Integrated Power Supply for TFT-LCD

Features

- **Input Supply Range: 2.5V ~ 5.0V**
- **I^2C Interface**
- **Current Mode Sync. Boost Converter for AVDD**
  - **Programmable Switching Frequency**
  - **4.5V to 11V Programmable Output**
  - **Integrated 14V/2A 0.15Ω Switching MOSFET**
  - **High Efficiency (90%)**
- **Sync. Buck Converter for V_{CORE}/V_{IO}**
  - **Programmable Switching Frequency**
  - **0.8V to 2.8V Programmable Output for V_{CORE}**
  - **1V to 2.8V Programmable Output for V_{IO}**
  - **Integrated 6V/1.2A 0.5Ω Switching MOSFET**
- **Sync. Boost Converter For V_{GH}**
  - **Programmable Switching Frequency**
  - **10V to 37V Programmable Output**
  - **Integrated 40V/1.2A 1Ω Switching MOSFET**
  - **Thermal Compensation**
- **Negative Charge-pump regulator for V_{GL1}/V_{GL2}**
  - **-4.4V to -11V Programmable Output for V_{GL1}**
  - **-4.4V to -18V Programmable Output for V_{GL2}**
- **Low Dropout Regulator**
  - **1.2V to 2.8V Programmable Output**
  - **300mA Maximum Output Current**
- **Two High-Performance Operational Amplifier**
  - **±150mA Output Short-Circuit Current**
  - **Rail-to-Rail Input and Output**
- **7 bits Programmable V_{COM} Calibrator**
  - **Thermal Compensation**
- **Programmable Voltage Detector**
- **Gate Pulse Modulator**
- **Protection Function**
  - **Over-Current Protection (OCP)**
  - **Over-Temperature Protection (OTP)**
  - **Over-Voltage Protection (OVP)**
  - **Output Under Voltage Protection (UVP)**
  - **Short Circuit Protection (SCP)**
- **Available in TQFN3.5X6.5-40 Package**

Applications

- **NB PCs**
- **Table PCs**

General Description

The G2518 include a AVDD boost converter, two buck converters, a VGH boost converter, two VGL negative charge pumps, a LDO regulator, a programmable V_{COM} generator with one high-speed amplifier, a high-speed operation amplifier, a gate voltage shaping function.

The AVDD boost converter provides the regulated supply voltage for the panel source driver ICs. It provides fast transient response to pulsed loading while achieving efficiency over 90%.

The V_{CORE}/V_{IO} is current mode Sync. Buck converters. It provides fast transient response and high efficiency.

The low-dropout(LDO) linear regulator can supply to 300mA current while input voltage is 3.3V.

The V_{GH} and V_{GL} can bias the TFT. The V_{GH} is regulated by current mode boost converter, and V_{GL} is regulated by negative charge pump.

One channel programmable op-amp is designed to drive the VCOM with the capability of high current and wide bandwidth.

The voltage detector monitors the supply voltage to issue a reset signal while the detected voltage is too low. The RESET output is an open-drain type that requires an external pull-up resistor.

The GPM is controlled by frame signals form T-CON to modulate the Gate-On voltage, VGHM, which acts a flicker compensation circuit to reduce the coupling effect between gate lines and pixels.

Thermal compensation function according to RNTC pin voltage is provided for V_{GH} and V_{COM} voltage selected by I^2C register and MTP.

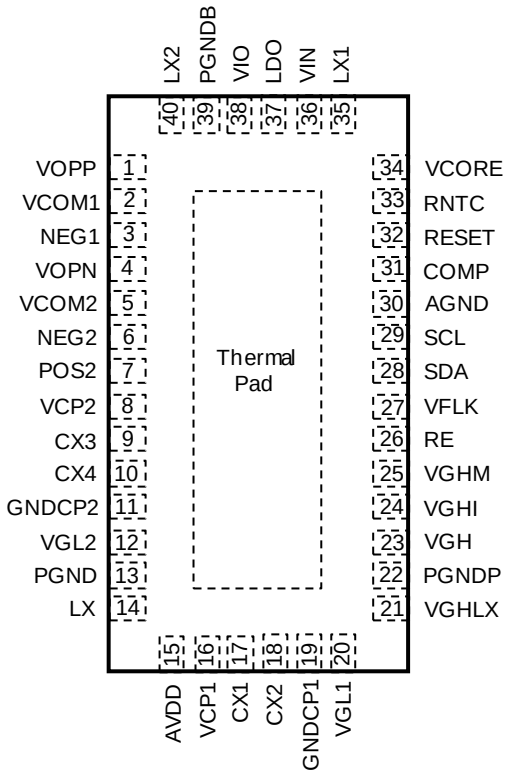
The G2518 is available in a 40-pin TQFN (3.5mm x 6.5mm) package.

Ordering Information

ORDER NUMBER	MARKING	TEMP. RANGE	PACKAGE (Green)
G2518KK1U	2518	-40°C to 85°C	TQFN3.5X6.5-40

Note: KK: TQFN3.5X6.5-40
1: Bonding Code
U: Tape & Reel
Green : Lead Free / Halogen Free.

Pin Configuration



G2518 TQFN3.5X6.5-40

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

Absolute Maximum Rating

VIN to GND. . . . . 0.3V to 7V
VIN to GND (100mS pulse). . . . . 0.3V to 12V
SDA, SCL to GND . . . . . -0.3V to 6V
PGND, PGNDB, PGNDP to GND. . . . . ±0.3V
COMP, VFLK, RESET, RNTC to GND. . . -0.3V to 6V
AVDD, LX to PGND . . . . . .-0.3V to 14V
LX1, LX2 to PGNDB . . . . . -0.3V to 6V
VGH, VGHLX to PGNDP . . . . . .-0.3V to 40V
VCORE, VIO, LDO to GND. . . . . -0.3V to 6V
VGHI, VGHM, RE to GND . . . . . -0.3V to 30V
VOPP to VOPN . . . . . .-0.3V to (V_{AVDD}+0.3V)
VCOM1, NEG1 to VOPN . . . . . -0.3V to (V_{AVDD}+0.3V)
VCOM2, POS2, NEG2 to VOPN.-0.3V to (V_{AVDD}+0.3V)
VCP1, CX1 to GNDCP1 . . . . . -0.3V to 12V
GNDCP1, CX2 to VGL1. . . . . -0.3V to 12V
VCP2, CX3 to GNDCP2 . . . . . -0.3V to 12V
GNDCP2, CX4 to VGL2. . . . . -0.3V to 12V

Recommend Operating Range

Thermal Resistance Junction to Ambient, (θ_{JA})
TQFN3.5X6.5-40 . . . . . 27.5°C/W
Continuous Power Dissipation (T_A = +25°C)
TQFN3.5X6.5-40 . . . . . .3.63W
Thermal Resistance Junction to Case, (θ_{JC})
TQFN3.5X6.5-40. . . . . 4.7°C/W
Operating Temperature Range . . . . . .-40°C to 85°C
Storage Temperature Range. . . . . -65°C to 150°C
Junction Temperature . . . . . 150°C
Reflow Temperature (soldering, 10sec) . . . . . 260°C
Electrostatic Discharge, VESD (*2)
ESD (HBM) 2kV/8kV
ESD (MM) 200V

Note1 :
Devices are ESD sensitive. Handing precaution is recommend. Except SDA, SCL, VIN pin 8kV for HBM

Electrical Characteristics

(V_{IN}=3.3V, V_{AVDD}=7.2V, GNF=0V, 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	CONDITIONS	MIN	TYP	MAX	UNITS
GENERAL					
Input Voltage Range		2.5	3.3	5.0	V
VIN Quiescent Current	All converter no switching	---	3	---	mA
	All converter switching	---	6	---	
Under-voltage Lockout Threshold	V_{IN} falling, turn off IC	---	2	---	V
	V_{IN} rising hysteresis	---	0.3	---	
Duration to Trigger Fault Condition	Boost, Buck, Charge pumps (Fcount = 1MHz)	---	60	---	ms
Thermal Shutdown Protection	Temperature rising	---	150	--	°C
	Hysteresis	---	15	---	

Electrical Characteristics (Continued)

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
AVDD Boost Converter					
Output Voltage Range	Programmable	4.5	---	11	V
Output Voltage Bit		---	7	---	Bits
Output Voltage Resolution		---	0.1	---	V
Output Voltage Tolerance	AVDD = 8.4V	-1	---	+1	%
Switching Frequency	Programmable	600	---	2000	kHz
Switching Frequency Bit		---	3	---	Bits
Switching Frequency Resolution		---	200	---	kHz
Maximum Duty Cycle		86	90	94	%
Transconductance of Error Amplifier	ΔI_{COMP} = ±2.5uA	---	100	--	µA/V
Line Regulation	V_{IN} = 2.5V to 5.5V	-0.3	---	+0.3	%/V
LX On-Resistance	Low Side $R_{DS(ON)}$	---	150	---	mΩ
	High Side $R_{DS(ON)}$	---	300	---	mΩ
LX Leakage Current	V_{LX} = 14.5V	---	1	20	µA
LX Current Limit	Programmable	1	---	2	A
Current Limit Bit		---	1	---	Bits
Current Limit Resolution		---	1	---	A
Soft-start time	Programmable	5	--	20	ms
Soft-start time Bit		---	2	---	Bits
Soft-start time Resolution		---	5	---	ms
Under Voltage Fault Trip Level	V_{AVDD} falling edge	---	NOM X80%	---	V
AVDD Under-Voltage-Lockout Threshold	AVDD rising for MTP programming	---	5	---	V
VGH Boost Converter					
Output Voltage Range	Programmable	10	---	37	V
Output Voltage Bit		---	5	---	Bits
Output Voltage Resolution		---	1	---	V
Output Voltage Tolerance	VGH = 20V	-3	---	+3	%
Switching Frequency	Programmable	600	---	2000	kHz
Switching Frequency Bit		---	3	---	Bits
Switching Frequency Resolution		---	200	---	kHz
Maximum Duty Cycle		86	90	94	%
Line Regulation	V_{IN} = 2.5V to 5.5V	-0.3	---	+0.3	%/V
VGHLX On-Resistance	Low Side $R_{DS(ON)}$	---	1	---	Ω
	High Side $R_{DS(ON)}$	---	1	---	Ω
VGHLX Leakage Current	V_{VGHLX} = 25V	---	1	20	µA
VGHLX Current Limit		---	1.2	---	A
Soft-start time	Programmable	2	---	8	ms
Soft-start time Bit		---	2	---	Bits
Soft-start time Resolution		---	2	---	ms
Under Voltage Fault Trip Level	V_{GH} falling edge	---	NOM X80%	---	V
VGH Under-Voltage-Lockout Threshold	VGH rising for MTP programming	4.5	5	5.5	V

Electrical Characteristics (Continued)

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
VCORE Buck Converter					
Output Voltage Range	Programmable	0.8	---	2.8	V
Output Voltage Bit		---	5	---	Bits
Output Voltage Resolution		---	0.1	---	V
Output Voltage Tolerance		-2	---	2	%
Switching Frequency	Programmable	600	---	2000	kHz
Switching Frequency Bit		---	3	---	Bits
Switching Frequency Resolution		---	200	---	kHz
LX1 to VIN Switch $R_{DS(ON)}$		---	500	---	mΩ
LX1 to PGNDB Switch $R_{DS(ON)}$		---	500	---	mΩ
LX1 Current Limit		0.8	1.2	---	A
LX1 Leakage Current	V_{LX1} = 0V	---	1	10	μA
Soft-start time	Programmable	2	---	8	ms
Soft-start time Bit		---	2	---	Bits
Soft-start time Resolution		---	2	---	ms
Under Voltage Fault Trip Level	V_{CORE} falling edge	---	NOM X80%	---	V
Over Voltage Fault Trip Level		---	NOM X125%	---	V
VIO Buck Converter					
Output Voltage Range		1	---	2.8	V
Output Voltage Bit		---	5	---	Bits
Output Voltage Resolution		---	0.1	---	V
Output Voltage Tolerance		-2	---	+2	%
Switching Frequency	Programmable	600	---	2000	kHz
Switching Frequency Bit		---	3	---	Bits
Switching Frequency Resolution		---	200	---	kHz
LX2 to VIN Switch $R_{DS(ON)}$		---	500	---	mΩ
LX2 to PGNDB Switch $R_{DS(ON)}$		---	500	---	mΩ
LX2 Current Limit		0.8	1.2	---	A
LX2 Leakage Current	V_{LX2} = 0V	---	1	10	μA
Soft-start time	Programmable	2	---	8	ms
Soft-start time Bit		---	2	---	Bit
Soft-start time Resolution		---	2	---	ms
Under Voltage Fault Trip Level	V_{IO} falling edge	---	NOM X80%	---	V
Over Voltage Fault Trip Level		---	NOM X125%	---	V
Low Dropout Linear Regulator					
Output Voltage Range		1.2	---	2.8	V
Output Voltage Bit		---	5	---	Bits
Output Voltage Resolution	V_{LDO} = 2.6V	---	0.1	---	V
Output Voltage Tolerance		-1	---	+1	%
Dropout Voltage	V_{IN} = 3.3V, I_{OUT} = 200mA	---	0.2	---	V
Current Limit		300	---	---	mA
VCOM1 Amplifier					
Positive Supply Voltage Range (VOPP)		4.5	---	11	V
Negative Supply Voltage Range (VOPN)	VOPP – VOPN <12V	-11	---	0	V
Supply Voltage Range	VOPP-VOPN > 5V	5	---	---	V
Supply Current	Buffer configuration, normal mode VPOS_=V_{AVDD}/2, no load	---	0.5	---	mA
Input Offset Voltage	(VNEG, VPOS, VCOM) ~ V_{AVDD} / 2	-15	---	+15	mV

Electrical Characteristics (Continued)

