

8A, 24V Input Synchronous Step Down Regulator

Features

- 4.5V to 24V Input Range
- Continual Output Current: 8A
- Integrated 10mΩ at VCC=5V N-Channel MOSFET for Low Side
- Integrated 20mΩ at VCC=5V N-Channel MOSFET for High Side
- Integrated Bypass Switch: 1.5Ω
- Internal Softstart Limits the Inrush Current
- +/-1% Internal Reference Voltage
- Maximum Output Voltage Set-Point: 5.5V
- Power Good Indicator
- Output Discharge Function
- Programmable Valley Current Limit Threshold by ILMT pin
- Latch-off Mode OVP & UVP Protections
- Latch-off Mode Over Temperature Protection
- Input UVLO
- RoHS Compliant and Halogen Free
- Compact Package: WQFN2.5X2.5-16

General Description

The G6028 develops a high efficiency synchronous step-down DC/DC regulator capable of delivering 8A current over a wide input voltage range of 4.5V to 24V.

Applications

- Notebook Computers, PC Computers, and Servers
- Ultrabook, Tablet Computers
- Single-Board Computer, Industrial PC
- Distributed Power Systems

Ordering Information

ORDER NUMBER	MARKING	TEMP. RANGE	PACKAGE (Green)
G6028UK1U	6028	-40°C to +85°C	WQFN2.5X2.5-16
G6028AUK1U	6028A	-40°C to +85°C	WQFN2.5X2.5-16
G6028BUK1U	6028B	-40°C to +85°C	WQFN2.5X2.5-16
G6028CUK1U	6028C	-40°C to +85°C	WQFN2.5X2.5-16

Note: UK : WQFN2.5X2.5-16

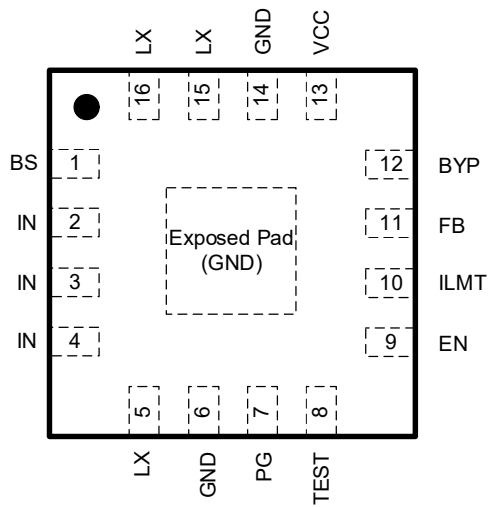
1: Bonding Code

U : Tape & Reel

Green : Lead Free / Halogen Free

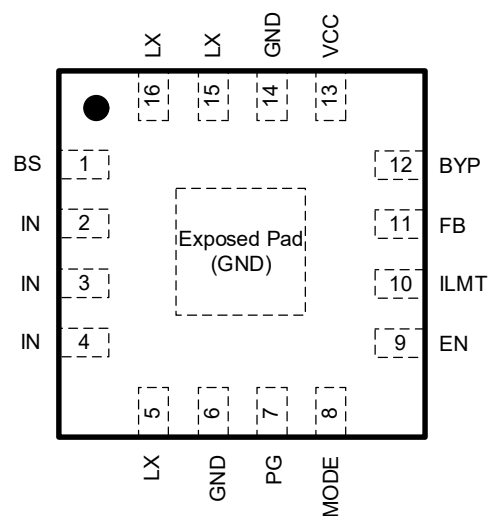
Pin Configuration

G6028



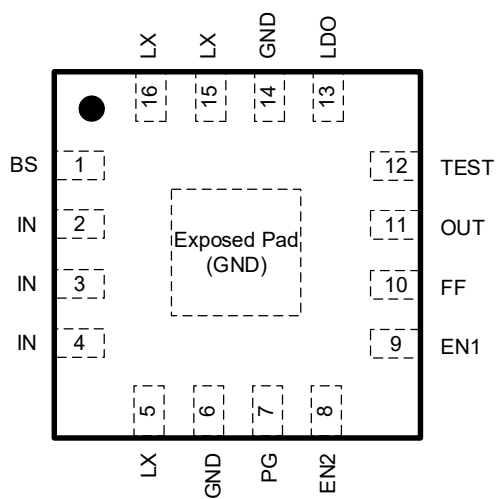
WQFN2.5x2.5-16

G6028A



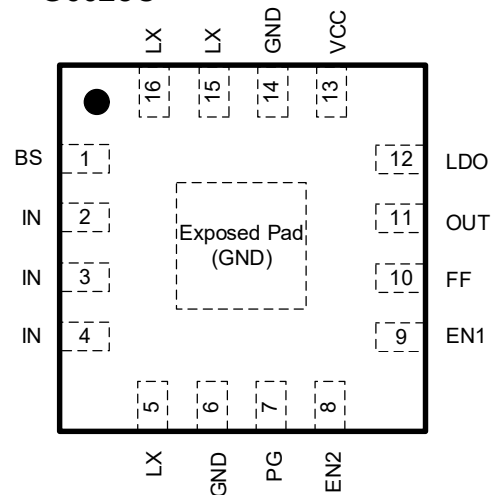
WQFN2.5x2.5-16

G6028B



WQFN2.5x2.5-16

G6028C



WQFN2.5x2.5-16

Absolute Maximum Ratings (Note 1)

IN to GND -0.3V to 28V
 LX, EN, EN1, EN2, PG, MODE to GND . . -0.3V to 26V
 <20ns -6V to 28V
 BS to LX (G6028/C). -0.3V to 6V
 BS to LX (G6028A/B). -0.3V to 4V
 BYP, FB, FF, VCC, TEST, LDO, OUT to AGND
 -0.3V to 6V

ILMT -0.3V to VCC+0.3V
 Operating Temperature (T_A) -40°C to 85°C
 Junction Temperature (T_J) -40°C to 150°C
 Storage Temperature (T_{stg}) -65°C to 150°C
 ESD (HBM) 2KV
 ESD (CDM) 1KV

Thermal Information (Note 2, 3)

THERMAL METRIC		WQFN2.5X2.5-16	UNIT
R _{θJA}	Junction to ambient thermal resistance	47.3	°C/W
R _{θJC_top}	Junction to case top thermal resistance	21.6	°C/W
R _{θJB}	Junction to board thermal resistance	9.6	°C/W
Ψ _{JT}	Junction to top characterization parameter	1.1	°C/W
Ψ _{JB}	Junction to board characterization parameter	9.8	°C/W
R _{θJC_bot}	Junction to case bottom thermal resistance	4.3	°C/W

Note 1 : Stresses beyond the “Absolute Maximum Ratings” may cause permanent damage to the device. These are stress ratings only. Functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

Note 2: Package thermal metric is obtained using the method described in JEDEC specification JESD51-7, using a four-layer board.

