



LCD Bias Power for Panel

General Description

The LP6282 includes a high-efficiency boost regulator, a VCOM buffer, and dual charge pump controller for active matrix TFT LCDs.

The converter is a high switching frequency current-mode regulator with an integrated N-Channel MOSFET that allows the use of small inductors and ceramic capacitors.

The charge pump controller provides regulated TFT Gate-On voltage. The regulation of the charge pump is generated by the internal comparator that senses the output voltage and compares it with an internal reference.

The Unity-Gain buffer can drive the VCOM voltage, that features high short-circuit current, fast slew rate and rail-to-rail inputs and outputs.

Other features include under-voltage protection, short circuit protection, thermal shutdown protection and under-voltage lockout (UVLO). The LP6282 is available in a space saving QFN-20 (0.4mm pitch) package.

Order Information

LP6282 □□□
 F: Green
 Package Type
 QV: QFN-20

Features

- ◆ Wide V_{IN} Range: 2.5V to 5.5V
- ◆ 1.5MHz Current-Mode Boost Regulator
 - Fast Transient Response to Pulsed Load
 - Cycle by Cycle Current Limit
 - Adjustable Soft-Start
- ◆ Control External P-MOS to Power Saving
- ◆ VGH and VGL Charge Pump
- ◆ Operation Amplifier for VCOM Buffer
 - Short Circuit Protection
- ◆ Under-Voltage Protection
- ◆ Over-Temperature Protection
- ◆ Available in QFN-20 (3mm×3mm)
- ◆ RoHS Compliant and Halogen Free
- ◆ Pb-Free Package

Applications

- ◇ LCD Panel

Marking Information

Device	Marking	Package	Shipping
LP6282	LPS	QFN-20	3K/REEL
	LP6282		
	YWX		

Y: Y is year code. W: W is week code. X: X is series number.