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
Input Bias Current	(VNEG, VPOS, VCOM) ~ V_{AVDD} / 2	-100	---	+100	nA
Output Voltage Swing High	IOUT = 100uA	VSUP -0.02	VSUP -0.005	---	V
	IOUT = 75mA	VSUP -1.8	VSUP -1.5	---	V
Output Voltage Swing Low	IOUT = -100uA	---	5	20	mV
	IOUT = -75mA	---	1.5	1.8	V
Short-Circuit Current	Source	---	+150	---	mA
	Sink	---	-150	---	mA
Output Current	VAVDD/2 , |Δ VOS|<10mV, Source	45	75	---	mA
	VAVDD/2 , |Δ VOS|<10mV, Sink	-45	-75	---	mA
Slew Rate		---	12	---	V/μs
Bandwidth	R_L=10kΩ, C_L=10pF	---	10	---	MHz
Programmable VCOM Calibrator					
Resolution		---	7	---	Bits
Integral Nonlinearity Error		---	1	---	LSB
Differential Nonlinearity Error		---	1	---	LSB
VCOM2 Amplifier					
Positive Supply Voltage Range (VOPP)		4.5	---	11	V
Negative Supply Voltage Range (VOPN)	VOPP – VOPN <12V	-11	---	0	V
Supply Voltage Range	VOPP-VOPN > 5V	5	---	---	V
Supply Current	VPOS_=V_{AVDD}/2, no load	---	3	---	mA
Input Offset Voltage	(VNEG, VPOS, VCOM) ~ V_{AVDD} / 2	-15	---	+15	mV
Input Bias Current	(VNEG, VPOS, VCOM) ~ V_{AVDD} / 2	-100	---	+100	nA
Output Voltage Swing High	IOUT = 100uA	VSUP -0.02	VSUP -0.005	---	V
	IOUT = 75mA	VSUP -1.8	VSUP -1.5	---	V
Output Voltage Swing Low	IOUT = -100uA	---	5	20	mV
	IOUT = -75mA	---	1.5	1.8	V
Short-Circuit Current	Source	---	+250	---	mA
	Sink	---	-250	---	mA
Output Current	VAVDD/2 , |Δ VOS|<10mV, Source	45	75	---	mA
	VAVDD/2 , |Δ VOS|<10mV, Sink	-45	-75	---	mA
Slew Rate		---	35	---	V/μs
Bandwidth	R_L=10kΩ, C_L=10pF	---	10	---	MHz
VGL1 Charge Pump Regulator					
Output Voltage Range	Programmable	-4.4	---	-11	V
Output Voltage Bit		---	6	---	Bits
Output Voltage Resolution		---	-0.1	---	V
Output Voltage Tolerance		-2	---	+2	%
Operation Frequency	Programmable	500	---	1000	kHz
Operation Frequency Bit		---	1	---	Bits
Operation Frequency Resolution		---	500	---	kHz
Line Regulation	V_{CP1} = 9V to 18V, V_{GL1}=-6V	---	0.2	---	%/V
CX Rds-on	P-MOSFET	---	4	6	Ω
	N-MOSFET	---	1.5	3	Ω
Soft-start time	Programmable, F_{VGL1} = 500kHz	4	---	16	ms
	Programmable, F_{VGL1} = 1MHz	1	---	4	ms
Soft-start time Bit		---	2	---	Bits
Soft-start time Resolution	F_{VGL1} = 500kHz	---	4	---	ms
	F_{VGL1} = 1MHz	---	1	---	ms
VGL1 Fault Trip Level	V_{GL1} rising edge	---	NOM X80%	---	V

Electrical Characteristics (Continued)

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
VGL2 Charge Pump Regulator					
Output Voltage Range	Programmable	-4.4	---	-18	V
Output Voltage Bit		---	7	---	Bits
Output Voltage Resolution		---	-0.2	---	V
Output Voltage Tolerance		-3	---	+3	%
Operation Frequency	Programmable	500	---	1000	kHz
Operation Frequency Bit		---	1	---	Bits
Operation Frequency Resolution		---	500	---	kHz
Line Regulation	V_{CP2} = 9V to 18V, V_{GL2}=-6V	---	0.2	---	%/V
CX Rds-on	P-MOSFET	---	4	6	Ω
	N-MOSFET	---	1.5	3	Ω
Soft-start time	Programmable, F_{VGL1} = 500kHz	4	---	16	ms
	Programmable, F_{VGL1} = 1MHz	1	---	4	ms
Soft-start time Bit		---	2	---	Bits
Soft-start time Resolution	F_{VGL1} = 500kHz	---	4	---	ms
	F_{VGL1} = 1MHz	---	1	---	ms
VGL2 Fault Trip Level	V_{GL2} rising edge	---	NOM X80%	---	V
Gate Pulse Modulator					
VFLK Input Voltage	VIH	1.2	---	---	V
	VIL	---	---	0.4	V
VFLK Input Current	V_{FLK} = GND or VIN	-1	---	+1	μA
VFLK to VGHM Minimum Delay	C_{LOAD}=100pF (Rising and Falling)	---	250	---	ns
VGHM delay time	Programmable	0	---	60	ms
VGHM delay time Bit		---	4	---	Bits
VGHM delay time Resolution		---	4	---	ms
VGHM stop level		3	---	11	V
VGHM stop level Bit		---	4	---	Bits
VGHM stop level Resolution		---	1	---	V
VGHI to VGHM Switching On Resistance	V_{FLK} = VIN, I_{VGHM}=10mA	---	15	30	Ω
VGHM to RE Switching On Resistance	V_{FLK} = GND, I_{VGHM}=-10mA	---	30	60	Ω
VGHI Input Current	V_{FLK} = GND or VIN	---	100	---	μA
Voltage Detector					
Output Voltage Range	Programmable	1.6	---	2.5	V
Output Voltage Bit		---	4	---	Bits
Output Voltage Resolution		---	0.1	---	V
Output Voltage Tolerance		-2	---	+2	%
RESET delay time	Programmable	1	---	64	ms
RESET delay time Bit		---	6	---	Bits
RESET Resolution		---	1	---	ms

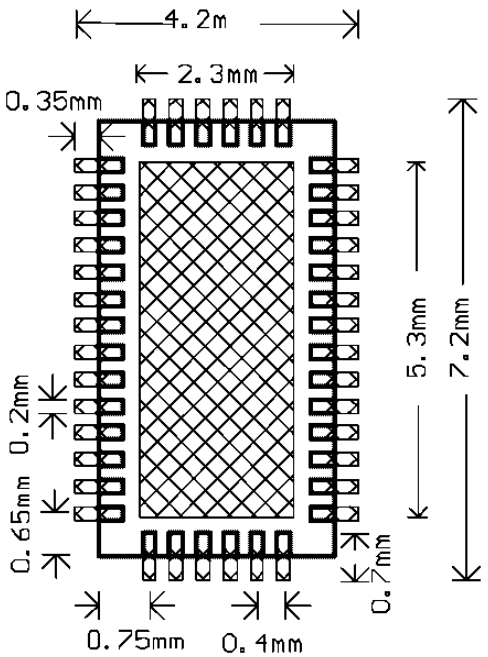
Electrical Characteristics (Continued)

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
I²C TIMING CHARACTERISTICS					
Logic Input High Voltage Threshold	VIH	1.2	---	---	V
Logic Input Low Voltage Threshold	VIL	---	---	0.4	V
Serial-Clock Frequency		0	100	400	kHz
Bus Free Time Between STOP and START Conditions		4.7	---	---	μs
Hold Time (Repeated) START Condition		0.6	---	---	μs
SCL Pulse-Width Low		1.3	---	---	μs
SCL Pulse-Width High		0.6	---	---	μs
Setup Time for a Repeated START Condition		0.6	---	---	μs
Data Hold Time		0	---	900	ns
Data Setup Time		100	---	---	ns
SDA and SCL Receiving Rise Time		---	---	300	ns
SDA and SCL Receiving Fall Time		----	---	300	ns
SDA Transmitting Fall Time		---	---	250	ns
Setup Time for STOP Condition		0.6	---	---	μs
Bus Capacitance		---	---	400	pF
Pulse Width of Suppressed Spike		---	---	50	ns

.

Minimum Footprint PCB Layout Section

TQFN3.5X6.5-40

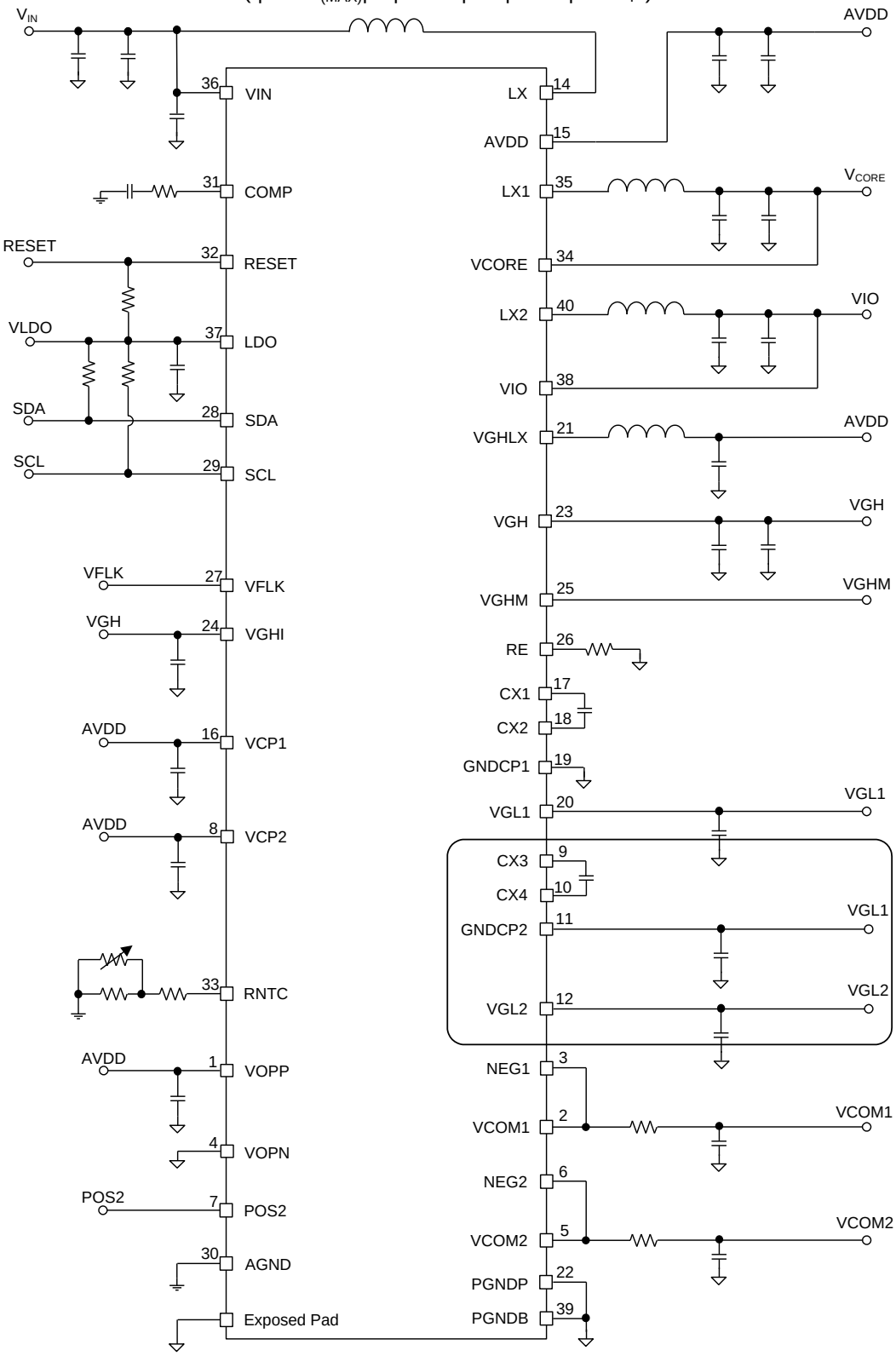


Pin Description

PIN	NAME	FUNCTION
1	VOPP	VCOM operation amplifier positive power supply.
2	VCOM1	VCOM1 operation amplifier output.
3	NEG1	VCOM1 operation amplifier inverting input.
4	VOPN	VCOM operation amplifier negative power supply.
5	VCOM2	VCOM2 operation amplifier output.
6	NEG2	VCOM2 operation amplifier inverting input.
7	POS2	VCOM2 operation amplifier non-inverting input.
8	VCP2	VGL2 charge pump power supply.
9	CX3	VGL2 charge pump flying capacitor node3.
10	CX4	VGL2 charge pump flying capacitor node4.
11	GNDCP2	Power GND for VGL2 charge pump.
12	VGL2	VGL2 output voltage.
13	PGND	Power GND for AVDD boost converter.
14	LX	AVDD boost converter switch node.
15	AVDD	AVDD output voltage.
16	VCP1	VGL1 charge pump power supply.
17	CX1	VGL1 charge pump flying capacitor node1.
18	CX2	VGL1 charge pump flying capacitor node2.
19	GNDCP1	Power GND for VGL1 charge pump.
20	VGL1	VGL1 output voltage.
21	VGHLX	VGH boost converter switch node.
22	PGNDP	Power GND for AVDD boost converter.
23	VGH	VGH output voltage.
24	VGHI	GPM power supply.
25	VGHM	VGHM is the supply voltage for the gate driver ICs.
26	RE	Switch input for discharge VGHM.
27	VFLK	VFLK is produced by timing controller for charging or discharging VGHM.
28	SDA	I2C-Compatible Serial Bidirectional Data Line
29	SCL	I2C-Compatible Clock Input.
30	AGND	Analog GND.
31	COMP	Compensation pin for AVDD Boost converter.
32	RESET	Voltage detector open-drain output for reset.
33	RNTC	External NTC feedback signal for temperature compensation.
34	VCORE	VCORE output voltage and feedback signal.
35	LX1	VCORE buck converter switch node.
36	VIN	Supply voltage input
37	LDO	Voltage output of the LDO.
38	VIO	VIO output voltage and feedback signal.
39	PGNDB	Power GND for buck converter.
40	LX2	VIO buck converter switch node.
Exposed Pad	GND	The exposed pad must be soldered to a large PCB and connected to GND for maximun power disspation.