Note 3: The maximum power dissipation is $P_{D(MAX)} = \frac{(T_{JMAX} - T_A)}{R_{\theta JA}}$, Exceeding the maximum allowable power dissipation results in excessive die temperature, and the device will enter thermal shutdown.

Electrical Characteristics

(IN=12V, VCC=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	CONDITIONS		MIN	TYP	MAX	UNITS
Input Supply Voltage						
IN Input Voltage Range	G6028		4.5	---	24	V
	G6028A/G6028B		4	---	24	
	G6028C		5.5	---	24	
IN Input UVLO Threshold	G6028		---	---	4.2	
	G6028A/G6028B		---	---	3.9	
	G6028C		---	---	5	
UVLO Hysteresis			---	0.3	---	
Quiescent Current	I _{OUT} =0A, V _{OUT} =V _{SET} X105%		---	85	110	
Shutdown Current	EN=0	G6028/G6028A	---	5	9	μA
	EN1=0, EN2=0	G6028B/G6028C				
	EN1=0, EN2=1		---	60	85	
Feedback Reference Voltage	G6028/G6028A		0.594	0.6	0.606	
Output Voltage Set-Point	CCM	G6028B	3.305	3.338	3.371	V
		G6028C	5.023	5.1	5.177	
FB Input Current	V _{FB} =1V	G6028/G6028A	-50	---	50	nA
High-side FET R _{DS(ON)}			---	20	---	mΩ
Low-side FET R _{DS(ON)}			---	10	---	
Output Discharge Current	V _{OUT} =1.2V	G6028	---	40	---	mA
		G6028A/G6028B/ G6028C	---	100	---	
Low-side FET Current Limit	ILMT=Low	G6028/G6028A	8	10.7	---	A
	ILMT=Floating	G6028	10	12.7	---	
		G6028A	12	14.9	---	
	ILMT=Connected to VCC pin	G6028	12	14.9	---	
		G6028A	16	---	---	
	G6028B/G6028C	10	12.7	---		
Soft-start Time	V _{OUT} from 0% to 100% V _{SET}	G6028	---	600	---	μs
		G6028A/G6028B	---	1200	---	
		G6028C	---	800	---	
EN/MODE Input Voltage High	G6028		1	---	---	V
	G6028A		0.8	---	---	
EN1/EN2 Input Voltage High	G6028B/G6028C		1	---	---	

Electrical Characteristics (continued)

PARAMETER	CONDITIONS		MIN	TYP	MAX	UNITS
EN/MODE Input Voltage Low	G6028/G6028A		---	---	0.4	V
EN1/EN2 Input Voltage Low	G6028B/G6028C					
ILMT Input Voltage High	G6028/G6028A		VCC-0.8	---	VCC	V
ILMT Input Voltage Low	G6028		---	---	0.4	
	G6028A		---	---	0.8	
Switching Frequency	V _{OUT} =1.2V, CCM	G6028	410	500	590	kHz
		G6028A/G6028B/ G6028C	510	600	690	
Min ON Time	V _{IN} =V _{IN,MAX}		---	50	---	ns
Min OFF Time	G6028		---	200	---	
	G6028A/G6028B/G6028C		---	150	---	
Output Over Voltage Threshold	V _{FB} rising	G6028/G6028A	117	120	123	%V _{REF}
	V _{FF} rising	G6028B/G6028C				
Output Over Voltage Hysteresis			---	5	---	
Output OVP Delay			---	20	---	μs
Output Under Voltage Protection Threshold			55	60	65	%V _{REF}
Output UVP Delay			---	200	---	μs
Power Good Rising Threshold	V _{FB} rising	G6028/G6028A	86	90	94	%V _{REF}
	V _{FF} rising	G6028B/G6028C				
Power Good Falling Threshold	V _{FB} falling	G6028/G6028A	81	85	89	
	V _{FF} falling	G6028B/G6028C				
Power Good Delay	Low to high		---	200	---	μs
	High to low		---	30	---	
Power Good Low Voltage	V _{FB} =0V, I _{PG} =5mA	G6028/G6028A	---	---	0.4	V
	V _{FF} =0V, I _{PG} =5mA	G6028B/G6028C				
VCC Output Voltage	G6028		---	5.0	---	
	VCC adds 1mA load	G6028A	3.2	3.3	3.4	
		G6028C	3.15	3.3	3.45	
LDO Output Voltage	V _{IN} =12V, I _{LDO} =1mA	G6028B	3.15	3.3	3.45	
	V _{IN} =12V	G6028C	---	5.0	---	
LDO Dropout Voltage	I _{LDO} =100mA	G6028B	---	300	---	mV
Bypass Switch R _{DS(ON)}			---	1.5	---	Ω
Bypass Switch Turn-on Voltage	G6028/G6028A/G6028B		2.97	3.1	---	V
	G6028C		4.5	4.7	---	
Bypass Switch Switchover Hysteresis	G6028/G6028A/G6028C		---	0.2	---	
	G6028B		---	0.15	---	
Bypass Switch OVP Threshold	G6028/G6028A		---	120	---	%V _{CC}
	G6028B/G6028C		---	120	---	%V _{LDO}
Thermal Shutdown Temperature			---	150	---	°C
Thermal Shutdown Hysteresis			---	15	---	

