24V/12A Ideal Diode

Features

- **4.5 V to 24V Operating Range**
- **5mΩ N-channel MOSFET**
- **30mV Forward Drop in Regulation**
- **Smooth Switchover**
- **DFN3X3-10 Package**

Applications

- **Laptop/PC**
- **Multiple Input Power Supplies**
- **Redundant Power Supplies**

General Description

The G3717B contains single power path ideal diode that uses an N-MOSFET replace for. The total capable of supplying is up to 12A with a typical forward conduction resistance of 5mΩ. It results in lower conduction forward voltage and lower power dissipation, smaller PCB layout size, and elimination of heatsink in high-power applications.

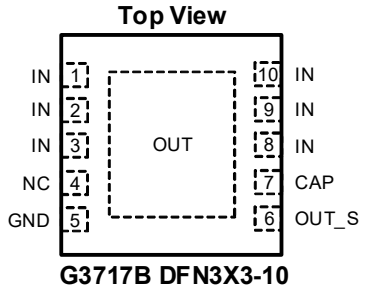
The G3717B operates from 4.5V to 24V and includes a charge pump to drive the high side N-channel MOSFET. The G3717B regulates the forward voltage drop of 30mV across the V_{IN} to V_{OUT} of internal MOSFET to ensure smooth current transfer from one path to the other without oscillation.

Ordering Information

ORDER NUMBER	MARKING	TEMP. RANGE	PACKAGE (Green)
G3717BQE1U	3717B	-40°C to +85°C	DFN3X3-10

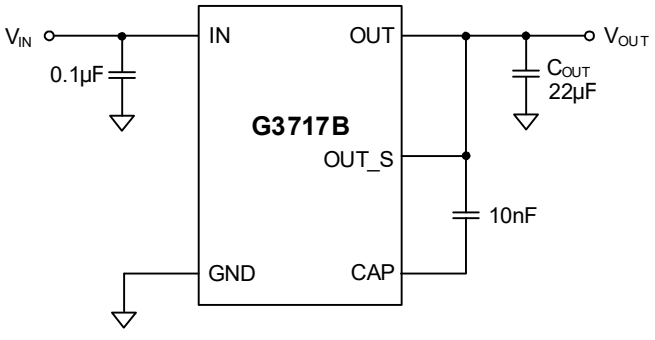
Note: QE: DFN3X3-10
1: Bonding Code
U: Tape & Reel
Green : Lead Free / Halogen Free

Pin Configuration



G3717B DFN3X3-10

Typical Application Circuit



Absolute Maximum Ratings

IN, OUT, OUT_S (OFF state) . . . . . -0.3V to 28V
CAP to OUT_S . . . . . .-0.3V to 7V
Operating Temperature (T_A) . . . . . -40°C to 85°C
Operating Junction Temperature (T_J) . -40°C to 150°C
Storage Temperature (T_{stg}) . . . . . -65°C to 150°C

Recommended Operating Conditions

IN, OUT, OUT_S . . . . . 4.5V to 24V
CAP to OUT_S . . . . . 0V to 6V
Output Current 12A
ESD (HBM) . . . . . ±2KV
ESD (CDM) . . . . . ±500V

Thermal Information

THERMAL METRIC		DFN3X3-10	UNIT
$R_{\theta JA}$	Junction to ambient thermal resistance	47.3	°C/W
$R_{\theta JC\_top}$	Junction to case top thermal resistance	44.5	°C/W
$R_{\theta JB}$	Junction to board thermal resistance	10.9	°C/W
Ψ_{JT}	Junction to top characterization parameter	0.9	°C/W
Ψ_{JB}	Junction to board characterization parameter	10.9	°C/W
$R_{\theta JC\_bot}$	Junction to case bottom thermal resistance	2.0	°C/W

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

V_{IN} = 20V, 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.