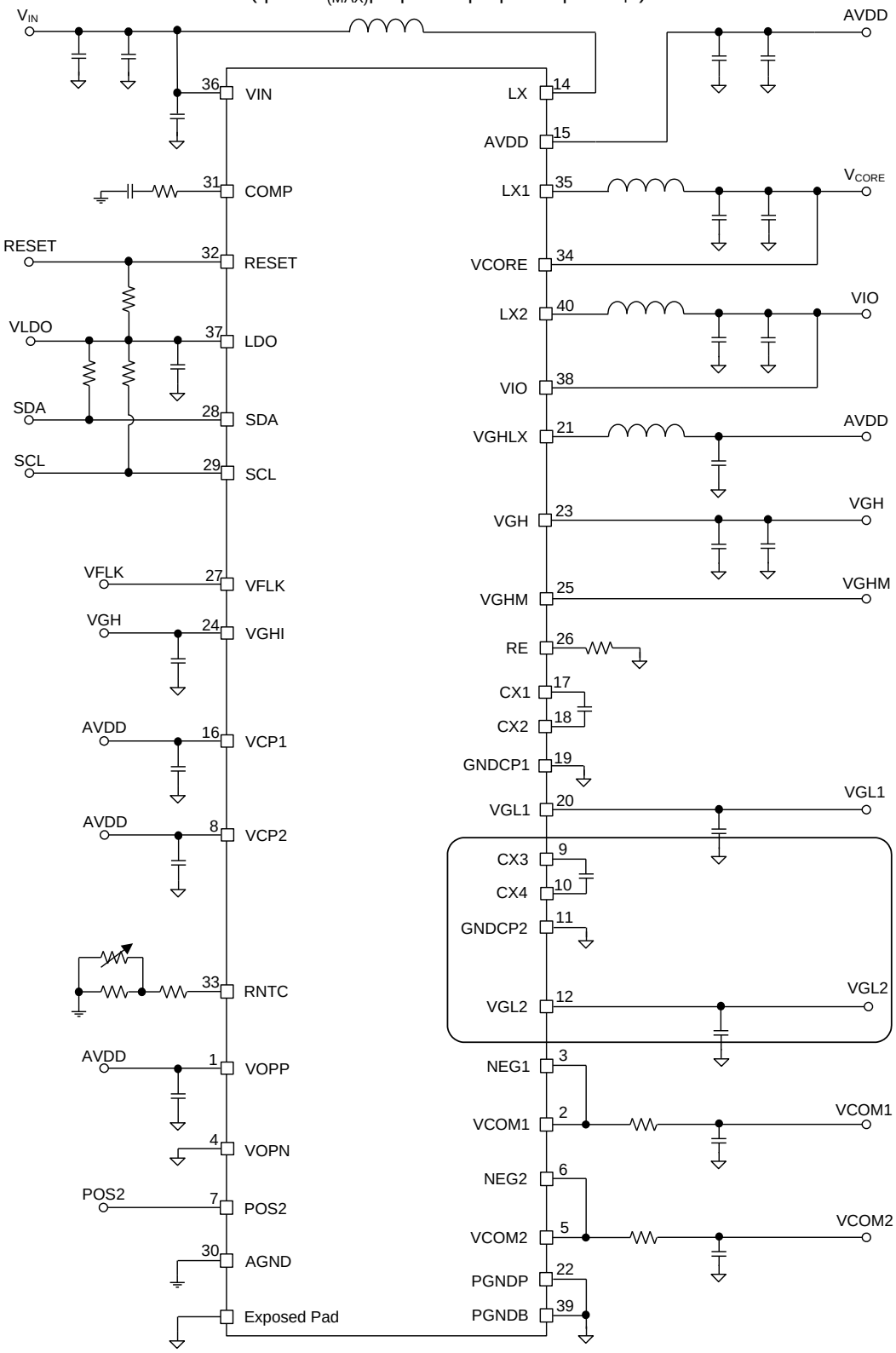
Application Circuit :

Positive AVDD Application Circuit
($|VGL2_{(MAX)}| = |AVDD| + 2|VGL1| - 4*V_F$)



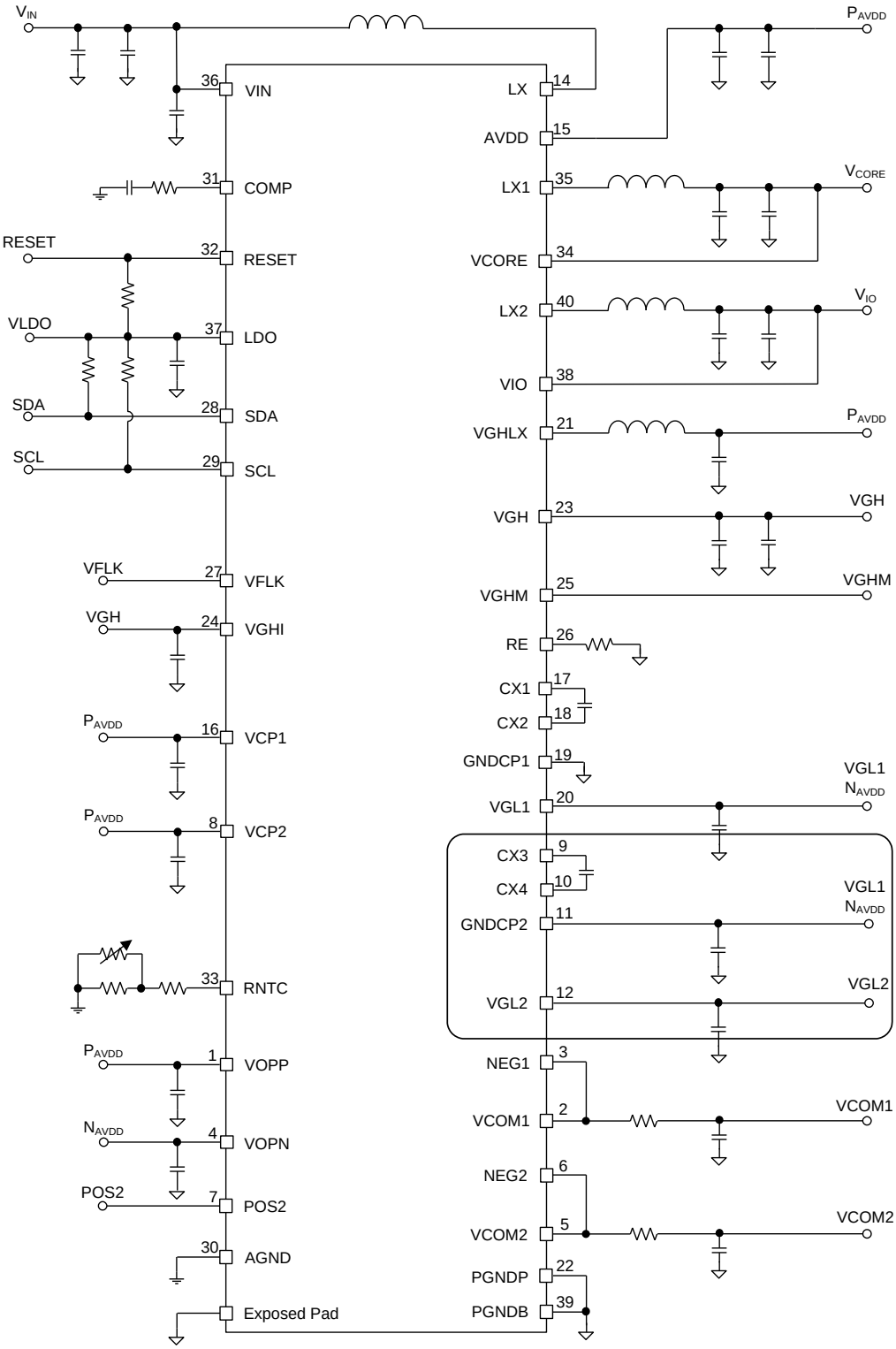
Application circuit 1

Positive AVDD Application Circuit
($|VGL2_{(MAX)}| = |AVDD| + |VGL1| - 4*V_F$)



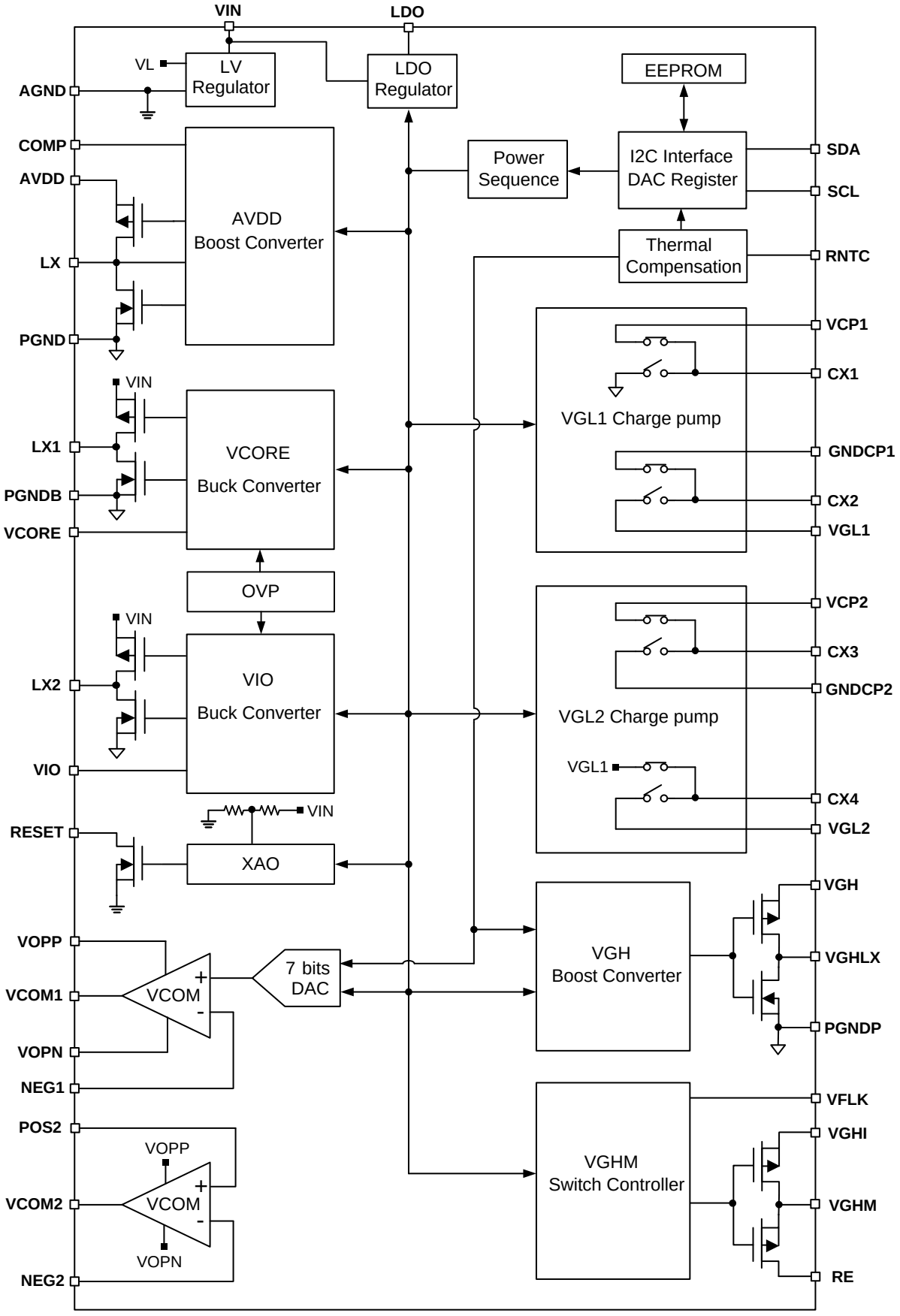
Application Circuit 2

P_{AVDD} and N_{AVDD} Application Circuit
($|VGL2_{(MAX)}| = |P_{AVDD}| + 2|N_{AVDD}| - 4*V_F$)

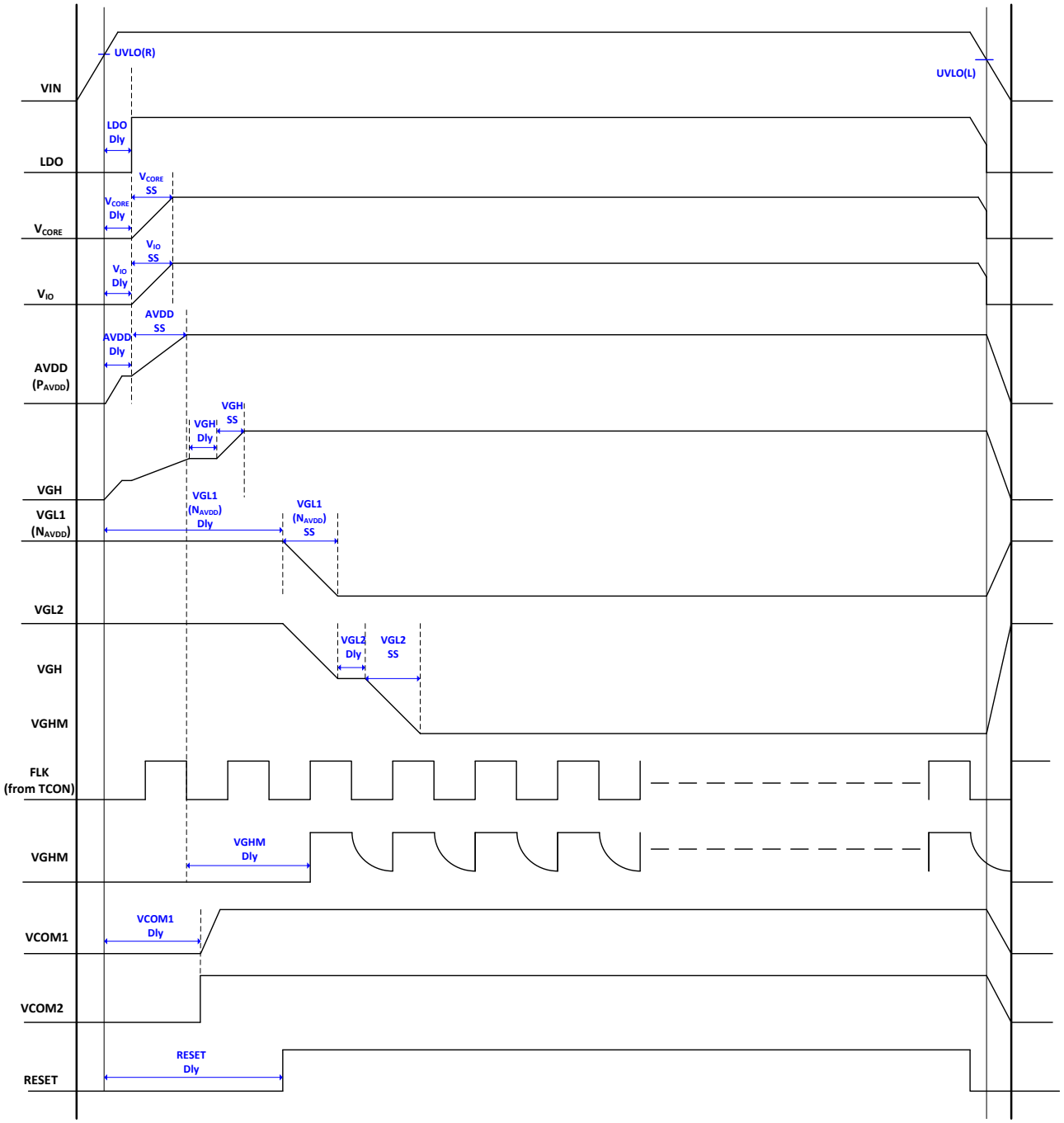


Application Circuit 3

Block Diagram



Timing Diagram



Applications Information

The G2518 contains one AVDD synchronous boost converter, two synchronous buck converters (VI/O and Vcore), one VGH synchronous boost converter with temperature compensation, two VGL negative charge pumps with internal switch, one LDO regulator, one digital VCOM operation amplifier with temperature compensation, one high-speed operation amplifier, one gate voltage shaping function (GPM) and one voltage detector (RESET). All channel functions can be used to program such as Enable/Disable channel, power on sequence, output voltage, switching frequency of converter .

Channel Enable / Disable Setting

The G2518 provides a function to control all channel output enable or disable setting by I^2C interface, please refer the register map.

When the AVDD output is disabled, VGH, VGL1, VGL2. VCOM1, VCOM2 are disabled, too. Because the VGL2 is supplied by VGL1, if the VGL1 disable, VGL2 also need to be disabled, or the IC will be shutdown. The other channels can be disabled individually.

The /VGHT_Enable is used to enable or disable VGH temperature compensation function. If this bit set 1, it means the temperature compensation is disable. Then the VGH output voltage will be setting by VGHHOT register.

The /VCOMT_Enable is used to enable or disable VOCM1 temperature compensation function. If this bit set 1, it means the temperature compensation is disable. Then the VCOM1 output voltage will be setting by VCOMCOLD register (0X13h).