Pin Description

PIN	NAME	FUNCTION
1	BS	Boot-strap pin. Supply high side gate driver. Connect a 0.1 μ F ceramic capacitor between the BS pin and the LX pin.
2, 3, 4	IN	Input pin. Decouple this pin to the GND pin with at least a 10 μ F ceramic capacitor.
5, 15, 16	LX	Inductor pin. Connect this pin to the switching node of the inductor.
6, 14, EP	GND	Ground pin.
7	PG	Power good indicator. Open drain output when the output voltage is within 90% to 120% of the regulation point.
8	TEST	G6028 For factory use only. Leave this pin floating or connect it to GND in application.
	MODE	G6028A Operating mode selection under light load. Pull this pin low for PFM operating and pull this pin high for FCCM operation. Do not leave this pin floating.
	EN2	G6028B Enable control of the IC and internal LDO. Pulling this pin high to turn on the IC and internal LDO. Do not leave this pin floating. G6028C
9	EN	G6028A Enable control of the IC. Pull high to turn on the IC and pull low to turn off the IC. G6028
		G6028B Enable control of the DC/DC regulator. Pulling this pin high to turn on the regulator. Do not leave this pin floating. G6028C
	EN1	G6028B G6028C
10	ILMT	G6028 Valley current limit threshold selection pin. G6028A
		G6028B G6028C
	FF	G6028B Output feed forward pin. Connect the RC network from the output to this pin. G6028C
11	FB	G6028 Output feedback pin. Connected to the center point of the resistor divider. G6028A
		G6028B Output pin. Connect to the output of Buck regulator. This pin also provides the bypass input for internal LDO. G6028C
	OUT	G6028B G6028C
12	BYP	G6028 External 3.3V bypass power supply input. Decouple this pin to the GND with a 1 μ F ceramic capacitor. Leave this pin floating if it is not used. G6028A
		G6028B For factory use only. Leave this pin floating in application.
	LDO	G6028C 5V LDO output. Decouple this pin to ground with a 4.7 μ F ceramic capacitor.
13	VCC	G6028 Internal 5V LDO output. Power supply for internal analog circuits and driving circuit. Decouple this pin to the GND with a 2.2 μ F ceramic capacitor.
		G6028A Internal 3.3V LDO output. Power supply for internal analog circuits and driving circuit. Decouple this pin to the GND with a 2.2 μ F ceramic capacitor.
		G6028C
	LDO	G6028B 3.3V LDO output. Decouple this pin to ground with at least a 4.7 μ F capacitor.

G6028 Series Comparison

Main Differences	G6028	G6028A	G6028B	G6028C
DCDC Output Voltage	ADJ	ADJ	3.3V	5V
LDO Output Voltage	X	X	3.3V	5V
DCDC Output UVP	Latch-off	Hiccup	Latch-off	Latch-off
MODE Pin for Light Load	X	Low: PFM High: FCCM	X	X
OUT Pin Switch-over Threshold	X	X	3.1V	4.7V
ILMT Pin for Current Limit	Selectable	Selectable	Fixed	Fixed

EN2/EN1 Control

G6028B/G6028C enable logic details in below table

EN2	EN1	STATE	LDO	BUCK
High	High	S0	On	On
High	Low	S3	On	Off
Low	Low/High	S4/S5	Off	Off

Output Under-Voltage Protection (UVP)

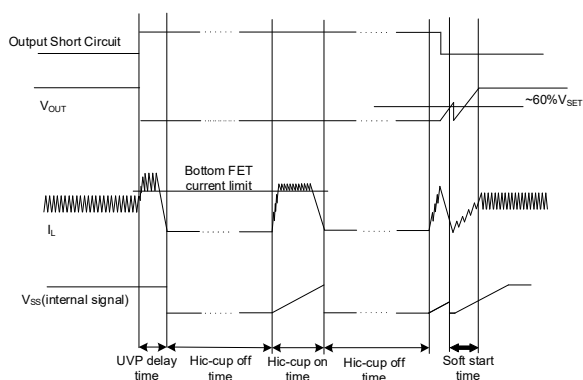
(Optional hic-cup function for G6028A)

If $V_{OUT} < 60\%$ of the set point for approximately $200\mu s$ occurring when the output short circuit or the load current is much heavier than the maximum current capacity, the output under voltage protection (UVP) will be triggered, and the device will enter into hic-cup protection mode. Timing specifications is as below:

