G2246

2.5A Integrated Switch-Mode One-Cell Li-Ion Charger

Features

- **4.0V ~ 5.5V Input Voltage Operation.**
- **Integrated switched mode Li-ion charger with dynamic power path function.**
- **Integrated Input DPM & Input OVP**
- **Built-In Thermal Regulation & Thermal Shutdown Function.**
- **4.2V/4.35V Adjustable Battery Regulation Voltage.**
- **Programmable Charging Current with 2.5A Maximum Current**
- **No Battery Detection**
- **TQFN3x3-16 Package**

Applications

Tablet PC
Smart Phone
Power Bank

General Description

The G2246 is a integrated LI-ion switch-mode charger and system power path management devices target at space-limited portable applications. The input voltage range with input overvoltage protection supports unregulated power sources. The input dynamic power management (V_{IN}-DPM) prevents the charger from crashing incorrectly configured power sources.

The built-in dynamic power path management (DPPM) powers the system while simultaneously and independently charging the battery. This feature supply the system load at all time while monitoring the charger current separately.

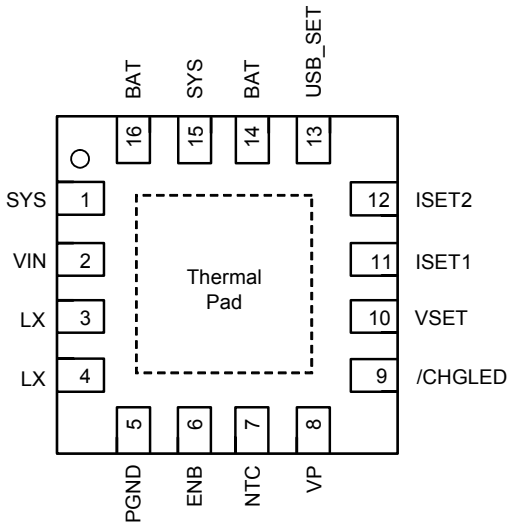
The charging current is determined by programming ISET1 or ISET2 pin, and battery regulation voltage is determined by VSET pin.

Ordering Information

ORDER NUMBER	MARKING	TEMP. RANGE	PACKAGE (Green)
G2246R41U	2246	-40°C~+85°C	TQFN3x3-16

Note: R4: TQFN3X3-16
1: Bonding code
U: Tape & Reel
Green : Lead Free / Halogen Free

Pin Configuration



G2246 TQFN3X3-16

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

Absolute Maximum Ratings

Supply Voltage, VIN. . . . . -0.3V to +10V
Other Pins. . . . . .-0.3V to +6V
Thermal Resistance Junction to Ambient, (θ_{JA})
TQFN3x3-16. . . . . .62°C /W
Continuous Power Dissipation (T_A=+25°C)
TQFN3x3-16. . . . . .2.01W
Operating Ambient Temperature. . . . . -40°C to +85°C
Storage Temperature range . . . . . .-55°C to +150°C
Reflow Temperature (Soldering, 10sec) . . . . . .260°C

ESD Susceptibility
ESD Susceptibility (HBM) (Other Pins) 2kV
ESD Susceptibility (MM). 200V

Recommended Operation Conditions

V_{IN} . . . . . 4.0V to +5.5V
V_{BAT} . . . . . 2.5V to +5.5V
Operating Ambient Temperature. . . . . .-40°C to 85°C
Operating Junction Temperature. . . . . +150°C

1. 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 are not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.
2. Device is ESD sensitive. Handling precaution recommended. The Human Body model is a 100pF capacitor discharged through a 1.5KΩ resistor into each pin.

Electrical characteristics

(VIN=SYS=5V, T_A=25°C.)

The device is not guaranteed to function outside its operating conditions. Parameters with MIN and/or MAX limits are 100% tested at +25°C, unless otherwise specified.

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT
VIN Input						
VIN Operating Range	V_{VIN}		4.0	---	5.5	V
VIN Under Voltage Lockout Threshold	V_{INUV}	VIN rising	---	3.8	4.0	V
VIN Under Voltage Lockout Hysteresis	ΔV_{INUV}		---	200	---	mV
VIN Over Voltage Threshold	V_{INOV}	VIN rising	5.85	6.1	6.35	V
VIN Over Voltage Hysteresis	ΔV_{INOV}		---	300	---	mV
VIN supply current	I_{SUPVIN}	I_{SYS}=I_{BAT}=0mA (V_{BAT}>V_{REG})	---	---	800	uA
VIN automatic shutdown threshold	ΔV_{ASDN}	VIN-BAT , VIN rising	---	200	300	mV
VIN automatic shutdown hysteresis	ΔV_{ASDNHS}	VIN-BAT , VIN falling	---	180	---	mV
VIN Current Limit	I_{VIN_LIMIT}		2.7	3	3.3	A
VIN DPM Regulation Voltage	V_{INDPM}	I_{BAT}=0A	4.4	4.52	4.64	V
SYS to VIN reverse current blocking	I_{VINREV}		---	1	---	μA
SYS Output						
Minimum SYS Regulation Voltage	V_{SYS_MIN}	BAT<V_{SYS_MIN}	3.5	3.6	3.7	V
SYS to BAT Voltage	V_{S2B}	BAT>V_{SYS_MIN}	---	200	---	mV
SYS Regulation Voltage under no-battery condition	V_{SYS_NOBAT}		4.4	4.5	4.6	V
SYS Regulation voltage in DPPM mode	ΔV_{SYS_DPPM}	BAT<V_{SYS_MIN} V_{DPPM}=V_{SYS_MIN}-ΔV_{SYS_DPPM}	---	200	---	mV
BAT to SYS ON Resistance	R_{ON_BAT}	BAT=4.2V, I_{SYS}=1A	---	50	---	mΩ
Battery Condition						
Battery Depletion Threshold	V_{BAT_DPL}	BAT falling	---	2.4	---	V
Battery Depletion rising hysteresis	$V_{BAT\_DPL\_HYS}$	BAT rising	---	200	---	mV

Electrical Characteristics (continued)