In addition, the VOCM1 can support two kind of panel applications. The VCOM1 output voltage reference is internal powered by AVDD to GND for full AVDD configuration (VCOMR=0) the VCOM1 setting range is from 0.4V to 5.52V, or AVDD to NAVDD for positive and negative AVDD configuration (VCOMR=1) the VCOM1 setting range is from -2.26V to 2.76V.

User can choose to enable/disable the GPM stop level. If the GPM_Stop_Enable bit set to 0, it means the GPM stop level is disable.

AVDD (Synchronous Boost Converter)

The AVDD boost converter is high efficiency PWM architecture with programmable switching frequency. The AVDD functions can be used to program power-on delay time, soft-start time, output voltage, switching frequency, current limit, LX slew rate, please refer the register map.

AVDD Soft-start time

The soft-start time function can reduce the input inrush current of power on. It has 2-bit register with 4 steps.

AVDD Output voltage

The output voltage can be programmed form 4.5V to 11V. Because changing the output voltage in big steps can temporarily demand switch currents greater than the current limit, it is recommended that each voltage step is about 100mV. It has 7-bits register for output voltage adjustable.

AVDD Switching frequency

The switching frequency has 3-bits register with 8 steps. The Higher switching frequency offers better transient response at the expense of slightly reduced efficiency.

AVDD Slew rate

The LX slew rate control function is used to optimize the efficiency and EMI. It has 3-bits register to adjust, and set the register to 00h is slowest slew rate.

AVDD Loop compensation

The AVDD uses an external compensation network connected to its COMP pin to stabilize its feedback loop. A simple series R-C network connected between COMP pin and GND is sufficient to achieve good performance in most applications. The recommended values are 75kΩ and 470pF.

VGH (Synchronous Boost Converter)

The VGH boost converter is PWM architecture with programmable power-on delay time, soft-start time, output voltage, switching frequency, please refer the register map.

VGH Soft-start time

The soft-start time function can reduce the input inrush current of power on. It has 2-bit register with 4 steps.

VGH Output voltage

The output voltage of VGH at hot temperatures can be programmed form 10V to 37V using the VGHHOT register, and cold temperatures can be programmed form 10V to 37V using the VGHCOLD register. The VGHHOT/VGHCOLD register has 5-bits register for output voltage adjustable. The each voltage step is about 1V.

VGH Temperature Compensation

The VGHHOT voltage is set VGH output voltage at TH, and VGHCOLD voltage is set VGH output voltage at TL. The VGH can be temperature compensated, allowing its output voltage to transition from VGHCOLD voltage (TL) to VGHHOT voltage (TH). The G2518 support two kinds of compensation curve. One is the VGHCOLD voltage larger than VGHHOT voltage, another is VGHCOLD voltage smaller than VGHHOT voltage. Temperature compensation curve is shown in Figure 1.

VGH Switching frequency

The switching frequency has 3-bits register with 8 steps. The switching frequency range is from 600kHz to 2MHz, and each step change is about 200kHz.

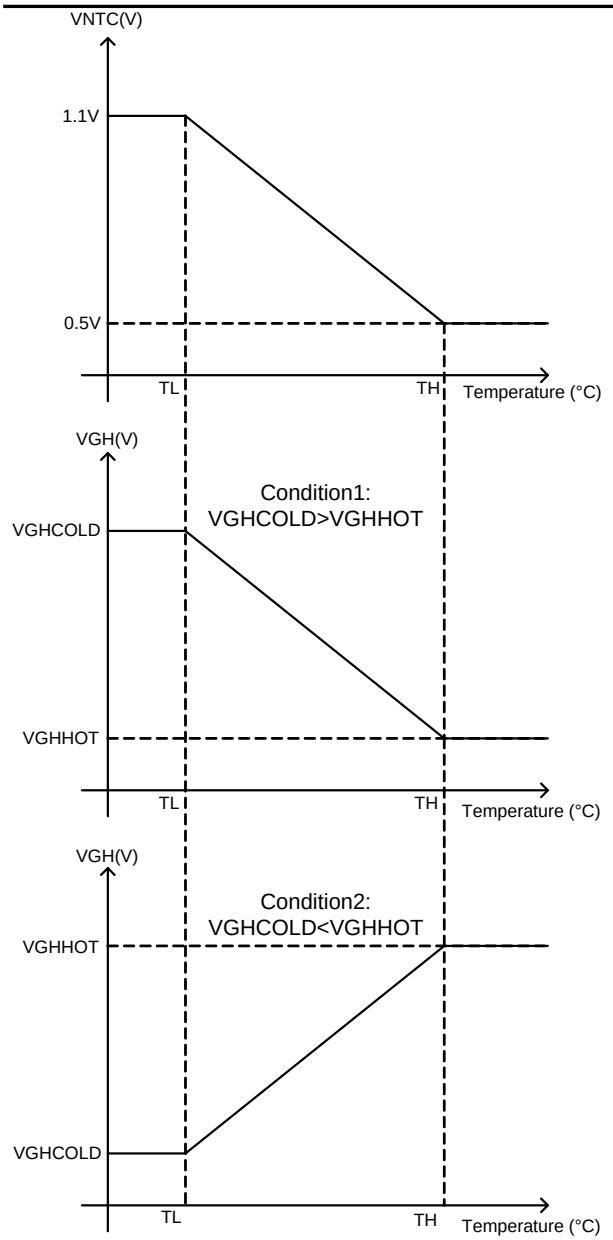


Figure 1. VGH Temperature Compensation Curve

Vcore (Synchronous Buck Converter)
The Vcore buck converter is high efficiency PWM architecture with programmable switching frequency. The Vcore functions can be used to program power-on delay time, soft-start time, output voltage, switching frequency, LX1 slew rate, please refer the register map.

Vcore Soft-start time
The soft-start time function can reduce the input inrush current of power on. It has 2-bits register with 4 steps.

Vcore Output voltage
The Vcore has 5-bits register for output voltage adjustment, the setting range is form 0.8V to 2.8V, and each voltage step is about 100mV.

Vcore Switching frequency
The switching frequency has 3-bits register with 8 steps. The switching frequency range is from 600kHz to 2MHz, and each step change is about 200kHz.

Vcore Slew rate
The LX1 slew rate control function is used to optimize the efficiency and EMI. It has 3-bits register to adjust, and set the register to 00h is slowest slew rate.

VIO (Synchronous Buck Converter)
The VIO buck converter is high efficiency PWM architecture with programmable switching frequency. The VIO functions can be used to program power-on delay time, soft-start time, output voltage, switching frequency, LX2 slew rate, please refer the register map.

VIO Soft-start time
The soft-start time function can reduce the input inrush current of power on. It has 2-bits register with 4 steps.

VIO Output voltage
The VIO has 5-bits register for output voltage adjustment, the setting range is form 1.0V to 2.8V, and each voltage step is about 100mV.

VIO Switching frequency
The switching frequency has 3-bits register with 8 steps. The switching frequency range is from 600kHz to 2MHz, and each step change is about 200kHz.

VIO Slew rate
The LX2 slew rate control function is used to optimize the efficiency and EMI. It has 3-bits register to adjust, and set the register to 00h is slowest slew rate.

VGL1 (Negative Charge Pump Regulator)
The VGL1 functions can be used to program power-on delay time, soft-start time, output voltage, switching frequency, please refer the register map.

VGL1 Soft-start time
The soft-start time function can reduce the input inrush current of power on. It has 2-bits register with 4 steps.

VGL1 Output voltage
The VGL1 has 7-bits register for output voltage adjustment, the setting range is form -4.4V to -11V, and each voltage step is about -100mV. Because the VGL1 voltage is supplied by AVDD, therefore the VGL1 maximum output voltage is limited by AVDD.

The VGL1 maximum output voltage could be calculated by below equation :
$VGL1_{(Max.)} = -AVDD + 4*V_F$

VGL1 Switching frequency
The switching frequency has 1-bit register with 2 steps. The switching frequency range is from 500kHz to 1MHz.

VGL2 (Negative Charge Pump Regulator)
The VGL2 functions can be used to program power-on delay time, soft-start time, output voltage, switching frequency, please refer the register map.

VGL2 Soft-start time
The soft-start time function can reduce the input inrush current of power on. It has 2-bits register with 4 steps.

VGL2 Output voltage
The VGL2 has 7-bits register for output voltage adjustment, the setting range is form -4.4V to -18V, and each voltage step is about -200mV. Because the VGL2 voltage is supplied by AVDD and VGL1, therefore the VGL2 maximum output voltage are limited by AVDD and VGL1.

The VGL2 maximum output voltage could be calculated by below table :

Condition	$VGL2_{(max.)}$ equation
GNDCP2=GND	$VGL2_{(Max.)}$ = -AVDD + (VGL1) + 4*V_F
GNDCP2=VGL1	$VGL2_{(Max.)}$ = -AVDD + (2*VGL1) + 4*V_F

VGL2 Switching frequency
The switching frequency has 1-bit register with 2 steps. The switching frequency range is from 500kHz to 1MHz.

LDO (Linear regulator)
The LDO functions can be used to program power-on delay time and output voltage, please refer the register map.

LDO Output voltage
The LDO has 5-bits register with 16 steps for output voltage adjustment, the setting range is form 1.2V to 2.8V, and each voltage step is about 100mV.

VCOM1 and VCOM2 (Operation amplifier)
The both of VCOM1 and VCOM2 are integrated a power-on delay time function. The delay time is adjustable by I^2C interface, please refer the register map.

VCOM1 Output voltage
The VCOM1 voltage calibration need two steps for adjustment. First step is set the central value of VCOM1 voltage. The VCOM1 voltage is programmable from 0.4V to 5.52V for full AVDD configuration (VCOMR=0) or -2.76V to 2.76V for positive and negative AVDD configuration (VCOMR=1) by VCOMCOLD register (0x13H). Second step is to calibrate the VCOM1 voltage by VCOM RAM register through I^2C interface. The VCOM register value indicates the voltage increment or decrement of VOCM1 which is preset by VCOMCOLD register.
The VCOMHOT/VCOMCOLD register has 7-bits register with 128 steps for output voltage adjustable.

VCOM1 Temperature Compensation
The temperature compensation for VCOM1 could be turn on or off by /VCOMT_Enable bit. If temperature compensation is ON state (/VCOMT_Enable=0), both VCOMHOT and VCOMCOLD need to be input. Otherwise only VCOMCOLD is active for VCOM1 voltage setting without temperature compensation.
The VCOMHOT voltage is set VCOM1 output voltage at TH, and VCOMCOLD voltage is set VCOM1 output voltage at TL. The VCOM1 can be temperature compensated, allowing its output voltage to transition from VCOMCOLD voltage (TL) to VCOMHOT voltage (TH). The G2518 support two kinds of compensation curve. One is the VCOMCOLD output voltage larger than VCOMHOT output voltage, another is VCOMCOLD voltage smaller than VCOMHOT voltage. Temperature compensation curve is shown in Figure 2.

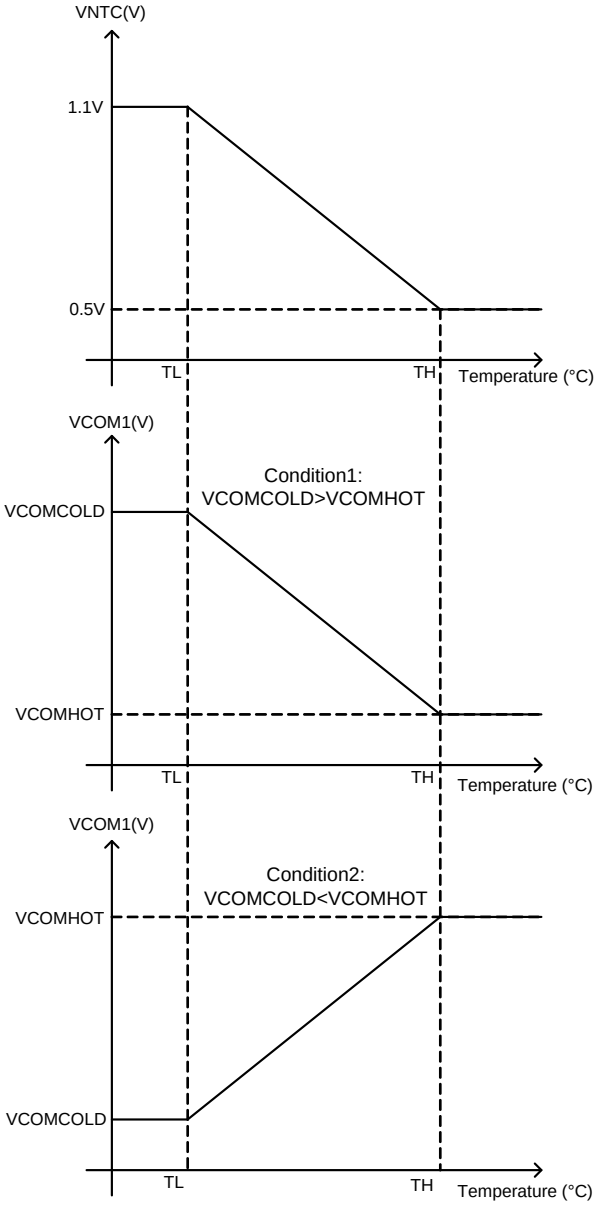


Figure 2. VCOM1 Temperature Compensation Curve

Gate Pulse Modulator

The gate pulse modulator function can be used to reduce image sticking in LCD panels by modulating the LCD panel's gate ON voltage (VGH).

The GPM functions can be used to program power-on delay time and VGHM stop level, please refer the register map.

VGHM stop level

The VGHM stop level is the voltage level when VGHM stop to falling. The setting range is form 3V to 11V, and each voltage step is about 1V. If the VGHM stop level smaller than the discharge voltage (RE pin voltage), the stop level will be clamped on the RE pin voltage.

RESET (Voltage detector)

The RESET pin generates an active-low reset signal for the T-CON. The RESET functions can be used to program power-on delay time and RESET voltage, please refer the register map. The setting range is form 1.6V to 2.5V, and each voltage step is about 100mV.

Under voltage Protection (UVP)

Output	Fault Time	Protector Behavior
AVDD	>60mS	All channel are disable
VGH	>60mS	All channel are disable
VGL1	>60mS	All channel are disable, except LDO
VGL2	>60mS	All channel are disable, except LDO
VIO		Nothing happened.
Vcore		Nothing happened.
LDO		Nothing happened.
VCOM		Nothing happened.

Over Temperature Protection (OTP)

The Over temperature protection prevents excessive power dissipation form overheating the G2518. When the junction temperature exceeds TJ=160°C, a thermal sensor actives the fault protection, which shuts down all output channels, allowing the device to cool down.

All of output channels starting work while junction temperature is cooled by approximately 15°C.