Typical Application Circuit

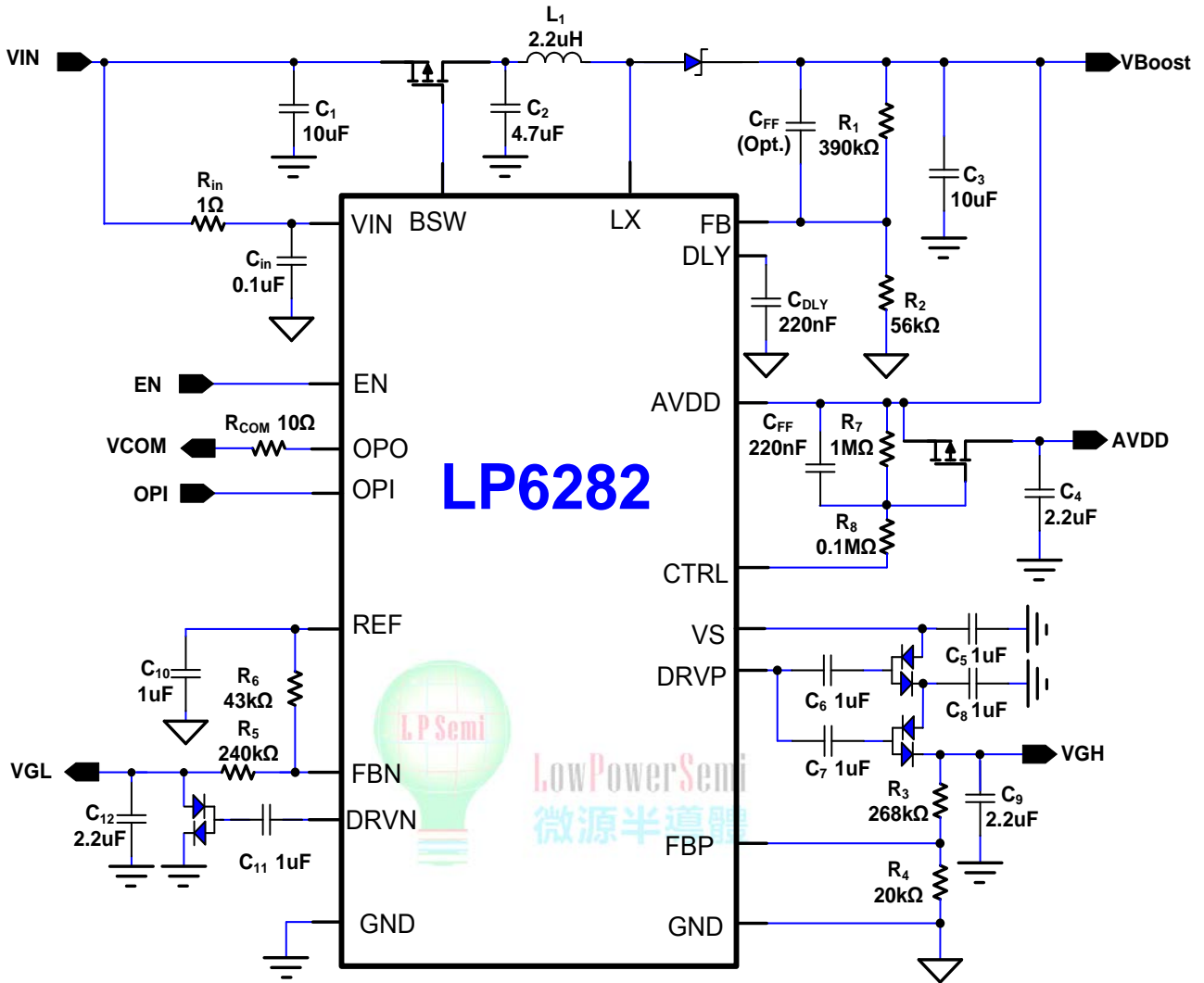


Figure 1. Typical Application Circuit of LP6282



Pin Configuration

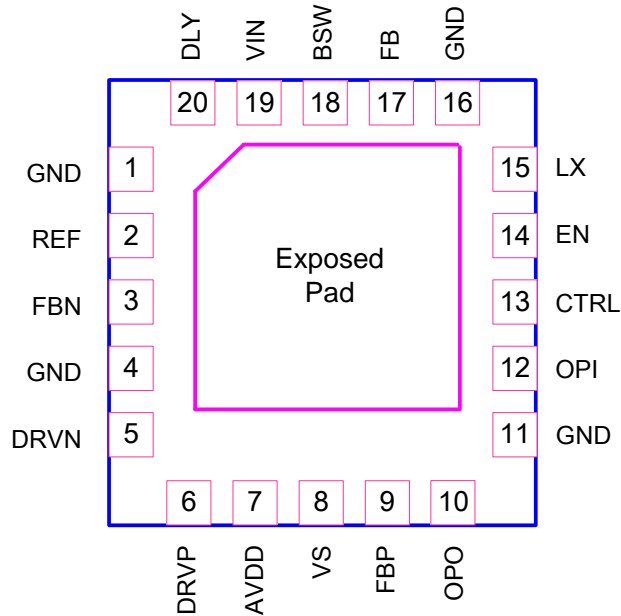


Figure 2. QFN-20 Package (3mm x 3mm) Top View

Function Block Diagram

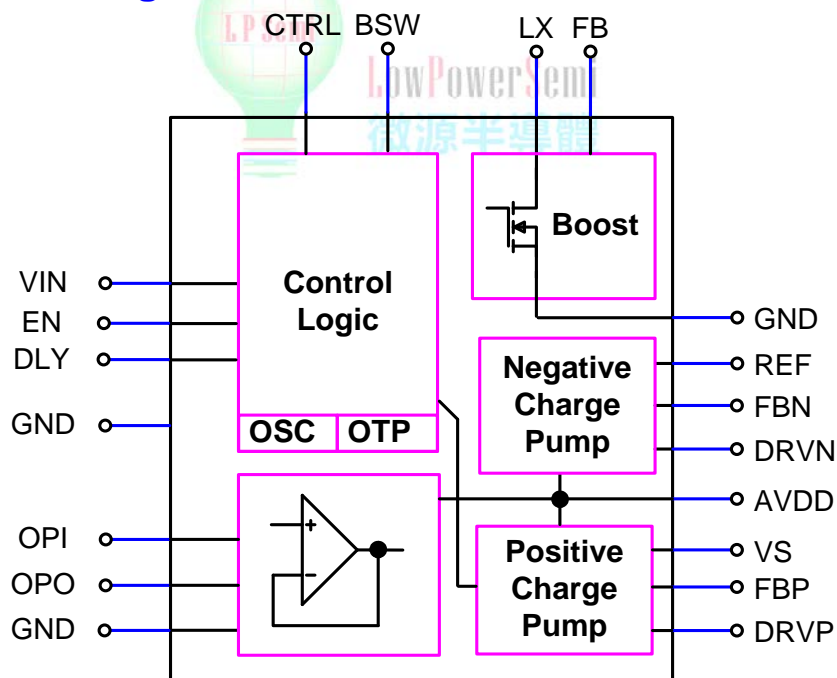


Figure 3. Function Block Diagram



Functional Pin Description

Pin NO.	Pin Name	Description
1,4,11,16	GND	Ground.
2	REF	Reference Voltage Output. Connect a ceramic capacitor between REF and GND.
3	FBN	VGL Charge-Pump Regulator Feedback Input. Connect to an external resistive voltage divider from the VGL to REF to set the output voltage.
5	DRVN	VGL Charge-Pump Regulator Driver Output.
6	DRVP	VGH Charge-Pump Regulator Driver Output.
7	AVDD	Source Driver Power. This supplies the Charge-Pump and OPA power source.
8	VS	Power Source of VGH regulator.
9	FBP	VGH Charge-Pump Regulator Feedback Input. Connect to an external resistive voltage divider from the VGH to GND to set the output voltage.
10	OPO	Unity-Gain OP Output pin.
12	OPI	Unity-Gain OP Input pin.
13	CTRL	External Power Switch Control Pin.
14	EN	Enable Pin.
15	LX	Boost Regulator Switching Node. Connect the inductor and the schottky diode to LX.