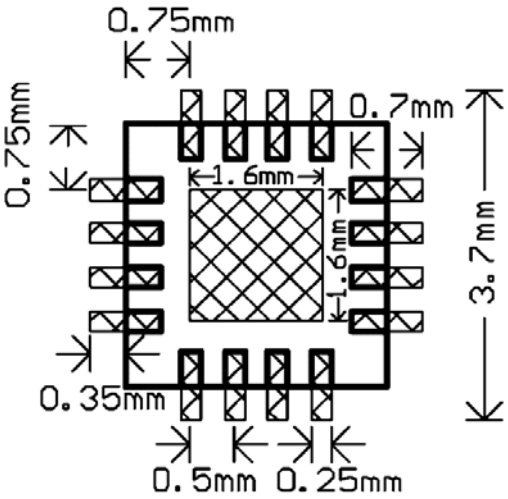
PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT
Battery Charger						
BAT Supply Current at battery supplement mode	I_{SUPBAT}	VIN=0V, BAT=4.2V, I_{SYS}=0A	---	---	15	μA
BAT Regulation voltage	$V_{BATREG1}$	VIN=5V, VSET=High	4.17	4.2	4.23	V
	$V_{BATREG2}$	VIN=5V, VSET=Low	4.31	4.35	4.38	V
BAT Re-Charge Threshold	$\%V_{RECHG}$	Battery re-charge threshold $=\%V_{RECHG}*V_{BATREGX}$	---	97.5	---	%
BAT Fast-Charge Threshold	$V_{FASTCHG}$	BAT Rising, (Pre-charge to fast charge)	2.9	3.0	3.1	V
BAT Fast-Charge Hysteresis	$\Delta V_{FASTCHG}$	BAT Falling, (Fast charge to pre-charge)	---	200	---	mV
BAT Pre-Charge Threshold	V_{PRECHG}	BAT Falling, (Pre-charge to trickle charge)	1.9	2.0	2.1	V
BAT Pre-Charge Hysteresis	ΔV_{PRECHG}	BAT Rising, (Trickle charge to pre-charge)	---	200	---	mV
Fast Charge Current Range	$I_{FASTCHG}$	$I_{CHG}=V_{ISET}/R_{ISET}*K_{ISET}$	0.5	---	2.5	A
ISET1/ISET2 Voltage Accuracy	V_{ISET}	Fast charge	1.97	2	2.03	V
ISET1/ISET2 Current Factor	K_{ISET}		450	500	550	A/A
BAT Pre-Charge Current	$\%I_{PRECHG}$	BAT=2.8V, I_{PRECHG}/I_{CHG}	5	10	15	%
Trickle Charge Current	$\%I_{TRICHG}$	BAT=2.0V	---	5	---	%
Termination Current Ratio	$\%I_{TERM}$	BAT=4.2V, $\%I_{TERM}=I_{TERM}/I_{CHG}$	5	10	15	%
PWM						
Switching Frequency	F_{OSC_CHG}		1.2	1.5	1.8	MHz
PVCCSW to SLX ON Resistance	R_{ON_P}	PMID=5V	---	100	---	mΩ
SLX to Ground ON Resistance	R_{ON_N}	PMID=5V	---	100	---	mΩ
Protection						
Thermal Regulation	THM_{REG}		---	100	---	°C
Thermal Shutdown Temperature	THM_{SD}		---	155	---	°C
Thermal Shutdown Hysteresis	ΔTHM_{SD}		---	20	---	°C
SYS Output Short Circuit Detection Threshold at BAT Supplement Mode	V_{SYS_SCP2}	BAT-SYS	---	300	---	mV
Time						
Fast Charge Safety Time	t_{FCHG}		---	16	---	hrs.
Pre-charge to Fast Charge Timer Ratio	$\%t_{PCHG}$	Pre-charge safety timer $t_{PCHG}=\%t_{PCHG}*t_{FCHG}$	---	1/8	---	
Safety Timer Accuracy	$\%t_{CHG}$		-15	---	15	%
VIN PGOOD Deglitch Time	t_{VINPG}	Time measure from VIN: 0->5V 1μS rise-time to PWM switching	---	1.875	---	mS
VIN Over Voltage Blanking Time	t_{VINOV}		---	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 PWM modulator Turn-Off Deglitch Time	t_{NO_VIN}		---	30	---	mS
No battery detection checking time	$t_{nobatchk}$			3.85		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

Electrical Characteristics (continued)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT
SYS Output Short circuit Recovery Time at Battery Supplement Mode	$t_{SYS\_SCP\_R}$		---	64	---	mS
Thermistor Monitor						
VP regulation voltage	V_{VP}	VSYS=5V	3.234	3.3	3.366	V
VP Under Voltage Lockout Threshold	V_{VPUV}		---	1.2	---	V
NTC-R Installation Detection Threshold at NTC	V_{NO_NTC-R}	As Percentage to VP	---	97	---	%
Cold Temperature Trip Point	V_{COLD}		75.5	76.5	77.5	% of VP
Hot Temperature Trip Point	V_{HOT}		34	35	36	% of VP
Temperature Trip Point Hysteresis			---	1	---	% of VP
NTC threshold to disable function				100		mV
Logic I/O						
Logic-Input Threshold (ENB,USB_SET,VSET)	V_{TH}	High threshold	1.6	---	---	V
	V_{TL}	Low threshold	---	---	0.3	V
Pull Low Resistance in USB_SET	R_{USB_SET}		---	100	---	KΩ
Open-Drain Output Low Voltage (/CHGLED)	V_{ODLOW}	I_{SINK}=10mA, V_{SYS}=3.7V	---	---	200	mV
Open-Drain Output Leakage Current	I_{LK_OD}	V_{OD}=5V	---	---	1	μA

Minimum Footprint PCB Layout Section

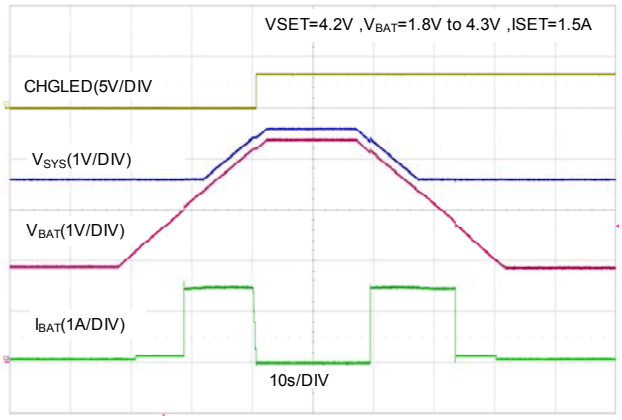
TQFN3X3-16



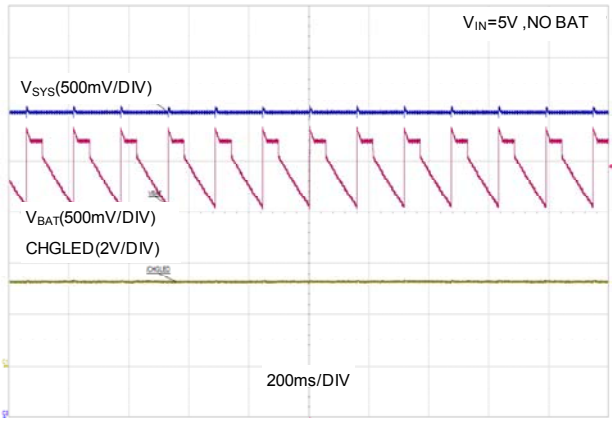
Typical Performance Characteristics

V_{IN}=5V , T_A=25°C, unless otherwise noted.

