

6+3 Channels PMU and Li-ion Battery Charger for DSC

Features

- 2.6V ~ 5.5V Input Voltage Operation.
- 95% Efficient DC/DC Converter
- Built-in 1-ch synchronous boost converter, 1-ch auto buck-boost converter, 3-ch synchronous buck converter, 1-ch WLED driver, 2-ch LDOs for CMOS image sensor, and 1-ch low quiescent current LDO for RTC.
- 31-steps brightness control by I^2C for WLED Driver
- Low Power consumption (Sleep Mode) < 10 μ A.
- Built-In Selectable Power ON/OFF Sequence for 4 Channels Synchronous Rectified Converter.
- Built-In Short Circuit Protection (SCP), Under Voltage Protection (UVP), and cycle-by cycle current limit for DC/DC Converters.
- Integrated Li-ion linear charger with dynamic power path function.
- Charge voltage and current control with JEITA compliant.
- Built-In Thermal Shutdown Function.
- Built-In Battery OVP Function.
- TQFN40 Package (5mmx5mm).

Applications

DSC and DV Power Supply

General Description

The G2206B provide a complete power supply solution for digital cameras. They improve performance, component count, and size compared to other multi-channel controllers in 1-cell Li-Ion. On-chip MOSFETs provide up to 92~95% efficiency for critical power supplies. All channels DC/DC operate at one fixed frequency of 1.5MHz/750KHz to optimize size, cost, and efficiency. All Synchronous converters operate at pulse skipping mode at light load. They also feature True-Shutdown as well as internal compensation to minimize external component count. The G2206B also provide Li-ion linear charger with dynamic power path control, and JEITA compliant. G2206B also has auto NTC-R 100k Ω /10k Ω detection circuit.

Ordering Information

ORDER NUMBER	MARKING	TEMP. RANGE	PACKAGE (Green)
G2206BRG1U	2206B	-40°C~+85°C	TQFN5X5-40

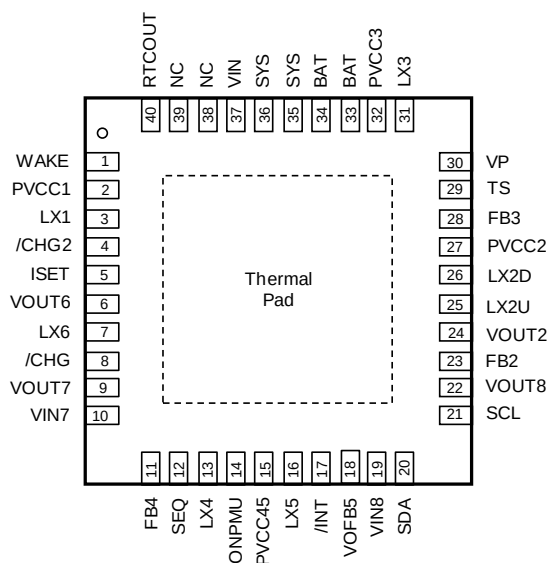
Note: RG:TQFN5x5-40

1: Bonding code

U: Tape & Reel

Green : Lead Free / Halogen Free.

Pin Configuration



G2206B TQFN5X5-40

Note: Recommend connecting the Thermal Pad to the Ground for excellent power dissipation.

Absolute Maximum Ratings

VIN -0.3V to +28V
 BAT, SYS, VCC, PVCC1, PVCC2, VOUT2, PVCC3, PVCC45, VIN7, VIN8. -0.3V to +6.3V
 VOUT6 -0.3V to +24V
 LX1,LX2D,LX2U,LX3,LX4,LX5(Spike Voltage<200ns)9V
 LX6 (Spike Voltage < 200ns). 27V
 FB2, FB3, FB4, VOFB5, ISET, VOUT7, VOUT8, RTCOU, VP -0.3V to +6.3V
 WAKE, /PG, /CHG, SEQ, ONPMU, /INT, SDA, SCL, TS, -0.3V to +6.3V
 Thermal Resistance Junction to Ambient, (θ_{JA})
 TQFN5X5-40 42°C/W⁽³⁾
 Continuous Power Dissipation ($T_A = +25^\circ\text{C}$)
 TQFN5X5-40 3250mW⁽³⁾

Thermal Resistance Junction to Case, (θ_{JC})

TQFN5X5-40 7°C/W
 Operation Ambient Temperature. -40°C to +85°C
 Storage Temperature Range -55°C to 150°C
 ESD (HBM) 4kV
 ESD (MM) 300V
 Reflow Temperature (soldering, 10sec) 260°C

Recommended Operation Conditions

VIN 4.5V to 5.5V
 BAT, SYS 2.8V to 5.5V
 PVCC2, PVCC3, PVCC45. 2.5V to 5.5V
 VIN7, VIN8. 1.5V to 3.3V
 Operating Ambient Temperature -40°C to 85°C
 Operating Junction Temperature 150°C

- Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.
- Device are ESD sensitive. Handling precaution recommended. The Human Body model is a 100pF capacitor discharged through a 1.5K Ω resistor into each pin.
- EVB G2206B Test

Electrical Characteristics

(SYS=VCC=PVCC1=PVCC2=PVCC3=PVCC45=3.6V, VOUT6=14V, $T_A=25^\circ\text{C}$, unless otherwise specified)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT
GENERAL						
VCC minimum Startup Voltage	VCC _{ST}		---	---	2.6	V
VCC Input Voltage Range	V _{CC}		2.6	---	5.5	V
VCC, SYS over voltage threshold	VCC _{OVL0}		5.6	5.8		V
Switch-Off Input Current	I _{VDD}	No Switching	---	2.2	2.4	mA
PMU Shutdown Current	I _{PMU_SD}	ONPMU=0	---	1	10	μA
OSCILLATOR						
Frequency	F _{OSC}	CH1/CH2/CH3/CH4/CH5	1.3	1.5	1.7	MHz
	F _{OSC2}	CH6	650	750	850	KHz
CH1 DC/DC Converter						
Soft-Start Internal	SS_CH1		---	6	---	mS
VO1 regulation voltage accuracy	VO1		-1.5	---	1.5	%
Maximum Duty Cycle	D _{maxCH1}	FB1=0.77V	90	93	96	%
PVCC1 Leakage Current	I _{PVCC1_LK}	V _{LX1} =0V, PVCC1=5.0V	---	1	5	μA
LX1 Leakage Current	I _{LX1_LK}	V _{LX1} =5.0V	---	1	5	μA
Switch ON Resistance	Ron1-N		---	125	---	m Ω
	Ron1-P		---	125	---	
Peak Current Limit	I _{LIM_CH1}		2.0	2.5	---	A
Under Voltage Protection Threshold	%V _{UVP_CH1}	Ratio=V _{UVP} /V _{OUT}	---	93.75	---	%
Short Circuit Protection threshold	%V _{SCP_CH1}	Ratio=V _{SCP} /V _{OUT}	---	12.5	---	%

Electrical Characteristics (continued)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT
CH2 DC/DC Converter						
Soft-Start Internal	SS_CH2		---	4	---	mS
FB2 pin Regulation Voltage	V _{FB2}	DICH2[2:0]=3'b100	0.788	0.80	0.812	V
Maximum Duty Cycle	D _{maxCH2}	FB2=0.77V DICH2[2:0]=3'b100	90	93	96	%
		LX2U LX2D	---	100	---	%
PVCC2 Leakage Current	I _{PVCC2_LK}	V _{LX2D} =0V, PVCC2=5.0V	---	1	5	μA
VO2 Leakage Current	I _{VO2_LK}	V _{LX2U} =0V, VO2=5.0V	---	1	5	μA
LX2D, LX2U Leakage Current	I _{LX2D_LK}	V _{LX2D} = V _{LX2U} =5.0V	---	1	5	μA
	I _{LX2U_LK}					
Switch ON Resistance	R _{on2-N}		---	125	---	mΩ
	R _{on2-P}		---	125	---	
Peak Current Limit	I _{LIM_CH2}		1.7	2.0	---	A
Under Voltage Protection Threshold	ΔV _{UVP_CH2}	ΔV _{UVP_CH2} = FB _{SET} -V _{FB_{UVP}}	---	50	---	mV
Short Circuit Protection threshold	V _{SCP_CH2}	FB2	---	0.1	---	V
CH3 DC/DC Converter , CH4 DC/DC Converter						
Soft-Start Internal	SS_CH3 SS_CH4			4		mS
FB3, FB4 pin Regulation Voltage	V _{FB3} , V _{FB4}	DICH3[2:0]=DICH4[2:0]=3'b100	0.788	0.80	0.812	V
FB3, FB4 pin Input Current	I _{FB3} I _{FB4}	FB3=FB4=0.8V	---	---	100	nA
Maximum Duty Cycle	D _{max}	FB3=FB4=0.77V DICH3[2:0]=DICH4[2:0]=3'b100	---	100	---	%
PVCC3, PVCC4 Leakage Current	I _{PV_LK}	V _{LX3} = V _{LX4} =0V, PVCC3=PVCC4=5.0V	---	1	5	μA
LX3, LX4 Leakage Current	I _{LXx_LK}	V _{LX3} = V _{LX4} =5.0V	---	1	5	μA
Switch ON Resistance	R _{on-N}		---	200	---	mΩ
	R _{on-P}		---	250	---	
Peak Current Limit	I _{LIM_CH34}		3.0	3.5	---	A
Under Voltage Protection Threshold	ΔV _{UVP_CH34}	ΔV _{UVP_CHx} = FB _{SET} -V _{FB_{UVP}}	---	50	---	mV
CH5 DC/DC Converter						
Soft-Start Internal	SS_CH5		---	4	---	mS
VO5 regulation voltage accuracy	VO5		-1.5	---	1.5	%
Maximum Duty Cycle	D _{max}	FB5=0.77V	---	100	---	%
PVCC5 Leakage Current	I _{PV_LK}	V _{LX5} =0V, PVCC5=5.0V	---	1	5	μA
LX5 Leakage Current	I _{LXx_LK}	V _{LX5} =5.0V	---	1	5	μA
Switch ON Resistance	R _{on5-N}		---	250	---	mΩ
	R _{on5-P}		---	250	---	
Peak Current Limit	I _{LIM_CH5}		1.3	1.5	---	A
Under Voltage Protection Threshold	ΔV _{UVP_CH5}	ΔV _{UVP_CH5} =0.8V-V _{FB_{UVP}}	---	50	---	mV
CH6 LED driver						
Soft-Start Internal	SS_CH6		---	10	---	mS
ISET pin Regulation Voltage	V _{ISET}	100% setting	0.237	0.25	0.263	V
Maximum Duty Cycle	D _{maxCH6}	ISET=0.2V, 100% setting,	90	93	96	%
LX6 Leakage Current	I _{LX7_LK}	LXLED=16V, VOLED=16V	---	1	5	μA
Switch ON Resistance	R _{on6-N}		---	400	---	mΩ
	R _{on6-P}		---	1000	---	mΩ
Peak Current Limit	I _{LIM_CH7}		---	1.1	---	A
Over Voltage Protection of VO6	V _{OVP6}	VOUT6 rising, LEDOVP=1'b1	22.5	24	---	V

Electrical Characteristics (continued)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT
CH7 LV LDO, CH8 LV LDO						
Input voltage range	V_{LDO1}		1.5	---	5.5	V
Soft-Start Internal	SS_LDO		---	2	---	mS
VOUT7, VOUT8 accuracy	$\%V_{LDO0}$	$I_o=100mA$,	-1.5	---	1.5	%
LDO Input Current	I_{LDO1}	VOUT7(8)=2.9V	---	---	75	μA
Dropout Voltage	V_{DOLDO1}	VOUT7(8)=2.8V, $I_o=300mA$	---	---	0.3	V
	V_{DOLDO2}	VOUT7(8)=1.0V, $I_o=300mA$	---	---	0.2	V
Output current limit	I_{LIM_LDO7}	VIN7=VOUT7+0.6V	300	---	---	mA
	I_{LIM_LDO8}	VIN8=VOUT8+0.5V	300	---	---	
LDO Load Regulation	$\%LD$	VIN7(8)=VOUT7(8)+0.5V, $I_o=1mA\sim 200mA$	---	---	0.5	%
Short Circuit Protection threshold	$\%V_{SCP_CH7}$ $\%V_{SCP_CH8}$	Ratio= V_{SCP}/V_{OUT}	---	12.5	---	%
RTC LDO						
Input voltage range (SYS)	V_{VINRTC}		---	---	5.5	V
Standby current	I_{Q1_RTC}	$V_{BAT}=4.2v$,	---	5	8	μA
Output voltage	V_{RTCO}	$I_o=0.1mA$, $V_{INRTC}=4.2v$	3	3.05	3.1	V
Dropout Voltage	V_{DO1_RTC}	$I_o=50mA$	---	---	1000	mV
	V_{DO2_RTC}	$I_o=3mA$	---	---	60	mV
Maximum Output Current		$V_{VINRTC}=4.2v$, $RTCO=95\%*V_{RTCO}$	60	---	200	mA
Wake Up Detect						
WAKE Impulse High Duration	T_{WAKEUP}	RTCO=3.05V	60	90	120	mS
WAKE Output	High level	RTCO=3.05V, $I_{SOURCE}=0.5mA$	---	RTCO -0.3V	RTCO	V
	Low level	RTCO=3.05V, $I_{SINK}=0.5mA$	0	0.3	---	V
BAT Wake Up Threshold Voltage	BAT_{WAKE}	RTCO=3.05V	3	3.15	3.3	V
VIN Wake Up Threshold voltage	VIN_{WAKE}	RTCO=3.05V	3.8	4	4.2	V
BAT Wake Up Deglitch Time	$t_{DGLBATWAKE}$		16	25	34	mS
VIN Wake Up Deglitch Time	$t_{DGLVINWAKE}$		16	25	34	mS
Logic Input						
ONPMU Input High Level Threshold	V_{HI}		1.4	---	---	V
ONPMU Input Low Level Threshold	V_{LO}		---	---	0.4	V

Charger Function

 (VIN=5.0V, BAT=4.0V, T_A=25°C, unless otherwise specified)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT
GENERAL						
VIN Under Voltage Lockout Threshold	VIN _{UVLO}	VIN = 0V to 4V	---	3.3	---	V
VIN Under Voltage Lockout Hysteresis	ΔVIN _{UVLO}	VIN = 4V to 0V	---	200	---	mV
VIN supply current	I _{SUPPLY}	I _{SY} =I _{BAT} =0mA, /ENCH=1'b0 (V _{BAT} >V _{REG1})	---	1	2	mA
		I _{SY} =I _{BAT} =0mA, /ENCH=1'b1 (V _{BAT} >V _{REG1})	---	0.8	1.5	mA
VIN suspend current	I _{USUS}	VIN=5V, USUS=1'b1	---	300	---	μA
VIN automatic shutdown threshold	ΔV _{ASDN}	VIN-BAT, VIN rising		200	300	mV
VIN automatic shutdown hysteresis	ΔV _{ASDNHS}	VIN-BAT, VIN falling	10	50	---	mV
Voltage Regulation						
VIN DPM Regulation voltage	V _{DPM}	VIN	4.3	4.4	4.5	V
SYS Regulation voltage	V _{SYS1}	VIN=5.2V, I _{SY} =800mA	4.8	4.9	5.0	V
SYS Regulation voltage in DPPM mode	V _{DPPM}	SYS	---	4.25	---	V
SYS Regulation voltage at Battery Supplement mode	ΔV _{SYS2}	BAT-SYS	---	30	---	mV
BAT Regulation voltage	V _{REG1}	Loading=20mA, /JEITA=1'b1, VSETH=1'b1, VSET2=1'b0	4.16	4.2	4.23	V
	V _{REG2}	Loading=20mA, /JEITA=1'b1, VSETH=1'b0, VSET2=1'b0	4.01	4.05	4.08	V
	V _{REG3}	Loading=20mA, /JEITA=1'b1, VSETH=1'b1, VSET2=1'b1	4.30	4.35	4.39	V
VIN to VSYS ON Resistance	R _{ON_IN}	I _{VIN} =1000mA	---	0.2	0.35	Ω
BAT to VSYS ON Resistance	R _{ON_BAT}	BAT=4.2V, I _{SY} =1A	---	0.05	0.1	Ω
Re-Charge Threshold	ΔV _{RECHG}	Battery re-charge threshold =V _{REGX} -ΔV _{RECHG}	60	100	140	mV
Current Regulation						
Fast Charge Current Setting Range	I _{CHG}		100	---	1200	mA
Fast Charge Current Accuracy	I _{CHG1}	ISETA=4'b0100	470	500	600	mA
	I _{CHG2}	ISETA=4'b1001	933	1000	1150	mA
VIN Current Limit	I _{IN_LIMIT1}	ISSET_IN[1:0]=2'b00	80	85	115	mA
	I _{IN_LIMIT2}	ISSET_IN[1:0]=2'b10	450	475	575	mA
	I _{IN_LIMIT3}	ISSET_IN[1:0]=2'b01	880	950	1150	mA
	I _{IN_LIMIT4}	ISSET_IN[1:0]=2'b11	1.2	1.5	2.2	A
Pre-Charge						
BAT Pre-charge Threshold	V _{PRECH}	BAT Rising	2.9	3.0	3.1	V
BAT Pre-charge Threshold Hysteresis	ΔV _{PRECH}		---	200	---	mV
Pre-Charge Current	I _{PRECHG}	BAT=2V, I _{PRECHG} /I _{CHG}	5	10	15	%
Charge Termination Detection						
Termination current Ratio to Fast Charge	I _{TERM1}	I _{CHG} >200mA	5	10	15	%
	I _{TERM2}	I _{CHG} ≤200mA	---	3.3	---	%
Logic INPUT/OUTPUT						
/CHG Pull Down Voltage	V _{/CHG}	I _{/CHG} =5mA	---	200	---	mV
/INT Pull Down Voltage	V _{/INT}	I _{/INT} =5mA	---	200	---	mV
/PG Pull Down Voltage	V _{/PG}	I _{/PG} =5mA	---	200	---	mV

Charger Function (continued)

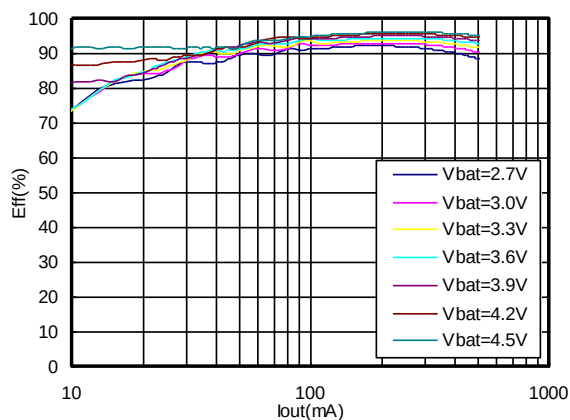
PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT
Protection						
Thermal Regulation	THM _{REG}		---	120	---	°C
Thermal Shutdown Temperature	THM _{SD}		---	155	---	°C
Thermal Shutdown Hysteresis	Δ THM _{SD}		---	20	---	°C
VIN Over Voltage Protection	VIN _{OVP}	VIN Rising	6.25	6.5	6.75	V
VIN Over Voltage Protection Hysteresis	Δ VIN _{OVP}	VIN=7V to 5V, VOVP -Δ VIN _{OVP}	---	350	---	mV
SYS Output Short Circuit Detection at VIN Power up	V _{SYS_SCP1}	VIN>VINUVLO & VIN>(BAT+ΔV _{ASDN})	1.1	1.2	1.3	V
SYS Output Short Circuit Detection Threshold at BAT Supplement Mode	V _{SYS_SCP2}	BAT-SYS	---	300	---	mV
Battery Installation Detection Threshold at TS	V _{NO_BAT}		---	90	---	% of VP
Time						
VIN PGOOD Deglitch Time	t _{PGOOD}	Time measured from VIN:0->5V 1μS rise-time to PGOOD Bit=H	---	1.875	---	mS
VIN Over Voltage Blanking Time	t _{VINOVP}		---	50	---	μS
Pre-Charge to Fast Charge Deglitch Time	t _{PF}		---	30	---	mS
Fast-Charge to Pre-Charge Deglitch Time	t _{FP}		---	30	---	mS
Termination Deglitch Time	t _{TERMI}		---	30	---	mS
Recharge Deglitch Time	t _{RECHG}		---	120	---	mS
Input power loss to SYS LDO Turn-Off Deglitch Time	t _{NO_VIN}		---	30	---	mS
Battery Installation Deglitch Time	t _{NO_BAT}		---	30	---	mS
NTC-R Detection Deglitch Time	t _{NTC-R}		---	30	---	mS
Pack Temperature Fault Detection Deglitch Time	t _{TS}		---	30	---	mS
SYS Output Short Circuit Deglitch Time at Battery Supplement Mode	t _{SYS_SCP}		---	250	---	μS
SYS Output Short circuit Recovery Time at Battery Supplement Mode	t _{SYS_SCP_R}		---	64	---	mS
Other						
VP regulation voltage	V _{VP}	V _{DPPM} =4.2V	3.234	3.3	3.366	V
VP Under Voltage Lockout Threshold			---	0.8	---	V
NTC						
Cold Temperature Trip Point(0°C)	V _{COLD}	NTC=100K	76	77	78	% of VP
		NTC=10K	71	72	73	
Hot Temperature Trip Point(60°C)	V _{HOT}	NTC=100K	28	29	30	% of VP
		NTC=10K	26	27	28	
Cool Temperature Trip Point(10°C)	V _{COOL}	NTC=100K	66	67	68	% of VP
		NTC=10K	62	63	64	
Warm Temperature Trip Point(45°C)	V _{WARM}	NTC=100K	35	36	37	% of VP
		NTC=10K	34	35	36	
Temperature Trip Point Hysteresis			---	1	---	% of VP