Device Address Setting

PMIC Device Address 7'b0100011

bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
PMIC Slave Address 7'b0100011							Read:1 Write:0

Configuration Parameter VCOM Device Address 7'b1001111

bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
Configuration Parameter VCOM Slave Address 7'b1001111							Read:1 Write:0

PMIC I²C Command

Write Operation

(a) Write Single Byte to DAC Register

Example : Writing 27h to DAC Address 02h (AVDD=8.4V)

	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0		Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0		Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0		
Start	0	1	0	0	0	1	1	0	SLAVE ACK	0	0	0	0	0	0	1	0	SLAVE ACK	0	0	1	0	0	1	1	1	SLAVE ACK	Stop

(b) Write Multi Byte to DAC Register

Example : Writing 27h, 28h, 29h to DAC Address 02h, 03h, 04h

	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0		Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0		Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0	
Start	0	1	0	0	0	1	1	0	SLAVE ACK	0	0	0	0	0	0	1	0	SLAVE ACK	0	0	1	0	0	1	1	1	SLAVE ACK

Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0		Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0		
0	0	1	0	1	0	0	0	SLAVE ACK	0	0	1	0	1	0	0	1	SLAVE ACK	Stop

(C) Write All DAC Register into EEPROM

Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0		Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0		Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0		
1	0	0	0	1	1	0	SLAVE ACK	1	1	1	1	1	1	1	1	SLAVE ACK	1	0	0	0	0	0	0	0	SLAVE ACK	Stop

Read Operation

(a) Read data form DAC register

Example : Reading Data form DAC Register Address 02h, 03h, 04h, 05h

	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0		Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0		Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0		
Start	0	1	0	0	0	1	1	0	SLAVE ACK	1	1	1	1	1	1	1	1	SLAVE ACK	0	0	0	0	0	0	0	0	SLAVE ACK	Stop

	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0		Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0	
Start	0	1	0	0	0	1	1	0	SLAVE ACK	0	0	0	0	0	0	1	0	SLAVE ACK

	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0		Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0		Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0	
Repeat Start	0	1	0	0	0	1	1	1	SLAVE ACK	D	D	D	D	D	D	D	D	Master ACK	D	D	D	D	D	D	D	D	Master ACK

Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0		Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0		
D	D	D	D	D	D	D	D	Master ACK	D	D	D	D	D	D	D	D	Master N-ACK	Stop

(a) Read data form EEPROM

Example : Reading Data form EEPROM Address 02h, 03h, 04h, 05h

	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0		Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0		Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0		
Start	0	1	0	0	0	1	1	0	SLAVE ACK	1	1	1	1	1	1	1	1	SLAVE ACK	0	0	0	0	0	0	0	1	SLAVE ACK	Stop

	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0		Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0	
Start	0	1	0	0	0	1	1	0	SLAVE ACK	0	0	0	0	0	0	1	0	SLAVE ACK

	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0		Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0		Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0		
Repeat Start	0	1	0	0	0	1	1	1	SLAVE ACK	D	D	D	D	D	D	D	D	Master ACK	D	D	D	D	D	D	D	D	Master ACK

Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0		Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0		
D	D	D	D	D	D	D	D	Master ACK	D	D	D	D	D	D	D	D	Master N-ACK	Stop

Configuration Parameter VCOM I²C Command

Write Operation

(a) Write Single Byte to DAC Register

Example : Writing 40h (7bit data) to DAC

	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0		Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0		
Stare	1	0	0	1	1	1	1	0	SLAVE ACK	1	0	0	0	0	0	0	1	SLAVE ACK	Stop

(b) Write Single Byte to DAC Register and EEPROM

Example : Writing 40h (7bit data) to DAC and EEPROM

	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0		Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0		
Stare	1	0	0	1	1	1	1	0	SLAVE ACK	1	0	0	0	0	0	0	0	SLAVE ACK	Stop

Read Operation

(a) Read Single data from DAC when DAC data same as EEPROM

Example : Read Data from DAC

	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0		Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0		
Stare	1	0	0	1	1	1	1	1	SLAVE ACK	D	D	D	D	D	D	D	0	SLAVE ACK	Stop

(b) Read Single data from DAC when DAC data different to EEPROM

Example : Read Data from DAC

	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0		Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0		
Stare	1	0	0	1	1	1	1	1	SLAVE ACK	D	D	D	D	D	D	D	1	SLAVE ACK	Stop

PMIC Register Map:

PMIC Slave Address : 0x23h

DVCOM Slave Address : 0x4Fh

Note	Inst/Prar	7	6	5	4	3	2	1	0	register default	description
	0x00	EN_LDO	EN_V_{CORE}	EN_V_{IO}	EN_VGL2	EN_VGL1	/EN_VGHT	EN-VGH	EN_AVDD	0x2F	Channel setting
	0x01		EN_GPM Stop	EN_GPM	EN_RESET	EN_VCOMR	/EN_VCOMT	EN_VCOM2	EN_VCOM1	0x15	Channel setting
	0x02		AVDD Voltage							0x27	AVDD Voltage6:0] : adjust AVDD output range 4.5V~11V, default : 8.4V
	0x03			AVDD Frequency			AVDD Slew Rate			0x08	AVDD S.R. [2:0] : adjust AVDD Slew Rate default : 00h AVDD FREQ. [5:3] : adjust FREQ range 0.6~2MHz default : 0.8MHz
	0x04			AVDD O.C.	AVDD Dly			AVDD Soft-start		0x00	AVDD SS [1:0] : adjust AVDD SS range 5~20mS, default : 5ms AVDD Dly [4:2] : adjust AVDD Dly range 0~30mS, default : 0ms AVDD O.C. [5] : adjust AVDD O.C. range 1~2A, default : 1A
	0x05				VGHHOT					0x0A	VGHHOT [4:0] :adjust VGHHOT range 10~37V, default : 20V
	0x06				VGHCOLD					0x0A	VGHCOLD [4:0] :adjust VGHCOLD range 10~37V, default : 20V
	0x07			VGH Dly	VGH Soft-start		VGH Frequency			0x08	VGH FREQ [2:0] : adjust VGH FREQ range 0.6~2MHz, default : 0.6MHz VGH SS [4:3] : adjust VGH SS range 2~8mS, default : 4ms VGH Dly [5] : adjust VGH Dly range 0~4ms, default : 0ms
	0x08		VGL1 Voltage							0x24	VGL1 Voltage[6:0] : adjust VGL1 output range -4.4V~-11V, default : -8.0V
	0x09		VGL2 Voltage							0x1C	VGL2 Voltage[6:0] : adjust VGL1 output range -4.4V~-18V, default :-10.0V
	0x0A			VGL1 Soft-start		VGL1 Dly			F_{VGL1}	0x14	FGVL1 [1] : adjust VGL1 FREQ range 0.5~1MHz, default : 0.5MHz VGL1 Dly [3:1] : adjust VGL1 Dly range 0~30mS, default : 10ms VGL1 SS [5:4] : adjust VGL1 SS range 4~16ms(F_{VGL1}=0.5MHz), VGL1 SS [5:4] : adjust VGL1 SS range 1~4ms(FVGL1=1MHz), default : 4ms
	0x0B			VGL2 Soft-start		VGL2 Dly			F_{VGL2}	0x10	FGVL2 [1] : adjust VGL1 FREQ range 0.5~1MHz, default : 0.5MHz VGL2 Dly [3:1] : adjust VGL1 Dly range 0~35mS, default : 0ms VGL2 SS [5:4] : adjust VGL1 SS range 2~8ms default : 4ms
	0x0C				V_{CORE} Voltage					0x04	VCORE Voltage[4:0] : adjust VCORE output range 0.8V~2.8V, default : 1.2V
	0x0D				VCORE Frequency			VCORE Soft-start		0x05	VCORE SS[1:0] : adjust VCORE SS range 2~8ms, default 4ms VCORE FREQ [4:2] : adjust VCORE FREQ range 0.6~2MHz, default : 0.8MHz
	0X0E				VCORE Dly		VCORE Slew Rate			0x14	VCORE S.R.[2:0] : adjust VCORE Slew Rate default : 04h VCORE Dly [4:3] : adjust VCORE Dly range 0~6ms, default : 4ms
	0x0F				VIO Voltage					0x06	VIO Voltage[4:0] : adjust VIO output range 1V~2.8V, default : 1.6V
	0x10				VIO Frequency			VIO Soft-start		0x05	VIO SS[1:0] : adjust VIO SS range 2~8ms, default : 4ms VIO FREQ [4:2] : adjust VIO FREQ range 0.6~2MHz, default : 0.8MHz
	0x11				VIO Dly		VIO Slew Rate			0x14	VIO S.R.[2:0] : adjust VIO Slew Rate default : 04h VIO Dly [4:3] : adjust VIO Dly range 0~6ms, default : 4ms
	0x12		LDO Dly		LDO Voltage					0x2E	LDO Voltage[4:0] : adjust LDO Output voltage range 1.2~2.8V, default : 2.6V LDO Dly [6:5] : adjust LDO Dly range 0~6ms, default : 4ms
	0x13		VCOMCOLD							0x91	VCOMCOLD7:0] : adjust VCOMCOLD range 0.8~5.1V(V_{COMR}=0) , default : 3.3V VCOMCOLD[7:0] : adjust VCOMCOLD range -1.86~2.44V(V_{COMR}=1) , default : 0.64V
	0x14		VCOMHOT							0x00	VCOMHOT[7:0] : adjust VCOMHOT range 0.8~5.1V(V_{COMR}=0) , default : 0.8V VCOMHOT[7:0] : adjustVCOMHOT range -1.86~2.44V(V_{COMR}=1). default : -1.86V
	0x15					VGHM Dly				0x08	VGHM Dly[3:0] : adjust VGHM Dly range 0~60ms default : 32ms
	0x16					VGHM Stop Level				0x05	VGHM Stop level[3:0] : adjust VGHM Stop level range 3~11V default : 8V
	0x17					RESET Voltage				0x04	RESET Voltage[3:0] : adjust RESET Voltage range 1.6~2.5V default : 2V
	0x18			RESET Dly						0x0B	RESET Dly[5:0] : adjust RESET Dly range 1~40ms default : 12ms
	0x19						VCOM Dly			0x05	VCOM Dly[2:0] : adjust VCOM Dly range 0~30ms default : 5ms
		Configuration Parameter VCOM									
	0xFF	Control Register									00 : Read data form DAC register 01 : Reaf data from EEPROM 80 : Write all DAC into EEPROM

Registers and DAC Settings

AVDD Voltage Register – Address 02h [6:0]

DAC Value	AVDD Voltage (V)	DAC Value	AVDD Voltage (V)	DAC Value	AVDD Voltage (V)	DAC Value	AVDD Voltage (V)
00h	4.5	10h	6.1	20h	7.7	30h	9.3
01h	4.6	11h	6.2	21h	7.8	31h	9.4
02h	4.7	12h	6.3	22h	7.9	32h	9.5
03h	4.8	13h	6.4	23h	8	33h	9.6
04h	4.9	14h	6.5	24h	8.1	34h	9.7
05h	5	15h	6.6	25h	8.2	35h	9.8
06h	5.1	16h	6.7	26h	8.3	36h	9.9
07h	5.2	17h	6.8	27h	8.4	37h	10
08h	5.3	18h	6.9	28h	8.5	38h	10.1
09h	5.4	19h	7	29h	8.6	39h	10.2
0Ah	5.5	1Ah	7.1	2Ah	8.7	3Ah	10.3
0Bh	5.6	1Bh	7.2	2Bh	8.8	3Bh	10.4
0Ch	5.7	1Ch	7.3	2Ch	8.9	3Ch	10.5
0Dh	5.8	1Dh	7.4	2Dh	9	3Dh	10.6
0Eh	5.9	1Eh	7.5	2Eh	9.1	3Eh	10.7
0Fh	6	1Fh	7.6	2Fh	9.2	3Fh	10.8
						40h	10.9
						41h	11

AVDD LX Frequency Register – Address 03h [5:3]

DAC Value	LX FREQ (KHz)	DAC Value	LX FREQ (KHz)	DAC Value	LX FREQ (KHz)	DAC Value	LX FREQ (KHz)
00h	600	02h	1000	04h	1400	06h	1800
01h	800	03h	1200	06h	1600	07h	2000

AVDD Current Limit Register – Address 04h [5]

DAC Value	Current Limit (A)	DAC Value	Current Limit (A)
00h	1	01h	2

AVDD Delay Time Register – Address 04h [4:2]

DAC Value	Delay Time (ms)	DAC Value	Delay Time (ms)	DAC Value	Delay Time (ms)	DAC Value	Delay Time (ms)
00h	0	02h	10	04h	20	06h	30
01h	5	03h	15	05h	25		

AVDD Soft-Start Time Register – Address 04h [1:0]

DAC Value	SS Time (ms)	DAC Value	SS Time (ms)	DAC Value	SS Time (ms)	DAC Value	SS Time (ms)
00h	5	01h	10	02h	15	03h	20

VGH HOT TEMP. Voltage Register – Address 05h [4:0]

DAC Value	VGHHOT Voltage (V)	DAC Value	VGHHOT Voltage (V)	DAC Value	VGHHOT Voltage (V)	DAC Value	VGHHOT Voltage (V)
00h	10	07h	17	0Eh	24	15h	31
01h	11	08h	18	0Fh	25	16h	32
02h	12	09h	19	10h	26	17h	33
03h	13	0Ah	20	11h	27	18h	34
04h	14	0Bh	21	12h	28	19h	35
05h	15	0Ch	22	13h	29	1Ah	36
06h	16	0Dh	23	14h	30	1Bh	37

VGH COLD TEMP Voltage Register – Address 06h [4:0]

DAC Value	VGHCOLD Voltage (V)	DAC Value	VGHCOLD Voltage (V)	DAC Value	VGHCOLD Voltage (V)	DAC Value	VGHCOLD Voltage (V)
00h	10	07h	17	0Eh	24	15h	31
01h	11	08h	18	0Fh	25	16h	32
02h	12	09h	19	10h	26	17h	33
03h	13	0Ah	20	11h	27	18h	34
04h	14	0Bh	21	12h	28	19h	35
05h	15	0Ch	22	13h	29	1Ah	36
06h	16	0Dh	23	14h	30	1Bh	37

VGH LX Frequency Register – Address 07h [2:0]

DAC Value	LX FREQ (KHz)	DAC Value	LX FREQ (KHz))	DAC Value	LX FREQ (KHz)	DAC Value	LX FREQ (KHz)
00h	600	02h	1000	04h	1400	06h	1800
01h	800	03h	1200	06h	1600	07h	2000

VGH Delay Time Register – Address 07h [5]

DAC Value	Delay Time (ms)	DAC Value	Delay Time (ms)
00h	0	01h	4

VGH Soft-Start Time Register – Address 07h [4:3]

DAC Value	SS Time (ms)	DAC Value	SS Time (ms)	DAC Value	SS Time (ms)	DAC Value	SS Time (ms)
00h	2	01h	4	02h	6	03h	8

VGL1 Voltage Register – Address 08h [6:0]