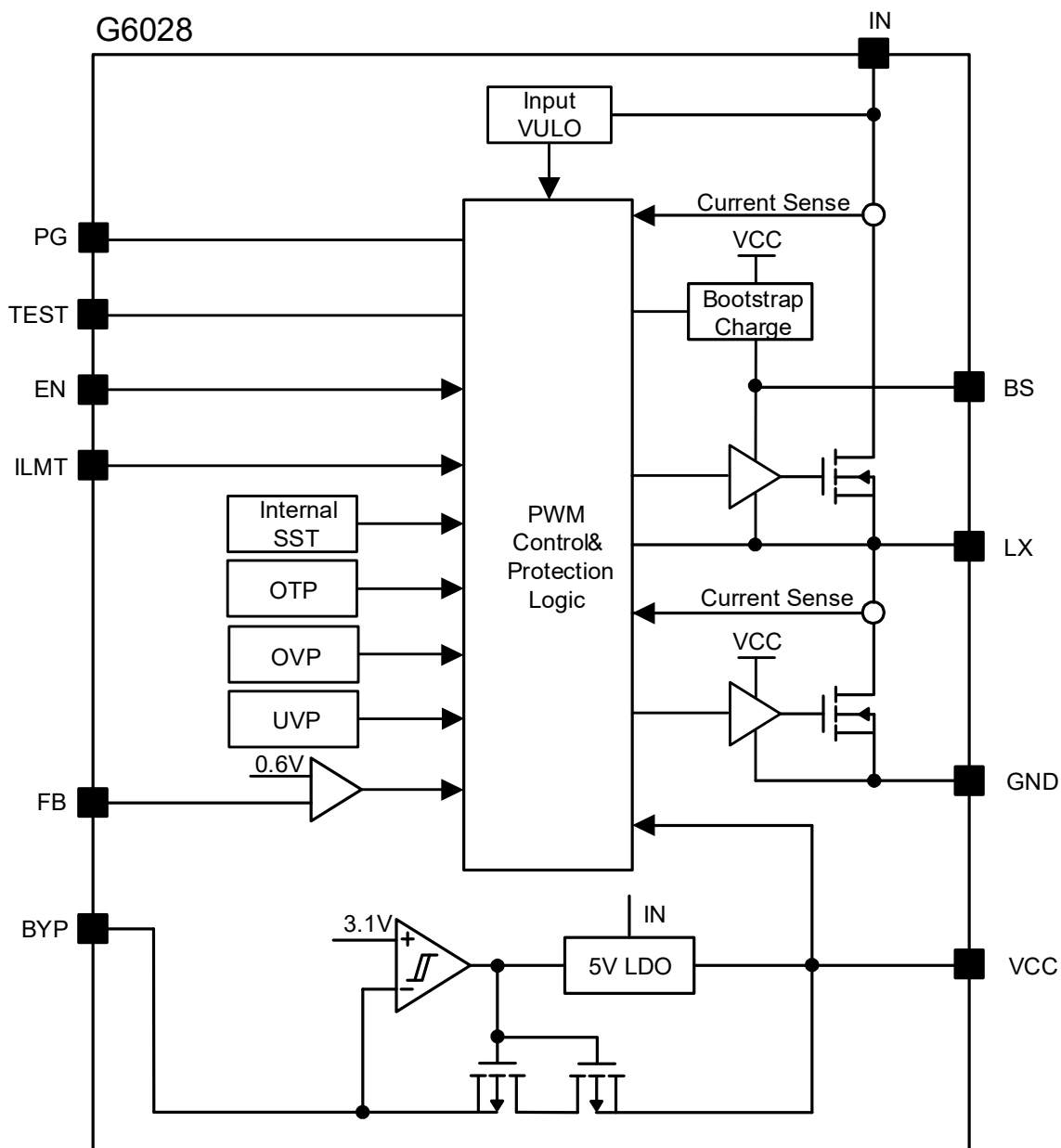
UVP delay time= $200\mu s$

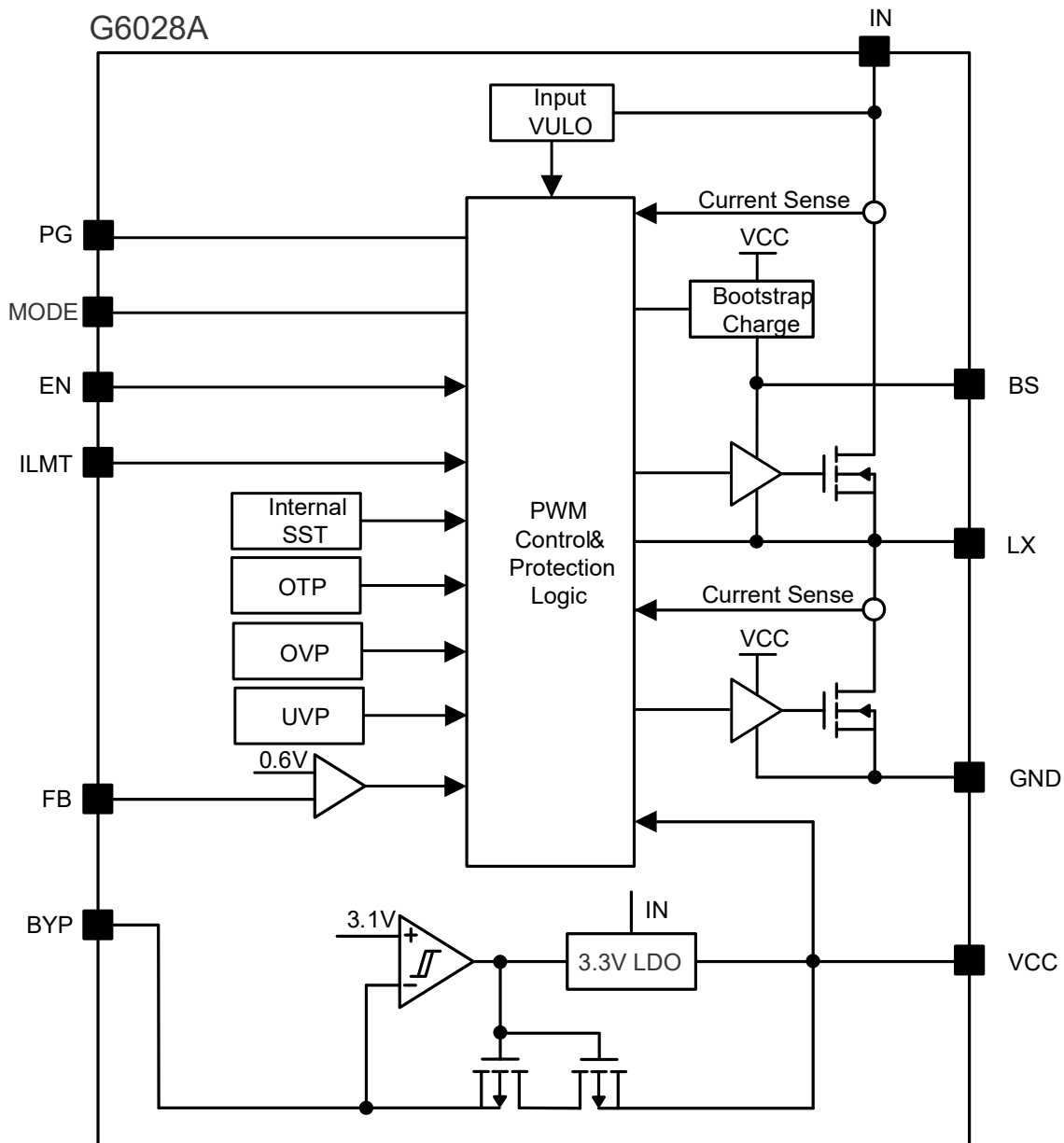