17	FB	Boost Regulator Feedback Input. Connect to an external resistive voltage divider from the output to FB to set the output voltage.
18	BSW	Boost Power Source Switch Control.
19	VIN	Supply Input. The input voltage range is between 2.5V to 5.5V. Connect a ceramic capacitor between VIN and GND.
20	DLY	AVDD to VGL Delay Time Setup Pin. Connect a capacitor between DLY and GND.
EP		Exposed pad. Connect this pin to other GND pin.



Absolute Maximum Ratings ^{Note 1}

◇ VIN, EN, BSW to GND	-----	-0.3V to +6V
◇ FB, FBP, FBN, DLY, REF to GND	-----	-0.3V to +6V
◇ AVDD, LX to GND	-----	-0.3V to +15V
◇ OPI, OPO, DRVP, DRVN to GND	-----	-0.3V to (AVDD + 0.3V)
◇ CTRL, VS to GND	-----	-0.3V to +15V
◇ Operating Junction Temperature Range (T _J)	-----	-40°C to +150°C
◇ Operation Ambient Temperature Range	-----	-40°C to +85°C
◇ Storage Temperature Range	-----	-65°C to +150°C
◇ Maximum Soldering Temperature (at leads, 10sec)	-----	+260°C
◇ Maximum Junction Temperature	-----	+150°C

Note 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 is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

Thermal Information

◇ Thermal Resistance

QFN-20 (3mm x 3mm), θ_{JA}	-----	59.6 °C/W
QFN-20 (3mm x 3mm), θ_{JC}	-----	32.5 °C/W