DAC Value	VGL1 Voltage (V)	DAC Value	VGL1 Voltage (V)	DAC Value	VGL1 Voltage (V)	DAC Value	VGL1 Voltage (V)
00h	-4.4	11h	-6.1	22h	-7.8	33h	-9.5
01h	-4.5	12h	-6.2	23h	-7.9	34h	-9.6
02h	-4.6	13h	-6.3	24h	-8	35h	-9.7
03h	-4.7	14h	-6.4	25h	-8.1	36h	-9.8
04h	-4.8	15h	-6.5	26h	-8.2	37h	-9.9
05h	-4.9	16h	-6.6	27h	-8.3	38h	-10
06h	-5	17h	-6.7	28h	-8.4	39h	-10.1
07h	-5.1	18h	-6.8	29h	-8.5	3Ah	-10.2
08h	-5.2	19h	-6.9	2Ah	-8.6	3Bh	-10.3
09h	-5.3	1Ah	-7	2Bh	-8.7	3Ch	-10.4
0Ah	-5.4	1Bh	-7.1	2Ch	-8.8	3Dh	-10.5
0Bh	-5.5	1Ch	-7.2	2Dh	-8.9	3Eh	-10.6
0Ch	-5.6	1Dh	-7.3	2Eh	-9	3Fh	-10.7
0Dh	-5.7	1Eh	-7.4	2Fh	-9.1	40h	-10.8
0Eh	-5.8	1Fh	-7.5	30h	-9.2	41h	-10.9
0Fh	-5.9	20h	-7.6	31h	-9.3	42h	-11
10h	-6	21h	-7.7	32h	-9.4		

VGL2 Voltage Register – Address 09h [6:0]

DAC Value	VGL2 Voltage (V)	DAC Value	VGL2 Voltage (V)	DAC Value	VGL2 Voltage (V)	DAC Value	VGL2 Voltage (V)
00h	-4.4	11h	-7.8	22h	-11.2	33h	-14.6
01h	-4.6	12h	-8	23h	-11.4	34h	-14.8
02h	-4.8	13h	-8.2	24h	-11.6	35h	-15
03h	-5	14h	-8.4	25h	-11.8	36h	-15.2
04h	-5.2	15h	-8.6	26h	-12	37h	-15.4
05h	-5.4	16h	-8.8	27h	-12.2	38h	-15.6
06h	-5.6	17h	-9	28h	-12.4	39h	-15.8
07h	-5.8	18h	-9.2	29h	-12.6	3Ah	-16
08h	-6	19h	-9.4	2Ah	-12.8	3Bh	-16.2
09h	-6.2	1Ah	-9.6	2Bh	-13	3Ch	-16.4
0Ah	-6.4	1Bh	-9.8	2Ch	-13.2	3Dh	-16.6
0Bh	-6.6	1Ch	-10	2Dh	-13.4	3Eh	-16.8
0Ch	-6.8	1Dh	-10.2	2Eh	-13.6	3Fh	-17
0Dh	-7	1Eh	-10.4	2Fh	-13.8	40h	-17.2
0Eh	-7.2	1Fh	-10.6	30h	-14	41h	-17.4
0Fh	-7.4	20h	-10.8	31h	-14.2	42h	-17.6
10h	-7.6	21h	-11	32h	-14.4	43h	-17.8
						44h	-18

VGL1 Frequency Register – Address 0Ah [0]

DAC Value	FREQ (kHz)	DAC Value	FREQ (kHz)
00h	500	01h	1000

VGL1 Delay Time Register – Address 0Ah [3:1]

DAC Value	Delay Time (ms)	DAC Value	Delay Time (ms)	DAC Value	Delay Time (ms)	DAC Value	Delay Time (ms)
00h	0	02h	10	04h	20	06h	30
01h	5	03h	15	06h	25		

VGL1 Soft-Start Time Register – Address 0Ah [5:4]

VGL1 Frequency = 500kHz							
DAC Value	SS Time (ms)	DAC Value	SS Time (ms)	DAC Value	SS Time (ms)	DAC Value	SS Time (ms)
00h	4	01h	8	02h	12	03h	16

VGL1 Frequency = 1000kHz							
DAC Value	SS Time (ms)	DAC Value	SS Time (ms)	DAC Value	SS Time (ms)	DAC Value	SS Time (ms)
00h	1	01h	2	02h	3	03h	4

VGL2 Frequency Register – Address 0Bh [0]

DAC Value	FREQ (kHz)	DAC Value	FREQ (kHz)
00h	500	01h	1000

VGL2 Delay Time Register – Address 0Bh [3:1]

DAC Value	Delay Time (ms)	DAC Value	Delay Time (ms)	DAC Value	Delay Time (ms)	DAC Value	Delay Time (ms)
00h	0	02h	10	04h	20	06h	30
01h	5	03h	15	06h	25	06h	35

VGL2 Soft-Start Time Register – Address 0Bh [5:4]

VGL2 Frequency = 500kHz							
DAC Value	SS Time (ms)	DAC Value	SS Time (ms)	DAC Value	SS Time (ms)	DAC Value	SS Time (ms)
00h	4	01h	8	02h	12	03h	16

VGL2 Frequency = 1000kHz							
DAC Value	SS Time (ms)	DAC Value	SS Time (ms)	DAC Value	SS Time (ms)	DAC Value	SS Time (ms)
00h	1	01h	2	02h	3	03h	4

VCORE Voltage Register – Address 0Ch [4:0]

DAC Value	VCORE Voltage (V)	DAC Value	VCORE Voltage (V)	DAC Value	VCORE Voltage (V)	DAC Value	VCORE Voltage (V)
00h	0.8	05h	1.3	0Ah	1.8	0Fh	2.3
01h	0.9	06h	1.4	0Bh	1.9	10h	2.4
02h	1	07h	1.5	0Ch	2	11h	2.5
03h	1.1	08h	1.6	0Dh	2.1	12h	2.6
04h	1.2	09h	1.7	0Eh	2.2	13h	2.7
						14h	2.8

VCORE Frequency Register – Address 0Dh [4:2]

DAC Value	LX1 FREQ (KHz)	DAC Value	LX1 FREQ (KHz))	DAC Value	LX1 FREQ (KHz)	DAC Value	LX1 FREQ (KHz)
00h	600	02h	1000	04h	1400	06h	1800
01h	800	03h	1200	06h	1600	07h	2000

VCORE Soft-Start Time Register – Address 0Dh [1:0]

DAC Value	SS Time (ms)	DAC Value	SS Time (ms)	DAC Value	SS Time (ms)	DAC Value	SS Time (ms)
00h	2	01h	4	02h	6	03h	8

VCORE Delay Time Register – Address 0Eh [4:3]

DAC Value	Delay Time (ms)	DAC Value	Delay Time (ms)	DAC Value	Delay Time (ms)	DAC Value	Delay Time (ms)
00h	0	01h	2	02h	4	03h	6

VIO Voltage Register – Address 0Fh [4:0]

DAC Value	VCORE Voltage (V)	DAC Value	VCORE Voltage (V)	DAC Value	VCORE Voltage (V)	DAC Value	VCORE Voltage (V)
00h	1	05h	1.5	0Ah	2	0Fh	2.5
01h	1.1	06h	1.6	0Bh	2.1	10h	2.6
02h	1.2	07h	1.7	0Ch	2.2	11h	2.7
03h	1.3	08h	1.8	0Dh	2.3	12h	2.8
04h	1.4	09h	1.9	0Eh	2.4		

VIO Frequency Register – Address 10h [4:2]

DAC Value	LX2 FREQ (KHz)	DAC Value	LX2 FREQ (KHz))	DAC Value	LX2 FREQ (KHz)	DAC Value	LX2 FREQ (KHz)
00h	600	02h	1000	04h	1400	06h	1800
01h	800	03h	1200	06h	1600	07h	2000

VIO Soft-Start Time Register – Address 10h [1:0]

DAC Value	SS Time (ms)	DAC Value	SS Time (ms)	DAC Value	SS Time (ms)	DAC Value	SS Time (ms)
00h	2	01h	4	02h	6	03h	8

VIO Delay Time Register – Address 11h [4:3]

DAC Value	Delay Time (ms)	DAC Value	Delay Time (ms)	DAC Value	Delay Time (ms)	DAC Value	Delay Time (ms)
00h	0	01h	2	02h	4	03h	6

LDO Delay Time Register – Address 12h [6:5]

DAC Value	Delay Time (ms)	DAC Value	Delay Time (ms)	DAC Value	Delay Time (ms)	DAC Value	Delay Time (ms)
00h	0	01h	2	02h	4	03h	6

LDO Voltage Register – Address 12h [4:0]

DAC Value	VCORE Voltage (V)	DAC Value	VCORE Voltage (V)	DAC Value	VCORE Voltage (V)	DAC Value	VCORE Voltage (V)
00h	1.2	04h	1.6	08h	2	0Ch	2.4
01h	1.3	05h	1.7	09h	2.1	0Dh	2.5
02h	1.4	06h	1.8	0Ah	2.2	0Eh	2.6
03h	1.5	07h	1.9	0Bh	2.3	0Fh	2.7
						10h	2.8

VGHM Delay Time Register – Address 15h [3:0]

DAC Value	Delay Time (ms)	DAC Value	Delay Time (ms)	DAC Value	Delay Time (ms)	DAC Value	Delay Time (ms)
00h	0	04h	16	08h	32	0Ch	48
01h	4	05h	20	09h	36	0Dh	52
02h	8	06h	24	0Ah	40	0Eh	56
03h	12	07h	28	0Bh	44	0Fh	60

VGHM Stop Level Register – Address 16h [3:0]

DAC Value	Stop Level (V)	DAC Value	Stop Level (V)	DAC Value	Stop Level (V)	DAC Value	Stop Level (V)
00h	3	02h	5	04h	7	06h	9
01h	4	03h	6	05h	8	07h	10
						08h	11

VCOMCOLD Voltage Register – Address 13h [7:0]

DAC Value	VCOMCOLD Voltage (V)		DAC Value	VCOMCOLD Voltage (V)		DAC Value	VCOMCOLD Voltage (V)	
	VCOMR=0	VCOMR=1		VCOMR=0	VCOMR=1		VCOMR=0	VCOMR=1
00h	0.8	-1.86	35h	1.46	-1.2	6Ah	2.52	-0.14
01h	0.8	-1.86	36h	1.48	-1.18	6Bh	2.54	-0.12
02h	0.8	-1.86	37h	1.5	-1.16	6Ch	2.56	-0.1
03h	0.8	-1.86	38h	1.52	-1.14	6Dh	2.58	-0.08
04h	0.8	-1.86	39h	1.54	-1.12	6Eh	2.6	-0.06
05h	0.8	-1.86	3Ah	1.56	-1.1	6Fh	2.62	-0.04
06h	0.8	-1.86	3Bh	1.58	-1.08	70h	2.64	-0.02
07h	0.8	-1.86	3Ch	1.6	-1.06	71h	2.66	0
08h	0.8	-1.86	3Dh	1.62	-1.04	72h	2.68	0.02
09h	0.8	-1.86	3Eh	1.64	-1.02	73h	2.7	0.04
0Ah	0.8	-1.86	3Fh	1.66	-1	74h	2.72	0.06
0Bh	0.8	-1.86	40h	1.68	-0.98	75h	2.74	0.08
0Ch	0.8	-1.86	41h	1.7	-0.96	76h	2.76	0.1
0Dh	0.8	-1.86	42h	1.72	-0.94	77h	2.78	0.12
0Eh	0.8	-1.86	43h	1.74	-0.92	78h	2.8	0.14
0Fh	0.8	-1.86	44h	1.76	-0.9	79h	2.82	0.16
10h	0.8	-1.86	45h	1.78	-0.88	7Ah	2.84	0.18
11h	0.8	-1.86	46h	1.8	-0.86	7Bh	2.86	0.2
12h	0.8	-1.86	47h	1.82	-0.84	7Ch	2.88	0.22
13h	0.8	-1.86	48h	1.84	-0.82	7Dh	2.9	0.24
14h	0.8	-1.86	49h	1.86	-0.8	7Eh	2.92	0.26
15h	0.82	-1.84	4Ah	1.88	-0.78	7Fh	2.94	0.28
16h	0.84	-1.82	4Bh	1.9	-0.76	80h	2.96	0.3
17h	0.86	-1.8	4Ch	1.92	-0.74	81h	2.98	0.32
18h	0.88	-1.78	4Dh	1.94	-0.72	82h	3	0.34
19h	0.9	-1.76	4Eh	1.96	-0.7	83h	3.02	0.36
1Ah	0.92	-1.74	4Fh	1.98	-0.68	84h	3.04	0.38
1Bh	0.94	-1.72	50h	2	-0.66	85h	3.06	0.4
1Ch	0.96	-1.7	51h	2.02	-0.64	86h	3.08	0.42
1Dh	0.98	-1.68	52h	2.04	-0.62	87h	3.1	0.44
1Eh	1	-1.66	53h	2.06	-0.6	88h	3.12	0.46
1Fh	1.02	-1.64	54h	2.08	-0.58	89h	3.14	0.48
20h	1.04	-1.62	55h	2.1	-0.56	8Ah	3.16	0.5
21h	1.06	-1.6	56h	2.12	-0.54	8Bh	3.18	0.52
22h	1.08	-1.58	57h	2.14	-0.52	8Ch	3.2	0.54
23h	1.1	-1.56	58h	2.16	-0.5	8Dh	3.22	0.56
24h	1.12	-1.54	59h	2.18	-0.48	8Eh	3.24	0.58
25h	1.14	-1.52	5Ah	2.2	-0.46	8Fh	3.26	0.6
26h	1.16	-1.5	5Bh	2.22	-0.44	90h	3.28	0.62
27h	1.18	-1.48	5Ch	2.24	-0.42	91h	3.3	0.64
28h	1.2	-1.46	5Dh	2.26	-0.4	92h	3.32	0.66
29h	1.22	-1.44	5Eh	2.28	-0.38	93h	3.34	0.68
2Ah	1.24	-1.42	5Fh	2.3	-0.36	94h	3.36	0.7
2Bh	1.26	-1.4	60h	2.32	-0.34	95h	3.38	0.72
2Ch	1.28	-1.38	61h	2.34	-0.32	96h	3.4	0.74
2Dh	1.3	-1.36	62h	2.36	-0.3	97h	3.42	0.76
2Eh	1.32	-1.34	63h	2.38	-0.28	98h	3.44	0.78
2Fh	1.34	-1.32	64h	2.4	-0.26	99h	3.46	0.8
30h	1.36	-1.3	65h	2.42	-0.24	9Ah	3.48	0.82
31h	1.38	-1.28	66h	2.44	-0.22	9Bh	3.5	0.84
32h	1.4	-1.26	67h	2.46	-0.2	9Ch	3.52	0.86
33h	1.42	-1.24	68h	2.48	-0.18	9Dh	3.54	0.88
34h	1.44	-1.22	69h	2.5	-0.16	9Eh	3.56	0.9

VCOMCOLD Voltage Register – Address 13h [7:0]

