GLF1200H, GLF1201H

Nano Current Power I_QSmart™ Switch with True Reverse Current Blocking

Product Specification

DESCRIPTION

The GLF1200H / GLF1201H is an advanced technology fully integrated I_QSmart™ load switch device with True Reverse Current Blocking (TRCB) technology and the slew rate control of the output voltage.

The GLF1200H / GLF1201H offers industry leading True Reverse Current Blocking (TRCB) performance, featuring an ultra-low threshold voltage. It minimizes reverse current flow in the event that the VOUT pin voltage exceeds the VIN voltage.

An integrated slew rate control can also enhance system reliability by mitigating bus voltage swings during switching events. Where uncontrolled switches can generate high inrush currents that result in voltage droop and/or bus reset events, the GLF slew rate control specifically limits inrush currents during turn-on to minimize voltage droop.

The GLF1200H / GLF1201H load switch device supports an industry leading wide input voltage range and helps to improve operating life and system robustness. Furthermore, one device can be used in multiple voltage rail applications which helps to simplify inventory management and reduces operating cost.

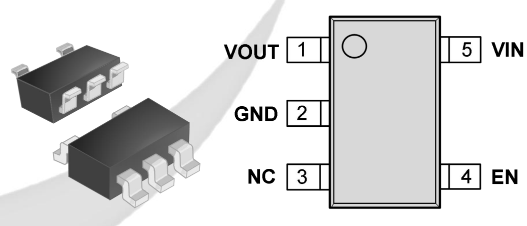
FEATURES

- True Reverse Current Blocking
- Ultra-Low I_Q: 0.47 µA Typ at 5.5 V_{IN}
- Ultra-Low I_{SD}: 26 nA Typ at 5.5 V_{IN}
- Low R_{ON} : 54 mΩ Typ at 5.5 V_{IN}
- I_{OUT} Max: 2 A
- Wide Input Range: 1.5 V to 5.5 V
  6 V abs max
- Controlled Rise Time: 600 µs at 3.3V_{IN}
- Internal EN Pull-Down Resistor on
- Integrated Output Discharge Switch: GLF1201H
- Wide Operating Temperature Range: -40 °C ~ 105 °C
- HBM: 4 kV, CDM: 2 kV

APPLICATIONS

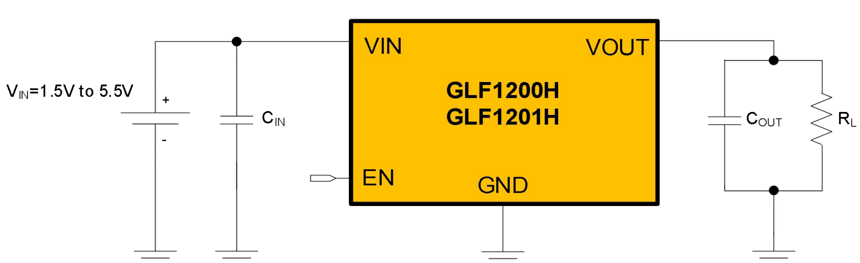
- Smart IoT Devices
- Portable Industrial Devices
- Low Power Subsystems

PACKAGE



SOT23-5L

APPLICATION DIAGRAM



ALTERNATE DEVICE OPTIONS

Part Number	Top Mark	R_{ON} (Typ) at 5.5 V_{IN}	TRCB	Output Discharge	EN Activity
GLF1200H-T1G7	DMH	54 mΩ	Yes	NA	High
GLF1201H-T1G7	DNH	54 mΩ		85 Ω	High