Electrical Characteristics

($V_{IN}=5V$, $V_{AVDD}=10V$, $V_{PCP}=18V$, $V_{NCP}=-7V$, $T_A=25^{\circ}C$, unless otherwise specified)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
General						
Input Supply Voltage	V_{IN}		2.5		5.5	V
AVDD	AVDD		6		12	V
Boost Switching Frequency	F_{LX}		1.25	1.5	1.75	MHz
Charge Pump Frequency	F_{CP}		400	500	600	kHz
V_{IN} Supply Current	I_Q	$V_{FB}=1.3V$, LX no Switching		0.3		mA
		$V_{FB}=1V$, LX Switching		2	5	mA
VIN Shutdown Current	I_{SD}			0.1	1	uA
Input UVLO Threshold	V_{UVLO}	V_{IN} Rising	2.15	2.25	2.35	V
UVLO Threshold Hysteresis	$V_{UVLO(HYS)}$	Falling Hysteresis		100		mV
Reference Voltage	V_{REF}	$I_{REF}=0\sim 2mA$	1.225	1.25	1.275	V
Thermal Shutdown Threshold	T_{SD}			160		$^{\circ}C$
Thermal Shutdown Hysteresis				30		$^{\circ}C$
Boost Regulator						
Maximum Duty-Cycle	D_{MAX}		86	90	94	%
Feedback Voltage	V_{FB}		1.225	1.25	1.275	V
Feedback Input Current	I_{FB}		-50		50	nA
Switch-ON Resistance	$R_{DS(ON)}$	$V_{IN}=3.6V$		500		m Ω
Current Limit	I_{Limit}		2			A
LX Leak Current	I_{Leak}	LX Off.	-1		1	μA
Internal Soft Start Time	T_{SS}			2		ms
Enable Input						
Input Threshold Voltage	V_{IH}	Logic High.	$0.7xV_{IN}$			V
	V_L	Logic Low			$0.3xV_{IN}$	
Enable Input Current	I_{EN}		-1		1	uA



Electrical Characteristics (Continued)

($V_{IN}=5V$, $V_{AVDD}=10V$, $V_{PCP}=18V$, $V_{NCP}=-7V$, $T_A=25^{\circ}C$, unless otherwise specified)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
System Control						
BSW Pull-down Current	I_{BSW}		3	5	10	μA
BSW to VIN R_{ON}	R_{BSW}			200		Ω
DLY Current Source	I_{DLY}			10		μA
DLY Threshold Voltage	V_{DLY}			1		V
Power Switch to GND Leakage Current	I_{PS}	$V_{PS}=15V$			100	nA
Power Switch ON Resistance	R_{DS_PS}			1		k Ω
AVDD to VS ON Resistor	R_{DS_VS}			50		Ω
CTRL Delay Time	T_{DLY1}			15		ms
AVDD to VGL Delay Time	T_{DLY2}		1		15	ms
VGL to VGH Delay Time	T_{DLY3}			15		ms
Charge Pump						
Charge Pump Soft Start Time	T_{SS_CP}			2		ms
Positive Feedback Voltage	V_{FBP}		1.225	1.25	1.275	V
DRVVP Output Current	I_{DRVVP}		5			mA
DRVVP Switch ON Resistance	R_{DS_DRVVP1}			20		Ω
	R_{DS_DRVVP2}			3.5		Ω
Negative Feedback Voltage	V_{FBN}		-25	0	25	mV
DRVVN Output Current	I_{DRVVN}		5			mA
DRVVN Switch ON Resistance	R_{DS_DRVVN1}			5		Ω
	R_{DS_DRVVN2}			12		Ω
Operation Amplifier						
Input Offset Voltage	V_{OS}	$V_{OPO}=V_{AVDD}/2$		2	15	mV
Output Voltage Swing High	V_{OH}	$I_{Load} = 100\mu A$	AVDD - 15	AVDD - 3		mV
		$I_{Load} = 5mA$	AVDD - 150	AVDD - 80		
Output Voltage Swing Low	V_{OL}	$I_{Load} = -100\mu A$		2	15	mV
		$I_{Load} = -5mA$		80	150	
Short Circuit Current	I_{OP_Short}	$V_{OPO} = V_{AVDD}/2$	± 50	± 70		mA
Slew Rate	SR	$V_{OPP}=2V$ to 8V, 8V to 2V, 20% to 80%		13		V/ μs
OPO Discharge	R_{OP}			2		k Ω