Charger Function (continued)

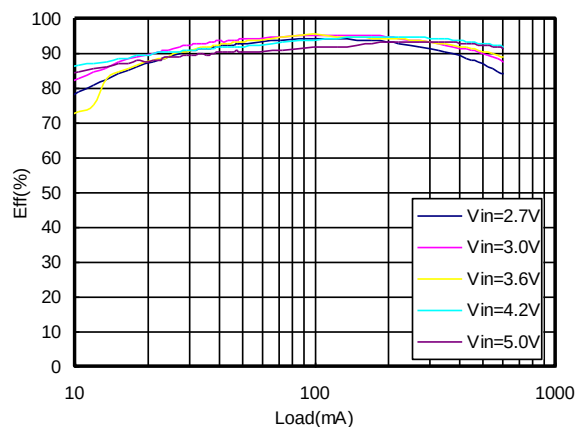
PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT
SMBus Interface						
Logic Input High Voltage		SCL, SDA	2	---	---	V
Logic Input Low Voltage		SCL, SDA	---	---	0.5	V
Logic Input Current		Logic inputs forced to VCC or GND	-2	---	2	μA
SMBus Input Capacitance		SCL, SDA	---	5	---	pF
SMBus Clock Frequency			---	---	400	kHz
SCL Clock Low Time	t_{LOW}	t_{LOW} , 10% to 10% points	1.3	---	---	μS
SCL Clock High Time	t_{HIGH}	t_{HIGH} , 90% to 90% points	0.6	---	---	μS
SMBus Start-Condition Setup Time			0.6	---	---	μS
SMBus Repeated Start-Condition Setup Time	$t_{SU: STA}$	90% to 90% points	0.6	---	---	μS
SMBus Start-Condition Hold Time	$t_{HD: STA}$	10% of SDA to 90% of SCL	0.6	---	---	μS
SMBus Stop-Condition Setup Time	$t_{SD: STO}$	90% of SCL to 10% of SDA	0.6	---	---	μS
SMBus Data Valid to SCL Rising-Edge Time	$t_{SU: DAT}$	10% or 90% of SDA to 10% of SCL	100	---	---	nS
SMBus Data-Hold Time	$t_{HD: DAT}$		300	---	---	nS
Rise Time of SCL/SDA signals	t_r	10% to 90% points	20	---	300	nS
Fall Time of SCL/SDA signals	t_f	90% to 10% points	20	---	300	nS
SMBus free time between a STOP and START condition	t_{BUF}		1.3	---	---	μS
Set-up time for STOP condition	$t_{SU: STO}$		0.6	---	---	μS

Typical Performance Characteristics
($T_A=25^{\circ}\text{C}$, unless otherwise specified)

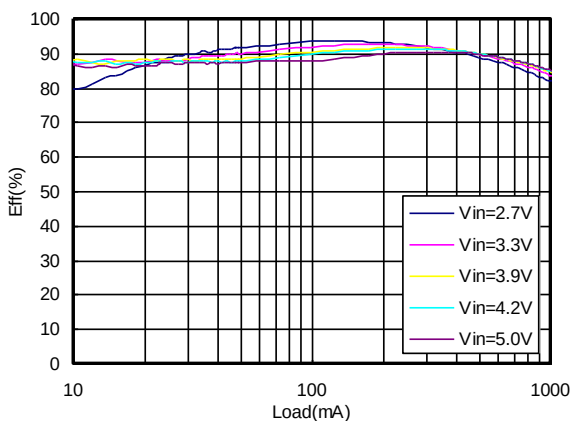
**CH1 Step-Up Efficiency vs.
Output Current**



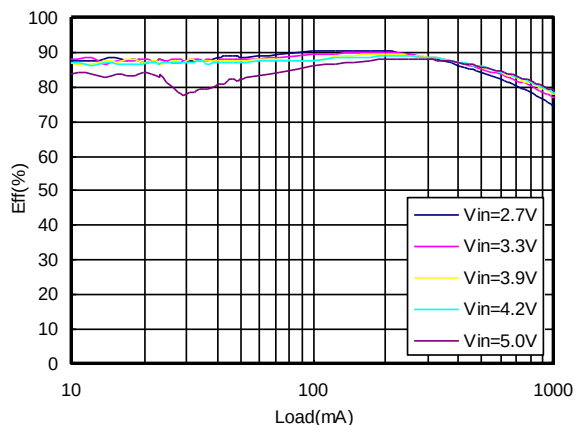
**CH2 Step-Up/Down Efficiency vs.
Output Current**



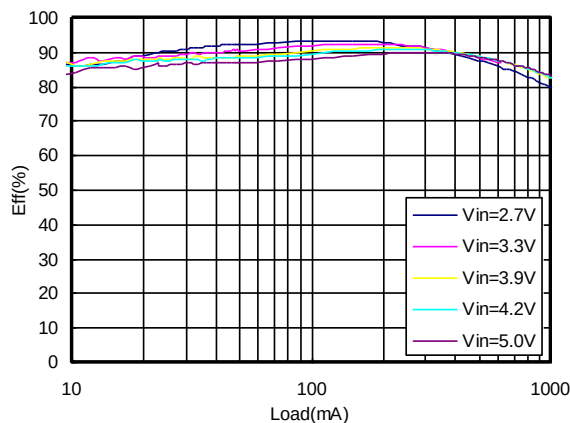
**CH3 Step-Down Efficiency vs.
Output Current**



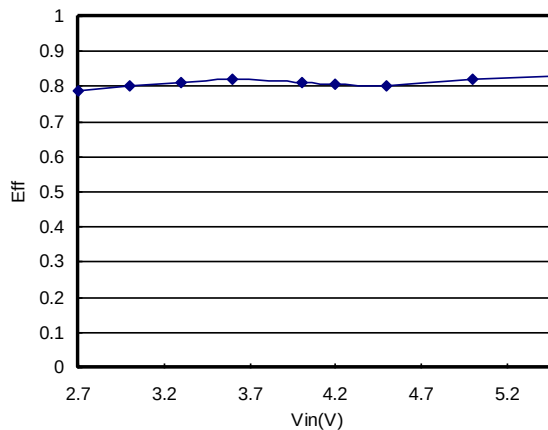
**CH4 Step-Down Efficiency vs.
Output Current**



**CH5 Step-Down Efficiency vs.
Output Current**

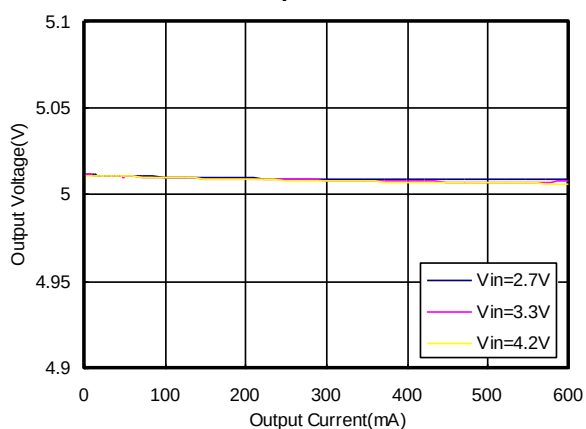


**CH6 Efficiency vs.
Input Voltage**

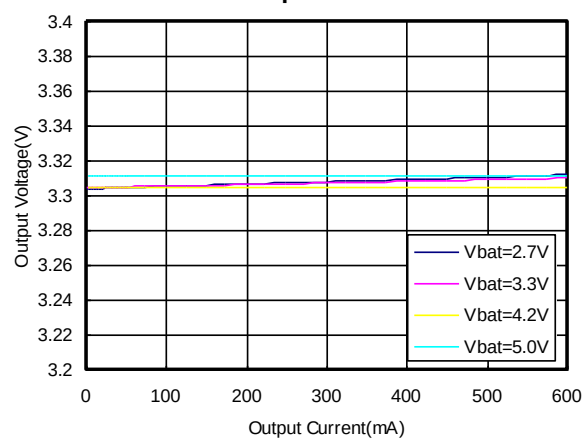


Typical Performance Characteristics (continued)

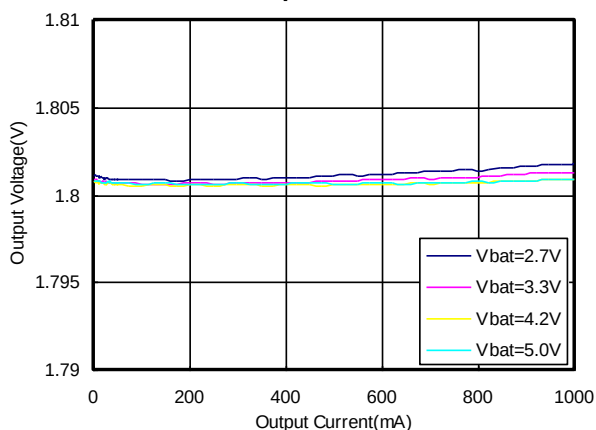
CH1 Step-Up Output Voltage vs. Output Current



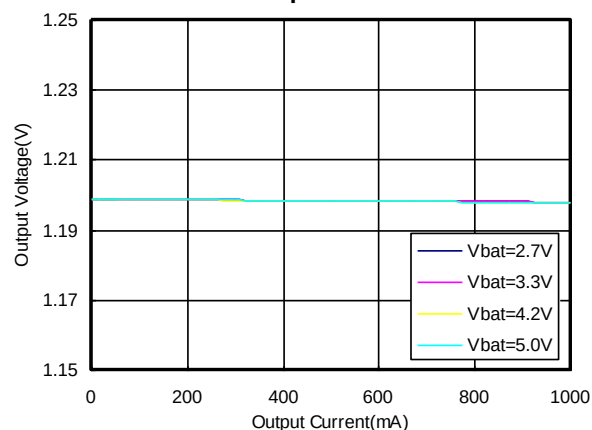
CH2 Step-Up/Down Output Voltage vs. Output Current



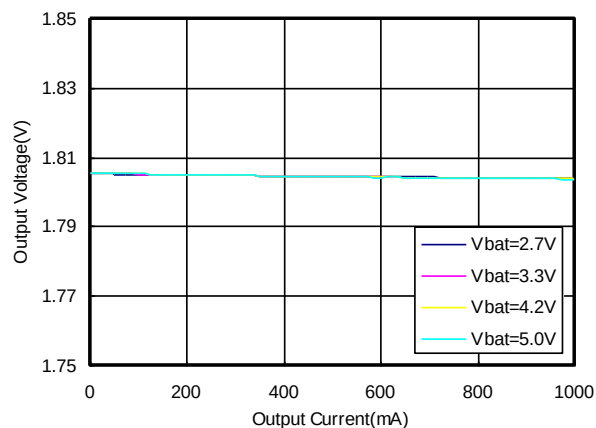
CH3 Step-Up Output Voltage vs. Output Current



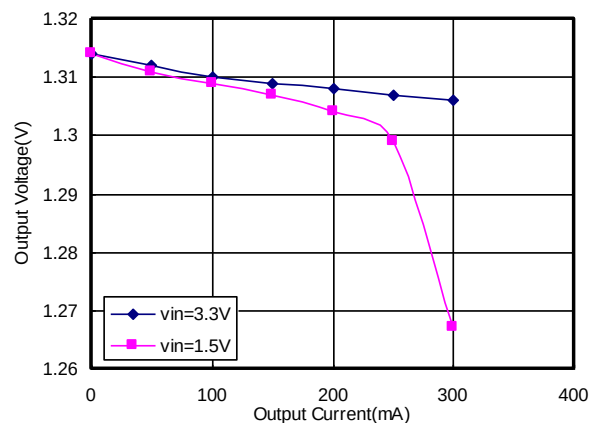
CH4 Step-Up Output Voltage vs. Output Current



CH5 Step-Up Output Voltage vs. Output Current

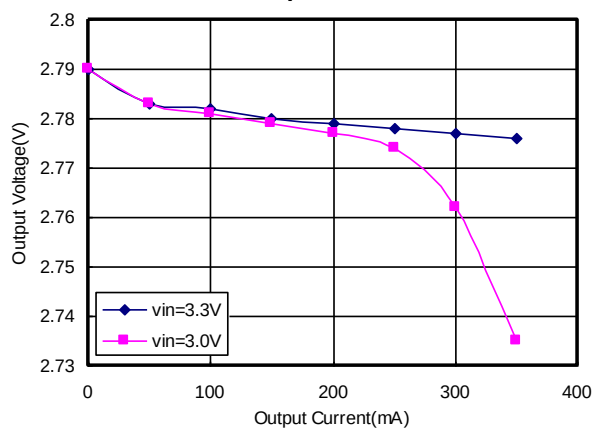


CH7 LDO Output Voltage vs. Output Current

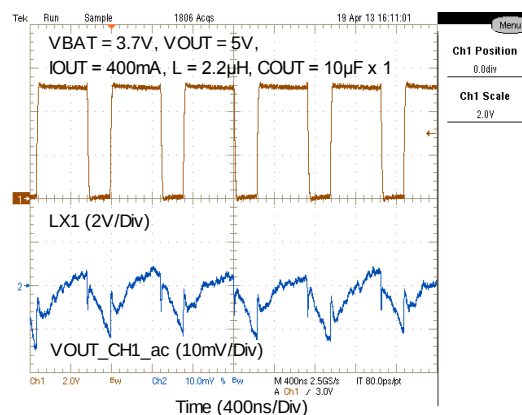


Typical Performance Characteristics (continued)

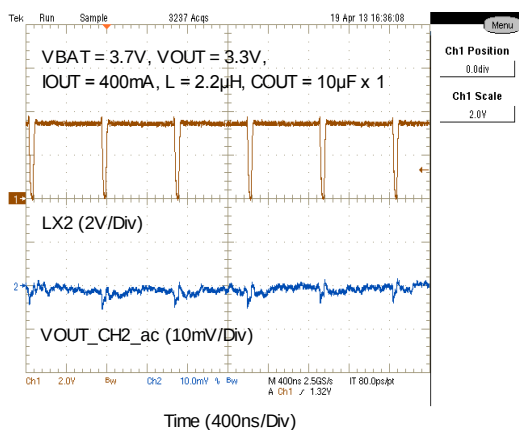
CH8 LDO Output Voltage vs.
Output Current



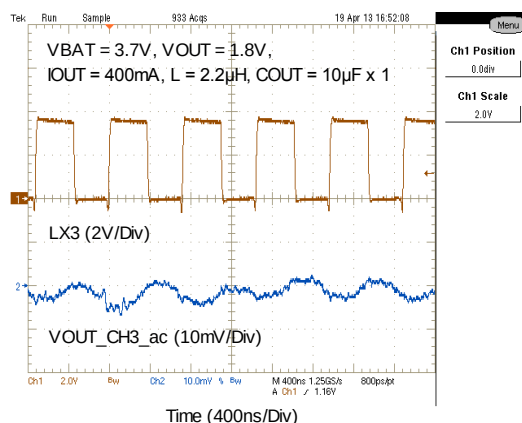
CH1 Output Voltage Ripple



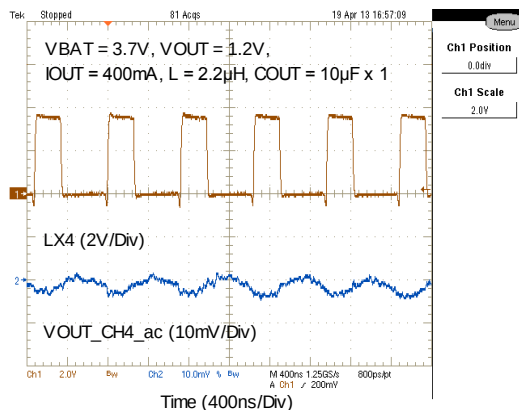
CH2 Output Voltage Ripple



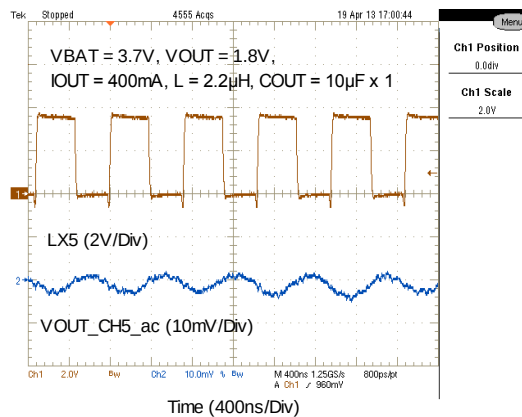
CH3 Output Voltage Ripple

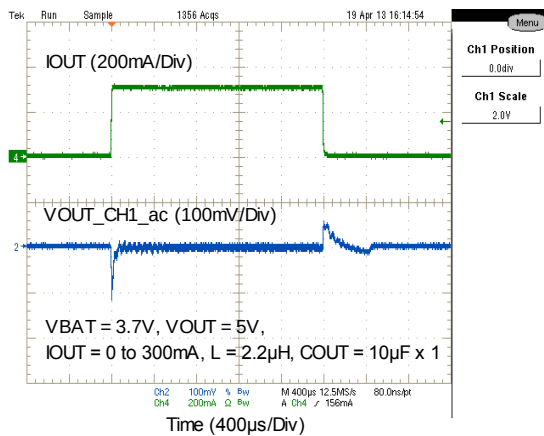
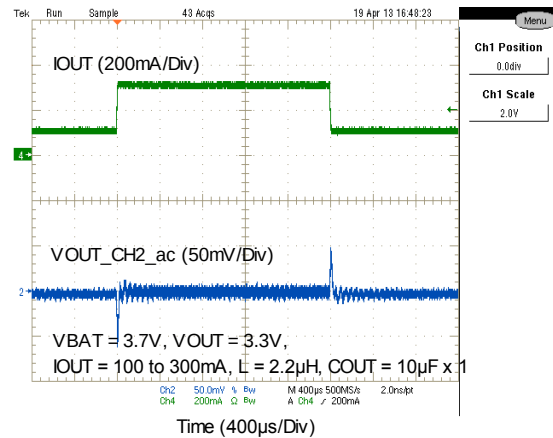
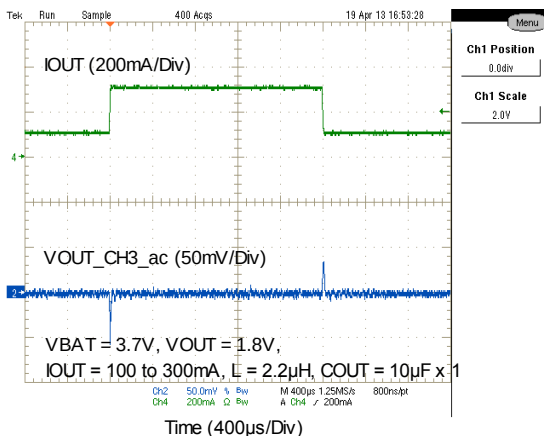
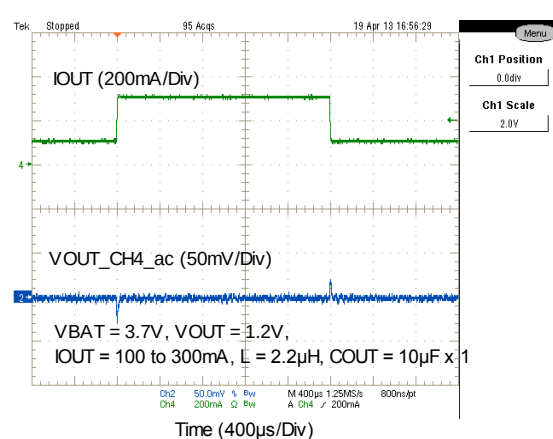
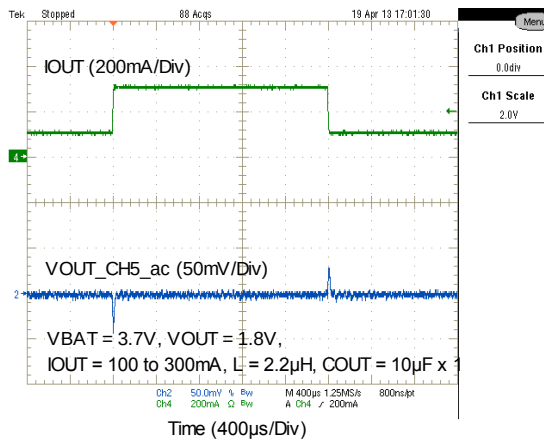
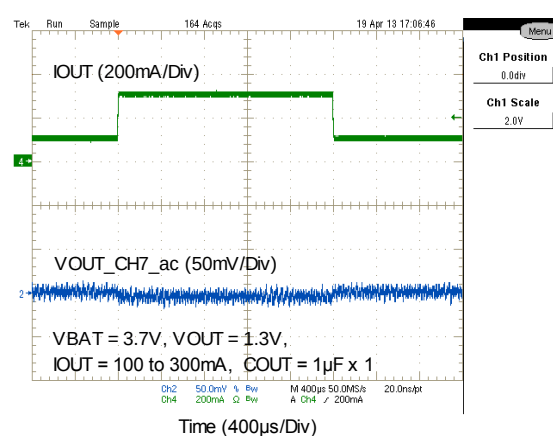