FUNCTIONAL BLOCK DIAGRAM

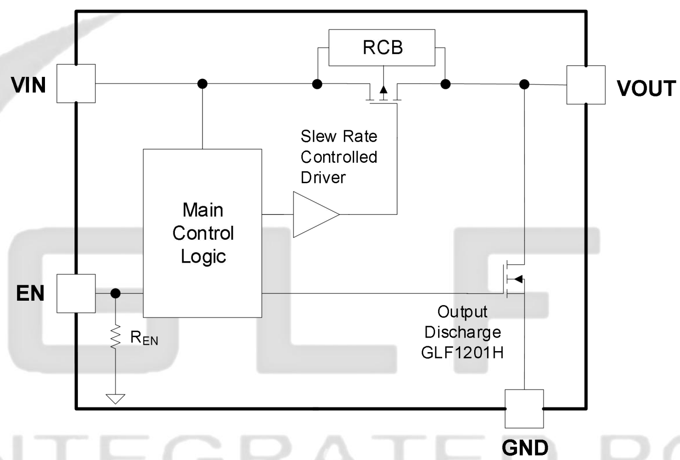


Figure 1. Functional Block Diagram

PIN CONFIGURATION

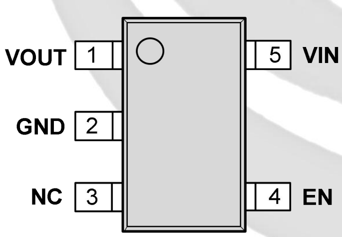


Figure 2. SOT23-5L

PIN DEFINITION

Pin #	Name	Description
1	VOUT	Switch Output
2	GND	Ground
3	NC	No connection
4	EN	Enable to control the switch
5	VIN	Switch Input. Supply Voltage for IC

ABSOLUTE MAXIMUM RATINGS

Stresses exceeding the absolute maximum ratings may damage the device. The device may not function or be operable above the recommended operating conditions; extended exposure to stresses above the recommended operating conditions may affect device reliability. The absolute maximum ratings are stress ratings only.

Symbol	Parameter		Min.	Max.	Unit
V_{IN}	V_{IN}, V_{OUT}, V_{EN} to GND		-0.3	6	V
I_{OUT}	Maximum Continuous Switch Current			2	A
T_{STG}	Storage Junction Temperature		-65	150	°C
θ_{JC}	Thermal Resistance, Junction to Case			90	°C/W
θ_{JA}	Thermal Resistance, Junction to Ambient			180	°C/W
ESD	Electrostatic Discharge Capability	Human Body Model, JESD22-A114	4		kV
		Charged Device Model, JESD22-C101	2		

Note. The θ_{JA} is measured at T_A = 25°C on a high effective thermal conductivity four-layer test board per JEDEC 51-7.

RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Min.	Max.	Unit
V_{IN}	Supply Voltage	1.5	5.5	V
T_A	Ambient Operating Temperature	-40	+105	°C

ELECTRICAL CHARACTERISTICS

Values are at V_{IN} = 3.3V and T_A = 25°C unless otherwise noted.

Symbol	Parameter	Conditions		Min.	Typ.	Max.	Unit
Basic Operation							
I_Q	Quiescent Current (1)	V_{IN} = V_{EN} = 5.5 V, I_{OUT} = 0 mA			0.47		µA
		V_{IN} = V_{EN} = 5.5 V, I_{OUT} = 0 mA, T_A = 85 °C (4)			0.52		
		V_{IN} = V_{EN} = 5.5 V, I_{OUT} = 0 mA, T_A = 105 °C (4)			0.54		
I_{SD}	Shut Down Current	V_{EN} = 0 V, V_{IN} = 1.5 V I_{OUT} = 0 mA			2.0		nA
		V_{EN} = 0 V, V_{IN} = 3.3 V I_{OUT} = 0 mA			3.0		
		V_{EN} = 0 V, V_{IN} = 4.2 V I_{OUT} = 0 mA			10		
		V_{EN} = 0 V, V_{IN} = 5.5 V I_{OUT} = 0 mA			26		
		V_{EN} = 0 V, V_{IN} = 5.5 V, I_{OUT} = 0 mA, T_A = 85 °C (4)			365		
		V_{EN} = 0 V, V_{IN} = 5.5 V, I_{OUT} = 0 mA, T_A = 105 °C (4)			1020		
R_{ON}	On-Resistance	V_{IN} = 5.5 V, I_{OUT} = 500 mA	T_A = 25 °C		54		mΩ
			T_A = 85 °C (4)		63		
			T_A = 105 °C (4)		68		
		V_{IN} = 3.3 V, I_{OUT} = 500 mA	T_A = 25 °C		64		
			T_A = 85 °C (4)		75		
			T_A = 105 °C (4)		81		
		V_{IN} = 1.8 V, I_{OUT} = 300 mA	T_A = 25 °C (4)		105		
		V_{IN} = 1.5 V, I_{OUT} = 100 mA	T_A = 25 °C		116		
R_{DSC}	Output Discharge Resistance	V_{EN} = Low, I_{FORCE} = 10 mA, GLF1201H			85		Ω
V_{IH}	EN Input Logic High Voltage	V_{IN} = 1.5 V to 5.5 V		1.2			V