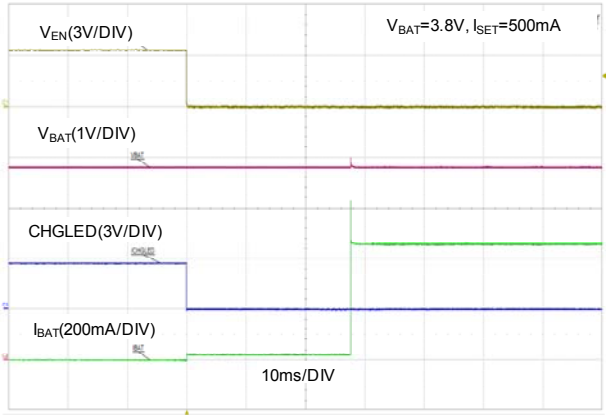
Battery Charge curve



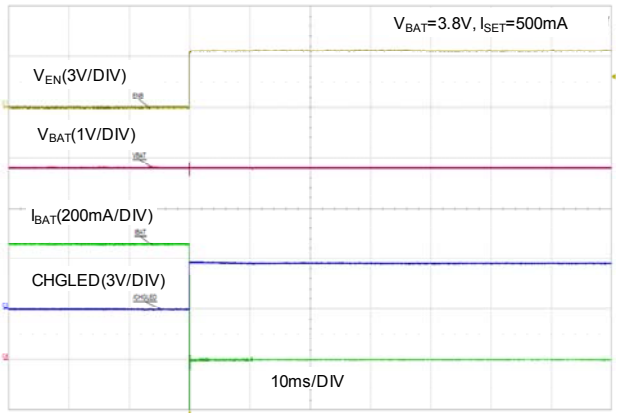
Auto recharge curve



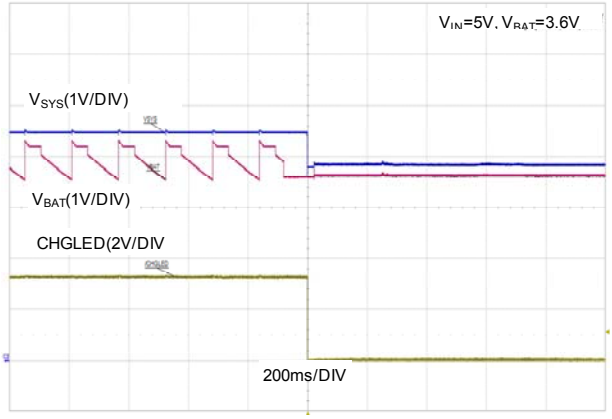
Charge Enable



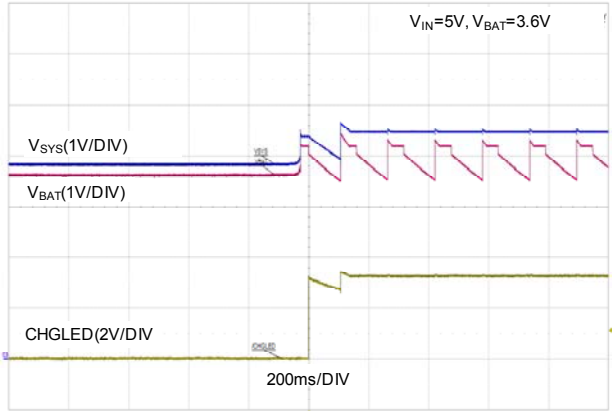
Charge Disable



Battery Plug in

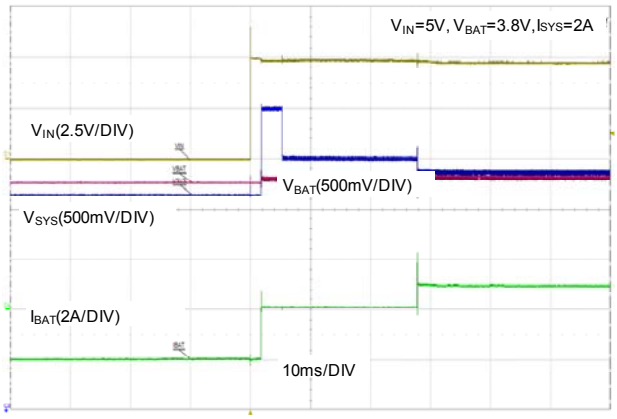


Battery Plug out

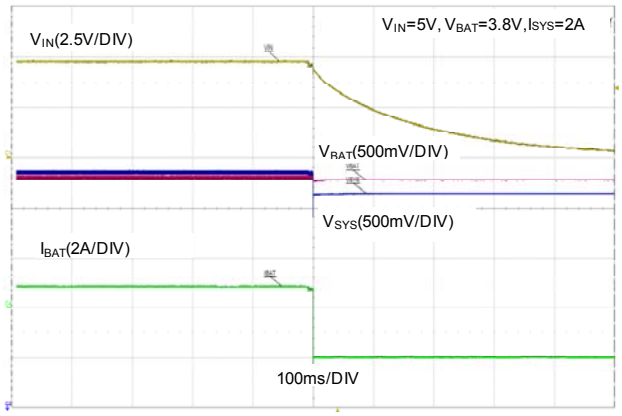


Typical Performance Characteristics (continued)

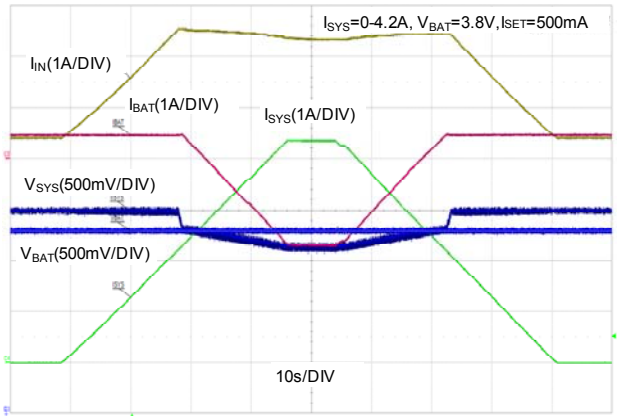
VIN Plug in



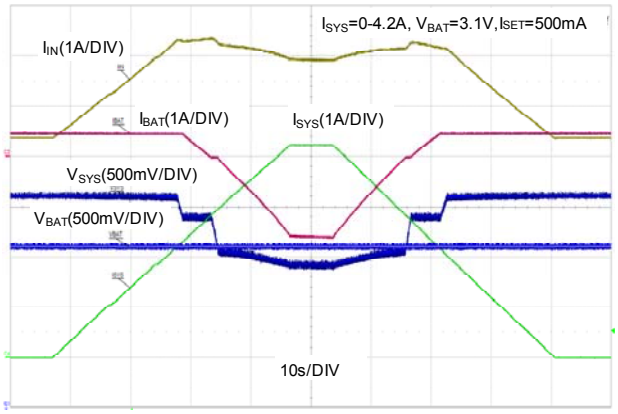
VIN Plug out



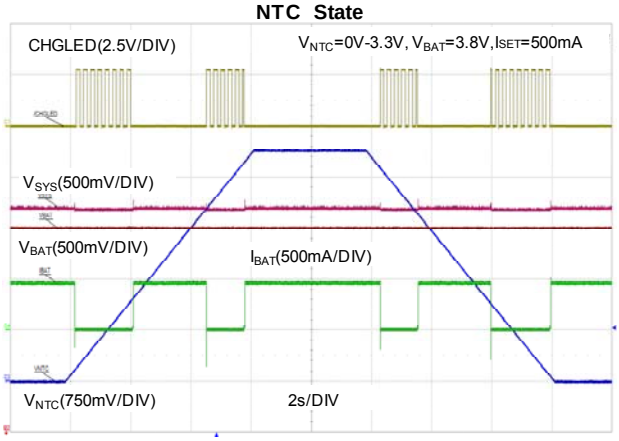
DPPM State 1



DPPM State 2

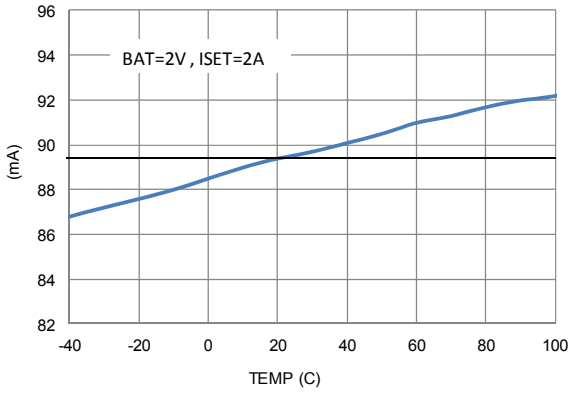


NTC State

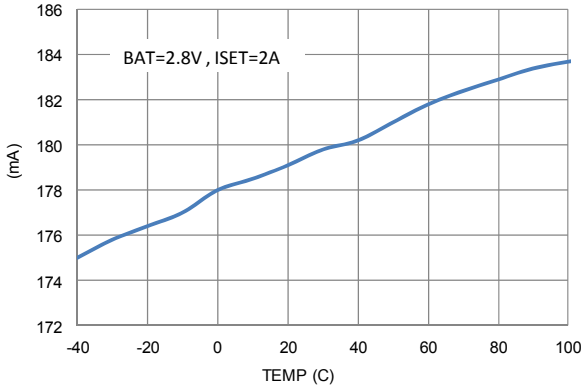


Typical Performance Characteristics (continued)