Hic-cup off time= $6ms$

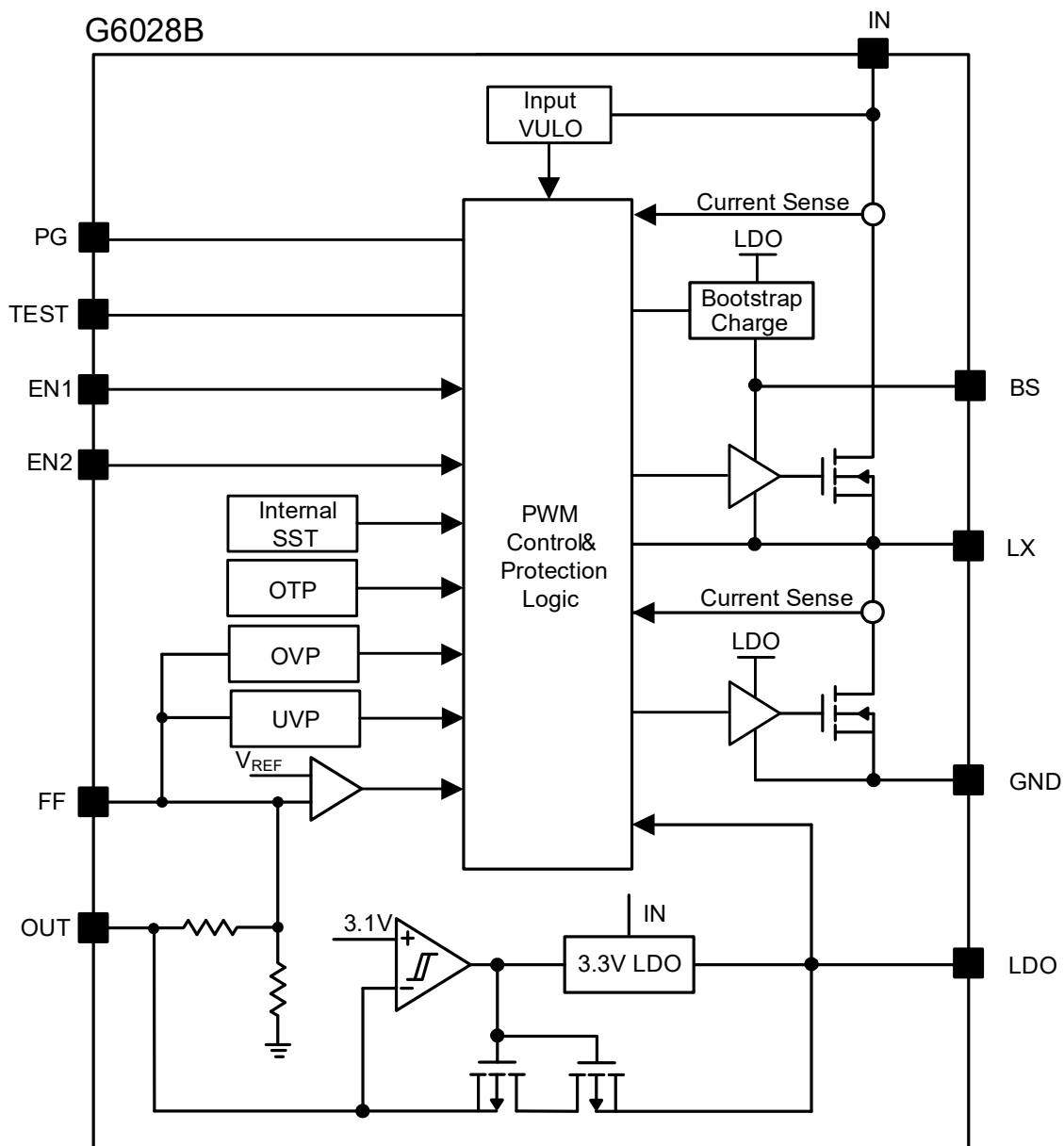
Hic-cup on time= $1.5ms$

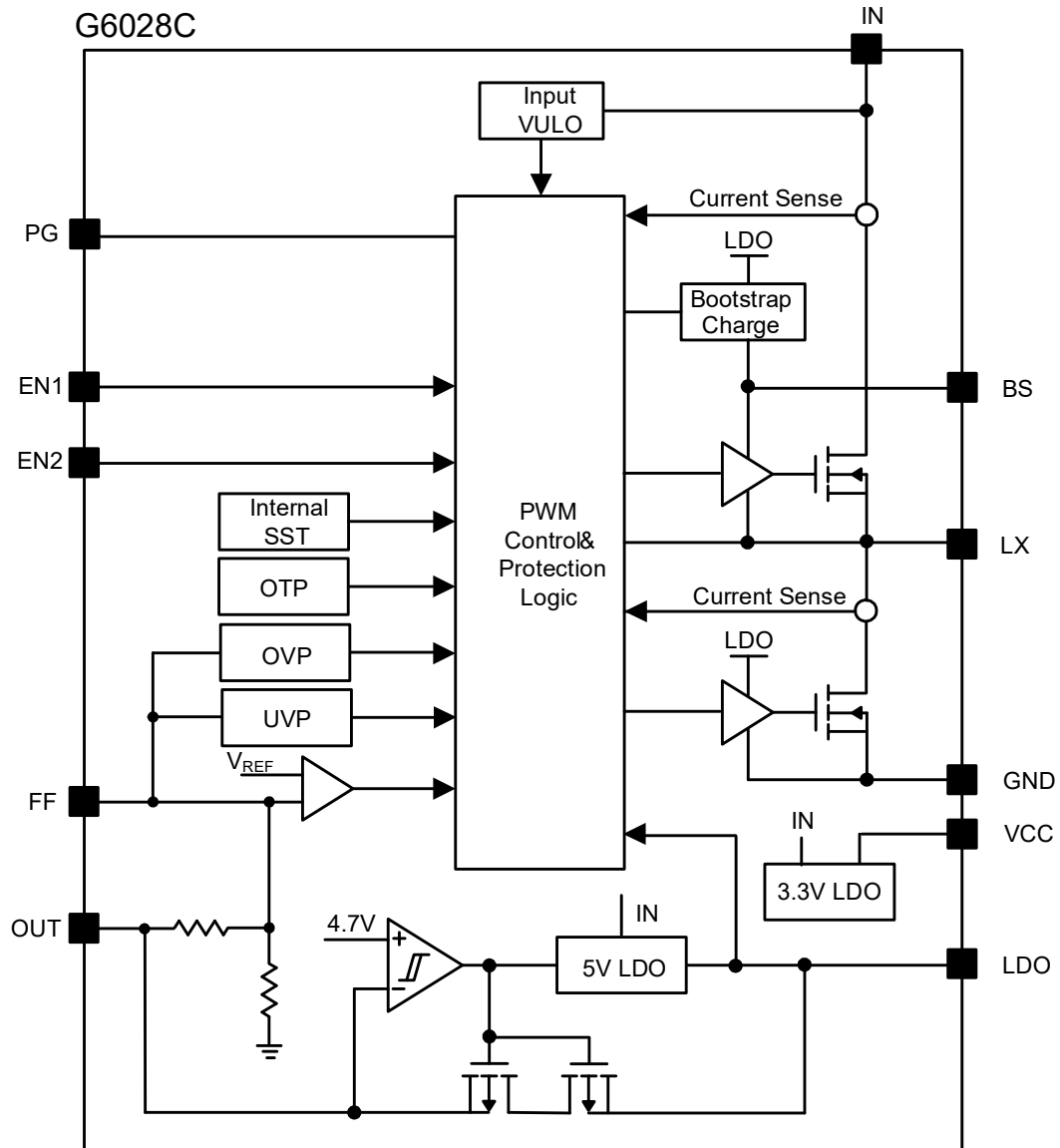