V_{IL}	EN Input Logic Low Voltage	V_{IN} = 1.5 V to 5.5 V			0.4	V
R_{EN}	EN Internal Resistance	Internal Pull-down Resistance:		10		MΩ
I_{EN}	EN Current	V_{EN} = 5.5 V		0.5		μA
V_{RCB_TH}	RCB Protection Threshold Voltage	$V_{OUT} – V_{IN}$		35		mV
V_{RCB_RL}	RCB Protection Release Voltage	$V_{IN} – V_{OUT}$		30		mV
Switching Characteristics (2, 3)						
t_{dON}	Turn-On Delay	R_L = 150 Ω, C_{OUT} = 0.1 μF		450		μs
t_R	V_{OUT} Rise Time			600		
t_{dOFF}	Turn-Off Delay (4)	R_L = 150 Ω, C_{OUT} = 0.1 μF : GLF1200H		17		
t_F	V_{OUT} Fall Time (4)			27		
t_{dOFF}	Turn-Off Delay (4)	R_L = 150 Ω, C_{OUT} = 0.1 μF : GLF1201H		17		
t_F	V_{OUT} Fall Time (3), (4)			12		

Notes:
1. I_Q does not include the enable pull down current (I_{EN}) through the pull-down resistor R_{EN}.
2. $t_{ON} = t_{dON} + t_R$, $t_{OFF} = t_{dOFF} + t_F$
3. Output discharge path is enabled during off.
4. By design; characterized, not production tested.