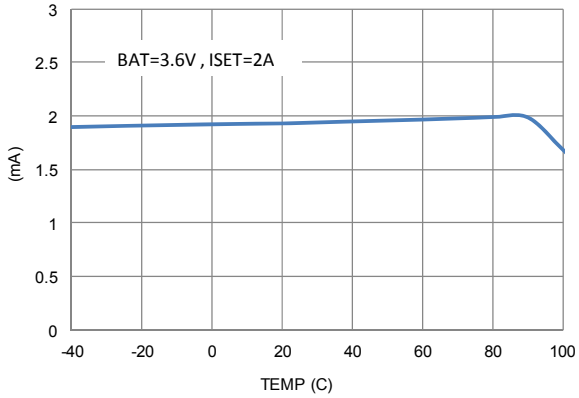
Trickle Charge current V.S Temp



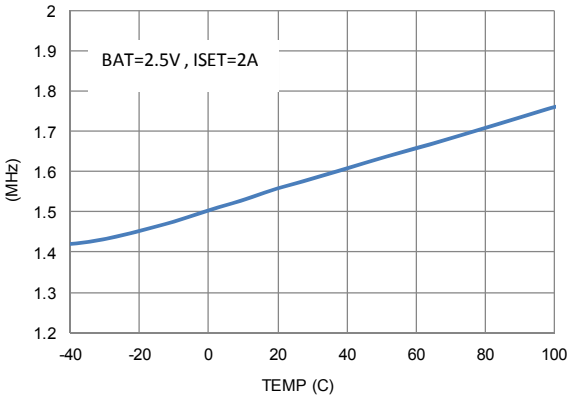
Pre Charge current V.S Temp



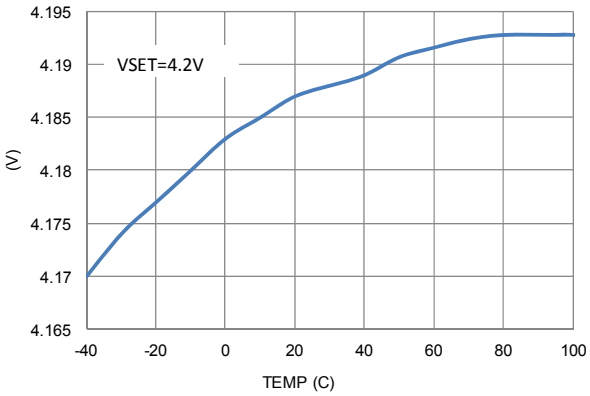
Fast Charge current V.S Temp



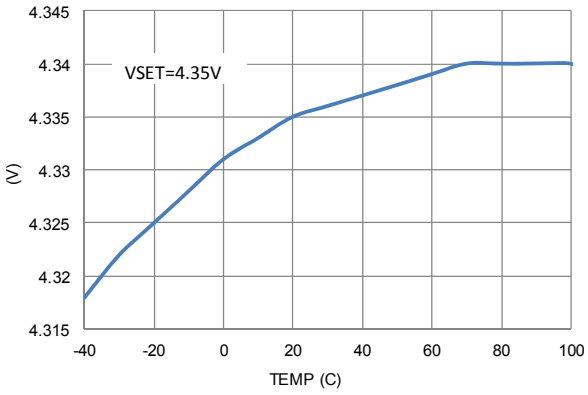
Switch freq V.S Temp



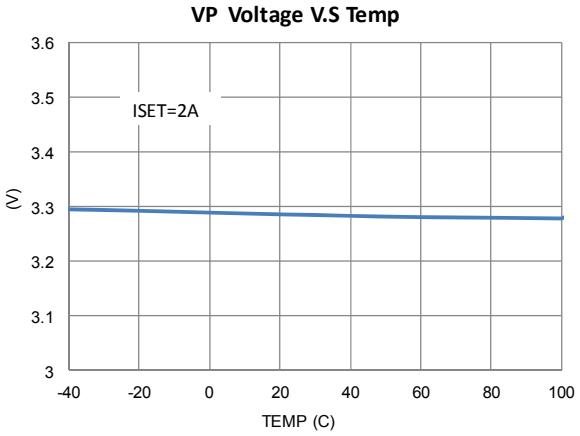
Battery Full Voltage V.S Temp

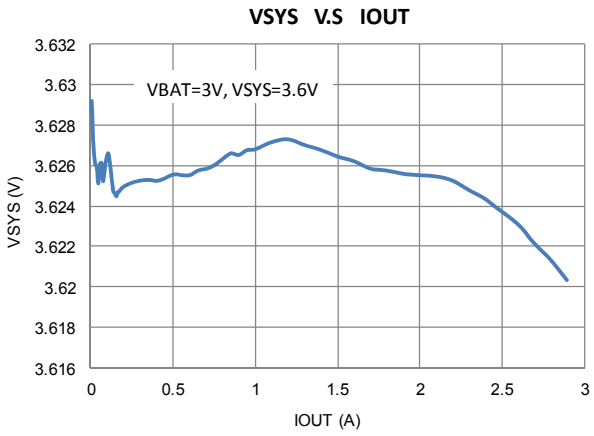


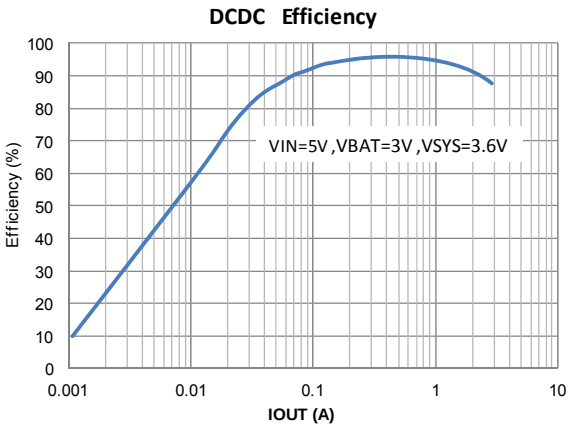
Battery Full Voltage V.S Temp

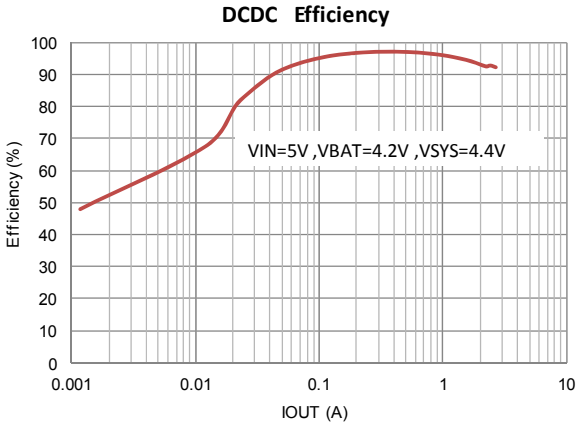


Typical Performance Characteristics (continued)