CH4 Output Voltage Ripple



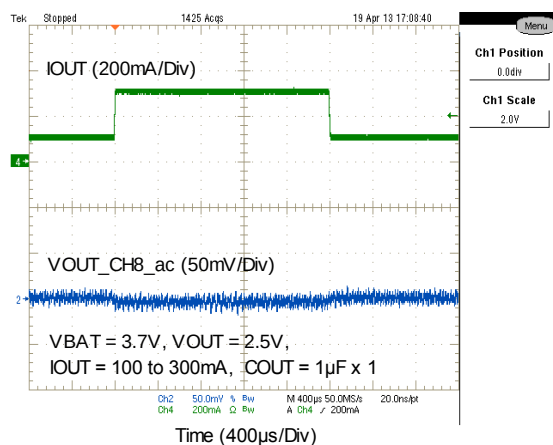
CH5 Output Voltage Ripple



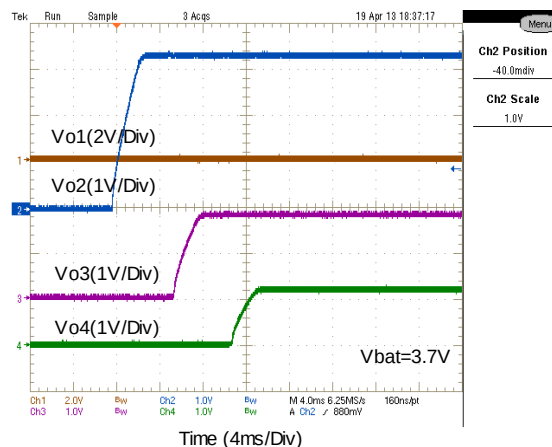
Typical Performance Characteristics (continued)
CH1 Load Transient Response

CH2 Load Transient Response

CH3 Load Transient Response

CH4 Load Transient Response

CH5 Load Transient Response

CH7 Load Transient Response


Typical Performance Characteristics (continued)

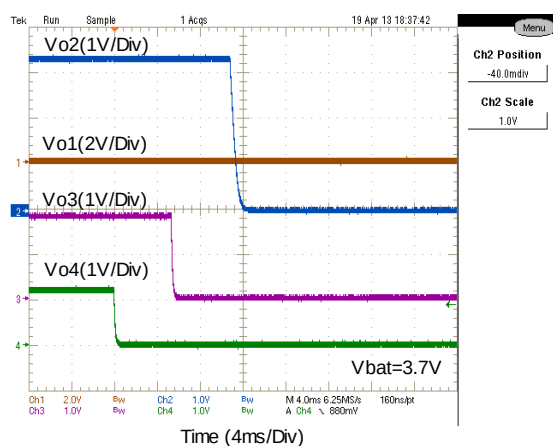
CH8 Load Transient Response



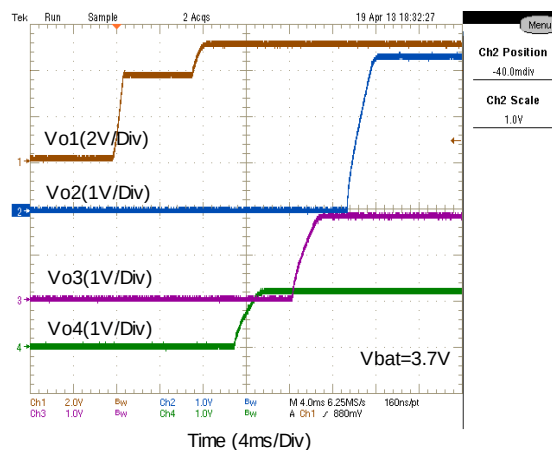
Power On Sequence R=0ohm



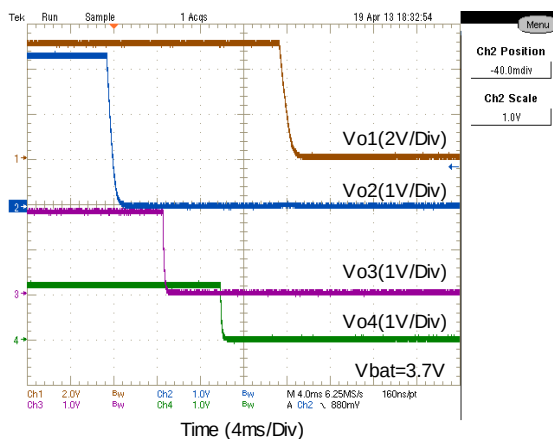
Power Off Sequence R=0ohm



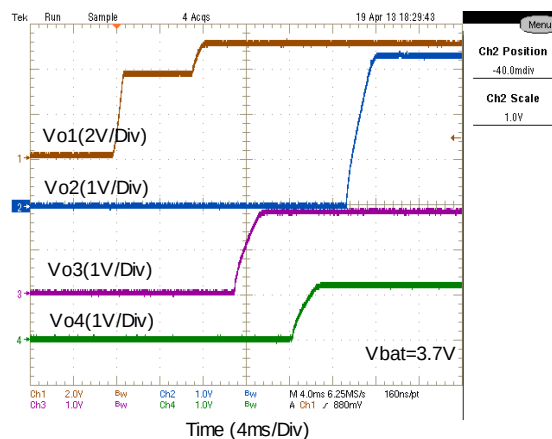
Power On Sequence R=0.63Kohm



Power Off Sequence R=0.63Kohm

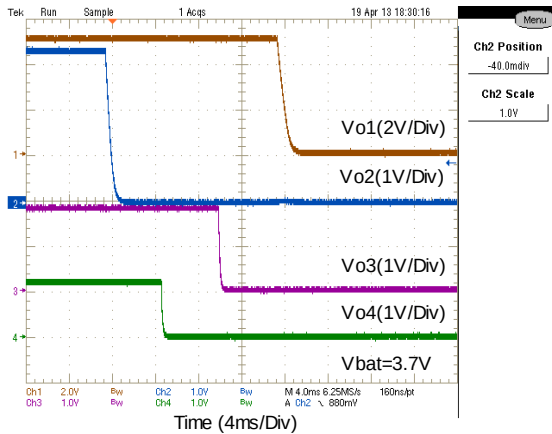


Power On Sequence R=10Kohm

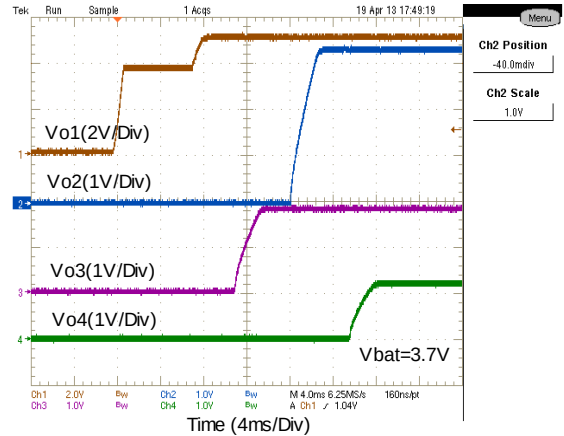


Typical Performance Characteristics (continued)

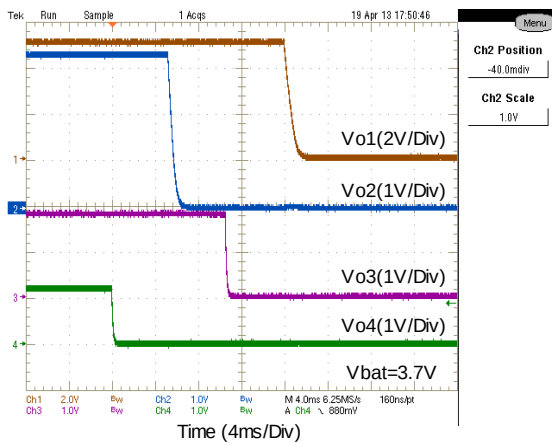
Power Off Sequence R=10Kohm



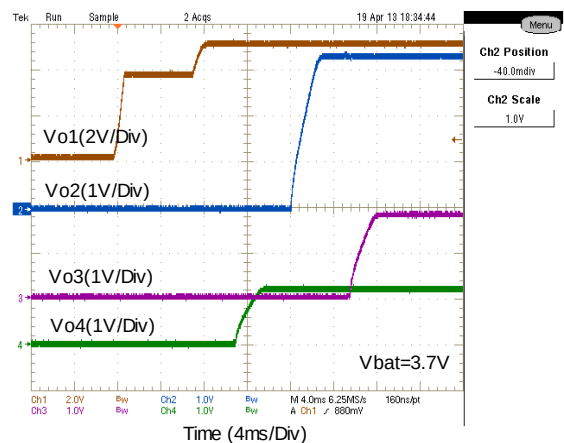
Power On Sequence R=40Kohm



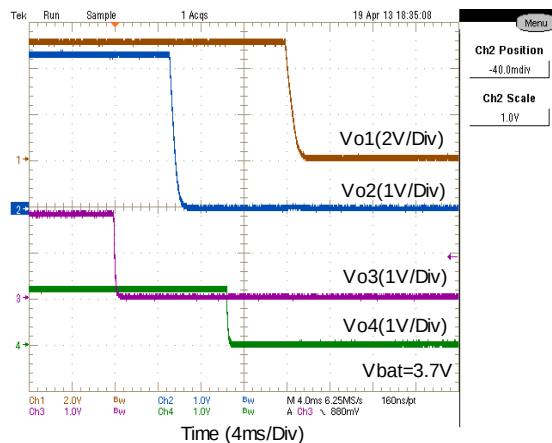
Power Off Sequence R=40Kohm



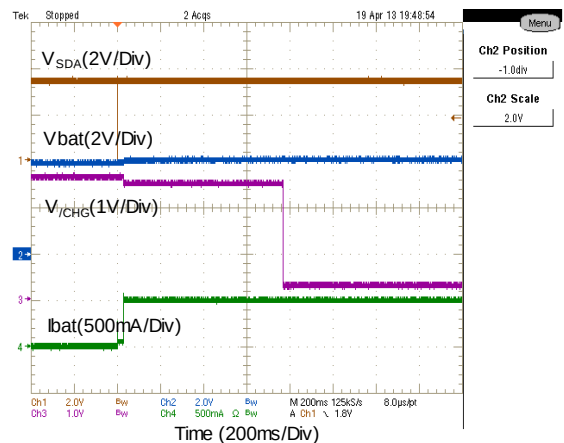
Power On Sequence R=160Kohm



Power Off Sequence R=160Kohm

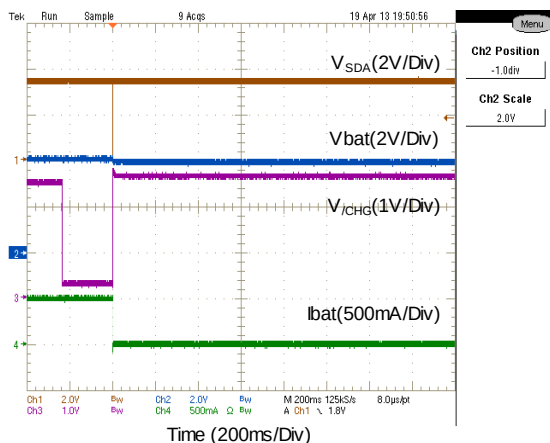


Charge On Control by I2C

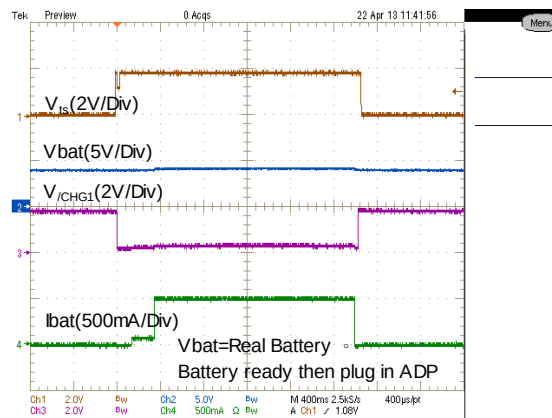


Typical Performance Characteristics (continued)

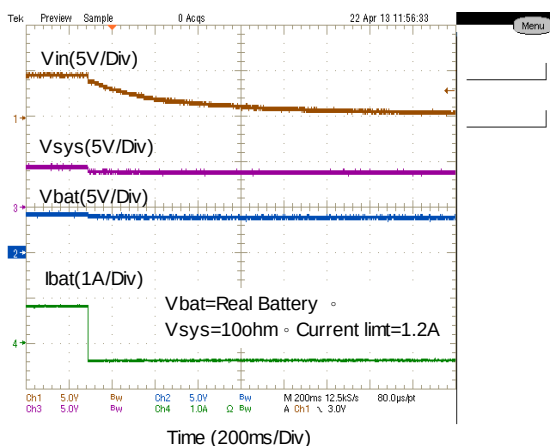
Charge Off Control by I2C



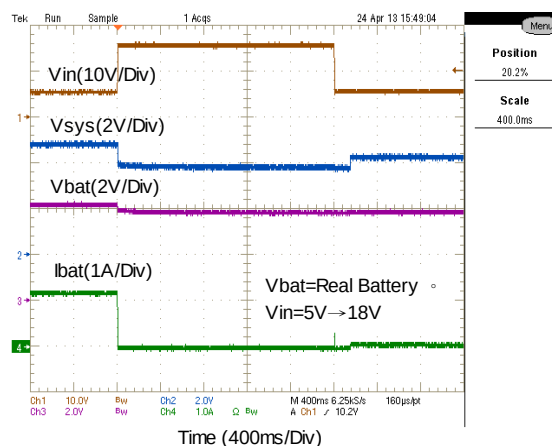
VTS On/Off



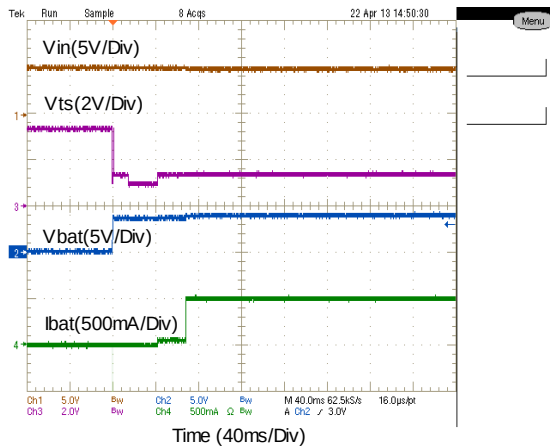
VIN Removal



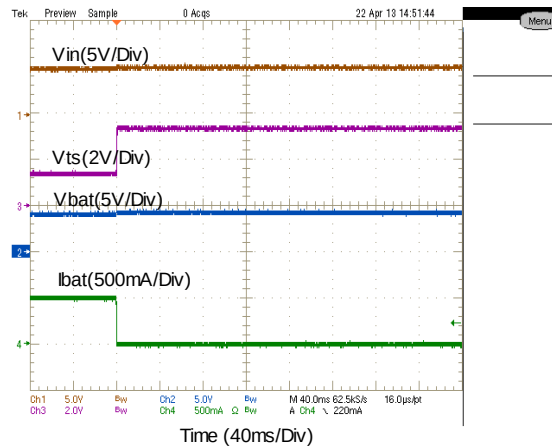
VIN Over Voltage Protection



Battery with NTC Resistor Plug-In

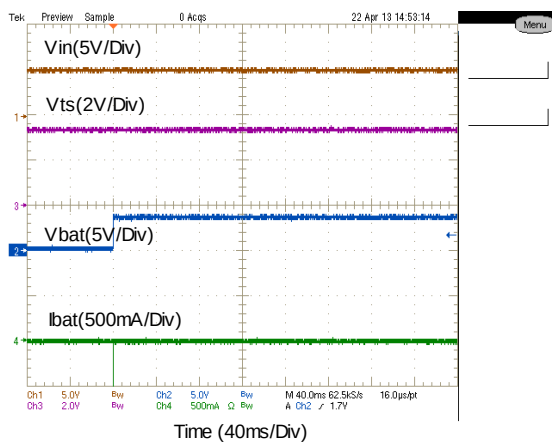


Battery with NTC Resistor Plug-Out

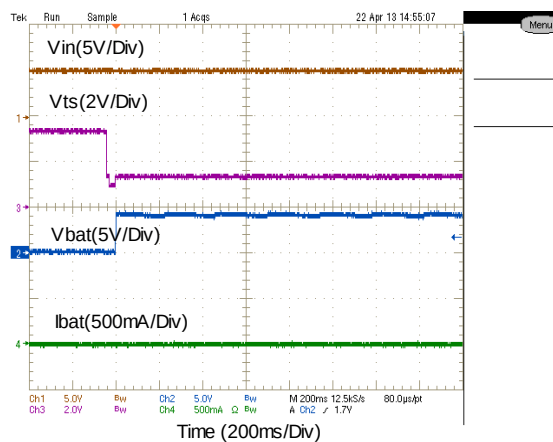


Typical Performance Characteristics (continued)

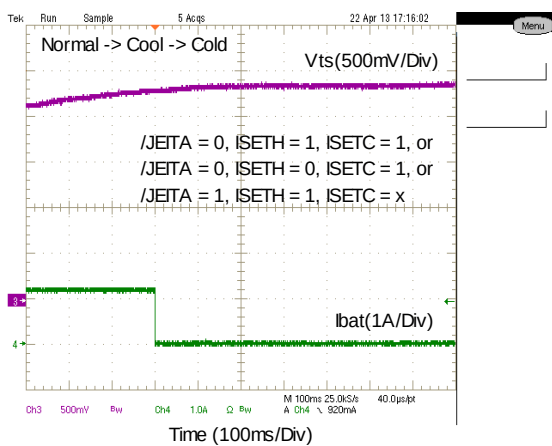
With Battery without NTC Resistor



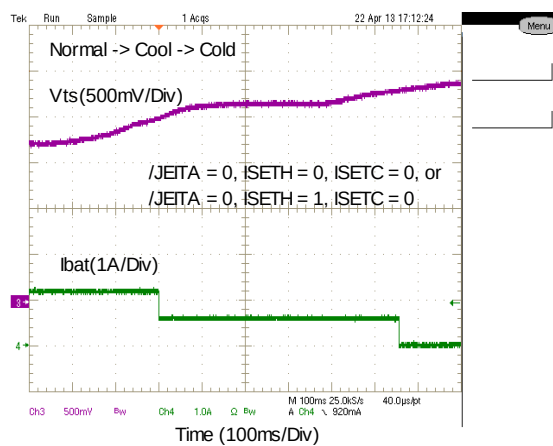
With NTC Resistor without Battery



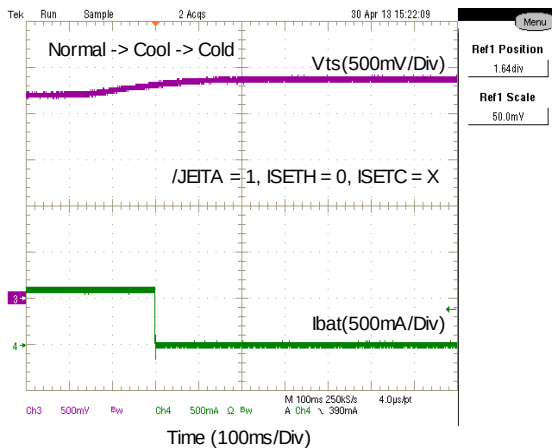
The Temperature of Battery Status



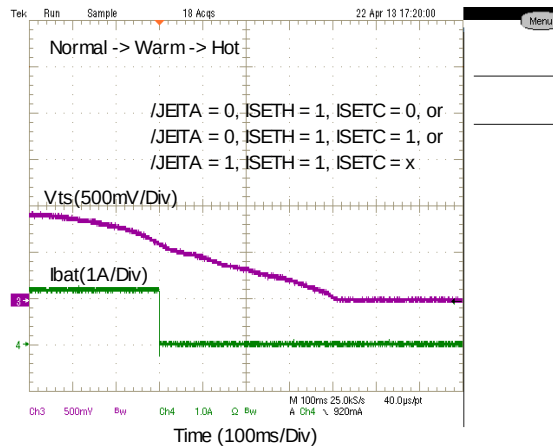
The Temperature of Battery Status



The Temperature of Battery Status

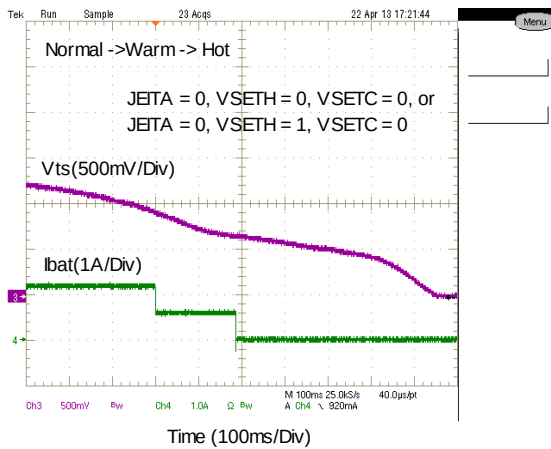


The Temperature of Battery Status

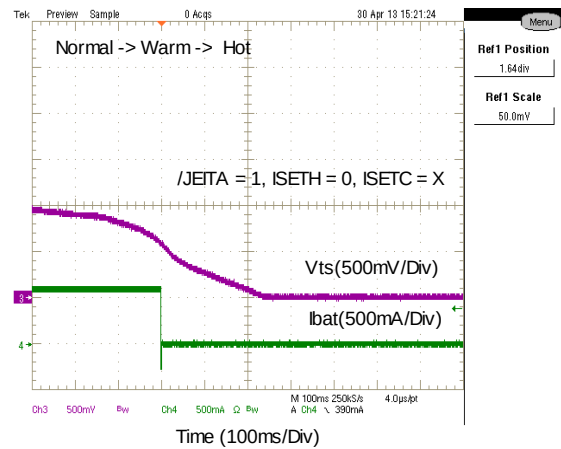


Typical Performance Characteristics (continued)