TIMING DIAGRAM

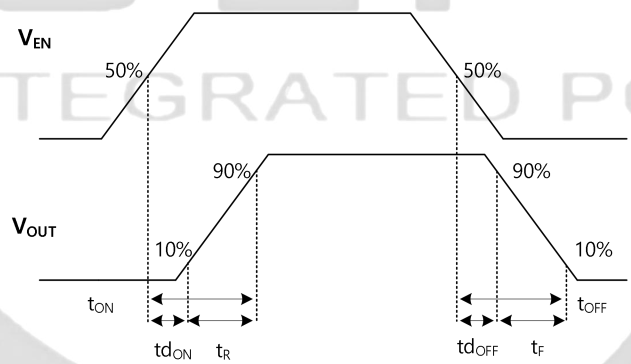


Figure 3. Timing Diagram

TYPICAL PERFORMANCE CHARACTERISTICS

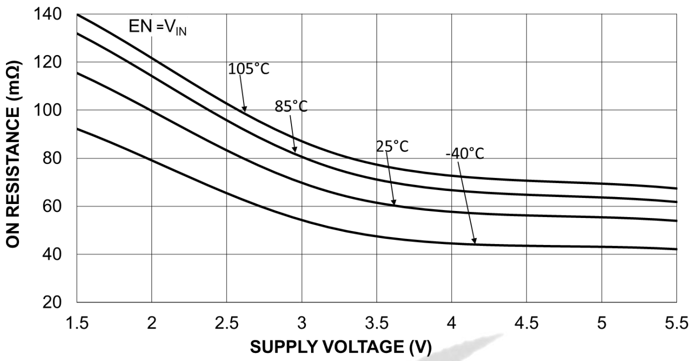


Figure 4. On-Resistance vs. Supply Voltage

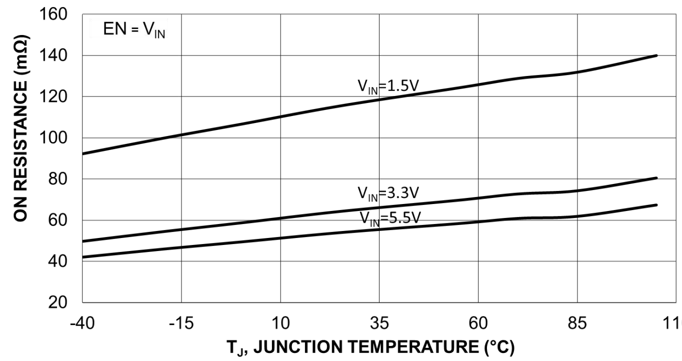


Figure 5. On-Resistance vs. Temperature

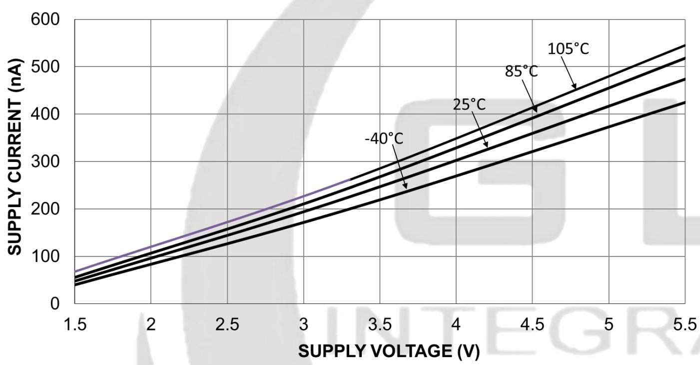


Figure 6. Quiescent Current vs. Supply Voltage

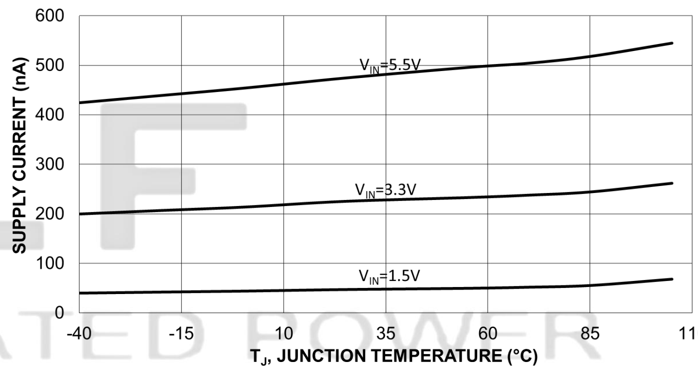


Figure 7. Quiescent Current vs. Temperature