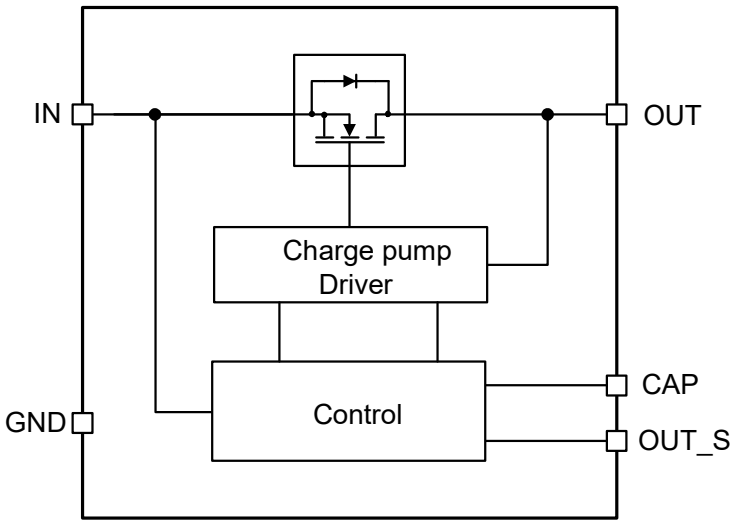
PARAMETER	SYMBOL	CONDITIONS	MIN.	TYP.	MAX.	UNIT
Input Voltage Rage	V_{IN}		4.5	---	24	V
Under Voltage Lockout Voltage	V_{UVLO}	IN Pin	---	3.73	---	V
Under Voltage Lockout Hysteresis Voltage	$V_{HYS(UVLO)}$		---	230	---	mV
CAP to OUT	VCAP-OUT	V_{IN} = 20V	---	5.3	---	V
Supply Current	I_{IN}	No Load	---	180	---	μA
IN to OUT On resistance	R_{ON}	I_{VIN} = 1A	---	5	---	mΩ
IN to OUT Regulation Voltage	V_{OL}	I_{VIN} = 0.1A	15	30	45	mV

Note
*1 Guaranteed by designed

Pin Description

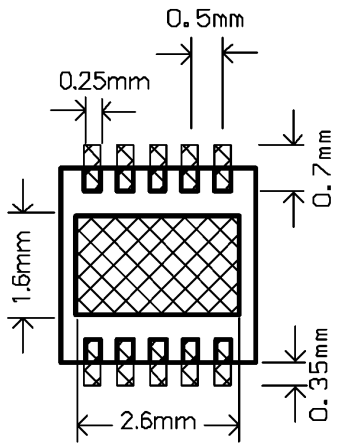
PIN	NAME	I/O	DESCRIPTION
1,2,3,8,9,10	IN	I	Diode Anode, V_{IN} input power supply terminal.
4	NC	I	No Connection.
5	GND		Ground.
6	OUT_S	O	Output voltage remote sense. This pin must be connected to OUT terminal.
7	CAP	O	The CAP pin is stand-alone connected to the OUT_S through a 10nF MLCC.
Thermal Pad	OUT	O	OUT is the common power supply output terminal. The exposed pad is the cathode of the ideal diodes, It is also the drain of the internal N-channel MOSFETs.

Function Diagram



Minimum Footprint PCB Layout Section

DFN3X3-10



Functional

IN

IN is input power supply terminal. IN is the anode of the ideal diode. It is also source terminal of the internal N-channel MOSFET.

OUT

OUT is the exposed pad which is the power supply output terminal. OUT is the common cathode of the ideal diode, It is also the drain of the internal N-channel MOSFET.

OUT_S

The OUT_S pin is the output voltage sense pin. It must be connected to the OUT pin.

CAP

The G3717B has an internal charge pump that pumps the internal gate-drive voltage high enough to fully turn on the N-channel MOSFET. Connect a 10nF external MLCC between CAP and OUT_S by an individual path.

Operation

The high stable power systems often use parallel connected or multi connected power supplies or battery for achieving redundant and enhance system reliability. The ideal diode has been popular in connecting these supplies at the POL(point of load) or converter. The advantage of ideal diodes is the lower forward voltage drop and the resulting lower power consumption loss. This drop reduces the available supply voltage and dissipates significant power. Using an N-channel MOSFET to replace a Schottky diode reduces the power dissipation and eliminates the need for costly heat sinks or large thermal layout in high power applications.