Block Diagram

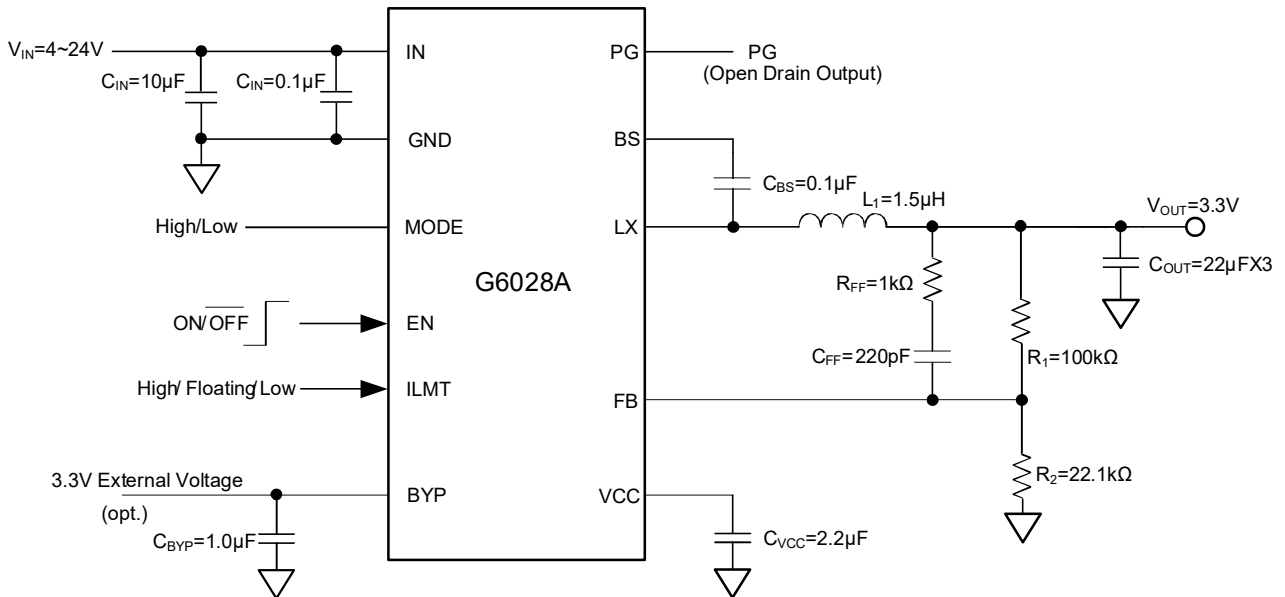
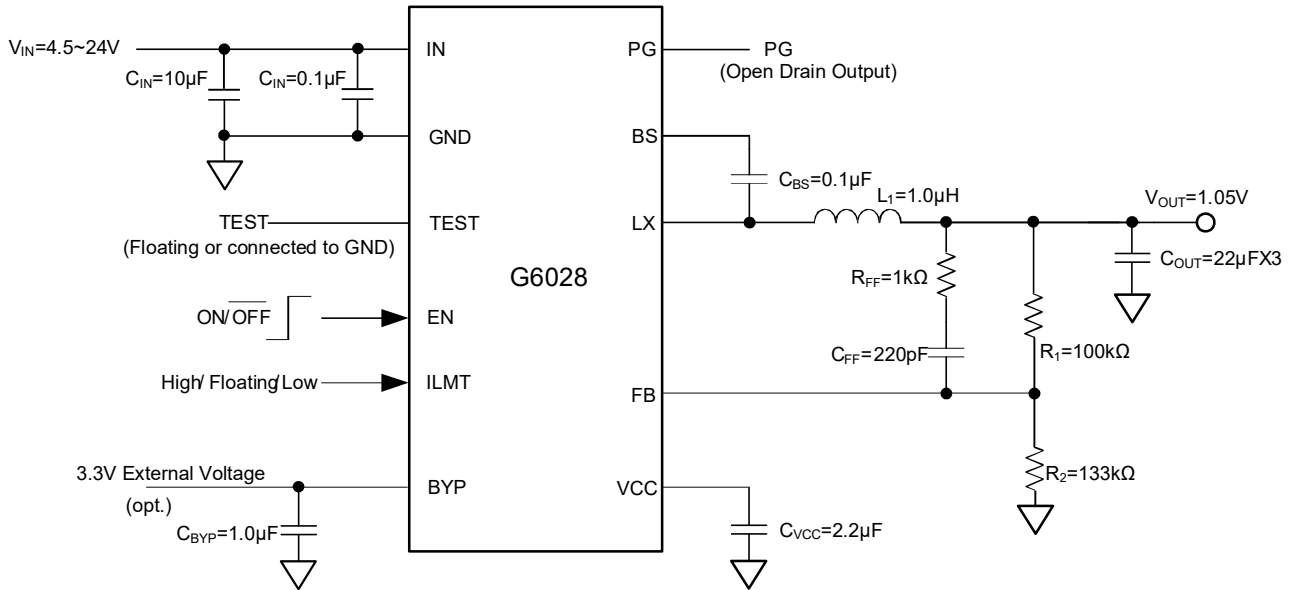