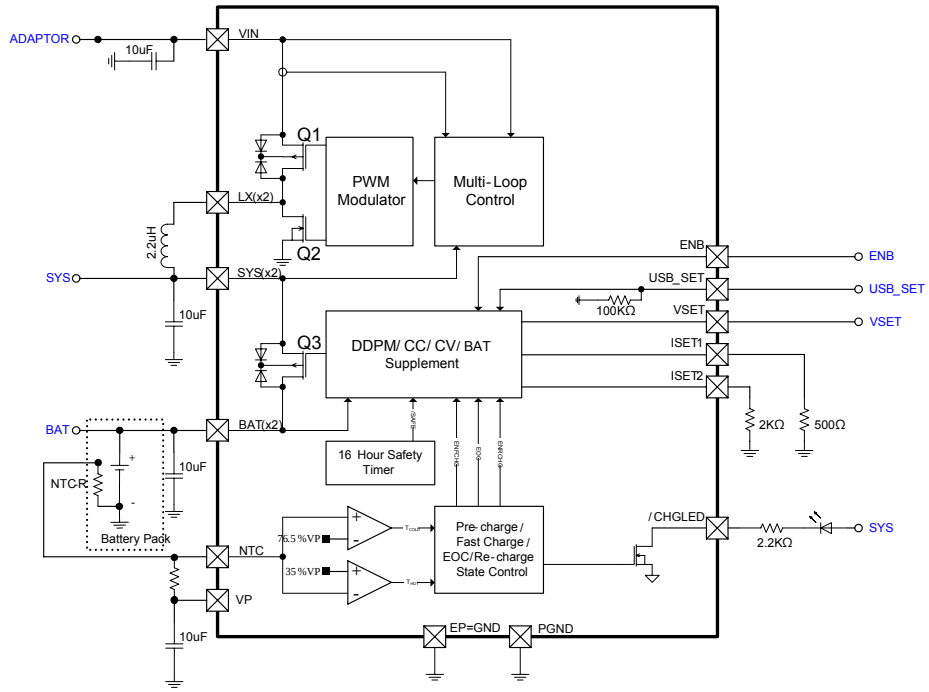




Pin Description

Pin No	Pin Name	Function
1,15	SYS	System Supply output. Bypass with a 10μF or greater ceramic capacitor. SYS connects to BAT though an internal 50mΩ system load switch when VIN is invalid, or when the V_{SYS} load is greater than the input current limit.
2	VIN	Adapter Power or USB Power Input. Bypass with a 10μF or greater capacitor each to GND and PGND.
3,4	LX	Inductor switch node of Switching Charger. Connect the inductor between LX and SYS.
5	PGND	Power Ground of Switching Charger.
6	ENB	Active Low Enable pin. Toggle this pin low to enable charging, and high to disable charging.
7	NTC	Thermistor input pin.
8	VP	Power Output 3.3V buffer for battery temperature sense. Bypass with a 0.1μF or greater ceramic capacitor.
9	/CHGLED	Indicator of Charger status with open drain output.
10	VSET	Used to set the battery regulation voltage. High: V_{BAT}=4.2V, Low: V_{BAT}=4.35V
11	ISET1	AC fast charging current set pin for AC input. Connecting a resistor between ISET1 to GND.
12	ISET2	USB fast charging current set pin for USB input. Connecting a resistor between ISET2 to GND.
13	USB_SET	Charging current selecting input. Toggle this pin low to select fast charging current set by ISET1, and high to select fast charging current set by ISET2.
14,16	BAT	Battery Connection. Connect to a single-cell Li+ battery. Bypass with a 10μF or greater ceramic capacitor.
EP	GND	The Exposed Pad must be soldered to a large PCB and connect to GND for maximum power dissipation.

Block Diagram & Application Circuit



Function Description

VIN Power Good

When the VIN voltage meets below conditions, the G2246 enters battery charging mode, and PWM controller is in buck mode. Otherwise, the PWM controller is off, and VIN is discharged through 2.5k resistor to ground :

- $V_{VIN} > V_{INUV}$
- $V_{VIN} > V_{BAT}+\Delta V_{ASDN}$
- $V_{VIN} < V_{INOV}$

The condition of $V_{VIN} > V_{BAT}+ \Delta V_{ASDN}$ is asserted with deglitch time t_{VINPG} (=1.875mS). After the condition is asserted, deglitch time t_{NO_VIN} (=30mS) is inserted.

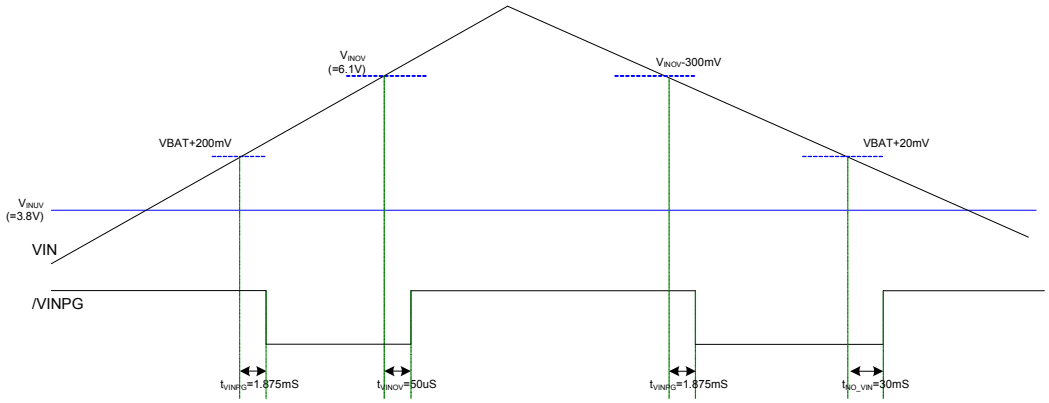
VIN over voltage condition is asserted with deglitch time t_{VINOV} (=50µS).After the condition is asserted, deglitch time t_{VINPG} (=1.875mS) is inserted.

VIN Over-Voltage Protection (VIN OVP)

The G2246 Li-ion charger accepts VIN input voltage up to 10V without damage. When VIN>V_{INOV} for a period longer than t_{VINOV}, the PWM Controller is OFF and the battery charging is stopped. When in VIN OVP mode, the SYS output is connected to battery through Q3 FET is fully ON. The V_{SYS_SCP2} circuit is active and monitors for overload conditions on SYS. Once the OVP function is removed, the safety timer is reset and a new charge cycle will be indicated by the /CHGLED output.

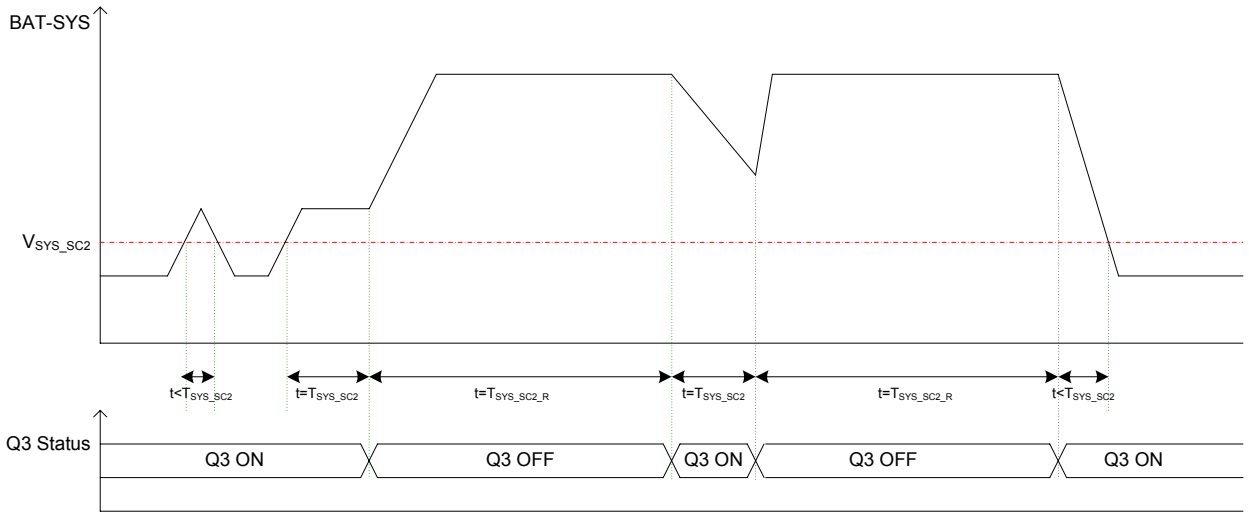
VIN Under-Voltage Lockout (VIN UVLO)