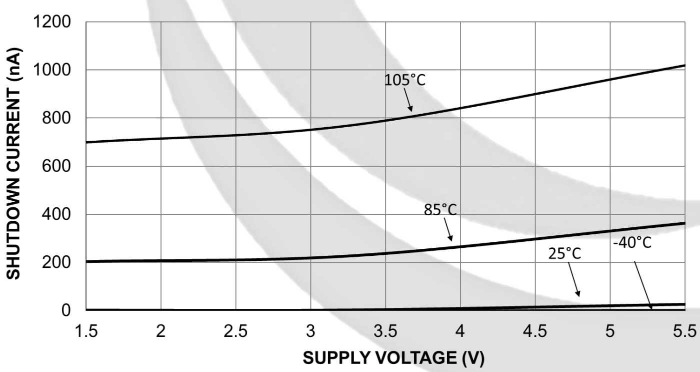


Figure 8. Shutdown Current vs. Supply Voltage

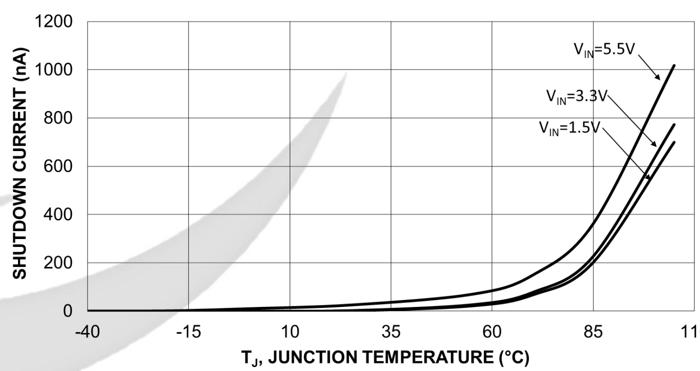


Figure 9. Shutdown Current vs. Temperature

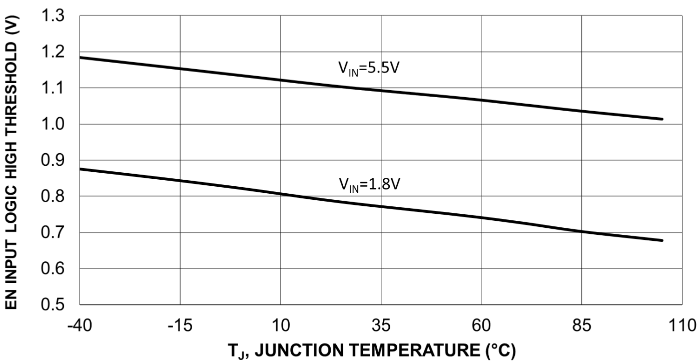


Figure 10. EN Input Logic High Threshold Vs. Temperature

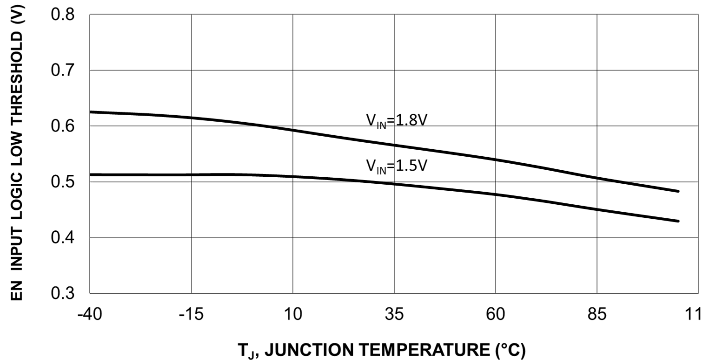


Figure 11. EN Input Logic Low Threshold Vs. Temperature

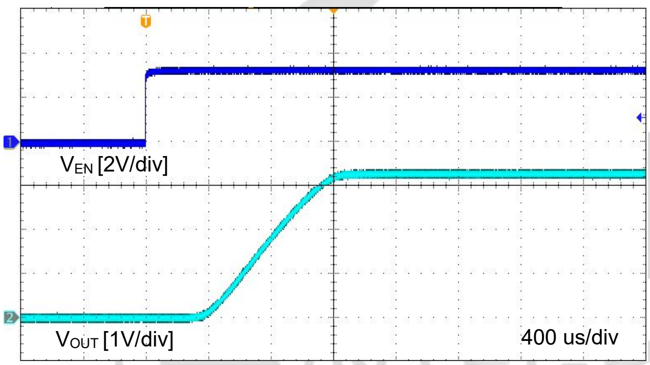


Figure 12. Turn-On Response, GLF1200H
V_{IN}=3.3 V, C_{IN}=0.1 µF, C_{OUT}=0.1 µF, R_L=150 Ω