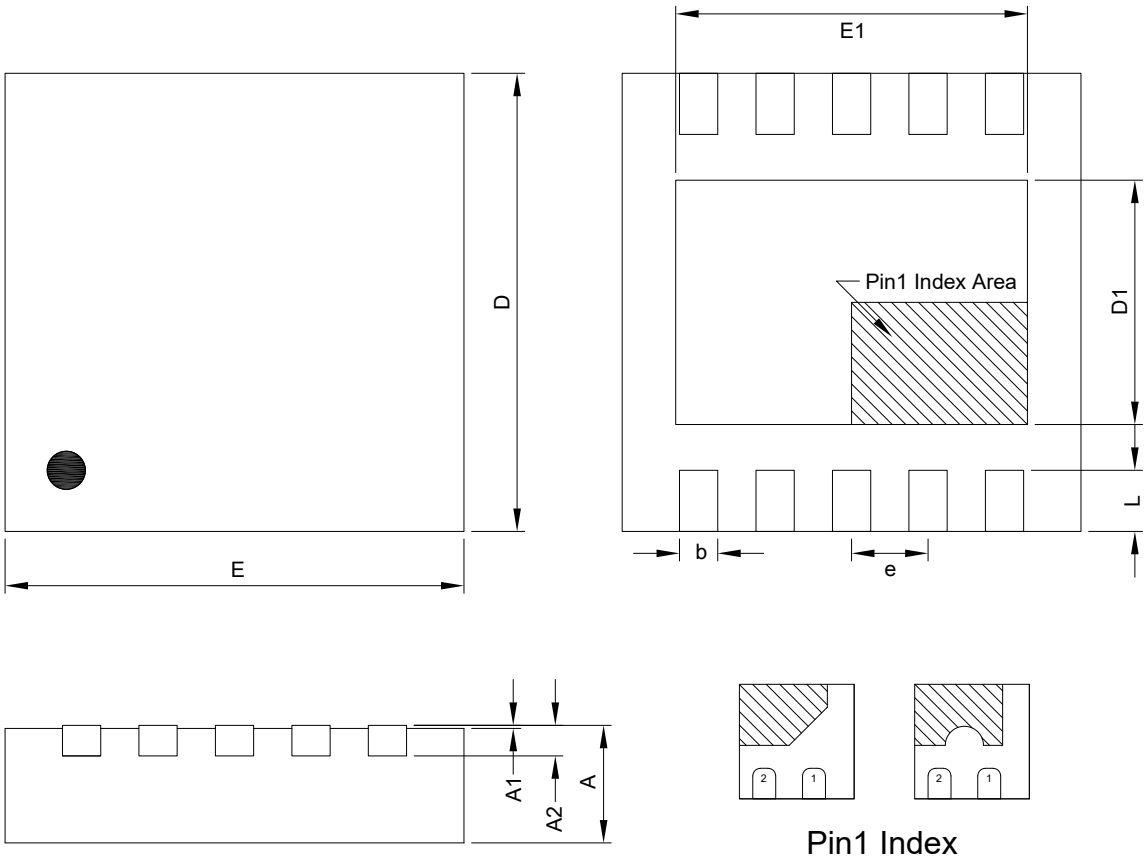
R_{DSON} *I_{LOAD}

In light load condition, If the load current is reduced causing the forward drop to fall below 30mV, the gate control loop will reduce the gate driving current to increase the R_{DSON} to try to achieve the 30mV drop voltage.

Application

The G3717B's layout should be considered: The OUT pin should be connected as closely as possible to the exposed pad (the cathode of the ideal diodes, the drain of the MOSFETs) for good accuracy. Keep the traces (polygon shapes) to the IN and OUT short and wide. The PCB traces associated with the power path through the MOSFET should have low resistance. The OUT acts as a heatsink to remove the heat from the device. The CAP pin is stand-alone connected to the OUT_S through a 10nF MLCC.

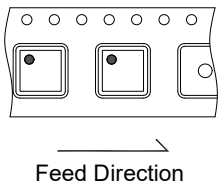
Package Information



DFN3X3-10 Package

Symbol	DIMENSION IN MM			DIMENSION IN INCH		
	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.
A	0.80	0.90	1.00	0.0315	0.0354	0.0394
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	1.50	1.60	1.75	0.0591	0.0630	0.0689
E1	2.20	2.60	2.70	0.0866	0.1024	0.1063
b	0.18	0.25	0.30	0.0071	0.0098	0.0118
e		0.50 BSC			0.0197 BSC	
L	0.30	0.40	0.50	0.0118	0.0157	0.0197

Taping Specification



PACKAGE	Q'TY/REEL
DFN3X3-10	3,000 ea