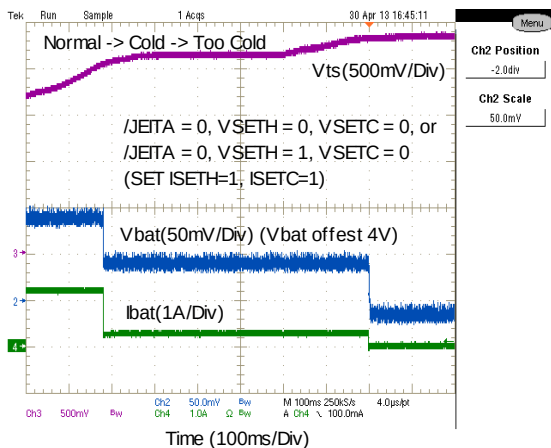
The Temperature of Battery Status



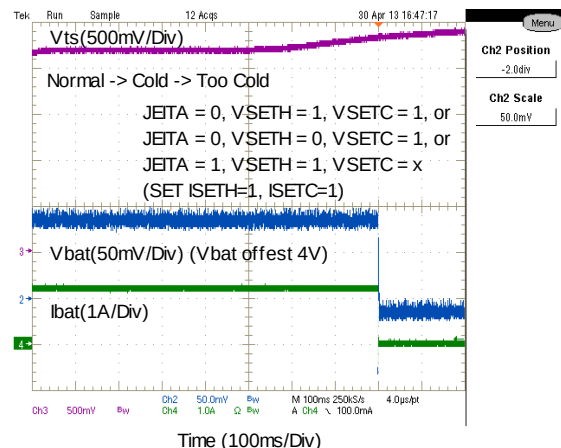
The Temperature of Battery Status



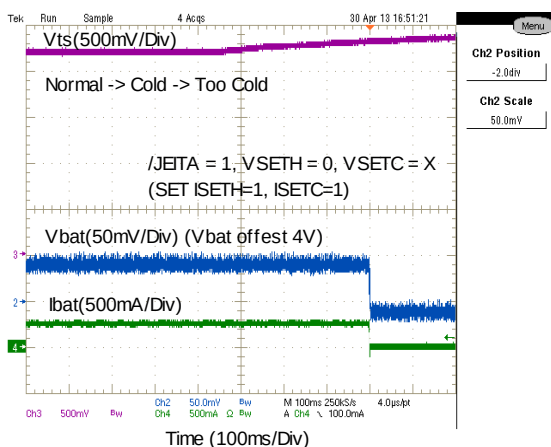
The Temperature of Battery Status



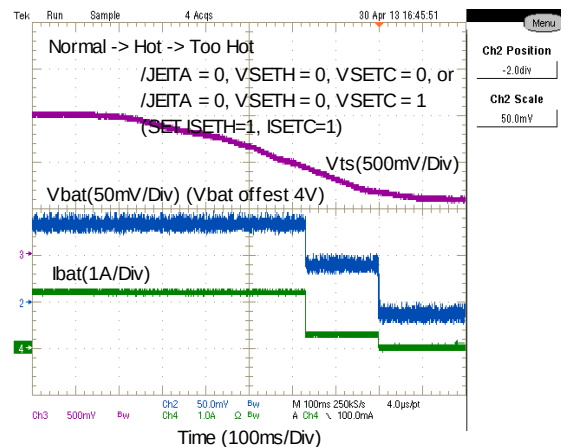
The Temperature of Battery Status



The Temperature of Battery Status

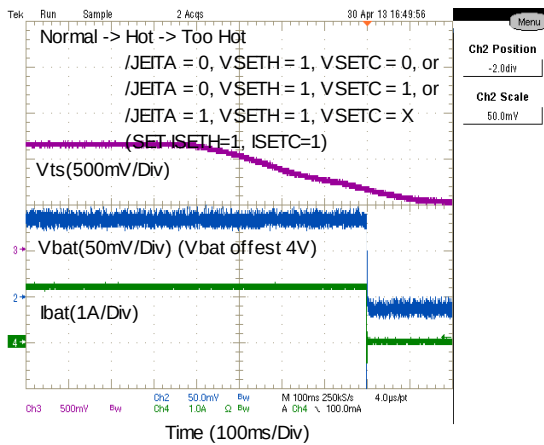


The Temperature of Battery Status

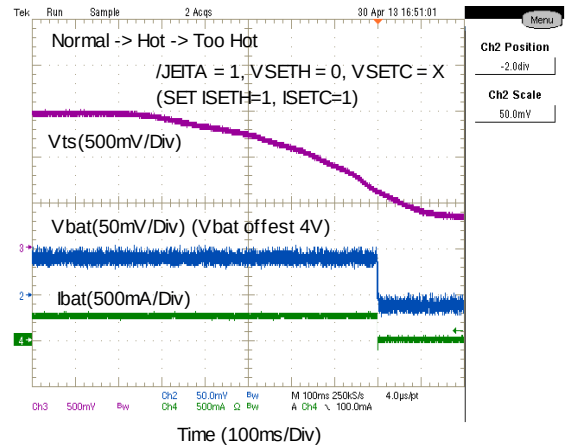


Typical Performance Characteristics (continued)

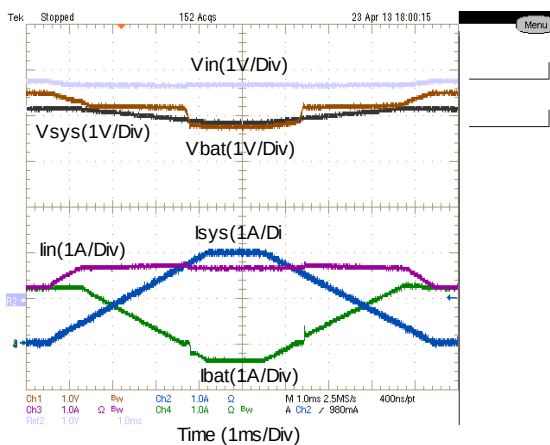
The Temperature of Battery Status



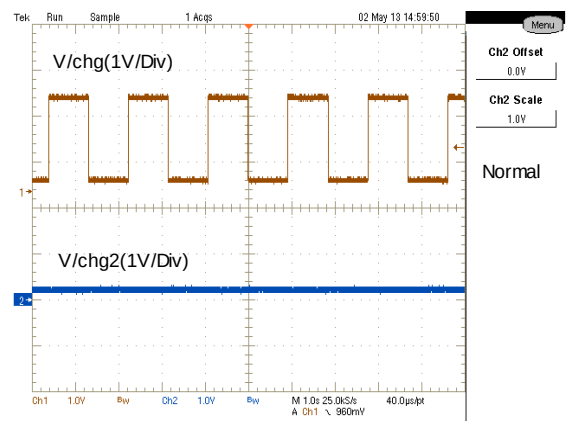
The Temperature of Battery Status



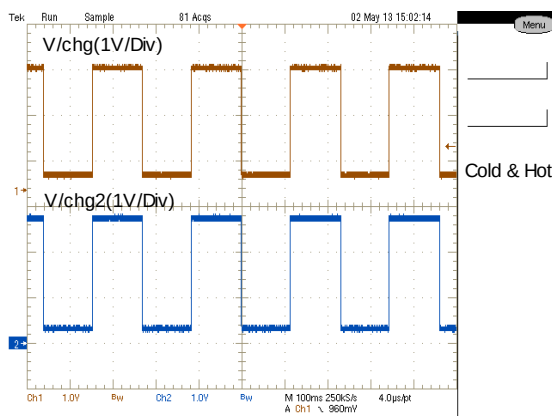
DPPM



/Charge single control when charging

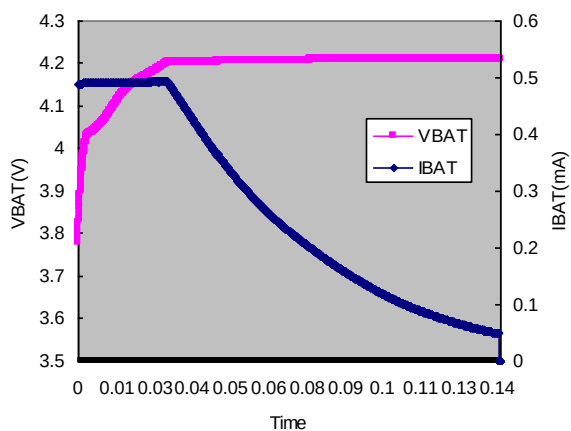


/Charge single control when charging

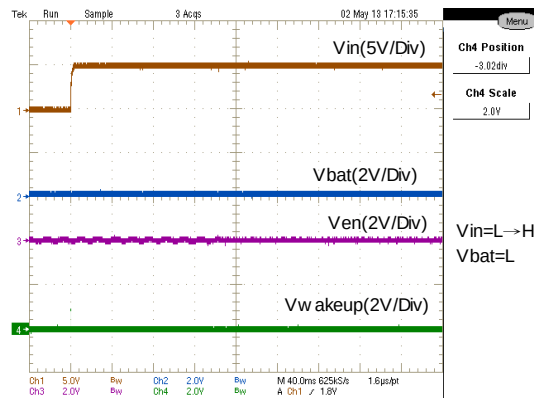


Typical Performance Characteristics (continued)

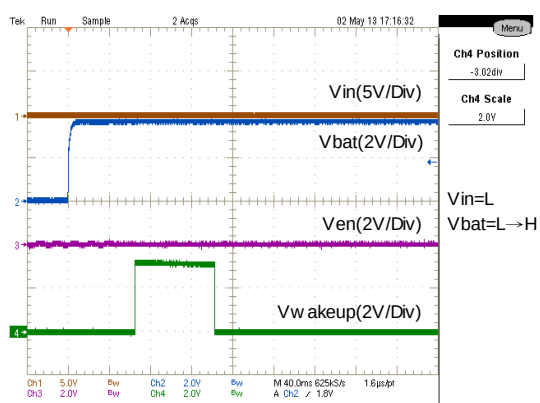
Battery Charge Cycle



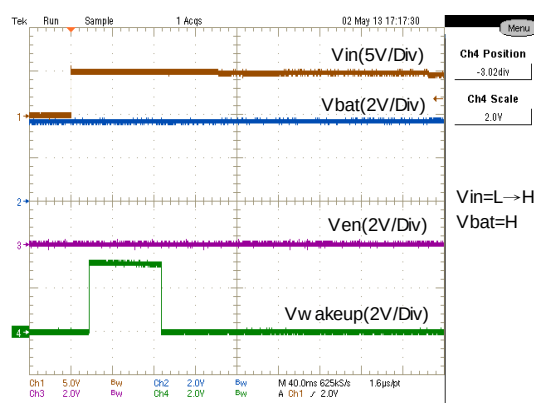
Wake Up Function(ONPMU=Ven=L)



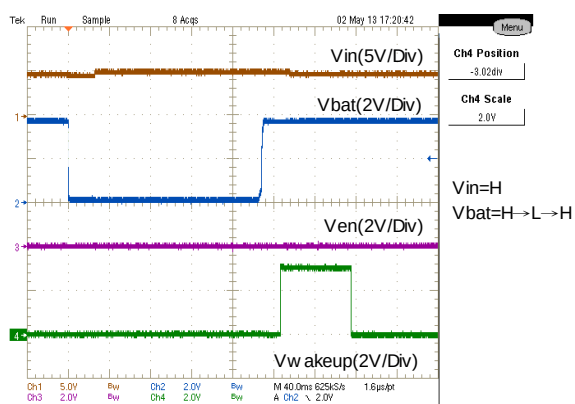
Wake Up Function(ONPMU=Ven=L)



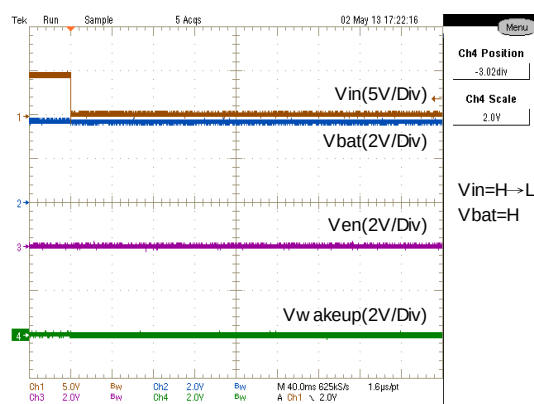
Wake Up Function(ONPMU=Ven=L)



Wake Up Function(ONPMU=Ven=L)

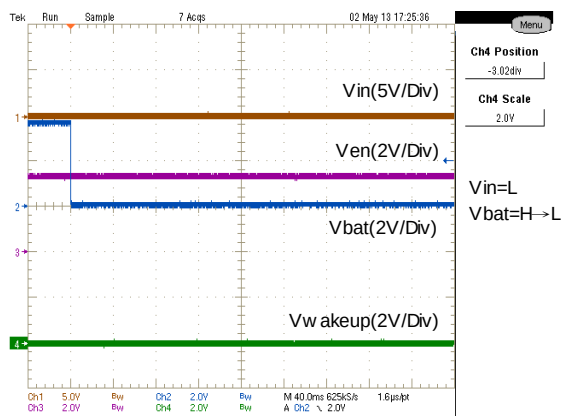


Wake Up Function(ONPMU=Ven=L)

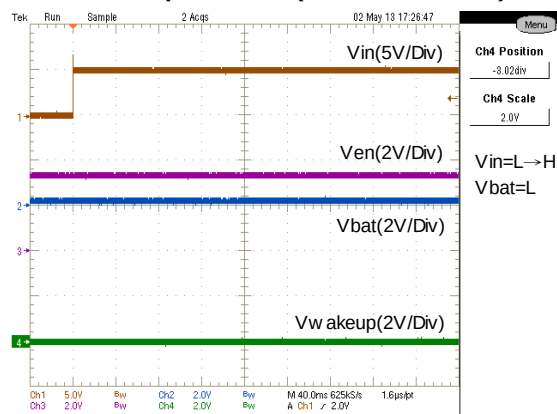


Typical Performance Characteristics (continued)

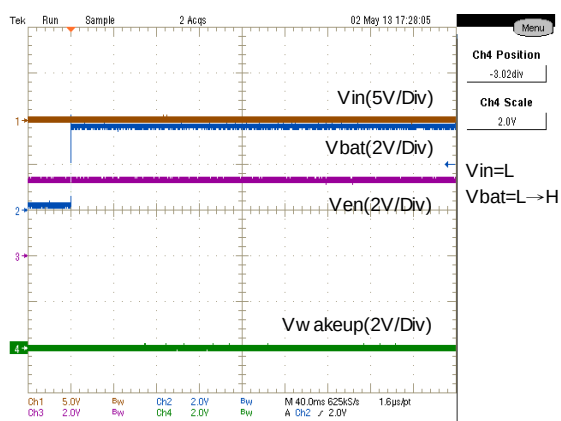
Wake Up Function(ONPMU=Ven=H)



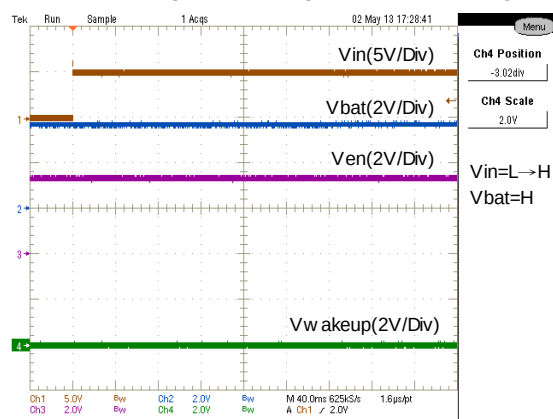
Wake Up Function(ONPMU=Ven=H)



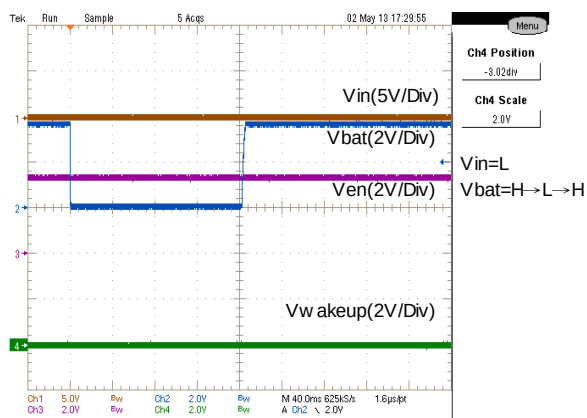
Wake Up Function(ONPMU=Ven=H)



Wake Up Function(ONPMU=Ven=H)

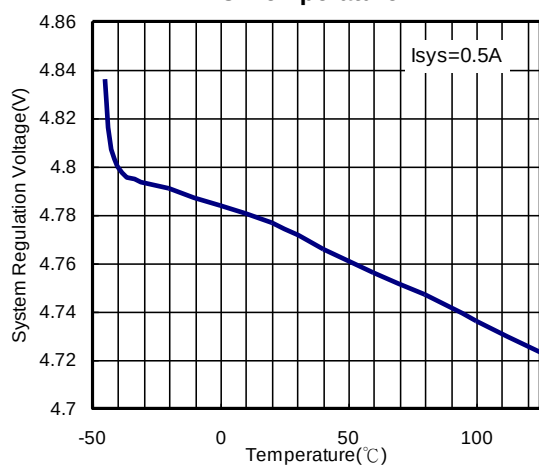


Wake Up Function(ONPMU=Ven=H)

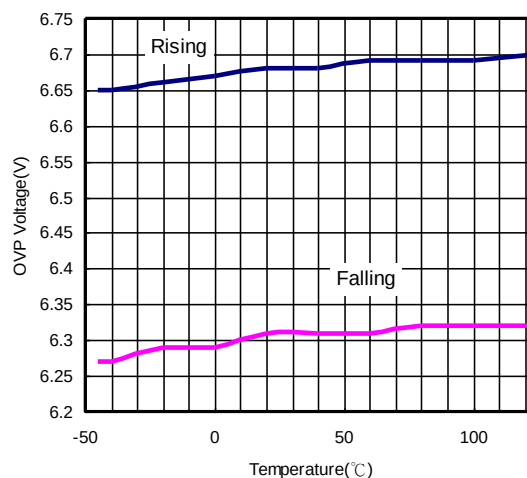


Typical Performance Characteristics (continued)

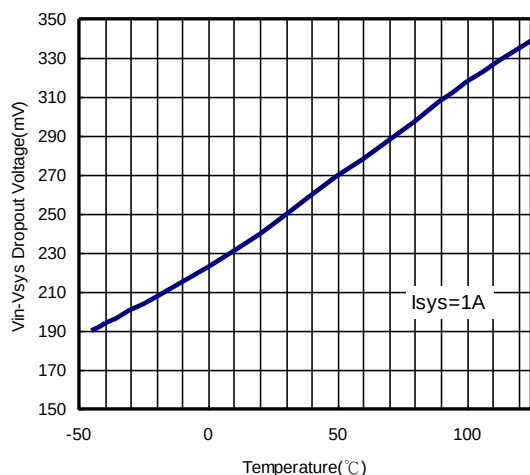
**System Regulation Voltage
vs. Temperature**



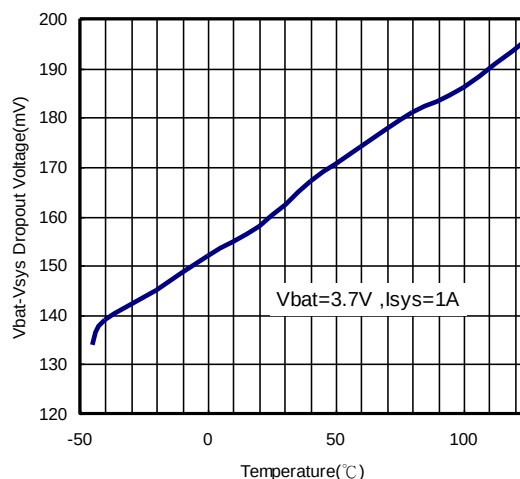
**OVP Theshold Voltage
vs. Temperature**



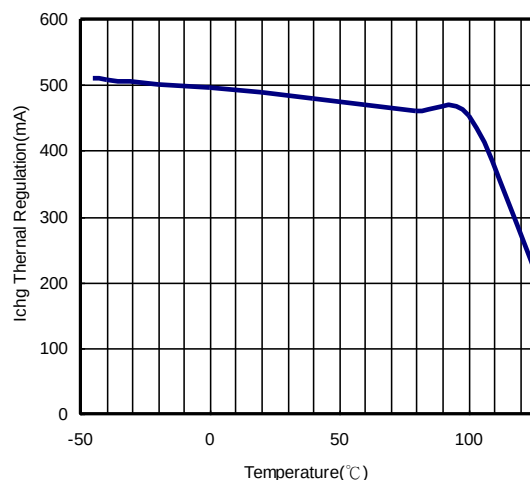
**Vin-Vsys Dropout Voltage
vs. Temperature**



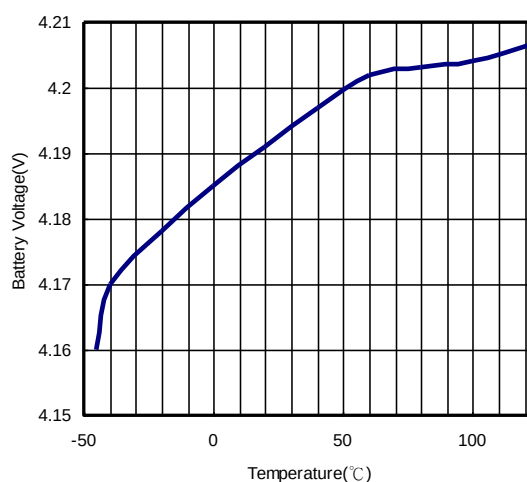
**Vbat-Vsys Dropout Voltage
vs. Temperature**