The G2246 Li-ion charger remains in power down mode when the input voltage VIN is below the under-voltage threshold V_{INUV}. In power down mode, the PWM Controller is OFF, and the Q3 FET that connects BAT to SYS is ON. The V_{SYS_SCP2} circuit is active and monitors for overload conditions on SYS.



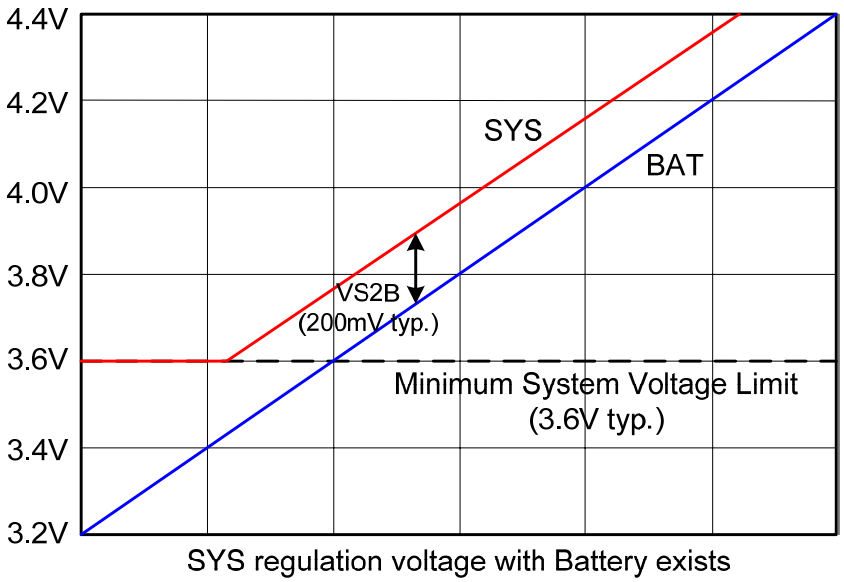
BAT to SYS Short Circuit Protection (SYS SCP)

The V_{SYS_SCP2} circuit is used for overload condition on SYS. When (BAT-SYS)>V_{SYS_SCP2} for a period longer than t_{SYS_SCP}, the Q3 FET that connects BAT to SYS is turned OFF and the internal recovery timer is start. After the time $t_{SYS\_SCP\_R}$ is reached, the Q3 FET is turned ON for a period t_{SYS_SCP} to see if the overload condition is removed.



SYS Voltage Regulation

The PWM modulator regulates the SYS voltage depending on the BAT condition. Under no-battery condition, the SYS voltage is fixed at V_{SYS_NOBAT}. With battery exists, the SYS voltage is regulated at V_{SYS_MIN} if the BAT voltage is smaller than V_{SYS_MIN}. As the BAT voltage rises above V_{SYS_MIN}, the voltage difference between SYS and BAT is always regulated at V_{S2B}.



SYS regulation voltage with Battery exists

Dynamic Power Path Management

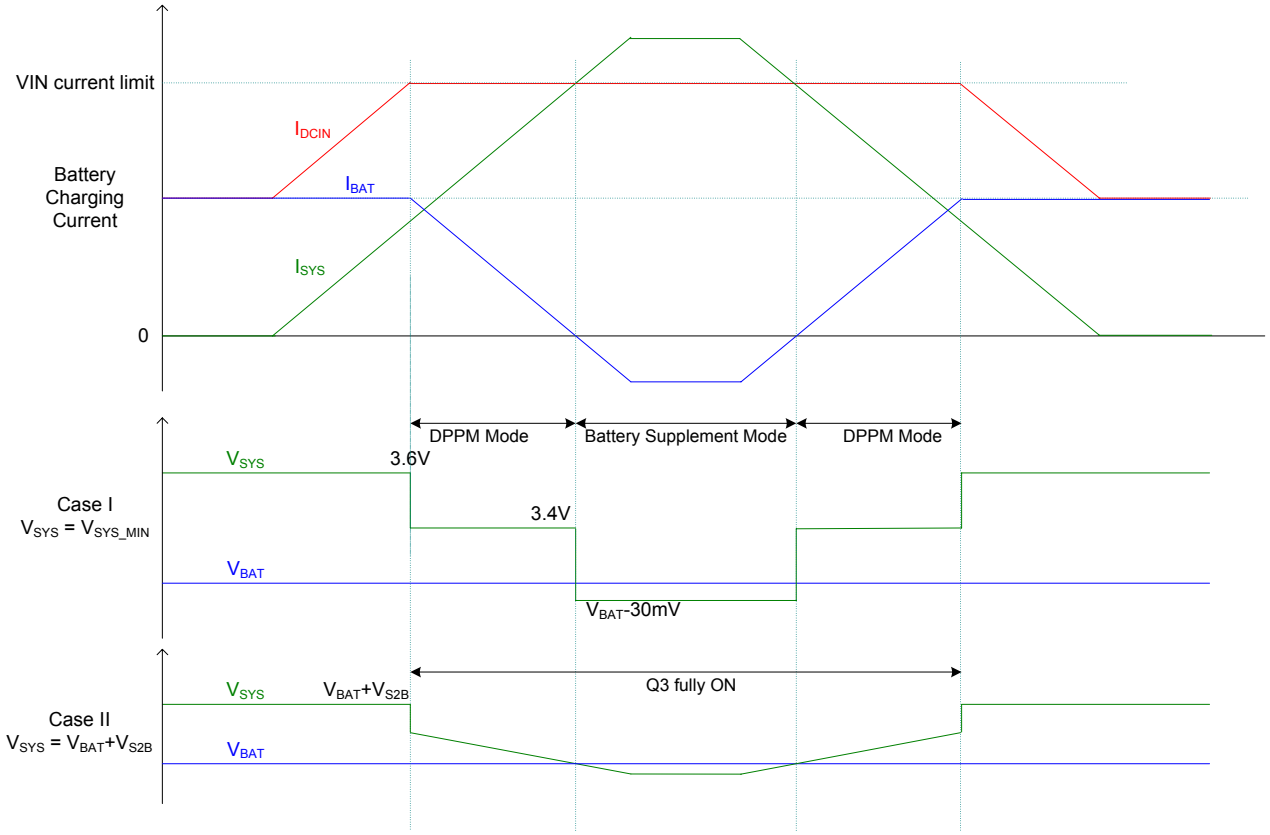
VIN-DPM mode is utilized in G2246 Li-ion charger for preventing it from crashing poorly designed or incorrectly configured VIN power source. If VIN voltage falls below V_{INDPM} (4.2V typ.), the battery charging current is reduced to prevent the VIN voltage falling further.