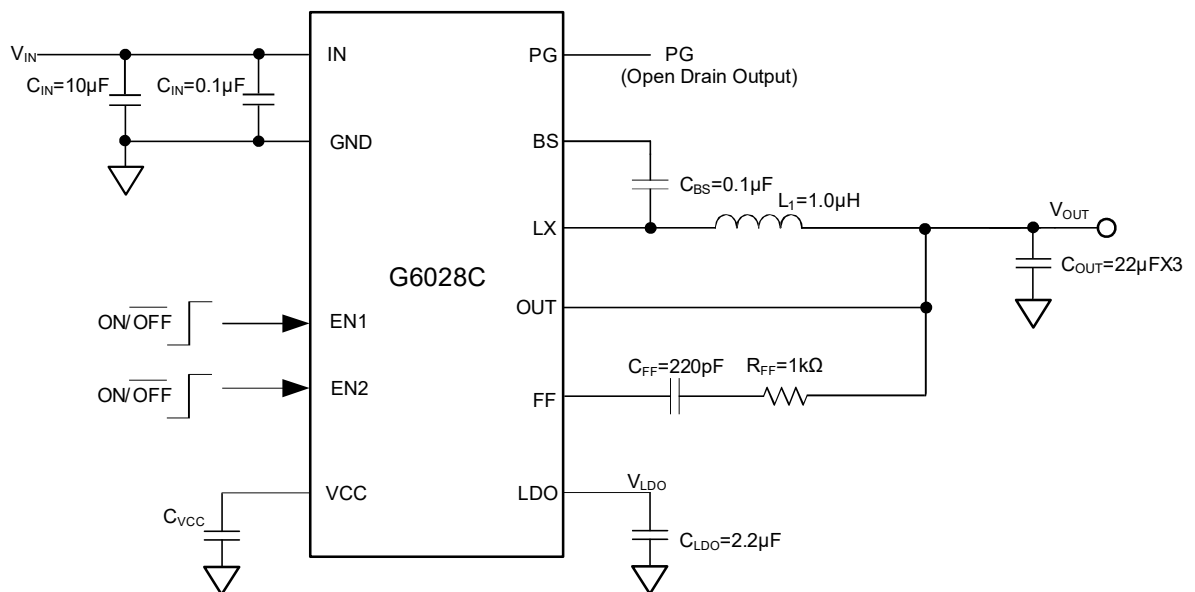
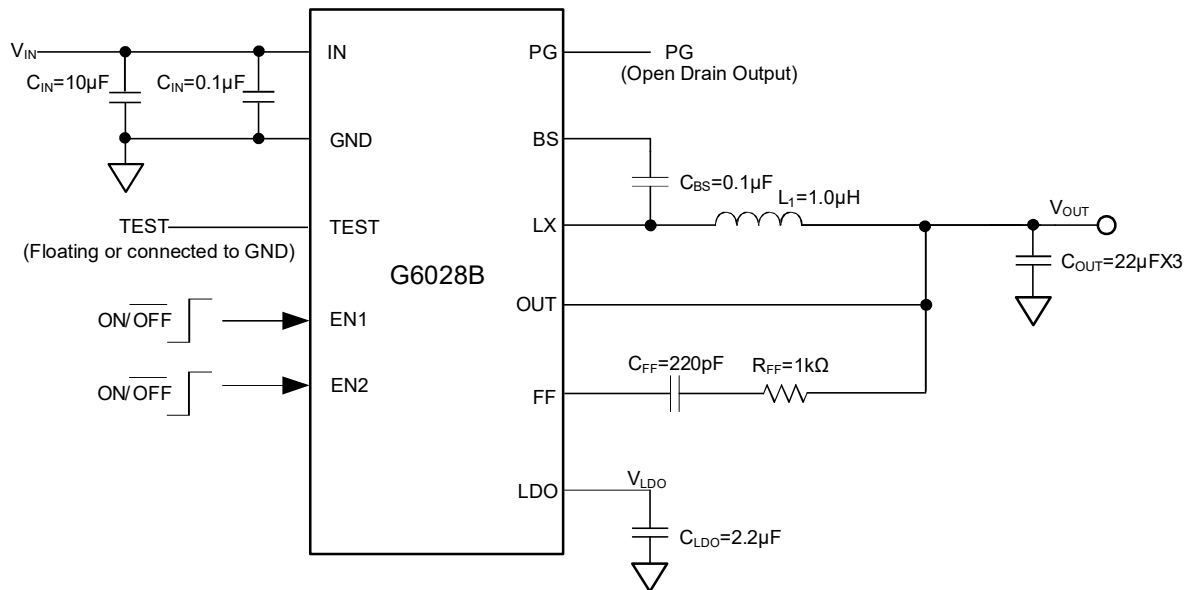