**Ichg Thermal Regulation
vs. Temperature**

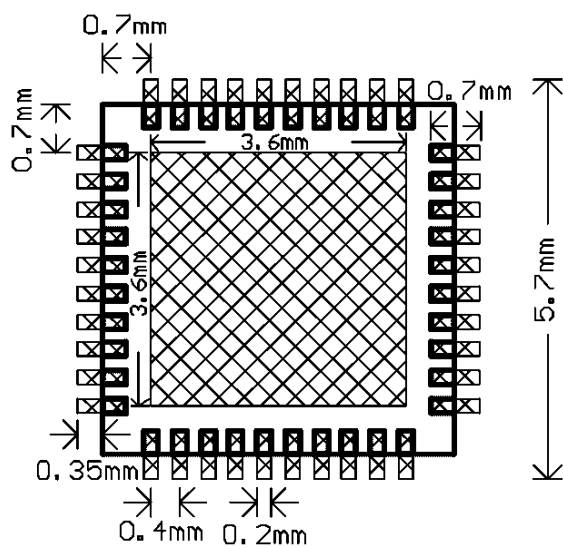


**Battery Regulation Voltage
vs. Temperature**



Minimum Footprint PCB Layout Section

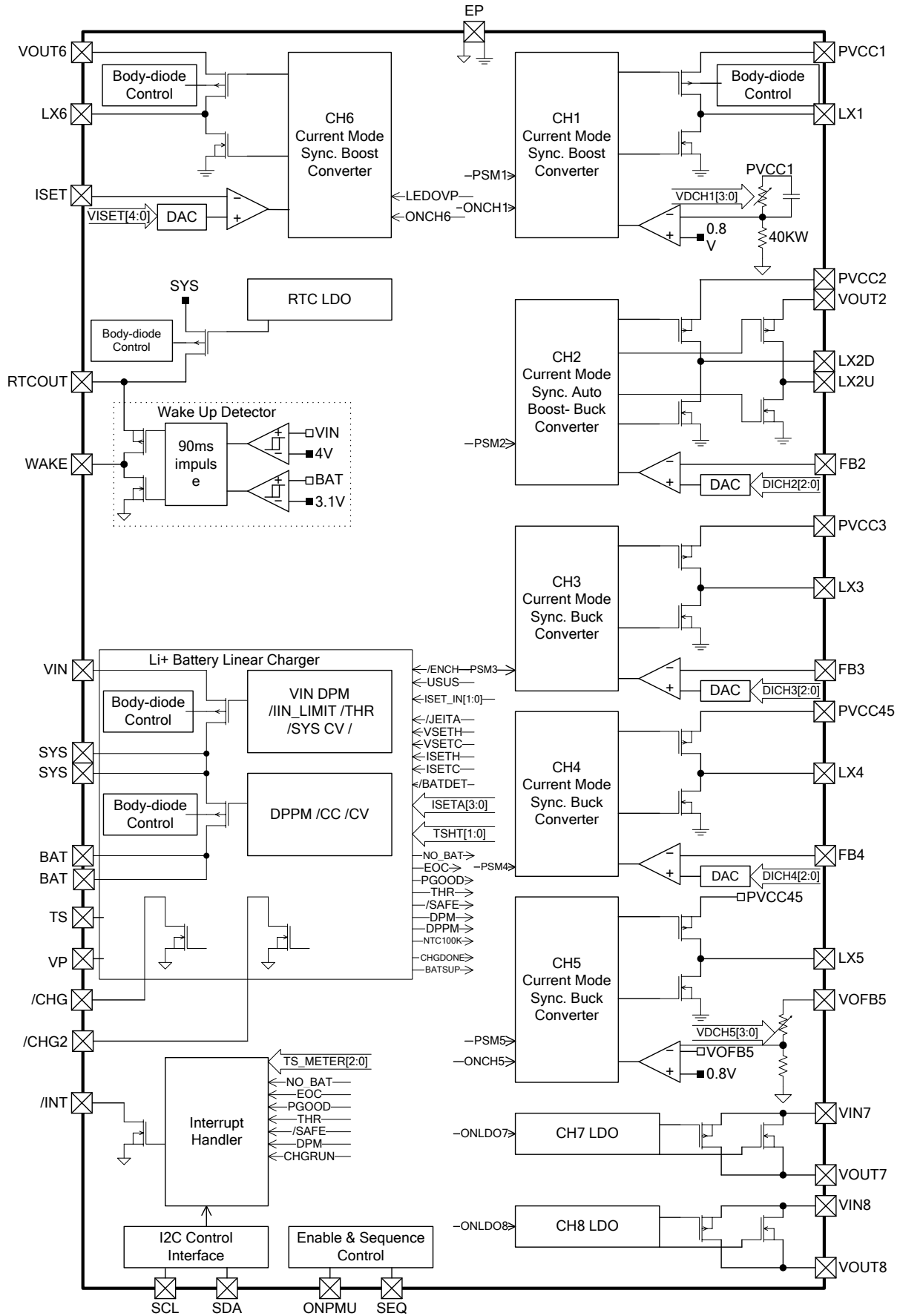
TQFN5X5-40



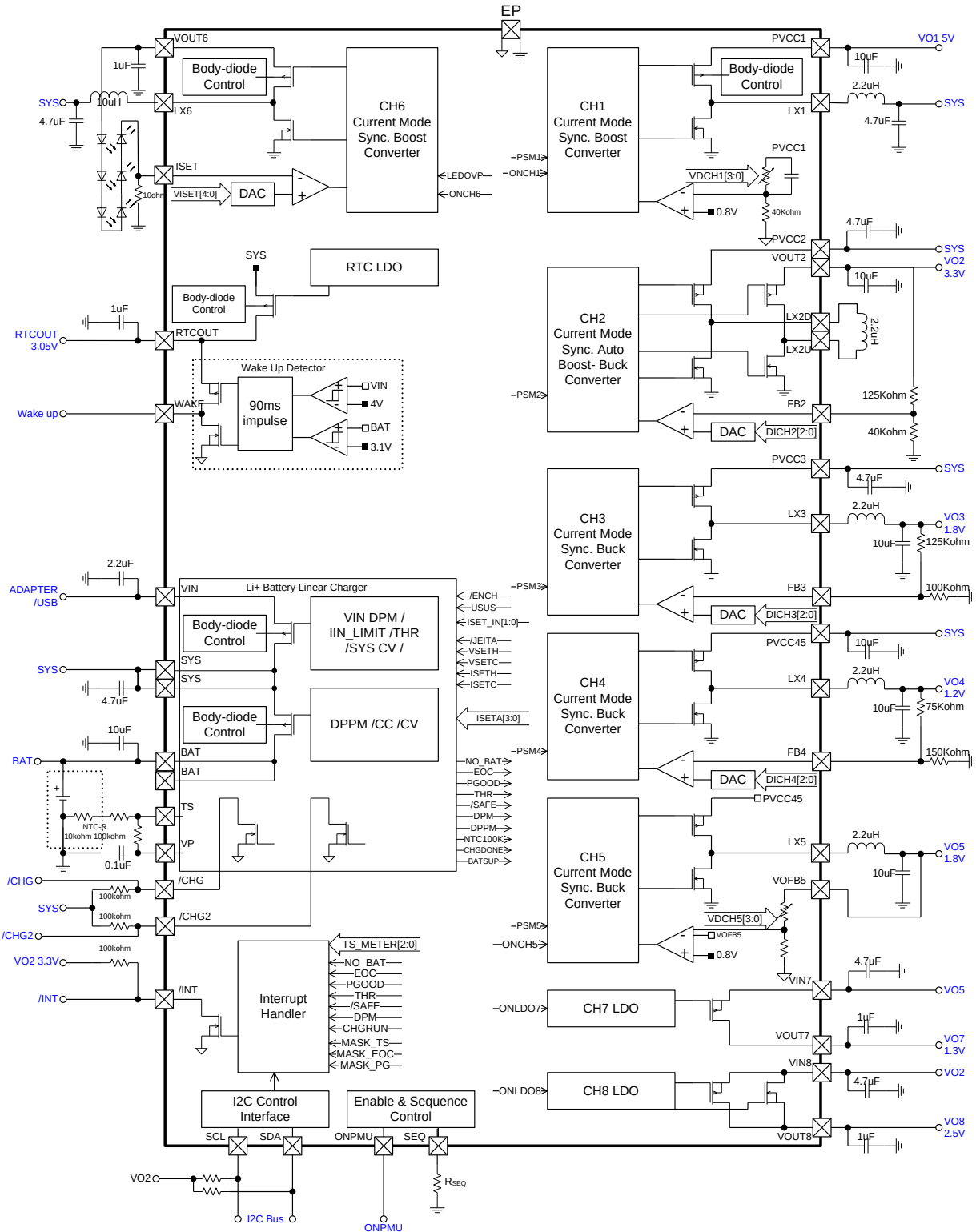
Pin Description

Pin No	Pin Name	Function
1	WAKE	Wake-up impulse push-pull output.
2	PVCC1	Power Output of CH1 Boost Converter
3	LX1	Inductor switch node CH1 Boost Converter.
4	/CHG2	2 nd Charger status with open drain output.
5	ISSET	LED current setting of CH6 LED Driver
6	VOUT6	Power output of CH6 LED Driver.
7	LX6	Inductor switch node of CH6 LED Driver.
8	/CHG	Charger status with open drain output.
9	VOUT7	LDO Output of CH7 LDO
10	VIN7	Power Input of CH7 LDO
11	FB4	Feedback Input of CH4 Buck Converter.
12	SEQ	Input Pin of Power Sequence Selection.
13	LX4	Inductor switch node of CH4 Buck Converter.
14	ONPMU	Enable PIN of PMU.
15	PVCC45	Power Input of CH4 and CH5 Buck Converter.
16	LX5	Inductor switch node of CH5 Buck Converter.
17	/INT	Interrupt Indicator with open drain output. If any toggle of events of JEITA Temperature, battery installed, end of charging, VIN power good, thermal regulation, safety timer expired, VIN DPM, power source detection happen, the output /INT goes low.
18	VOFB5	Power Feedback of CH5.
19	VIN8	Power Input of CH8 LDO
20	SDA	Data Input PIN of I ² C interface.
21	SCL	Clock Input PIN of I ² C interface.
22	VOUT8	LDO Output of CH8 LDO
23	FB2	Feedback Input of CH2 Buck-Boost Converter.
24	VOUT2	Power Output of CH2 Buck-Boost Converter
25	LX2U	Inductor switch node CH2 Buck-Boost Converter.
26	LX2D	Inductor switch node CH2 Buck-Boost Converter.
27	PVCC2	Power Input of CH2 Buck-Boost Converter
28	FB3	Feedback Input of CH3 Buck Converter.
29	TS	Battery Temperature Sense.
30	VP	Power output 3.3V buffer for battery temperature sense.
31	LX3	Inductor switch node of CH3 Buck Converter.
32	PVCC3	Power Input of CH3 Buck Converter.
33,34	BAT	Battery Charger current output. Bypass with a 10uF capacitor for stability.
35,36	SYS	System Supply output. Bypass with a 4.7uF or greater capacitor.
37	VIN	Adapter Power or USB Power Input. Bypass with a 4.7uF or greater capacitor.
38,39	NC	No Connection
40	RTCOUT	RTC power output.
EP	AGND, PGNDX	All converters' power ground and chip analog ground. For good thermal dissipation, connect EP to the power and analog ground plane.

Block Diagram



Application circuit

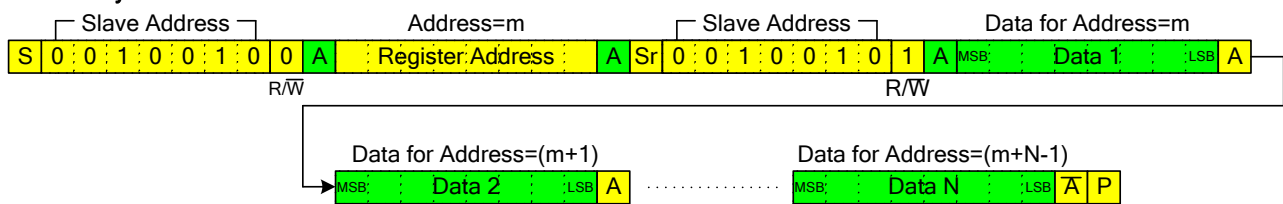


I2C Interface

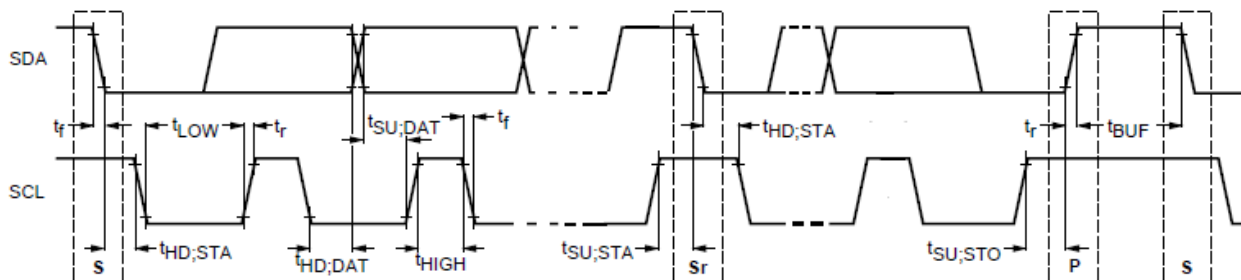
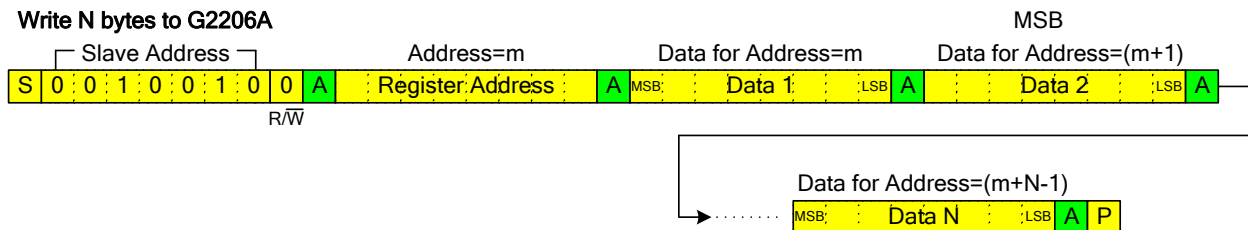
G2206B I2C slave address=7'b0010010. The write or read bit stream (N≥1) is shown below:

- S Driven by Master
- S Start
- A Driven by G2206A
- P Stop
- Sr Repeat Start

Read N bytes from G2206A



Write N bytes to G2206A



I2C Register Map

Address	Byte Name		Data							
			b7	b6	b5	b4	b3	b2	b1	b0
00h	A0	Meaning	PMURST	CHGRST	LEDOVP	PSM5	ENDPM	TSD	MOD6	TSSEL
		Default	1	0	0	1	0	0	1	1
		Read/Write	R/W	R/W	R/W	R/W	R/W	R	R	R/W
01h	A1	Meaning	ERR1	ERR2	ERR3	ERR4	ERR5	ERR6	ERR7	ERR8
		Default	0	0	0	0	0	0	0	0
		Read/Write	R	R	R	R	R	R	R	R
02h	A2	Meaning	ONCH5	ONLDO7	ONLDO8	VISET[4:0]				
		Default	0	0	0	0	0	0	0	0
		Read/Write	R/W	R/W	R/W	R/W	R/W	R/W	R/W	R/W
03h	A3	Meaning	PSM1	PSM2	PSM3	PSM4	VDLDO8[3:0]			
		Default	1	1	1	1	1	1	0	0
		Read/Write	R/W	R/W	R/W	R/W	R/W	R/W	R/W	R/W
04h	A4	Meaning	VDCH1[3:0]				ONCH1	DICH2[2:0]		
		Default	1	0	1	0	0	1	0	0
		Read/Write	R/W	R/W	R/W	R/W	R/W	R/W	R/W	R/W
05h	A5	Meaning	FLST	DICH3[2:0]			FLST2	DICH4[2:0]		
		Default	1	1	0	0	1	1	0	0
		Read/Write	R/W	R/W	R/W	R/W	R/W	R/W	R/W	R/W
06h	A6	Meaning	VDCH5[3:0]				VDLDO7[3:0]			
		Default	1	0	0	0	0	0	1	1
		Read/Write	R/W	R/W	R/W	R/W	R/W	R/W	R/W	R/W
07h	A7	Meaning	TIMER[3:0]				/ENCH	USUS	ISET_IN[1:0]	
		Default	0	1	0	0	0	0	1	0
		Read/Write	R/W	R/W	R/W	R/W	R/W	R/W	R/W	R/W
08h	A8	Meaning	TSHT[1:0]		reserved	CHGSTEN2	ISETA[3:0]			
		Default	0	0	0	1	0	0	0	0
		Read/Write	R/W	R/W	R/W	R/W	R/W	R/W	R/W	R/W
09h	A9	Meaning	/JEITA	VSETH	VSETC	ISETH	ISETC	CHGSTEN	INT	DPM
		Default	0	0	0	0	0	1	0	0
		Read/Write	R/W	R/W	R/W	R/W	R/W	R/W	R/W	R
0Ah	A10	Meaning	TS_METER[2:0]			NO_BAT	EOC	PGOOD	THR	/SAFE
		Default	0	0	0	0	0	0	0	0
		Read/Write	R	R	R	R	R	R	R	R
0Bh	A11	Meaning	reserved	reserved	reserved	VSET2	reserved	reserved	reserved	reserved
		Default	0	0	0	0	0	0	0	0
		Read/Write	R	R	R	R	R	R	R	R
0Ch	A12	Meaning	DPPM	NTC100K	CHGDONE	BATSUP	reserved	/BATDET	reserved	reserved
		Default	1	1	0	0	0	0	0	0
		Read/Write	R	R	R	R	R/W	R/W	R/W	R/W

I2C Register Function Table

Byte Name	Data Bit	Data Name	Function Description					
A0	b7	PMURST	Reset condition of the registers 02h~06h when ONPMU goes Low level.					
			SYS<1.3V	ONPMU	PMURST	Condition of registers 02h~06h		
			TRUE	X	X	Reset		
			FALSE	0	1	Reset		
					0	NO Reset		
				1	1	NO Reset		
1	NO Reset							
A0	b6	CHGRST	Reset condition of the registers 07h~09h when BAT goes under BAT _{WAKE} (3.1V).					
			SYS<1.3V	VIN<VIN _{UVLO}	BAT<BAT _{WAKE}	CHGRST	Condition of registers 07h~09h	
			TRUE	X	X	X	Reset	
			FALSE	TRUE	X	X	Reset	
				FALSE	TRUE	1	Reset	
						0	NO Reset	
					FALSE	1	NO Reset	
						0	NO Reset	
				A0	b5	LEDOVP	Setting CH6 VOUT6 over voltage protection threshold	
			LEDOVP				VOUT6 OVP threshold	
0	15V							
1	24V							
A0	b4	PSM5	CH5 Pulse Skipping Mode Enable Signal.					
			PSM5	Operation mode				
			0	PWM				
			1	PWM+PSM				
A0	b3	ENDPM	Enable VIN DPM function.					
			ENDPM	VIN DPM function				
			1	Enable				
			0	Disable				
A0	b2	TSD	TSD is used to record if the thermal shutdown of G2206B occurs.					
			TSD	Thermal Shutdown occurs				
			0	NO				
			1	YES				
A0	b1	MOD6	MOD6 is used to record the result of CH6 mode detection.					
			MOD6	Operation mode				
			0	PWM				
			1	PWM+PSM				
A0	b0	TSSEL	TSSEL is used to set the TS/VP ratio when the register bit A12./BATDET=1'b1.					
			TSSEL	TS/VP Ratio		NTC-R		
				Temp.=0°C	Temp.=60°C			
			0	72%	27%	10K		
			1	77%	29%	100K		