DPPM mode is utilized in G2246 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 VIN input current limit, the SYS voltage falls. The battery charging current is reduced to prevent the SYS voltage falling further. IN DPPM mode, the battery charging termination detection is halted.

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 battery supplements the SYS load. In Battery Supplement Mode, the battery charging termination detection is halted.

If the SYS load keeps increasing until (BAT-SYS)>V_{SYS_SCP2}, the BAT to SYS short circuit protection is active.



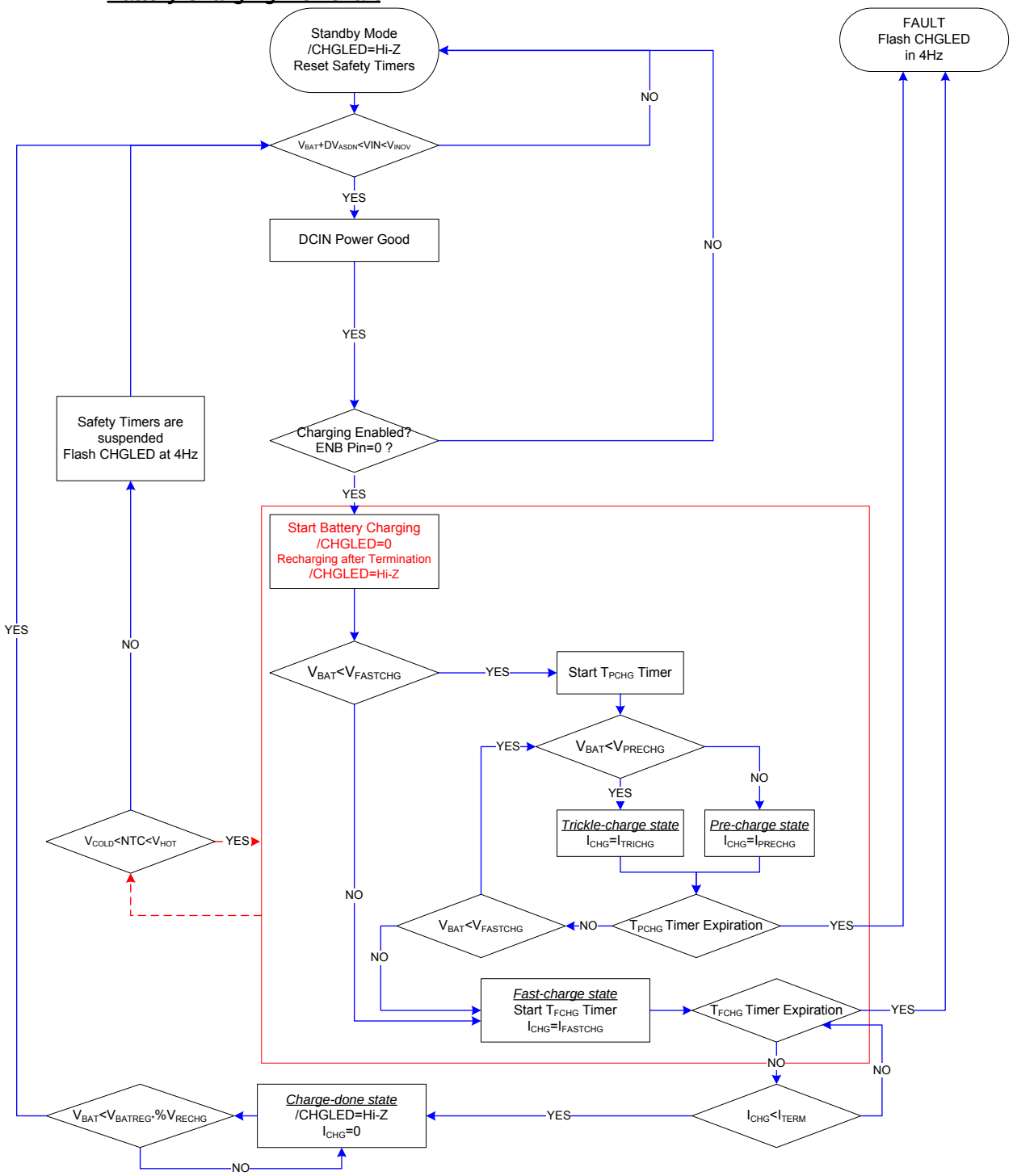
VIN not Connected

When no input source is connected to VIN, SYS is powered strictly from battery. During this mode, the Q3 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 Charging

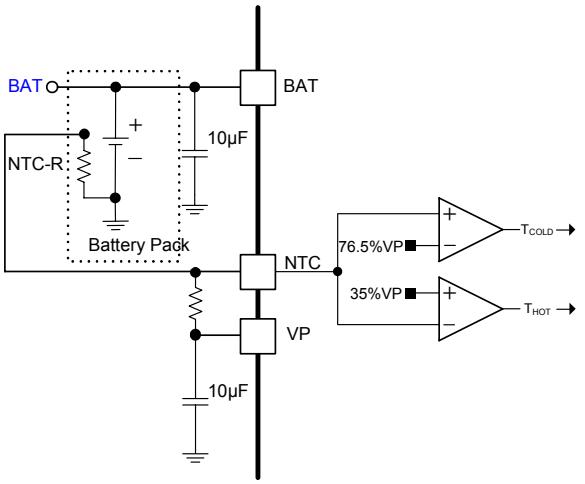
Once the VIN power good is sustained, set ENB Pin low to initiate battery charging. The battery is charged in four phases: trickle charge, pre-charge, constant current fast charge, and a constant voltage regulation. The battery charging flow chart is as below:

Battery Charging Flowchart



Battery Pack Temperature Monitoring

When G2246 detects the presence of the battery, the G2246 detects battery NTC-R is presented or not by detecting the voltage level of NTC pin. If the voltage of NTC pin is lower than 97% of VP with duration longer than t_{NO_NTC} (30ms typ.), the battery NTC-R is presented.



After the G2246 battery NTC-R detection is finished, the NTC 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 NTC is outside of the operating range (V_{COLD} to V_{HOT}), charging is suspended and the safety timer maintain their values but suspend counting.

Battery Detection

The battery detection function is active once the battery charging is initiate. G2246 detects the existence of the battery with two phases, Charge-Done phase and Re-Charge phase. The Charge-Done phase is triggered by the charge termination signal I_{TERM}. At the same time, a detection timer is started and a small current is introduced to pull down the BAT voltage. If the BAT voltage does NOT reach the re-charge level (V_{BATREG}*%V_{RECHG}) within the time $t_{nobatchk}$ of the timer, the battery is presented. The Re-Charge phase, on the other hand, is triggered by the re-charge signal. The detection timer is started and the new charging period will charge up the BAT voltage. If the charge current does NOT reach the termination level within the time $T_{nobatchk}$ of the timer, the battery is presented. NOBAT state will be indicated by the /CHGLED output only if both the two phases determine that the battery is not exist. To detect the absence of the battery correctly, the capacitance at the BAT pin without battery must be smaller than 150µF.

Thermal Regulation Loop and Thermal Shutdown

The G2246 contain a thermal regulation loop that monitors the die temperature. If the temperature heat up, the thermal regulation loop reduces the VIN input current to maintain the die temperature less than THM_{REG} (100°C typ.). The 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 PWM Controller is turned OFF, and G2246 charger enters Battery Supplement Mode to ensure that the battery powers the load on SYS.