DAC Value	VCOMCOLD Voltage (V)		DAC Value	VCOMCOLD Voltage (V)	
	VCOMR=0	VCOMR=1		VCOMR=0	VCOMR=1
9Fh	3.58	0.92	D4h	4.64	1.98
A0h	3.6	0.94	D5h	4.66	2
A1h	3.62	0.96	D6h	4.68	2.02
A2h	3.64	0.98	D7h	4.7	2.04
A3h	3.66	1	D8h	4.72	2.06
A4h	3.68	1.02	D9h	4.74	2.08
A5h	3.7	1.04	DAh	4.76	2.1
A6h	3.72	1.06	DBh	4.78	2.12
A7h	3.74	1.08	DCh	4.8	2.14
A8h	3.76	1.1	DDh	4.82	2.16
A9h	3.78	1.12	DEh	4.84	2.18
AAh	3.8	1.14	DFh	4.86	2.2
ABh	3.82	1.16	E0h	4.88	2.22
ACh	3.84	1.18	E1h	4.9	2.24
ADh	3.86	1.2	E2h	4.92	2.26
AEh	3.88	1.22	E3h	4.94	2.28
AFh	3.9	1.24	E4h	4.96	2.3
B0h	3.92	1.26	E5h	4.98	2.32
B1h	3.94	1.28	E6h	5	2.34
B2h	3.96	1.3	E7h	5.02	2.36
B3h	3.98	1.32	E8h	5.04	2.38
B4h	4	1.34	E9h	5.06	2.4
B5h	4.02	1.36	EAh	5.08	2.42
B6h	4.04	1.38	EBh	5.1	2.44
B7h	4.06	1.4	ECh	5.1	2.44
B8h	4.08	1.42	EDh	5.1	2.44
B9h	4.1	1.44	EEh	5.1	2.44
BAh	4.12	1.46	EFh	5.1	2.44
BBh	4.14	1.48	F0h	5.1	2.44
BCh	4.16	1.5	F1h	5.1	2.44
BDh	4.18	1.52	F2h	5.1	2.44
BEh	4.2	1.54	F3h	5.1	2.44
BFh	4.22	1.56	F4h	5.1	2.44
C0h	4.24	1.58	F5h	5.1	2.44
C1h	4.26	1.6	F6h	5.1	2.44
C2h	4.28	1.62	F7h	5.1	2.44
C3h	4.3	1.64	F8h	5.1	2.44
C4h	4.32	1.66	F9h	5.1	2.44
C5h	4.34	1.68	FAh	5.1	2.44
C6h	4.36	1.7	FBh	5.1	2.44
C7h	4.38	1.72	FCh	5.1	2.44
C8h	4.4	1.74	FDh	5.1	2.44
C9h	4.42	1.76	FEh	5.1	2.44
CAh	4.44	1.78	FFh	5.1	2.44
CBh	4.46	1.8			
CCh	4.48	1.82			
CDh	4.5	1.84			
CEh	4.52	1.86			
CFh	4.54	1.88			
D0h	4.56	1.9			
D1h	4.58	1.92			
D2h	4.6	1.94			
D3h	4.62	1.96			

VCOMHOT Voltage Register – Address 14h [7:0]

DAC Value	VCOMHOT Voltage (V)		DAC Value	VCOMHOT Voltage (V)		DAC Value	VCOMHOT Voltage (V)	
	VCOMR=0	VCOMR=1		VCOMR=0	VCOMR=1		VCOMR=0	VCOMR=1
00h	0.8	-1.86	35h	1.46	-1.2	6Ah	2.52	-0.14
01h	0.8	-1.86	36h	1.48	-1.18	6Bh	2.54	-0.12
02h	0.8	-1.86	37h	1.5	-1.16	6Ch	2.56	-0.1
03h	0.8	-1.86	38h	1.52	-1.14	6Dh	2.58	-0.08
04h	0.8	-1.86	39h	1.54	-1.12	6Eh	2.6	-0.06
05h	0.8	-1.86	3Ah	1.56	-1.1	6Fh	2.62	-0.04
06h	0.8	-1.86	3Bh	1.58	-1.08	70h	2.64	-0.02
07h	0.8	-1.86	3Ch	1.6	-1.06	71h	2.66	0
08h	0.8	-1.86	3Dh	1.62	-1.04	72h	2.68	0.02
09h	0.8	-1.86	3Eh	1.64	-1.02	73h	2.7	0.04
0Ah	0.8	-1.86	3Fh	1.66	-1	74h	2.72	0.06
0Bh	0.8	-1.86	40h	1.68	-0.98	75h	2.74	0.08
0Ch	0.8	-1.86	41h	1.7	-0.96	76h	2.76	0.1
0Dh	0.8	-1.86	42h	1.72	-0.94	77h	2.78	0.12
0Eh	0.8	-1.86	43h	1.74	-0.92	78h	2.8	0.14
0Fh	0.8	-1.86	44h	1.76	-0.9	79h	2.82	0.16
10h	0.8	-1.86	45h	1.78	-0.88	7Ah	2.84	0.18
11h	0.8	-1.86	46h	1.8	-0.86	7Bh	2.86	0.2
12h	0.8	-1.86	47h	1.82	-0.84	7Ch	2.88	0.22
13h	0.8	-1.86	48h	1.84	-0.82	7Dh	2.9	0.24
14h	0.8	-1.86	49h	1.86	-0.8	7Eh	2.92	0.26
15h	0.82	-1.84	4Ah	1.88	-0.78	7Fh	2.94	0.28
16h	0.84	-1.82	4Bh	1.9	-0.76	80h	2.96	0.3
17h	0.86	-1.8	4Ch	1.92	-0.74	81h	2.98	0.32
18h	0.88	-1.78	4Dh	1.94	-0.72	82h	3	0.34
19h	0.9	-1.76	4Eh	1.96	-0.7	83h	3.02	0.36
1Ah	0.92	-1.74	4Fh	1.98	-0.68	84h	3.04	0.38
1Bh	0.94	-1.72	50h	2	-0.66	85h	3.06	0.4
1Ch	0.96	-1.7	51h	2.02	-0.64	86h	3.08	0.42
1Dh	0.98	-1.68	52h	2.04	-0.62	87h	3.1	0.44
1Eh	1	-1.66	53h	2.06	-0.6	88h	3.12	0.46
1Fh	1.02	-1.64	54h	2.08	-0.58	89h	3.14	0.48
20h	1.04	-1.62	55h	2.1	-0.56	8Ah	3.16	0.5
21h	1.06	-1.6	56h	2.12	-0.54	8Bh	3.18	0.52
22h	1.08	-1.58	57h	2.14	-0.52	8Ch	3.2	0.54
23h	1.1	-1.56	58h	2.16	-0.5	8Dh	3.22	0.56
24h	1.12	-1.54	59h	2.18	-0.48	8Eh	3.24	0.58
25h	1.14	-1.52	5Ah	2.2	-0.46	8Fh	3.26	0.6
26h	1.16	-1.5	5Bh	2.22	-0.44	90h	3.28	0.62
27h	1.18	-1.48	5Ch	2.24	-0.42	91h	3.3	0.64
28h	1.2	-1.46	5Dh	2.26	-0.4	92h	3.32	0.66
29h	1.22	-1.44	5Eh	2.28	-0.38	93h	3.34	0.68
2Ah	1.24	-1.42	5Fh	2.3	-0.36	94h	3.36	0.7
2Bh	1.26	-1.4	60h	2.32	-0.34	95h	3.38	0.72
2Ch	1.28	-1.38	61h	2.34	-0.32	96h	3.4	0.74
2Dh	1.3	-1.36	62h	2.36	-0.3	97h	3.42	0.76
2Eh	1.32	-1.34	63h	2.38	-0.28	98h	3.44	0.78
2Fh	1.34	-1.32	64h	2.4	-0.26	99h	3.46	0.8
30h	1.36	-1.3	65h	2.42	-0.24	9Ah	3.48	0.82
31h	1.38	-1.28	66h	2.44	-0.22	9Bh	3.5	0.84
32h	1.4	-1.26	67h	2.46	-0.2	9Ch	3.52	0.86
33h	1.42	-1.24	68h	2.48	-0.18	9Dh	3.54	0.88
34h	1.44	-1.22	69h	2.5	-0.16	9Eh	3.56	0.9

VCOMHOT Voltage Register – Address 14h [7:0]

DAC Value	VCOMHOT Voltage (V)		DAC Value	VCOMHOT Voltage (V)	
	VCOMR=0	VCOMR=1		VCOMR=0	VCOMR=1
9Fh	3.58	0.92	D4h	4.64	1.98
A0h	3.6	0.94	D5h	4.66	2
A1h	3.62	0.96	D6h	4.68	2.02
A2h	3.64	0.98	D7h	4.7	2.04
A3h	3.66	1	D8h	4.72	2.06
A4h	3.68	1.02	D9h	4.74	2.08
A5h	3.7	1.04	DAh	4.76	2.1
A6h	3.72	1.06	DBh	4.78	2.12
A7h	3.74	1.08	DCh	4.8	2.14
A8h	3.76	1.1	DDh	4.82	2.16
A9h	3.78	1.12	DEh	4.84	2.18
AAh	3.8	1.14	DFh	4.86	2.2
ABh	3.82	1.16	E0h	4.88	2.22
ACh	3.84	1.18	E1h	4.9	2.24
ADh	3.86	1.2	E2h	4.92	2.26
AEh	3.88	1.22	E3h	4.94	2.28
AFh	3.9	1.24	E4h	4.96	2.3
B0h	3.92	1.26	E5h	4.98	2.32
B1h	3.94	1.28	E6h	5	2.34
B2h	3.96	1.3	E7h	5.02	2.36
B3h	3.98	1.32	E8h	5.04	2.38
B4h	4	1.34	E9h	5.06	2.4
B5h	4.02	1.36	EAh	5.08	2.42
B6h	4.04	1.38	EBh	5.1	2.44
B7h	4.06	1.4	ECh	5.1	2.44
B8h	4.08	1.42	EDh	5.1	2.44
B9h	4.1	1.44	EEh	5.1	2.44
BAh	4.12	1.46	EFh	5.1	2.44
BBh	4.14	1.48	F0h	5.1	2.44
BCh	4.16	1.5	F1h	5.1	2.44
BDh	4.18	1.52	F2h	5.1	2.44
BEh	4.2	1.54	F3h	5.1	2.44
BFh	4.22	1.56	F4h	5.1	2.44
C0h	4.24	1.58	F5h	5.1	2.44
C1h	4.26	1.6	F6h	5.1	2.44
C2h	4.28	1.62	F7h	5.1	2.44
C3h	4.3	1.64	F8h	5.1	2.44
C4h	4.32	1.66	F9h	5.1	2.44
C5h	4.34	1.68	FAh	5.1	2.44
C6h	4.36	1.7	FBh	5.1	2.44
C7h	4.38	1.72	FCh	5.1	2.44
C8h	4.4	1.74	FDh	5.1	2.44
C9h	4.42	1.76	FEh	5.1	2.44
CAh	4.44	1.78	FFh	5.1	2.44
CBh	4.46	1.8			
CCh	4.48	1.82			
CDh	4.5	1.84			
CEh	4.52	1.86			
CFh	4.54	1.88			
D0h	4.56	1.9			
D1h	4.58	1.92			
D2h	4.6	1.94			
D3h	4.62	1.96			