Byte Name	Data Bit	Data Name	Function Description																																								
A1	b7~b0	ERR1 ~ERR8	Record whether the UVP protection of CH1~CH5, CH7, CH8 and the OVP of CH6 ever occurs respectively. <table><tr><th>ERRx</th><th>Protection Occurs</th></tr><tr><td>0</td><td>NO</td></tr><tr><td>1</td><td>YES</td></tr></table>	ERRx	Protection Occurs	0	NO	1	YES																																		
ERRx	Protection Occurs																																										
0	NO																																										
1	YES																																										
A2	b7	ONCH5	CH5 Enable Signal. <table><tr><th>ONCH5</th><th>CH5 Status</th></tr><tr><td>0</td><td>shutdown</td></tr><tr><td>1</td><td>operation</td></tr></table>	ONCH5	CH5 Status	0	shutdown	1	operation																																		
ONCH5	CH5 Status																																										
0	shutdown																																										
1	operation																																										
A2	b6	ONLDO7	CH7 Enable Signal. <table><tr><th>ONLDO7</th><th>LDO7 Status</th></tr><tr><td>0</td><td>shutdown</td></tr><tr><td>1</td><td>operation</td></tr></table>	ONLDO7	LDO7 Status	0	shutdown	1	operation																																		
ONLDO7	LDO7 Status																																										
0	shutdown																																										
1	operation																																										
A2	b5	ONLDO8	CH8 Enable Signal. <table><tr><th>ONLDO8</th><th>LDO8 Status</th></tr><tr><td>0</td><td>shutdown</td></tr><tr><td>1</td><td>operation</td></tr></table>	ONLDO8	LDO8 Status	0	shutdown	1	operation																																		
ONLDO8	LDO8 Status																																										
0	shutdown																																										
1	operation																																										
A2	b4~b0	VISET[4:0]	Setting CH6 ISET Voltage, and shutdown CH6 if VISET[4:0]=5'b00000. V(ISET)=0.25VxVISET[4:0]/31 <table><tr><th>VISET[4:0]</th><th>V(ISET)</th><th>VISET[4:0]</th><th>V(ISET)</th></tr><tr><td>11111</td><td>0.25V</td><td>00000</td><td>0V, CH6 shutdown</td></tr></table>	VISET[4:0]	V(ISET)	VISET[4:0]	V(ISET)	11111	0.25V	00000	0V, CH6 shutdown																																
VISET[4:0]	V(ISET)	VISET[4:0]	V(ISET)																																								
11111	0.25V	00000	0V, CH6 shutdown																																								
A3	b7~b4	PSM1~4	CH1 ~CH4 Pulse Skipping Mode Enable Signal. <table><tr><th>PSMx</th><th>Operation mode</th></tr><tr><td>0</td><td>PWM</td></tr><tr><td>1</td><td>PWM+PSM</td></tr></table>	PSMx	Operation mode	0	PWM	1	PWM+PSM																																		
PSMx	Operation mode																																										
0	PWM																																										
1	PWM+PSM																																										
A3	b3~b0	VDLDO8 [3:0]	Setting LDO8 Output Voltage. <table><tr><th>VDLDO8[3:0]</th><th>VO8</th><th>VDLDO8[3:0]</th><th>VO8</th><th>VDLDO8[3:0]</th><th>VO8</th><th>VDLDO8[3:0]</th><th>VO8</th></tr><tr><td>1111</td><td>3.3V</td><td>1011</td><td>2.5V</td><td>0111</td><td>1.7V</td><td>0011</td><td>1.3V</td></tr><tr><td>1110</td><td>3.2V</td><td>1010</td><td>2.2V</td><td>0110</td><td>1.6V</td><td>0010</td><td>1.2V</td></tr><tr><td>1101</td><td>3.1V</td><td>1001</td><td>2.0V</td><td>0101</td><td>1.5V</td><td>0001</td><td>1.1V</td></tr><tr><td>1100</td><td>2.8V</td><td>1000</td><td>1.8V</td><td>0100</td><td>1.4V</td><td>0000</td><td>SW</td></tr></table>	VDLDO8[3:0]	VO8	VDLDO8[3:0]	VO8	VDLDO8[3:0]	VO8	VDLDO8[3:0]	VO8	1111	3.3V	1011	2.5V	0111	1.7V	0011	1.3V	1110	3.2V	1010	2.2V	0110	1.6V	0010	1.2V	1101	3.1V	1001	2.0V	0101	1.5V	0001	1.1V	1100	2.8V	1000	1.8V	0100	1.4V	0000	SW
VDLDO8[3:0]	VO8	VDLDO8[3:0]	VO8	VDLDO8[3:0]	VO8	VDLDO8[3:0]	VO8																																				
1111	3.3V	1011	2.5V	0111	1.7V	0011	1.3V																																				
1110	3.2V	1010	2.2V	0110	1.6V	0010	1.2V																																				
1101	3.1V	1001	2.0V	0101	1.5V	0001	1.1V																																				
1100	2.8V	1000	1.8V	0100	1.4V	0000	SW																																				
A4	b7~b4	VDCH1 [3:0]	Setting CH1 Output Voltage <table><tr><th>VDCH1[3:0]</th><th>VO1</th><th>VDCH1[3:0]</th><th>VO1</th><th>VDCH1[3:0]</th><th>VO1</th><th>VDCH1[3:0]</th><th>VO1</th></tr><tr><td>1111</td><td>5.5V</td><td>1011</td><td>5.1V</td><td>0111</td><td>4.7V</td><td>0011</td><td>3.9V</td></tr><tr><td>1110</td><td>5.4V</td><td>1010</td><td>5.0V</td><td>0110</td><td>4.6V</td><td>0010</td><td>3.8V</td></tr><tr><td>1101</td><td>5.3V</td><td>1001</td><td>4.9V</td><td>0101</td><td>4.5V</td><td>0001</td><td>3.7V</td></tr><tr><td>1100</td><td>5.2V</td><td>1000</td><td>4.8V</td><td>0100</td><td>4.0V</td><td>0000</td><td>3.6V</td></tr></table>	VDCH1[3:0]	VO1	VDCH1[3:0]	VO1	VDCH1[3:0]	VO1	VDCH1[3:0]	VO1	1111	5.5V	1011	5.1V	0111	4.7V	0011	3.9V	1110	5.4V	1010	5.0V	0110	4.6V	0010	3.8V	1101	5.3V	1001	4.9V	0101	4.5V	0001	3.7V	1100	5.2V	1000	4.8V	0100	4.0V	0000	3.6V
VDCH1[3:0]	VO1	VDCH1[3:0]	VO1	VDCH1[3:0]	VO1	VDCH1[3:0]	VO1																																				
1111	5.5V	1011	5.1V	0111	4.7V	0011	3.9V																																				
1110	5.4V	1010	5.0V	0110	4.6V	0010	3.8V																																				
1101	5.3V	1001	4.9V	0101	4.5V	0001	3.7V																																				
1100	5.2V	1000	4.8V	0100	4.0V	0000	3.6V																																				
A4	b3	ONCH1	CH1 Enable Signal when sequence ID is SEQ#0. <table><tr><th>ONCH1</th><th>CH1 Status</th></tr><tr><td>0</td><td>shutdown</td></tr><tr><td>1</td><td>operation</td></tr></table>	ONCH1	CH1 Status	0	shutdown	1	operation																																		
ONCH1	CH1 Status																																										
0	shutdown																																										
1	operation																																										
A4	b2~b0	DICH2 [2:0]	Setting CH2 Feedback Reference Voltage. VO2=VFB2x(RUP+RDWN)/RDWN <table><tr><th>DICH2[2:0]</th><th>VFB2</th><th>DICH2[2:0]</th><th>VFB2</th></tr><tr><td>111</td><td>0.86V</td><td>011</td><td>0.78V</td></tr><tr><td>110</td><td>0.84V</td><td>010</td><td>0.76V</td></tr><tr><td>101</td><td>0.82V</td><td>001</td><td>0.74V</td></tr><tr><td>100</td><td>0.80V</td><td>000</td><td>0.72V</td></tr></table>	DICH2[2:0]	VFB2	DICH2[2:0]	VFB2	111	0.86V	011	0.78V	110	0.84V	010	0.76V	101	0.82V	001	0.74V	100	0.80V	000	0.72V																				
DICH2[2:0]	VFB2	DICH2[2:0]	VFB2																																								
111	0.86V	011	0.78V																																								
110	0.84V	010	0.76V																																								
101	0.82V	001	0.74V																																								
100	0.80V	000	0.72V																																								

Byte Name	Data Bit	Data Name	Function Description																																								
A5	b7	FLST	FLST is used to control the /CHG pin status when the register bit A9.CHGSTEN=1'b0 <table><tr><th>FLST</th><th>/CHG Pin Status</th></tr><tr><td>1</td><td>Hi-Z</td></tr><tr><td>0</td><td>Low</td></tr></table>	FLST	/CHG Pin Status	1	Hi-Z	0	Low																																		
FLST	/CHG Pin Status																																										
1	Hi-Z																																										
0	Low																																										
A5	b6~b4	DICH3 [2:0]	Setting CH3 Feedback Reference Voltage. $VO3=VFB3x(R_{UP}+R_{DWN})/R_{DWN}$ <table><tr><th>DICH3[2:0]</th><th>VFB3</th><th>DICH3[2:0]</th><th>VFB3</th></tr><tr><td>111</td><td>0.86V</td><td>011</td><td>0.78V</td></tr><tr><td>110</td><td>0.84V</td><td>010</td><td>0.76V</td></tr><tr><td>101</td><td>0.82V</td><td>001</td><td>0.74V</td></tr><tr><td>100</td><td>0.80V</td><td>000</td><td>0.72V</td></tr></table>	DICH3[2:0]	VFB3	DICH3[2:0]	VFB3	111	0.86V	011	0.78V	110	0.84V	010	0.76V	101	0.82V	001	0.74V	100	0.80V	000	0.72V																				
DICH3[2:0]	VFB3	DICH3[2:0]	VFB3																																								
111	0.86V	011	0.78V																																								
110	0.84V	010	0.76V																																								
101	0.82V	001	0.74V																																								
100	0.80V	000	0.72V																																								
A5	b3	FLST2	FLST2 is used to control the /CHG2 pin status when the register bit A8.CHGSTEN2=1'b0 <table><tr><th>FLST2</th><th>/CHG2 Pin Status</th></tr><tr><td>1</td><td>Hi-Z</td></tr><tr><td>0</td><td>Low</td></tr></table>	FLST2	/CHG2 Pin Status	1	Hi-Z	0	Low																																		
FLST2	/CHG2 Pin Status																																										
1	Hi-Z																																										
0	Low																																										
A5	b2~b0	DICH4 [2:0]	Setting CH4 Feedback Reference Voltage. $VO4=VFB4x(R_{UP}+R_{DWN})/R_{DWN}$ <table><tr><th>DICH4[2:0]</th><th>VFB4</th><th>DICH4[2:0]</th><th>VFB4</th></tr><tr><td>111</td><td>0.86V</td><td>011</td><td>0.78V</td></tr><tr><td>110</td><td>0.84V</td><td>010</td><td>0.76V</td></tr><tr><td>101</td><td>0.82V</td><td>001</td><td>0.74V</td></tr><tr><td>100</td><td>0.80V</td><td>000</td><td>0.72V</td></tr></table>	DICH4[2:0]	VFB4	DICH4[2:0]	VFB4	111	0.86V	011	0.78V	110	0.84V	010	0.76V	101	0.82V	001	0.74V	100	0.80V	000	0.72V																				
DICH4[2:0]	VFB4	DICH4[2:0]	VFB4																																								
111	0.86V	011	0.78V																																								
110	0.84V	010	0.76V																																								
101	0.82V	001	0.74V																																								
100	0.80V	000	0.72V																																								
A6	b7~b4	VDCH5 [3:0]	Setting CH5 Output Voltage. When VDCH5=4'b0000, $VO5=0.8x(R_{UP}+R_{DWN})/R_{DWN}$ <table><tr><th>VDCH5[3:0]</th><th>VO5</th><th>VDCH5[3:0]</th><th>VO5</th><th>VDCH5[3:0]</th><th>VO5</th><th>VDCH5[3:0]</th><th>VO5</th></tr><tr><td>1111</td><td>2.8V</td><td>1011</td><td>2.3V</td><td>0111</td><td>1.7V</td><td>0011</td><td>1.3V</td></tr><tr><td>1110</td><td>2.7V</td><td>1010</td><td>2.2V</td><td>0110</td><td>1.6V</td><td>0010</td><td>1.2V</td></tr><tr><td>1101</td><td>2.6V</td><td>1001</td><td>2.0V</td><td>0101</td><td>1.5V</td><td>0001</td><td>1.1V</td></tr><tr><td>1100</td><td>2.5V</td><td>1000</td><td>1.8V</td><td>0100</td><td>1.4V</td><td>0000</td><td>Ext.</td></tr></table>	VDCH5[3:0]	VO5	VDCH5[3:0]	VO5	VDCH5[3:0]	VO5	VDCH5[3:0]	VO5	1111	2.8V	1011	2.3V	0111	1.7V	0011	1.3V	1110	2.7V	1010	2.2V	0110	1.6V	0010	1.2V	1101	2.6V	1001	2.0V	0101	1.5V	0001	1.1V	1100	2.5V	1000	1.8V	0100	1.4V	0000	Ext.
VDCH5[3:0]	VO5	VDCH5[3:0]	VO5	VDCH5[3:0]	VO5	VDCH5[3:0]	VO5																																				
1111	2.8V	1011	2.3V	0111	1.7V	0011	1.3V																																				
1110	2.7V	1010	2.2V	0110	1.6V	0010	1.2V																																				
1101	2.6V	1001	2.0V	0101	1.5V	0001	1.1V																																				
1100	2.5V	1000	1.8V	0100	1.4V	0000	Ext.																																				
A6	b3~b0	VDLDO7 [3:0]	Setting LDO7 Output Voltage. <table><tr><th>VDLDO7[3:0]</th><th>VO7</th><th>VDLDO7[3:0]</th><th>VO7</th><th>VDLDO7[3:0]</th><th>VO7</th><th>VDLDO7[3:0]</th><th>VO7</th></tr><tr><td>1111</td><td>3.3V</td><td>1011</td><td>2.5V</td><td>0111</td><td>1.7V</td><td>0011</td><td>1.3V</td></tr><tr><td>1110</td><td>3.2V</td><td>1010</td><td>2.2V</td><td>0110</td><td>1.6V</td><td>0010</td><td>1.2V</td></tr><tr><td>1101</td><td>3.1V</td><td>1001</td><td>2.0V</td><td>0101</td><td>1.5V</td><td>0001</td><td>1.1V</td></tr><tr><td>1100</td><td>2.8V</td><td>1000</td><td>1.8V</td><td>0100</td><td>1.4V</td><td>0000</td><td>SW</td></tr></table>	VDLDO7[3:0]	VO7	VDLDO7[3:0]	VO7	VDLDO7[3:0]	VO7	VDLDO7[3:0]	VO7	1111	3.3V	1011	2.5V	0111	1.7V	0011	1.3V	1110	3.2V	1010	2.2V	0110	1.6V	0010	1.2V	1101	3.1V	1001	2.0V	0101	1.5V	0001	1.1V	1100	2.8V	1000	1.8V	0100	1.4V	0000	SW
VDLDO7[3:0]	VO7	VDLDO7[3:0]	VO7	VDLDO7[3:0]	VO7	VDLDO7[3:0]	VO7																																				
1111	3.3V	1011	2.5V	0111	1.7V	0011	1.3V																																				
1110	3.2V	1010	2.2V	0110	1.6V	0010	1.2V																																				
1101	3.1V	1001	2.0V	0101	1.5V	0001	1.1V																																				
1100	2.8V	1000	1.8V	0100	1.4V	0000	SW																																				

Byte Name	Data Bit	Data Name	Function Description																																								
A7	b7~b4	TIMER[3:0]	Setting Charger Safety Timer. T _{SAFE} =(TIMER[3:0]+1) hours. Fast Charge safety time T _{FASTCHG} =T _{SAFE} . Pre-Charge safety time T _{PRECHG} =T _{SAFE} /8.																																								
A7	b3	/ENCH	Charger Enable Signal. <table><tr><th>/ENCH</th><th>Charger Status</th></tr><tr><td>0</td><td>operation</td></tr><tr><td>1</td><td>shutdown</td></tr></table>	/ENCH	Charger Status	0	operation	1	shutdown																																		
/ENCH	Charger Status																																										
0	operation																																										
1	shutdown																																										
A7	b2	USUS	VIN Suspend Control Input. <table><tr><th>USUS</th><th>VIN Status</th></tr><tr><td>0</td><td>No Suspend</td></tr><tr><td>1</td><td>Suspend</td></tr></table>	USUS	VIN Status	0	No Suspend	1	Suspend																																		
USUS	VIN Status																																										
0	No Suspend																																										
1	Suspend																																										
A7	b1~b0	ISSET_IN[1:0]	Setting VIN Current Limit Threshold. <table><tr><th>ISSET_IN[1:0]</th><th>VIN Current Limit</th></tr><tr><td>00</td><td>85mA</td></tr><tr><td>01</td><td>1.0A</td></tr><tr><td>10</td><td>475mA</td></tr><tr><td>11</td><td>1.5A</td></tr></table>	ISSET_IN[1:0]	VIN Current Limit	00	85mA	01	1.0A	10	475mA	11	1.5A																														
ISSET_IN[1:0]	VIN Current Limit																																										
00	85mA																																										
01	1.0A																																										
10	475mA																																										
11	1.5A																																										
A8	b7~b6	TSHT[1:0]	Set TS/VP ratio to monitor battery pack temperature for HOT boundary. <table><tr><th rowspan="2">TSHT[1:0]</th><th rowspan="2">Battery Pack Temp.</th><th colspan="2">TS/VP Ratio</th></tr><tr><th>10k NTC-R</th><th>100k NTC-R</th></tr><tr><td>00</td><td>60°C</td><td>27%</td><td>29%</td></tr><tr><td>01</td><td>58°C</td><td>28%</td><td>30%</td></tr><tr><td>10</td><td>56°C</td><td>29%</td><td>31%</td></tr><tr><td>11</td><td>54°C</td><td>30%</td><td>32%</td></tr></table>	TSHT[1:0]	Battery Pack Temp.	TS/VP Ratio		10k NTC-R	100k NTC-R	00	60°C	27%	29%	01	58°C	28%	30%	10	56°C	29%	31%	11	54°C	30%	32%																		
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A8	b4	CHGSTEN2	CHGSTEN2 is used to set indication method of /CHG2 PIN, and reset to 1'b0 only when SYS<1.3V. /CHG2 pin status are directly controlled by the register bits A5.FLST2 if CHGSTEN2=1'b0. When CHGSTEN2=1'b1, the /CHG2 pin status are based on the charger state shown below: <table><tr><th rowspan="2">Charger State</th><th>CHGSTEN=1'b1</th></tr><tr><th>/CHG2 Status</th></tr><tr><td>Charging Done</td><td rowspan="4">Hi-Z</td></tr><tr><td>Recharging after Termination</td></tr><tr><td>IC Disabled or No valid VIN power</td></tr><tr><td>Battery Not Installed</td></tr><tr><td>Charging</td><td>Low</td></tr><tr><td>Safety Timer Expired</td><td rowspan="4">Flash at 4Hz (50% Duty)</td></tr><tr><td>Charger in Thermal Regulation</td></tr><tr><td>Charger in Thermal Shutdown</td></tr><tr><td>Battery Pack too cold or too hot</td></tr></table>	Charger State	CHGSTEN=1'b1	/CHG2 Status	Charging Done	Hi-Z	Recharging after Termination	IC Disabled or No valid VIN power	Battery Not Installed	Charging	Low	Safety Timer Expired	Flash at 4Hz (50% Duty)	Charger in Thermal Regulation	Charger in Thermal Shutdown	Battery Pack too cold or too hot																									
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A8	b3~b0	ISETA[3:0]	ISETA[3:0] is used to set the battery charge current level. <table><tr><th>ISETA[3:0]</th><th>I_{CHG}</th><th>ISETA[3:0]</th><th>I_{CHG}</th><th>ISETA[3:0]</th><th>I_{CHG}</th><th>ISETA[3:0]</th><th>I_{CHG}</th></tr><tr><td>0000</td><td>0.1A</td><td>0100</td><td>0.5A</td><td>1000</td><td>0.9A</td><td>1100</td><td>1.2A</td></tr><tr><td>0001</td><td>0.2A</td><td>0101</td><td>0.6A</td><td>1001</td><td>1.0A</td><td>1101</td><td>1.2A</td></tr><tr><td>0010</td><td>0.3A</td><td>0110</td><td>0.7A</td><td>1010</td><td>1.1A</td><td>1110</td><td>1.2A</td></tr><tr><td>0011</td><td>0.4A</td><td>0111</td><td>0.8A</td><td>1011</td><td>1.2A</td><td>1111</td><td>1.2A</td></tr></table>	ISETA[3:0]	I _{CHG}	ISETA[3:0]	I _{CHG}	ISETA[3:0]	I _{CHG}	ISETA[3:0]	I _{CHG}	0000	0.1A	0100	0.5A	1000	0.9A	1100	1.2A	0001	0.2A	0101	0.6A	1001	1.0A	1101	1.2A	0010	0.3A	0110	0.7A	1010	1.1A	1110	1.2A	0011	0.4A	0111	0.8A	1011	1.2A	1111	1.2A
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Byte Name	Data Bit	Data Name	Function Description																																																																																										
A9	b7~b3	/JEITA VSETH VSETC ISETH ISETC	If /JEITA is stated to low, VSETH/ISETH is used to setting battery regulation voltage and charging current between Temp=45°C and Temp=60°C. VSETC/ISETC is used to setting battery regulation voltage and charging current between T=0°C and Temp=10°C.																																																																																										
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			A9	b2	CHGSTEN	CHGSTEN is used to set indication method of /CHG PIN, and reset to 1'b0 only when SYS<1.3V. /CHG pin status are directly controlled by the register bits A5.FLST if CHGSTEN=1'b0. When CHGSTEN=1'b1, the /CHG pin status are based on the charger state shown below:																																																																																							
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A9	b1	INT	INT is used to control the output status of /INT pin. When interrupt events happen, /INT pin goes low and the bit A9.INT is set to 1'b1. After Micro-processor write the bit to be 1'b0, /INT pin goes to high-Z state.																																																																																										
			<table><tr><td>INT</td><td>/INT Pin Status</td></tr><tr><td>0</td><td>Hi-Z</td></tr><tr><td>1</td><td>Low</td></tr></table>	INT	/INT Pin Status	0	Hi-Z	1	Low																																																																																				
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A9	b0	DPM	DPM is used to record the VIN DPM mode status .																																																																																										
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Byte Name	Data Bit	Data Name	Function Description	
A10	b7~b5	TS_METER [2:0]	Record the battery temperature by detecting the TS pin voltage.	
			TS_METER[2:0]	Battery Temp.
			110	T ≤ 0°C
			100	0°C < T ≤ 10°C
			000	10°C < T ≤ 45°C
			001	45°C < T ≤ 60°C
			011	60°C < T
			010	VP<0.8V
A10	b4	NO_BAT	Battery installed by detecting TS<90%xVP.	
			NO_BAT	Battery installed
			0	YES
			1	NO
A10	b3	EOC	EOC show the charger status.	
			EOC	Char er Status
			0	During Charging
			1	Charging Done or Recharging after Termination
A10	b2	PGOOD	VIN power status.	
			PGOOD	VIN Status
			0	VIN < V _{UVLO}
			0	V _{UVLO} < VIN < (V _{BAT+} V _{ASDN})
			1	(V _{BAT+} V _{ASDN}) < VIN < V _{OVLO}
			0	VIN > V _{OVLO}
A10	b1	THR	THR show the status of thermal regulation on charger	
			THR	Thermal Regulation Happen
			0	NO
			1	YES
A10	b0	/SAFE	/SAFE show the status of Safety Timer.	
			/SAFE	Safety Timer Status
			0	No Expired
			1	Expired

Byte Name	Data Bit	Data Name	Function Description	
A11	b4	VSET2	VSET2 is used to set the battery regulation voltage.	
			VSET2	V _{BATREG}
			0	4.2V
			1	4.35V
A12	b7	DPPM	DPPM is used to record the DPPM mode status .	
			DPPM	Status
			0	Out of DPPM Mode
			1	In DPPM Mode
A12	b6	NTC100K	NTC100K is used to record the resistance of the NTC thermistor.	
			NTC100K	NTC Thermistor
			0	10KΩ
			1	100KΩ
A12	b5	CHGDONE	CHGDONE show the charger status. CHGDONE is reset by recharging.	
			CHGDONE	Charger Status
			0	During Charging
			1	Charging Done
A12	b4	BATSUP	BATSUP is used to record the Battery Supplement mode status .	
			BATSUP	Status
			0	Out of Battery Supplement Mode
			1	In Battery Supplement Mode
A12	b2	/BATDET	/BATDET bit is used to disable the auto battery type detection. The TS/VP threshold of Battery pack temperature monitor is auto adjusted by the battery type detection result if the /BATDET bit is 1'b0. Otherwise, the TS/VP threshold is decided by the register bit A0.TSSEL.	
			/BATDET	Auto Battery Type Detection
			0	Enable
			1	Disable

FUNCTION DESCRIPTION

PMU

The G2206B's PMU includes five DC/DC Converter, one WLED driver working in boost mode, and three LDO regulators to generate a multiple-output digital camera power-supply system.

	CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8	CH9
	Boost	Buck-Boost	Buck	Buck	Buck	Boost	LDO	LDO	LDO
Topology	Synchronous PWM	Synchronous PWM	Synchronous PWM	Synchronous PWM	Synchronous PWM	Synchronous PWM			
Fsw (MHz)	1.5	1.5	1.5	1.5	1.5	0.75			
VOUT	3.6V~5.5V configured by I2C	Configured by External Resistors	Configured by External Resistors	Configured by External Resistors	1.1V~2.8V by I2C or by External Resistors		1.1V~3.3V or Power Switch by I2C	1.1V~3.3V or Power Switch by I2C	3.05V
Reference voltage on FB		0.72V~0.86V by I2C	0.72V~0.86V by I2C	0.72V~0.86V by I2C					
Light load mode	Yes	Yes	Yes	Yes	Yes	Yes			

PMU Power ON/OFF Sequence

G2206B's CH1, CH2, CH3 and CH4 start to power on when the voltage on SYS is higher than its UVLO threshold 1.3V, and toggle ONPMU high. After finishing the power on sequence, toggling ONPMU low will start the power off sequence. G2206B support six power on/off sequences for CH1, CH2, CH3 and CH4 by different resistor connecting between SEQ pin to ground.

R_SEQ		Sequence
Short to SYS	Power-on	CH2→CH3→CH4
	Power-off	CH4→CH3→CH2
40kΩ	Power-on	CH1→CH3→CH2→CH4
	Power-off	CH4→CH2→CH3→CH1
10kΩ	Power-on	CH1→CH3→CH4→CH2
	Power-off	CH2→CH4→CH3→CH1
2.5kΩ	Power-on	CH1→CH2→CH4→CH3
	Power-off	CH3→CH4→CH2→CH1
0.63kΩ	Power-on	CH1→CH4→CH3→CH2
	Power-off	CH2→CH3→CH4→CH1
160kΩ	Power-on	CH1→CH4→CH2→CH3
	Power-off	CH3→CH2→CH4→CH1

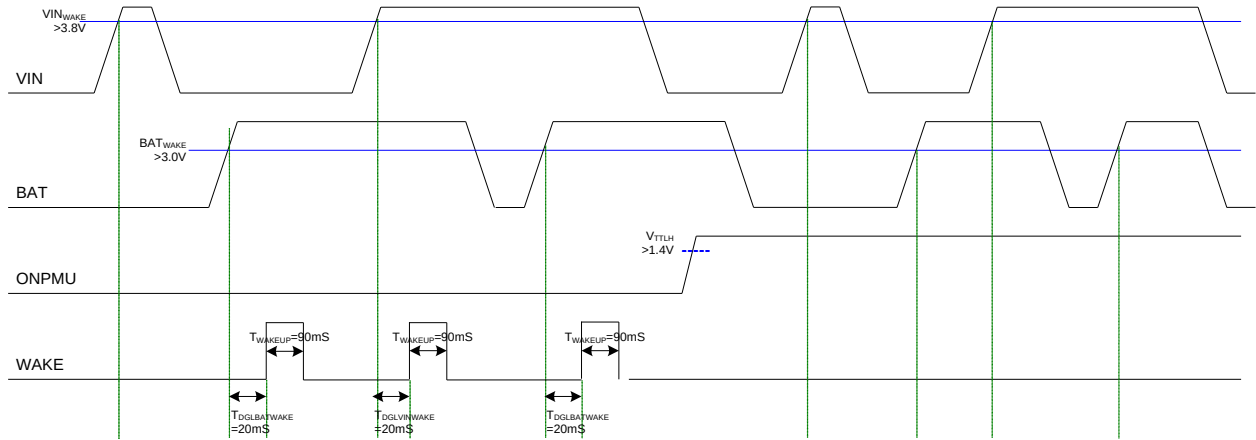
PMU Fault Protection

G2206B PMU provides battery over voltage protection, over-current protection, under-voltage protection, short-circuit protection, and thermal shutdown protection to achieve complete protection.

	Protection type	Threshold	Protection methods	Reset Method
SYS	OVP	SYS>5.8V	IC shutdown	Reset by toggling ONPMU
CH1 Boost	Current Limit	NMOS current>2.5A	NMOS Off, PMOS on	Automatic Reset at next cycle
	UVP	VOUT1<93.75%*VOUT _{SET}	IC shutdown if period above 128ms	Reset by toggling ONPMU
	SCP	VOUT1<12.5%*VOUT _{SET}	Disable LXSU switching	Remove SCP condition.
	VOUT SCP	VOUT1<1V	Disable LXSU switching	Remove VOUT1<1V condition.
CH2 Buck-Boost	Current Limit	LX2D PMOS current>2.0A	PMOS Off, NMOS on	Automatic Reset at next cycle
	UVP	FB2<(FB2 _{SET} -50mV)	IC shutdown if period above 128ms	Reset by toggling ONPMU
	SCP	FB2<0.1V	Disable LX2U switching	Remove FB2<0.1V condition
	VOUT SCP	VOUT2<1V	Disable LX2U switching	Remove VOUT2<1V condition.
CH3 Buck	Current Limit	PMOS current>3.5A	PMOS Off, NMOS on	Automatic Reset at next cycle
	UVP	FB3<(FB3 _{SET} -50mV)	IC shutdown if period above 128ms	Reset by toggling ONPMU
CH4 Buck	Current Limit	NMOS current>3.5A	PMOS Off, NMOS on	Automatic Reset at next cycle
	UVP	FB4<(FB4 _{SET} -50mV)	IC shutdown if period above 128ms	Reset by toggling ONPMU
CH5 Buck	Current Limit	NMOS current>1.5A	PMOS Off, NMOS on	Automatic Reset at next cycle
	UVP	FB2<0.75V	IC shutdown if period above 128ms	Reset by toggling ONPMU
CH6 WLED Driver	Current Limit	NMOS current>1.1A	NMOS Off	Automatic Reset at next cycle
	OVP	VOUT6>OVP _{SET}	NMOS Off	VOUT6<OVP _{SET}
	SCP	VOUT6<0.8V	Disable LX6 Switching	Remove SCP condition
CH7,CH8 LDO	Current Limit	PMOS current>300mA		PMOS current<300mA
	UVP	VOUTX<12.5%*VOUTX _{SET}	PMOS Off	Reset by toggling ONPMU Or I2C Control
CH9 RTCLDO	Current Limit	PMOS current>150mA		PMOS current<150mA
Thermal	TSD	Junction Temp. >150°C	IC shutdown	Reset by toggling ONPMU

WAKE UP

G2206B provide a high signal with 90mS(typ.) duration at WAKE pin to notify Controller that the power is valid. The high level of WAKE is the output voltage of RTCLDO. WAKE signal is asserted with deglitch time $T_{DGLBATWAKE}$ and $T_{DGLVINWAKE}$ after BAT or VIN voltage reaching its threshold voltage to eliminate any chattering on the input.



Li-ion Charger

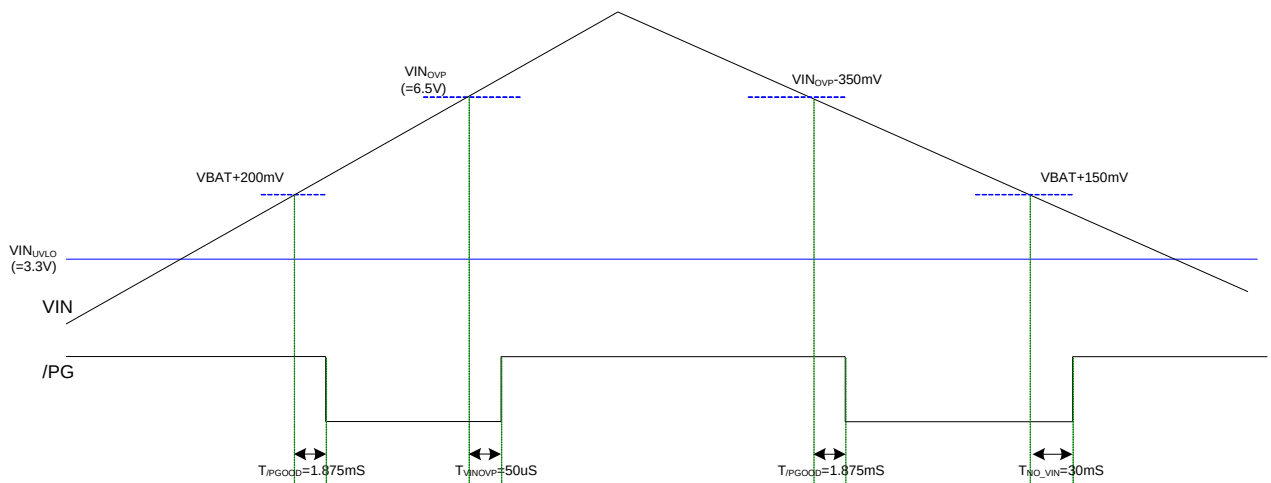
VIN Power Good /PG

/PG, with open drain output, is used to indicate the VIN voltage meets below conditions:

- ◆ $V_{VIN} > V_{VIN_{UVLO}}$
- ◆ $V_{VIN} > V_{BAT} + V_{VIN_{ASDN}}$
- ◆ $V_{VIN} < V_{VIN_{OVP}}$

The condition of $V_{VIN} > V_{BAT} + V_{VIN_{ASDN}}$ is asserted with deglitch time T_{PGOOD} (=1.875mS). After the condition is asserted, a deglitch time T_{NO_VIN} (=30mS) is inserted.

VIN over voltage condition is asserted with deglitch time t_{VINOV} (=50uS). After the condition is asserted, a deglitch time T_{PGOOD} (=1.875mS) is inserted.



VIN Over-Voltage Protection (OVP)

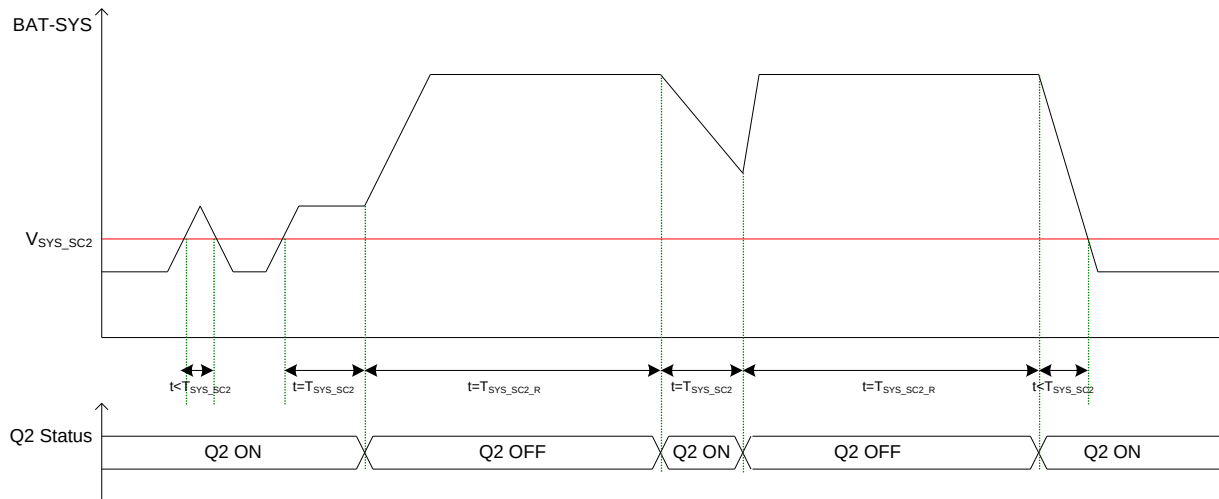
The G2206B Li-ion charger accepts VIN input voltage up to 28V without damage. When $V_{IN} > V_{VIN_{OVP}}$ for a period longer than T_{VINOV} , the Q1 FET that connects VIN to SYS is OFF and the battery charging is stopped. When in VIN OVP mode, the SYS output is connected to battery through Q2 FET is fully ON. Once the OVP function is removed, the safety timer are reset and a new charge cycle will be indicated by the /CHG output.

VIN Under-Voltage Lockout (UVLO)

The G2206B Li-ion charger remains in power down mode when the input voltage V_{IN} is below the under-voltage threshold V_{IN_UVLO} . In power down mode, the Q1 FET that connects V_{IN} to SYS is OFF, and the Q2 FET that connects BAT to SYS is ON. The V_{SYS_SC2} circuit is active and monitors for overload conditions on SYS.

SYS Short Circuit Protection (SCP)

In VIN suspend mode ($USUS=1'b1$) or power down Mode ($V_{IN} < V_{IN_UVLO}$), the SYS is powered by battery pack, and the V_{SYS_SC2} circuit is active for overload condition on SYS. When $(BAT-SYS) > V_{SYS_SC2}$, for a period longer than t_{SYS_SCP} , the Q2 FET that connects BAT to SYS is turned OFF and the internal recovery timer is start. After the time $t_{SYS_SCP_R}$ of the recovery timer is reached, the Q2 FET is turned ON for a period t_{SYS_SCP} to see if the overload condition is removed.

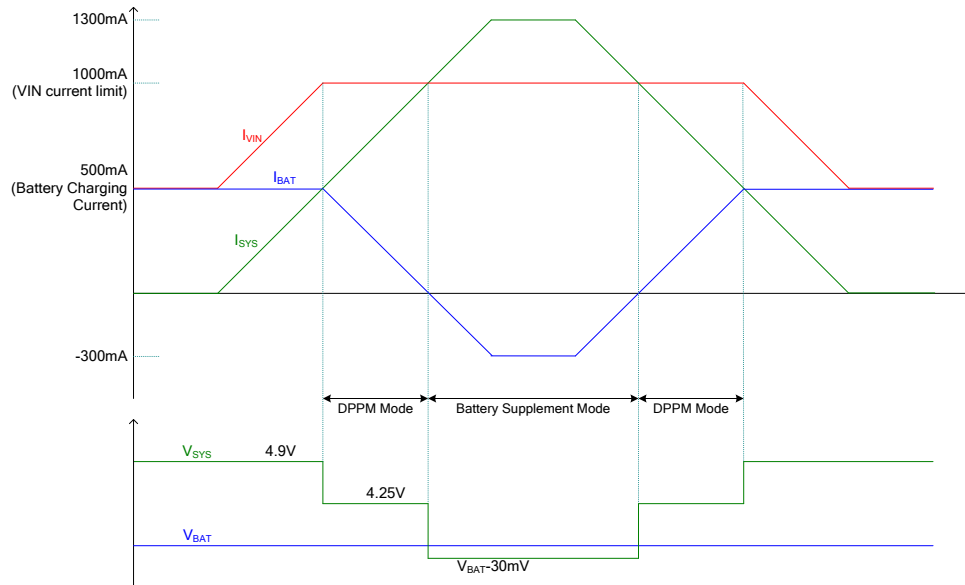


Dynamic Power Path Management

VIN-DPM mode is utilized in G2206B Li-ion charger for preventing it from crashing poorly designed or incorrectly configured VIN power source. If VIN voltage falls below V_{DPM} (4.4V typ.), the input current limit is reduced to prevent the VIN voltage falling further. When in VIN-DPM mode, the register DPM is 1'b1.

DPPM mode is utilized in G2206B Li-ion charger to maintain SYS voltage in the increasing SYS output current. When the sum of the battery charging current and the SYS output current exceeds the VIN input current limit, the SYS voltage falls. Once the SYS voltage falls below V_{DPPM} (4.3V typ.), the battery charging current is reduced to prevent the SYS voltage falling further. IN DPPM mode, the battery charging termination detection is halted and the register DPPM is 1'b1

In DPPM mode, if the battery charging current is reduced to zero and the SYS output current increases beyond the VIN input current limit, the SYS voltage falls further. When the SYS voltage falls below V_{SYS2} , the battery supplements the SYS load. In Battery Supplement Mode, the SYS short circuit is active and the battery charging termination detection is halted, and the register BATSUP is 1'b1.

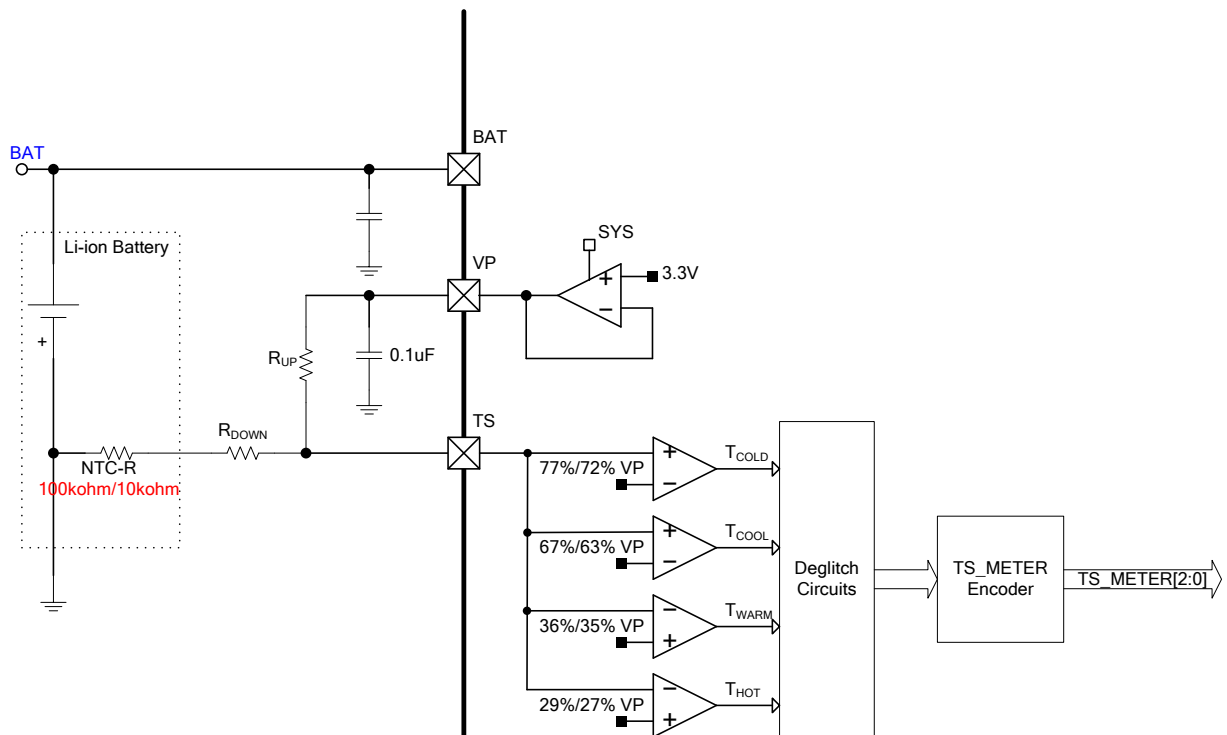


VIN Suspend Mode or VIN not Connected

When no input source is connected to VIN or in VIN suspend mode by setting register USUS=1'b1, SYS is powered strictly from battery. During this mode, the Q2 FET that connects BAT to SYS is fully on, and the SYS voltage is not regulated, but the SYS short circuit protection is active.