Safety Timer

The G2246 charger contains an internal safety timer for the trickle charge, pre-charge, fast-charge phases to prevent potential damage to the battery and the system. The timer value of the fast-charge phase is 16 hrs, and the timer value of trickle charge and pre-charge is 1/8 of the fast-charge timer value. When the temperature of the battery pack monitored by the NTC thermistor through NTC pin is out of the operating range (V_{COLD} to V_{HOT}), 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.

Once the safety timer is expired, the G2246 latches off the charging progress, and the latch can be reset by these conditions shown below:

- Remove VIN
- Remove Battery
- ENB Pin=High

/CHGLED Indicator

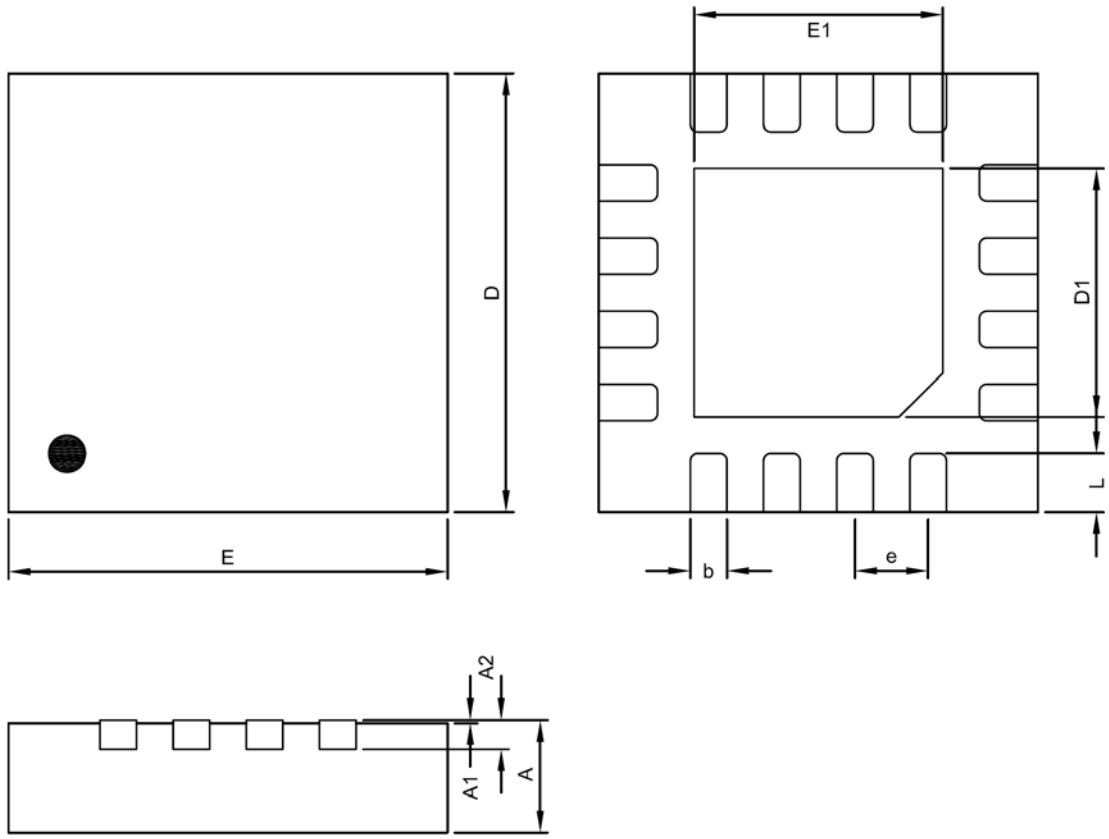
The open-drain CHGLED output indicates various charger operations.

Charger State	CHGLED 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
Battery Pack too cold or too hot	
Charger in Thermal Shutdown	
Charger in Thermal Regulation	

Fault Protection

Operating Mode	Function	Error Description	Condition	Behavior	Reset requirement	After reset
Charging	VIN	VIN-OVP	1. VIN > 6.1V 2. Deglitch time = 50μS	1. PWM Controller turn off 2. Stop charging mode 3. MOS Q3 full turn on	1. VIN < 5.8V (V_{INOV}-300mV) 2. Deglitch time =1.875mS	1. Auto restart charge mode 2. Safety timer reset
		VIN_PG	VIN_PG=0 when: 1. VIN < 3.6V (V_{INUV}) (falling) 2. VIN < VBAT+20mV (falling) Deglitch time=30mS (falling)	1. PWM Controller turn off 2. Stop charging mode 3. MOS Q3 full turn on	VIN_PG=1 when: 1. DCIN > 3.8V (V_{INUV}) (rising) 2.VIN>BAT+200mV (rising) Deglitch time=1.875mS (rising)	1.Auto restart charge mode 2.Safety timer reset
	SYS	SYS-SCP	1. (VBAT-VSYS) > V_{SYS_SCP2}=300mV 2. Deglitch time =250μS(t_{SYS_SCP})	1. MOS Q3 turned off 2. V_{SYS_SCP2} timer will start 3. After 64mS($t_{SYS\_SCP\_R}$) Q3 will turn on and check V_{SYS_SCP2} again, VSYS_SCP timer will reset	1. VSYS_SCP will auto check & recover 2. (VBAT-VSYS) < V_{SYS_SCP2}=300mV 3. Deglitch time =64mS($t_{SYS\_SCP\_R}$)	MOS Q3 turned on
	Thermal	NO NTC	NTC voltage > 97% VP	Stop NTC-R detection	1. Install NTC-R	Start NTC-R detection
		VP short	VP voltage under 1.2V	Stop NTC-R detection	1. Remove VP short	Start NTC-R detection
		Thermal Regulation	IC die temp over 100	Reduce VIN current to make die under 100 degree	IC die temp under 100 degree	VIN current recover
		Thermal SD	IC die temp over 155	1. Turn off PWM Controller and stop charging 2. Full turn on Q3 MOS to keep VSYS	IC die temp under 135 degree	Turn on PWM Controller and start charging mode
Battery Supply	SYS	SYS-SCP	1. (VBAT-VSYS) > V_{SYS_SCP2} =300mV 2. Deglitch time =250μS(t_{SYS_SCP})	1. MOS Q3 turned off 2. V_{SYS_SCP2} timer will start 3. After 64mS($t_{SYS\_SCP\_R}$) Q3 will turn on and check V_{SYS_SCP2} again, VSYS_SCP timer will reset	1. VSYS_SCP will auto check & recover 2. (VBAT-VSYS) < V_{SYS_SCP2}=300mV 3. Deglitch time =64mS($t_{SYS\_SCP\_R}$)	MOS Q3 turned on

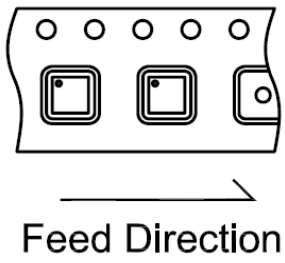
Package Information



TQFN3X3-16 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	2.95	3.00	3.05	0.1161	0.1181	0.1201
E	2.95	3.00	3.05	0.1161	0.1181	0.1201
D1	1.60	1.70	1.80	0.0630	0.0669	0.0689
E1	1.60	1.70	1.80	0.0630	0.0669	0.0689
b	0.18	0.25	0.30	0.0071	0.0098	0.0118
e	0.50 BSC			0.0197 BSC		
L	0.30	0.35	0.40	0.0118	0.0138	0.0157

Taping Specification



PACKAGE	Q'TY/REEL
TQFN3X3-16	3,000 ea