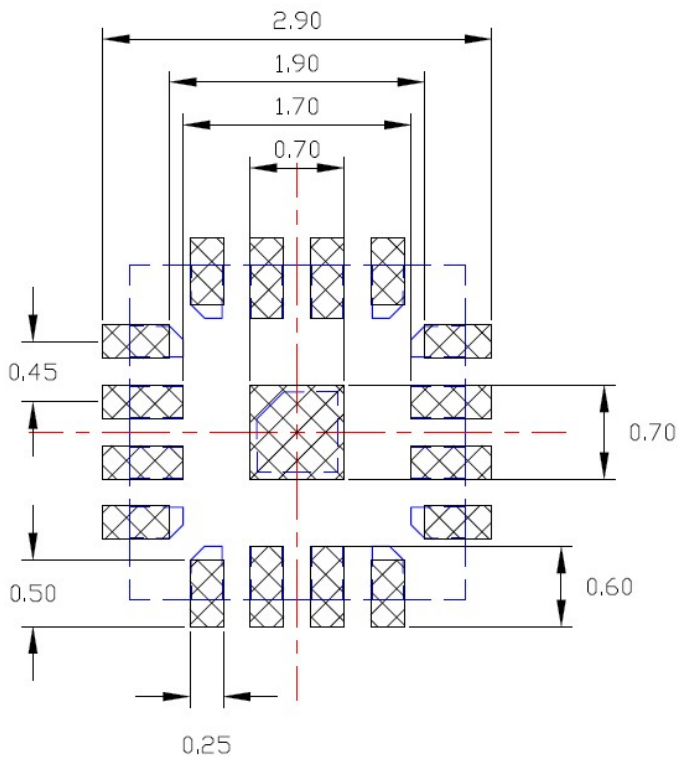


Typical Application

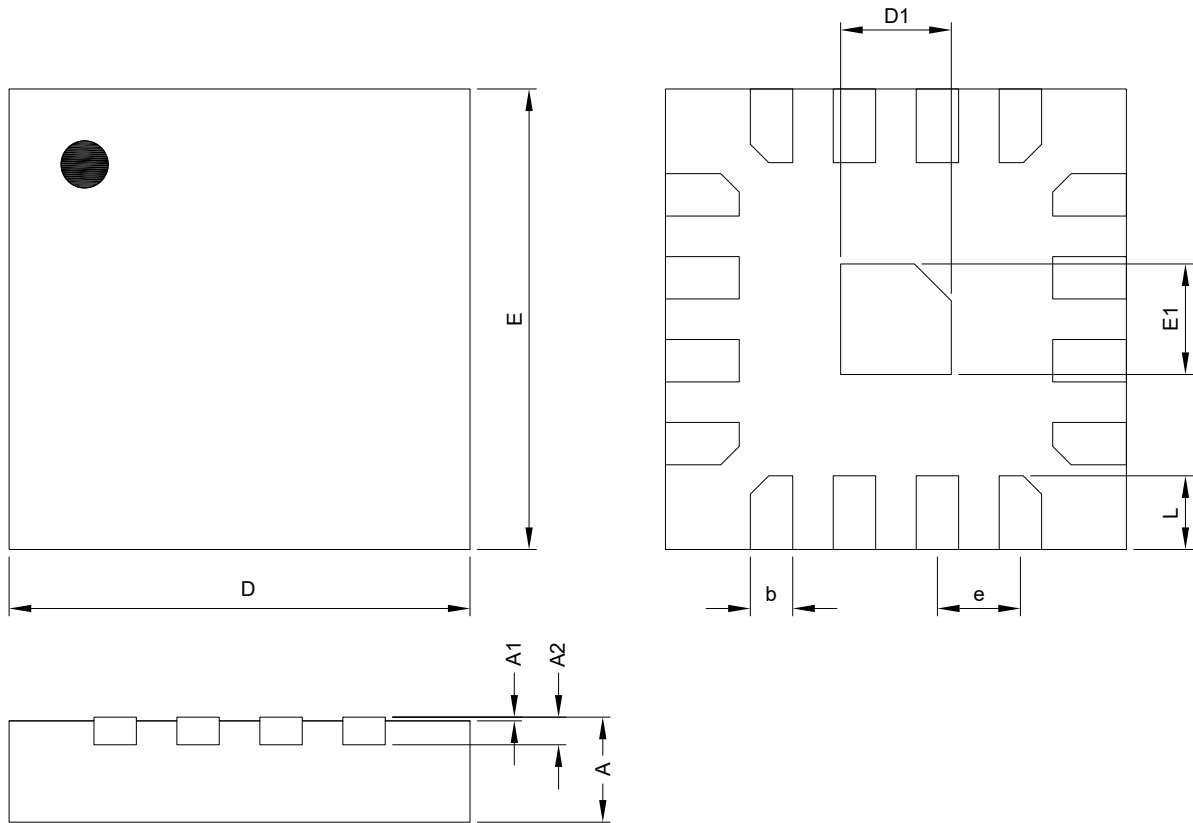




Minimum footprint PCB Layout Section



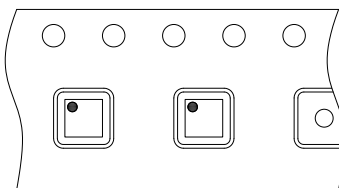
Package Information



WQFN2.5X2.5-16 Package

Symbol	DIMENSION IN MM			DIMENSION IN INCH		
	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.
A	0.50	0.55	0.60	0.0197	0.0217	0.0236
A1	0.00	---	0.05	0.0000	---	0.0020
A2	0.15 REF			0.0059 REF		
D	2.45	2.50	2.55	0.0965	0.0984	0.1004
E	2.45	2.50	2.55	0.0965	0.0984	0.1004
D1	0.55	0.60	0.65	0.0217	0.0236	0.0256
E1	0.55	0.60	0.65	0.0217	0.0236	0.0256
b	0.15	0.23	0.28	0.0059	0.0091	0.0110
e	0.45 BSC			0.0177 BSC		
L	0.30	0.40	0.45	0.0118	0.0157	0.0177

Taping Specification



→
Feed Direction

PACKAGE	Q'TY/REEL
WQFN2.5X2.5-16	3,000 ea

GMT Inc. does not assume any responsibility for use of any circuitry described, no circuit patent licenses are implied and GMT Inc. reserves the right at any time without notice to change said circuitry and specifications.