Battery Detection & Battery Pack Temperature Monitoring

When input source is connected to VIN or ONPMU pin is applied high, the G2206B detects battery is presented or not by detecting the voltage level of TS pin. If the voltage of TS pin is lower than 90% of VP with duration longer than t_{NO_BAT} (30ms typ.), the battery is presented and the register NO_BAT is 1'b0.



After the battery is installed and the G2206B battery detection is finished, the TS input voltage connects to the NTC thermistor in the battery pack to monitor the battery temperature and prevent over temperature condition. During charging with the voltage at TS is outside of the operating range (V_{COLD} to V_{HOT}), charging is suspended and the safety timer maintain their values but suspend counting.

The G2206B provides users easily implement the JEITA standard for systems with I2C interface. Charge current and voltage where the voltage at TS is inside the range (V_{COLD} to V_{COOL} , V_{COOL} to V_{WARM} , and V_{HOT} to V_{WARM}) can be controlled by I2C. See in detail at I2C Register Function Table.

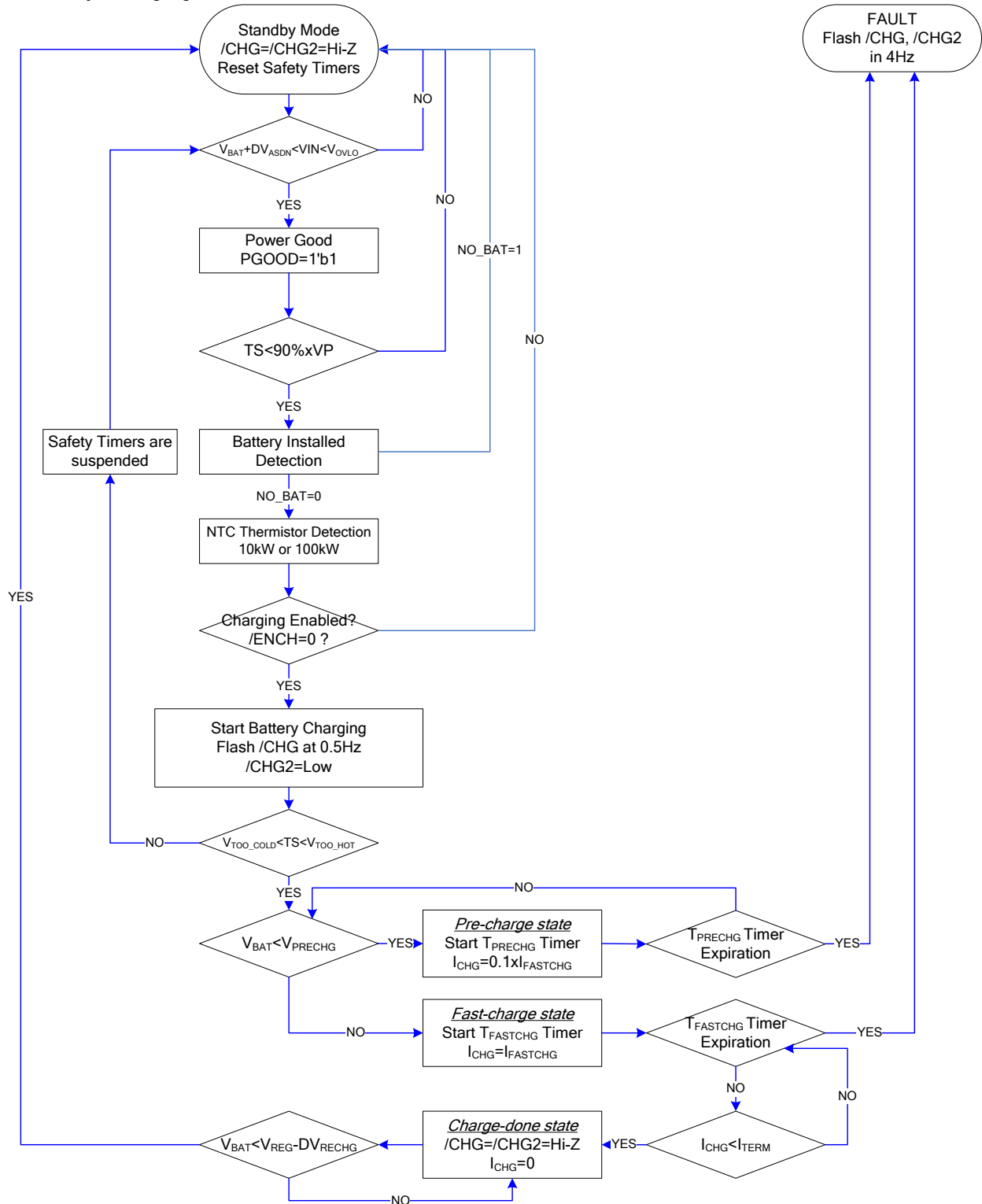
The G2206B supports 100k and 10k NTC thermistor, and the suggested R_{UP} and R_{DOWN} resistor values are as below:

NTC Thermistor	$R_{UP} (\Omega)$	$R_{DOWN} (\Omega)$
10K	11K	1K
100K	117K	26K

Battery Charging

Once the VIN power good is sustained, battery is installed, and the battery pack temperature is in the operating range, set /ENCH low to initiate battery charging. The battery is charged in three phases: pre-charge, constant current fast charge, and a constant voltage regulation. The battery charging flow chart is as below:

Battery Charging Flowchart



In the pre-charge phase, the battery is charged at with the pre-charge current (I_{PRECHG}). The battery is charged with the fast-charge current (I_{CHG}) when the battery voltage is higher than V_{PRECHG} . As the battery voltage reaches $V_{BAT(REG)}$, the battery is held at a constant voltage of $V_{BAT(REG)}$ and the charge current tapers off as the battery approaches full charge. When the battery current reach I_{TERM} , the /CHG pin indicates charging done by going high-impedance.

The termination detection is disabled whenever the charging current is reduced in these four conditions as below:

- ◆ Thermal regulation loop is active, and is indicated by register THR=1'b1
- ◆ DPPM loop is active, and is indicated by register DPPM=1'b1
- ◆ VIN-DPM loop is active, and is indicated by register DPM=1'b1
- ◆ Battery Supplement Mode is active, and is indicated by register BATSUP=1'b1

The fast-charge current is set by register ISETA[3:0] through I2C control. The ratio of pre-charge current to fast-charge current is 10%. When the fast-charge current is set lower than or equal to 200mA, the ratio of termination detection current to fast-charge current is 3.3%. Otherwise, the ratio of termination detection current to fast-charge current is 10%.

Once a charge cycle is complete, the battery voltage is monitored. When the battery voltage falls below V_{RCH} , a new charging cycle is start.

Safety Timer

The G2206B charger contains an internal safety timer for the pre-charge, fast-charge phases to prevent potential damage to the battery and the system. The timer value of the fast-charge phase is programmed by the register TIMER[3:0] through I2C control, and the timer value of pre-charge is 1/8 of the fast-charge timer value. See details in the Register Function Table. When the temperature of the battery pack monitored by the NTC thermistor through TS pin is out of the operating range ($0^{\circ}\text{C} < T < 60^{\circ}\text{C}$), the safety timer maintains the timer value but suspends the counting. Once the temperature is back in the operating range, the safety timer resumes from the timer value maintained previously.

Thermal Regulation Loop and Thermal Shutdown

The G2206B contain a thermal regulation loop that monitors the die temperature. If the temperature heat up, the thermal regulation loop reduces the VIN input current limit to maintain the die temperature less than THM_{REG} (120°C typ.). Ther battery termination detection is disabled when thermal regulation loop is active.

Despite the operation of the thermal loop, the die temperature continues to rise above THM_{SD} (155°C typ.) in some cases, the FET Q1 connects VIN to SYS is turned OFF, and G2206B charger enters Battery Supplement Mode to ensure that the battery powers the load on SYS.

/CHG and /CHG2 Indicator

The open-drain /CHG and /CHG2 output indicates various charger operations, and the indication method is controlled by the register CHGSTEN and CHGSTEN2 through I2C interface.

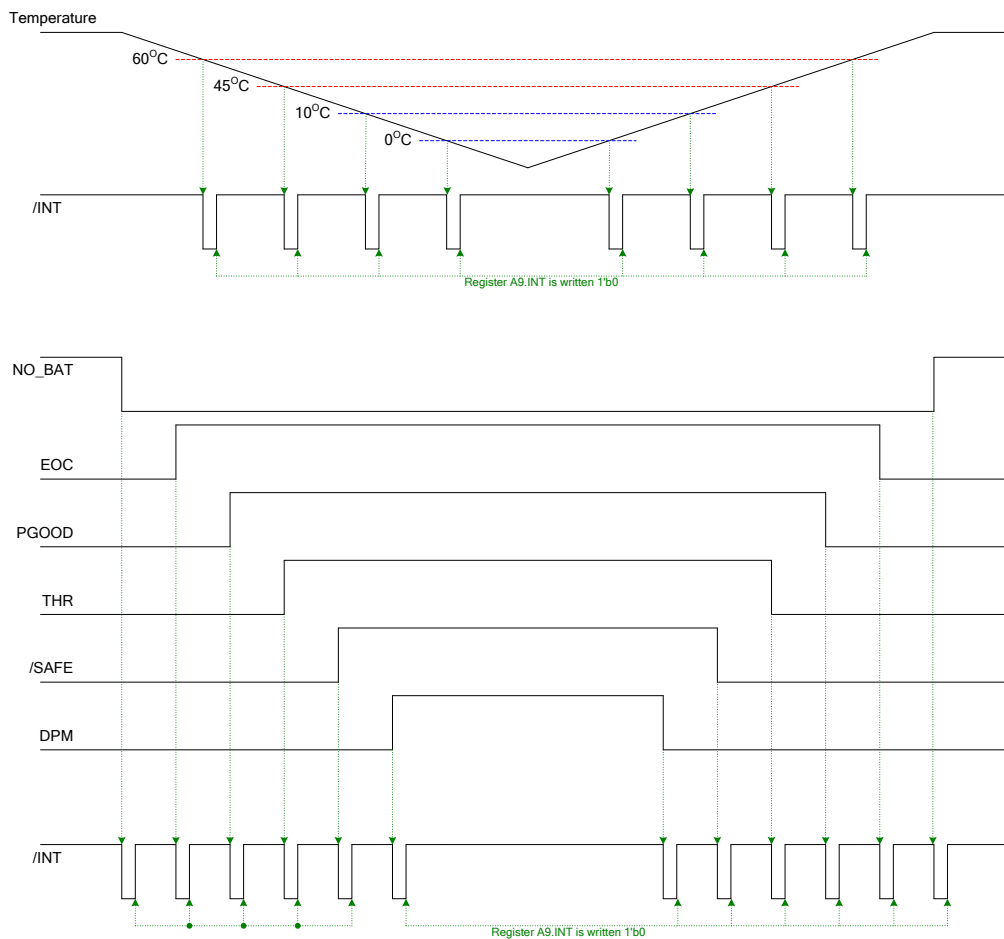
Charger State	/CHG Status			/CHG2 Status				
	CHGSTEN=1'b1	CHGSTEN=1'b0		CHGSTEN2=1'b1	CHGSTEN2=1'b0			
		FLST=1	FLST=0		FLST2=1	FLST2=0		
Charging Done	Hi-Z	Hi-Z	Low	Hi-Z	Hi-Z	Low		
Recharging after Termination								
IC Disabled or No valid VIN power								
Battery Not Installed								
Charging	Flash at 0.5Hz						Low	
Safety Timer Expired	Flash at 4Hz							
Charger in Thermal Regulation								
Charger in Thermal Shutdown								
Battery Pack too cold or too hot								

/INT, Interrupt Signal

The G2206B indicates interrupt signal to external processor by /INT open-drain output. /INT is toggled low and INT bit is set to 1'b1 when these conditions shown below happen. After /INT is toggled low in these conditions, /INT is toggled high by written INT bit 1'b0 through I²C interface.

- ◆ JEITA temperature limit detected by TS voltage, V_{COLD} , V_{COOL} , V_{WARM} , V_{HOT} are reached.
- ◆ Battery not installed.
- ◆ End of Charging.
- ◆ VIN power good
- ◆ Safety timer expired.
- ◆ VIN DPM happens or not
- ◆ Thermal regulation loop is active or not.
- ◆ Auto Power Source Detection completed.

/INT Toggle Low	When PMU turns on with event condition		During PMU On	
	No Event	Event Occurred	Event Appear	Event Disappear
JEITA Temperature Limit	NO	YES	YES	YES
Battery Not Installed (NO_BAT)	NO	YES	YES	YES
End of Charging (EOC)	NO	YES	YES	YES
VIN Power Good (PGOOD)	NO	YES	YES	YES
Safety Timer Expired (/SAFE)	NO	YES	YES	YES
VIN DPM is active (DPM)	NO	YES	YES	YES
Thermal Regulation is active (THR)	NO	YES	YES	YES

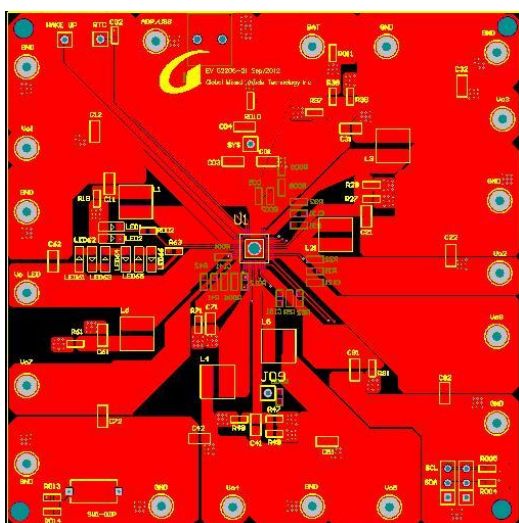


PCB Layout Considerations

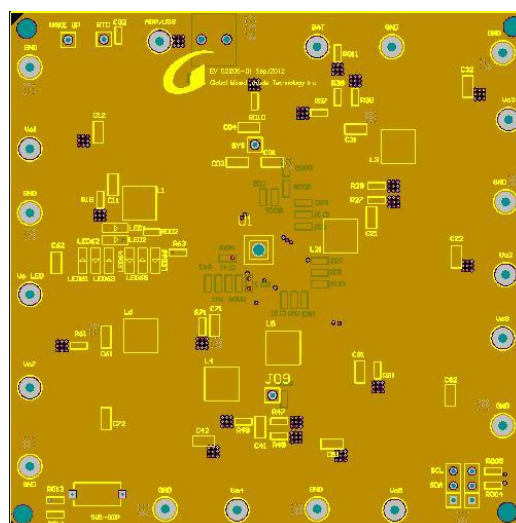
1. Power loop of converters should be connected with the shortest and widest traces as possible.
2. The REF should connect to G2206B as close as possible, and keep away from switch noise source, such as LX node.
3. The feedback network trace must be from the output capacitor, and the external feedback resistors should be placed next to the FB pin. The route of feedback network should keep away from the switching noise source.
4. The input capacitor should be placed as close as possible to the IC pins as well as the output capacitor.
5. The exposed pad (EP) is internally connected to all converters power ground, for good thermal dissipation, multilayer PCB is recommended, and the EP pad must be connected to the power and analog ground plane.

EV Board PCB Layout Section

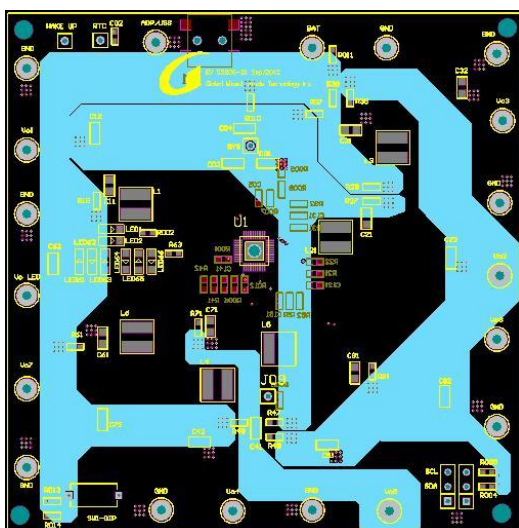
Top Side



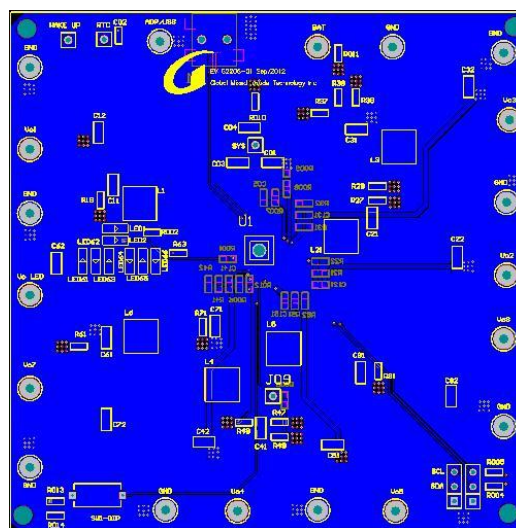
Midlayer1



Midlayer2

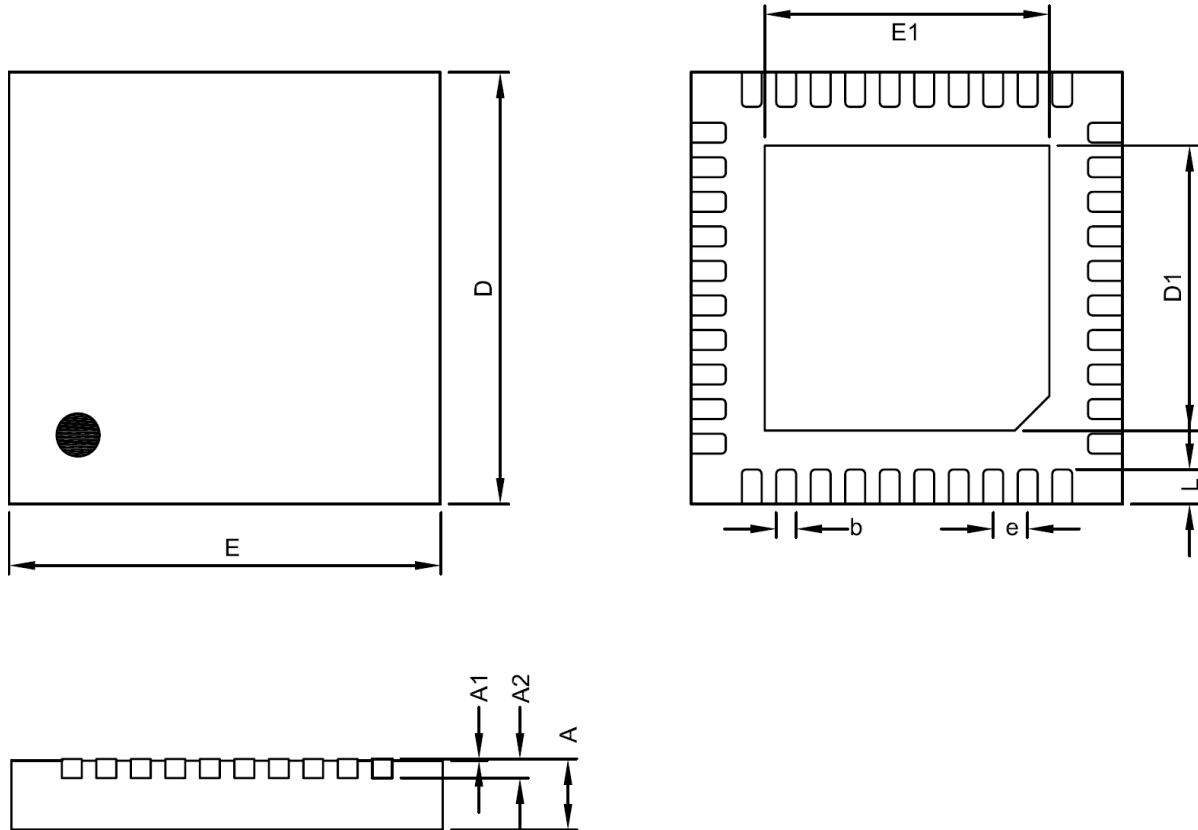


Bottom side



TQFN5X5-40 Board	Information
Board Material	FR4
Size	90mm×90mm
Board Thickness	1.6mm
Layers	4
Copper Thickness	2 oz.

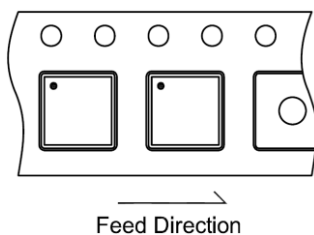
Package Information



TQFN5X5-40 Package

Symbol	DIMENSION IN MM			DIMENSION IN INCH		
	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.
A	0.70	0.75	0.80	0.0276	0.0295	0.0315
A1	0.00	---	0.05	0.0000	---	0.0020
A2	0.20 REF			0.0079 REF		
D	4.95	5.00	5.05	0.1949	0.1969	0.1988
E	4.95	5.00	5.05	0.1949	0.1969	0.1988
D1	3.50	3.60	3.70	0.1378	0.1417	0.1457
E1	3.50	3.60	3.70	0.1378	0.1417	0.1457
b	0.15	0.20	0.25	0.0059	0.0079	0.0098
e	0.40 BSC			0.0157 BSC		
L	0.35	0.40	0.45	0.0138	0.0157	0.0177

Taping Specification



PACKAGE	Q'TY/REEL
TQFN5X5-40	3,000 ea

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