Power On/ Off Sequence

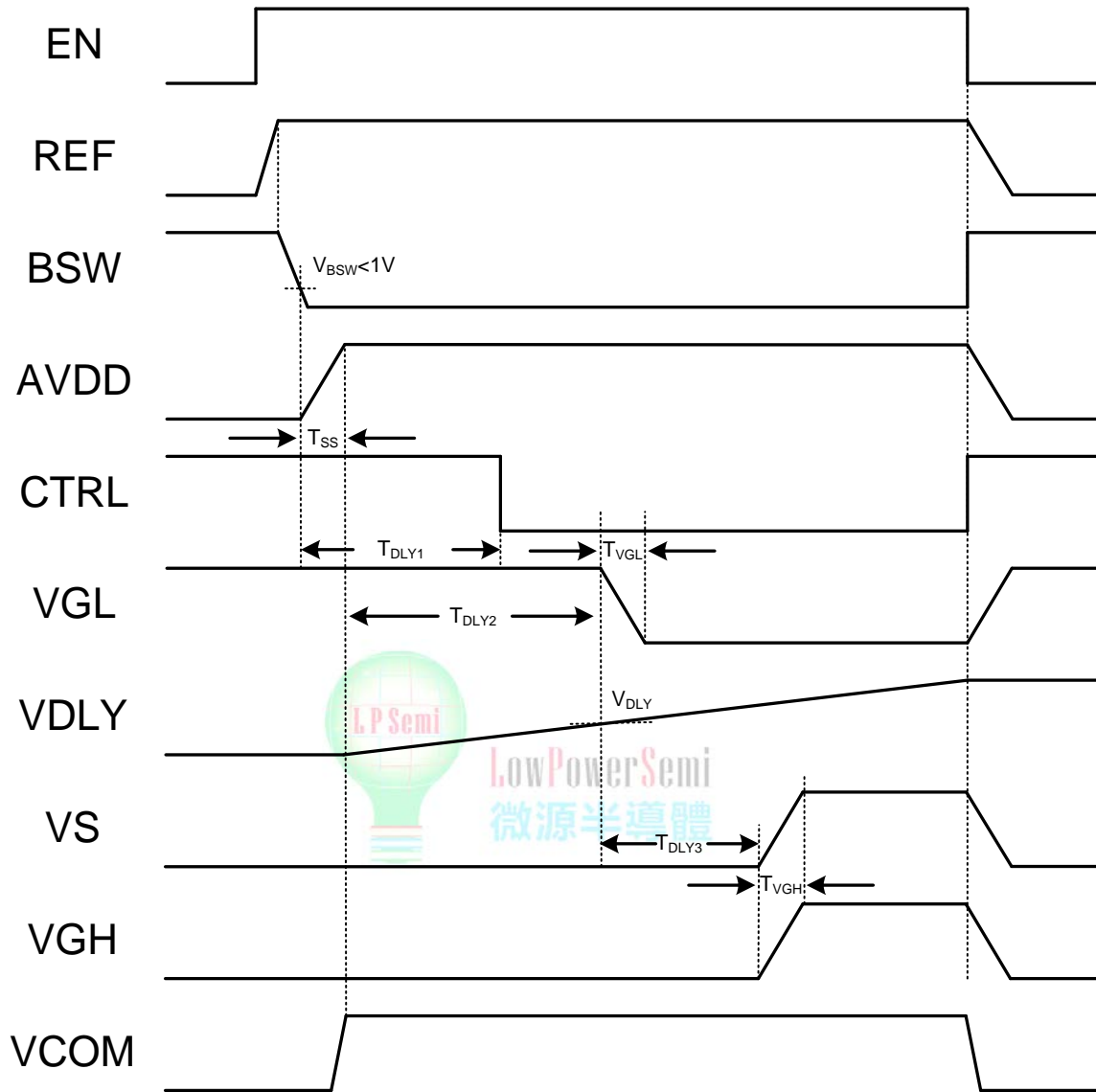
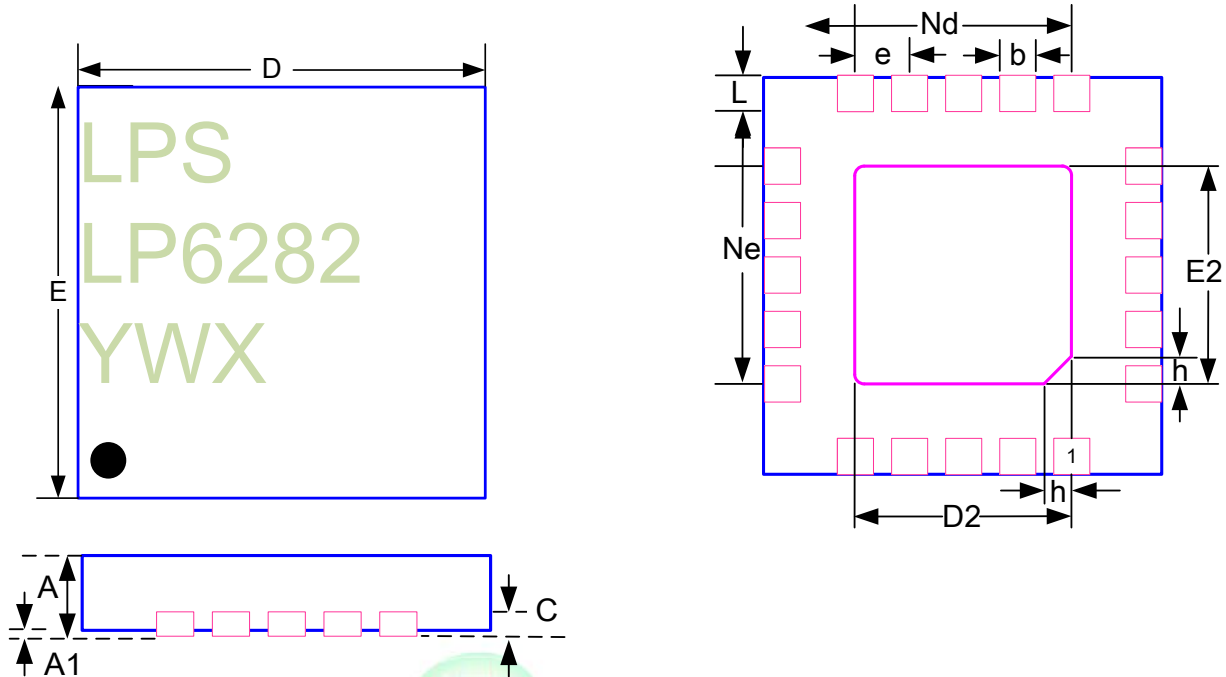


Figure 4. Power Sequence and GPM Control



Outline Information

QFN-20 Package (3x3) pitch 0.4 (Unit: mm)



SYMBOL	DIMENSION IN MILLIMETER		
	MIN	NOM	MAX
A	0.700	0.750	0.800
A1	---	0.020	0.050
b	0.150	0.200	0.250
C	0.180	0.200	0.250
D	2.900	3.000	3.100
D2	1.550	1.650	1.750
E	2.900	3.000	3.100
E2	1.550	1.650	1.750
e	0.400 BSC		
Nd	1.600 BSC		
Ne	1.600 BSC		
L	0.350	0.400	0.450
h	0.200	0.250	0.300