Configuration Parameter VCOM

DAC Value	VCOM Voltage (V)		DAC Value	VCOM Voltage (V)	
	VCOMR=0	VCOMR=1		VCOMR=0	VCOMR=1
00h	VCOM1-(10mVx64)	VCOM1-(10mVx64)	35h	VCOM1-(10mVx11)	VCOM1-(10mVx11)
01h	VCOM1-(10mVx63)	VCOM1-(10mVx63)	36h	VCOM1-(10mVx10)	VCOM1-(10mVx10)
02h	VCOM1-(10mVx62)	VCOM1-(10mVx62)	37h	VCOM1-(10mVx9)	VCOM1-(10mVx9)
03h	VCOM1-(10mVx61)	VCOM1-(10mVx61)	38h	VCOM1-(10mVx8)	VCOM1-(10mVx8)
04h	VCOM1-(10mVx60)	VCOM1-(10mVx60)	39h	VCOM1-(10mVx7)	VCOM1-(10mVx7)
05h	VCOM1-(10mVx59)	VCOM1-(10mVx59)	3Ah	VCOM1-(10mVx6)	VCOM1-(10mVx6)
06h	VCOM1-(10mVx58)	VCOM1-(10mVx58)	3Bh	VCOM1-(10mVx5)	VCOM1-(10mVx5)
07h	VCOM1-(10mVx57)	VCOM1-(10mVx57)	3Ch	VCOM1-(10mVx4)	VCOM1-(10mVx4)
08h	VCOM1-(10mVx56)	VCOM1-(10mVx56)	3Dh	VCOM1-(10mVx3)	VCOM1-(10mVx3)
09h	VCOM1-(10mVx55)	VCOM1-(10mVx55)	3Eh	VCOM1-(10mVx2)	VCOM1-(10mVx2)
0Ah	VCOM1-(10mVx54)	VCOM1-(10mVx54)	3Fh	VCOM1-(10mVx1)	VCOM1-(10mVx1)
0Bh	VCOM1-(10mVx53)	VCOM1-(10mVx53)	40h	VCOM1	VCOM1
0Ch	VCOM1-(10mVx52)	VCOM1-(10mVx52)	41h	VCOM1+(10mVx1)	VCOM1+(10mVx1)
0Dh	VCOM1-(10mVx51)	VCOM1-(10mVx51)	42h	VCOM1+(10mVx2)	VCOM1+(10mVx2)
0Eh	VCOM1-(10mVx50)	VCOM1-(10mVx50)	43h	VCOM1+(10mVx3)	VCOM1+(10mVx3)
0Fh	VCOM1-(10mVx49)	VCOM1-(10mVx49)	44h	VCOM1+(10mVx4)	VCOM1+(10mVx4)
10h	VCOM1-(10mVx48)	VCOM1-(10mVx48)	45h	VCOM1+(10mVx5)	VCOM1+(10mVx5)
11h	VCOM1-(10mVx47)	VCOM1-(10mVx47)	46h	VCOM1+(10mVx6)	VCOM1+(10mVx6)
12h	VCOM1-(10mVx46)	VCOM1-(10mVx46)	47h	VCOM1+(10mVx7)	VCOM1+(10mVx7)
13h	VCOM1-(10mVx45)	VCOM1-(10mVx45)	48h	VCOM1+(10mVx8)	VCOM1+(10mVx8)
14h	VCOM1-(10mVx44)	VCOM1-(10mVx44)	49h	VCOM1+(10mVx9)	VCOM1+(10mVx9)
15h	VCOM1-(10mVx43)	VCOM1-(10mVx43)	4Ah	VCOM1+(10mVx10)	VCOM1+(10mVx10)
16h	VCOM1-(10mVx42)	VCOM1-(10mVx42)	4Bh	VCOM1+(10mVx11)	VCOM1+(10mVx11)
17h	VCOM1-(10mVx41)	VCOM1-(10mVx41)	4Ch	VCOM1+(10mVx12)	VCOM1+(10mVx12)
18h	VCOM1-(10mVx40)	VCOM1-(10mVx40)	4Dh	VCOM1+(10mVx13)	VCOM1+(10mVx13)
19h	VCOM1-(10mVx39)	VCOM1-(10mVx39)	4Eh	VCOM1+(10mVx14)	VCOM1+(10mVx14)
1Ah	VCOM1-(10mVx38)	VCOM1-(10mVx38)	4Fh	VCOM1+(10mVx15)	VCOM1+(10mVx15)
1Bh	VCOM1-(10mVx37)	VCOM1-(10mVx37)	50h	VCOM1+(10mVx16)	VCOM1+(10mVx16)
1Ch	VCOM1-(10mVx36)	VCOM1-(10mVx36)	51h	VCOM1+(10mVx17)	VCOM1+(10mVx17)
1Dh	VCOM1-(10mVx35)	VCOM1-(10mVx35)	52h	VCOM1+(10mVx18)	VCOM1+(10mVx18)
1Eh	VCOM1-(10mVx34)	VCOM1-(10mVx34)	53h	VCOM1+(10mVx19)	VCOM1+(10mVx19)
1Fh	VCOM1-(10mVx33)	VCOM1-(10mVx33)	54h	VCOM1+(10mVx20)	VCOM1+(10mVx20)
20h	VCOM1-(10mVx32)	VCOM1-(10mVx32)	55h	VCOM1+(10mVx21)	VCOM1+(10mVx21)
21h	VCOM1-(10mVx31)	VCOM1-(10mVx31)	56h	VCOM1+(10mVx22)	VCOM1+(10mVx22)
22h	VCOM1-(10mVx30)	VCOM1-(10mVx30)	57h	VCOM1+(10mVx23)	VCOM1+(10mVx23)
23h	VCOM1-(10mVx29)	VCOM1-(10mVx29)	58h	VCOM1+(10mVx24)	VCOM1+(10mVx24)
24h	VCOM1-(10mVx28)	VCOM1-(10mVx28)	59h	VCOM1+(10mVx25)	VCOM1+(10mVx25)
25h	VCOM1-(10mVx27)	VCOM1-(10mVx27)	5Ah	VCOM1+(10mVx26)	VCOM1+(10mVx26)
26h	VCOM1-(10mVx26)	VCOM1-(10mVx26)	5Bh	VCOM1+(10mVx27)	VCOM1+(10mVx27)
27h	VCOM1-(10mVx25)	VCOM1-(10mVx25)	5Ch	VCOM1+(10mVx28)	VCOM1+(10mVx28)
28h	VCOM1-(10mVx24)	VCOM1-(10mVx24)	5Dh	VCOM1+(10mVx29)	VCOM1+(10mVx29)
29h	VCOM1-(10mVx23)	VCOM1-(10mVx23)	5Eh	VCOM1+(10mVx30)	VCOM1+(10mVx30)
2Ah	VCOM1-(10mVx22)	VCOM1-(10mVx22)	5Fh	VCOM1+(10mVx31)	VCOM1+(10mVx31)
2Bh	VCOM1-(10mVx21)	VCOM1-(10mVx21)	60h	VCOM1+(10mVx32)	VCOM1+(10mVx32)
2Ch	VCOM1-(10mVx20)	VCOM1-(10mVx20)	61h	VCOM1+(10mVx33)	VCOM1+(10mVx33)
2Dh	VCOM1-(10mVx19)	VCOM1-(10mVx19)	62h	VCOM1+(10mVx34)	VCOM1+(10mVx34)
2Eh	VCOM1-(10mVx18)	VCOM1-(10mVx18)	63h	VCOM1+(10mVx35)	VCOM1+(10mVx35)
2Fh	VCOM1-(10mVx17)	VCOM1-(10mVx17)	64h	VCOM1+(10mVx36)	VCOM1+(10mVx36)
30h	VCOM1-(10mVx16)	VCOM1-(10mVx16)	65h	VCOM1+(10mVx37)	VCOM1+(10mVx37)
31h	VCOM1-(10mVx15)	VCOM1-(10mVx15)	66h	VCOM1+(10mVx38)	VCOM1+(10mVx38)
32h	VCOM1-(10mVx14)	VCOM1-(10mVx14)	67h	VCOM1+(10mVx39)	VCOM1+(10mVx39)
33h	VCOM1-(10mVx13)	VCOM1-(10mVx13)	68h	VCOM1+(10mVx40)	VCOM1+(10mVx40)
34h	VCOM1-(10mVx12)	VCOM1-(10mVx12)	69h	VCOM1+(10mVx41)	VCOM1+(10mVx41)

Configuration Parameter VCOM

DAC Value	VCOM Voltage (V)		DAC Value	VCOM Voltage (V)	
	VCOMR=0	VCOMR=1		VCOMR=0	VCOMR=1
6AH	VCOM1+(10mVx42)	VCOM1+(10mVx42)	75H	VCOM1+(10mVx53)	VCOM1+(10mVx53)
6BH	VCOM1+(10mVx43)	VCOM1+(10mVx43)	76H	VCOM1+(10mVx54)	VCOM1+(10mVx54)
6CH	VCOM1+(10mVx44)	VCOM1+(10mVx44)	77H	VCOM1+(10mVx55)	VCOM1+(10mVx55)
6DH	VCOM1+(10mVx45)	VCOM1+(10mVx45)	78H	VCOM1+(10mVx56)	VCOM1+(10mVx56)
6EH	VCOM1+(10mVx46)	VCOM1+(10mVx46)	79H	VCOM1+(10mVx57)	VCOM1+(10mVx57)
6FH	VCOM1+(10mVx47)	VCOM1+(10mVx47)	7AH	VCOM1+(10mVx58)	VCOM1+(10mVx58)
70H	VCOM1+(10mVx48)	VCOM1+(10mVx48)	7BH	VCOM1+(10mVx59)	VCOM1+(10mVx59)
71H	VCOM1+(10mVx49)	VCOM1+(10mVx49)	7CH	VCOM1+(10mVx60)	VCOM1+(10mVx60)
72H	VCOM1+(10mVx50)	VCOM1+(10mVx50)	7DH	VCOM1+(10mVx61)	VCOM1+(10mVx61)
73H	VCOM1+(10mVx51)	VCOM1+(10mVx51)	7EH	VCOM1+(10mVx62)	VCOM1+(10mVx62)
74H	VCOM1+(10mVx52)	VCOM1+(10mVx52)	7FH	VCOM1+(10mVx63)	VCOM1+(10mVx63)

RESET Voltage Register – Address 17h [3:0]

DAC Value	Stop Level (V)	DAC Value	Stop Level (V)	DAC Value	Stop Level (V)	DAC Value	Stop Level (V)
00h	1.6	03h	1.9	06h	2.2	09h	2.5
01h	1.7	04h	2	07h	2.3		
02h	1.8	05h	2.1	08h	2.4		

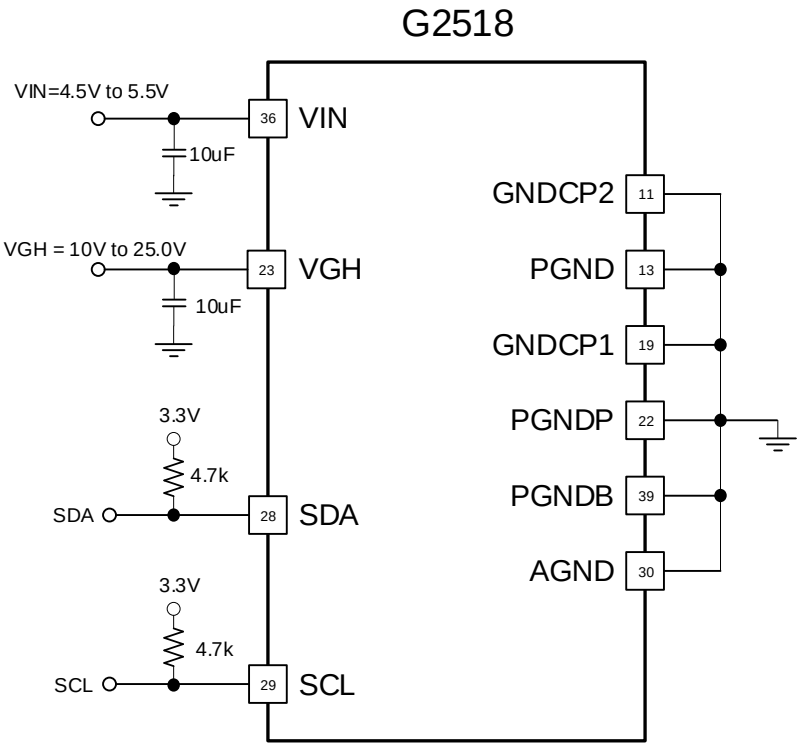
RESET Delay Time Register – Address 18h [5:0]

DAC Value	Delay Time (ms)	DAC Value	Delay Time (ms)	DAC Value	Delay Time (ms)	DAC Value	Delay Time (ms)
0H	1	AH	11	14H	21	1EH	31
1H	2	BH	12	15H	22	1FH	32
2H	3	CH	13	16H	23	20H	33
3H	4	DH	14	17H	24	21H	34
4H	5	EH	15	18H	25	22H	35
5H	6	FH	16	19H	26	23H	36
6H	7	10H	17	1AH	27	24H	37
7H	8	11H	18	1BH	28	25H	38
8H	9	12H	19	1CH	29	26H	39
9H	10	13H	20	1DH	30	27H	40

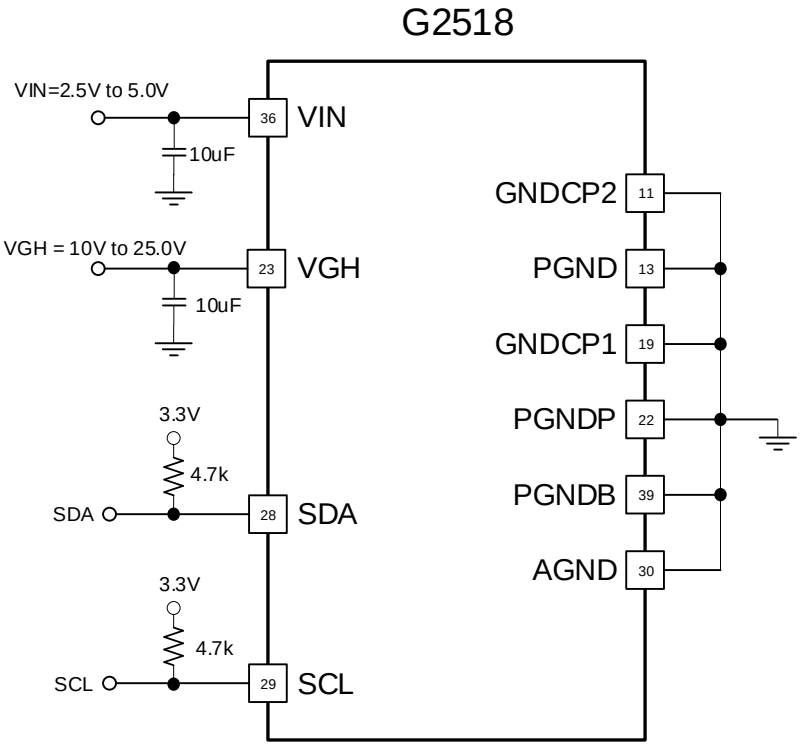
VCOM Delay Time Register – Address 19h [5:0]

DAC Value	Delay Time (ms)	DAC Value	Delay Time (ms)	DAC Value	Delay Time (ms)	DAC Value	Delay Time (ms)
0H	0	2H	10	4H	20	6H	30
1H	5	3H	15	5H	25		

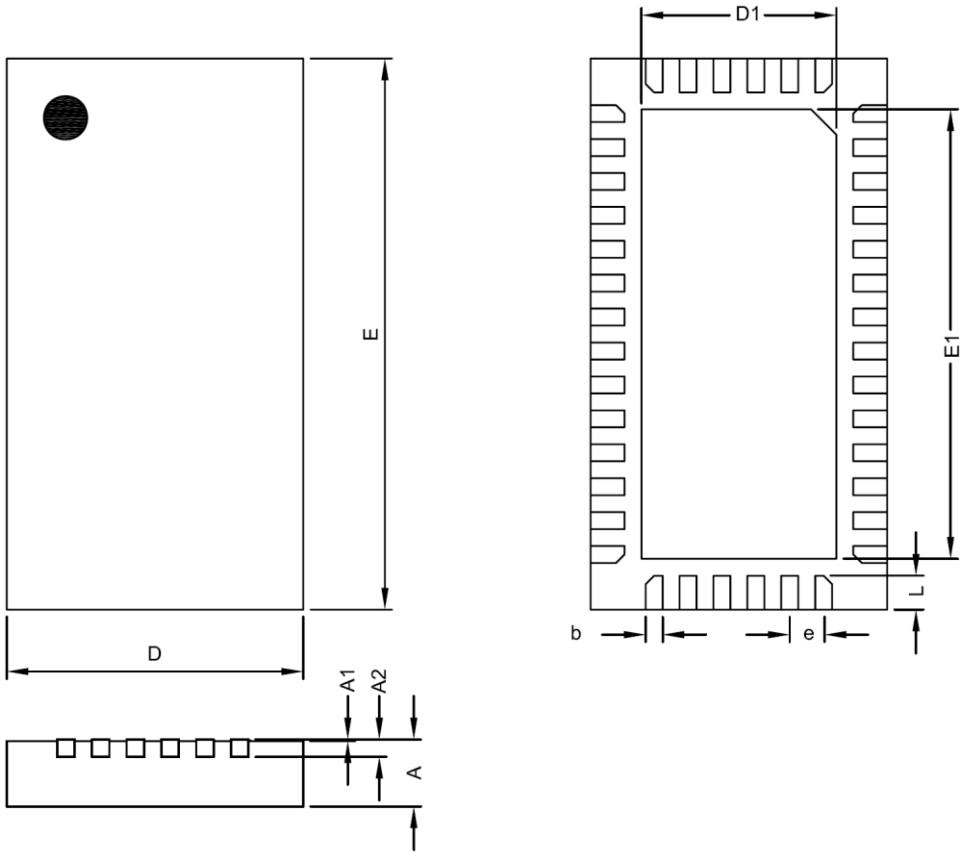
Coding Circuit for Single Chip



Coding Circuit for Panel Module



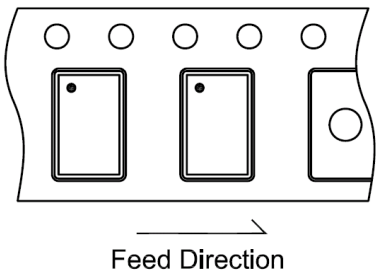
Package Information



TQFN3.5X6.5-40 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	3.40	3.50	3.60	0.1339	0.1378	0.1417
E	6.40	6.50	6.60	0.2520	0.2559	0.2598
D1	2.25	2.30	2.35	0.0886	0.0906	0.0925
E1	5.25	5.30	5.35	0.2067	0.2087	0.2106
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
TQFN3.5X6.5-40	3,000 ea