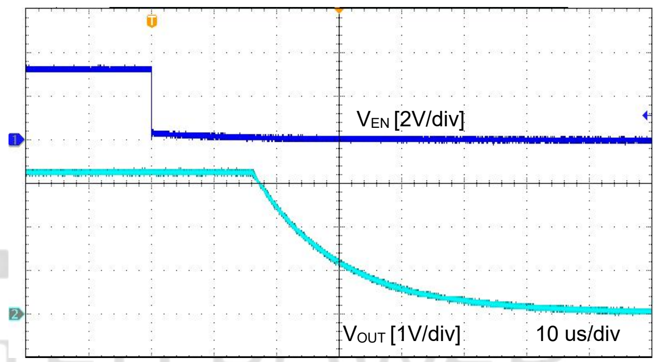


Figure 13. Turn-Off Response, GLF1200H
V_{IN}=3.3 V, C_{IN}=0.1 µF, C_{OUT}=0.1 µF, R_L=150 Ω

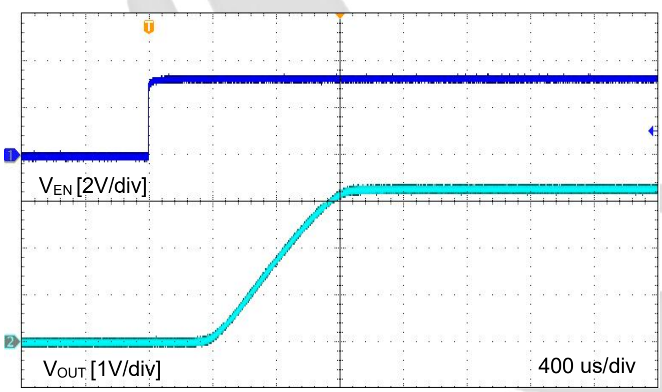


Figure 14. Turn-On Response, GLF1201H
V_{IN}=3.3 V, C_{IN}=0.1 µF, C_{OUT}=0.1 µF, R_L=150 Ω

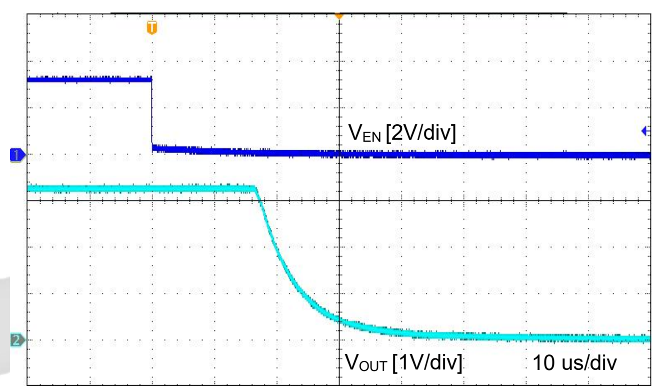


Figure 15. Turn-Off Response, GLF1201H
V_{IN}=3.3 V, C_{IN}=0.1 µF, C_{OUT}=0.1 µF, R_L=150 Ω

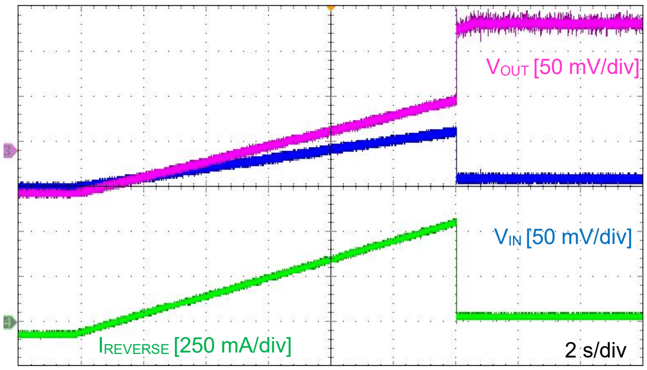


Figure 16. Reverse Current Blocking Threshold

V_{IN}=3.3 V, V_{OUT} =Up to 3.4 V in C_{IN}=0.1 µF, C_{OUT}=0.1 µF, R_L=150 Ω

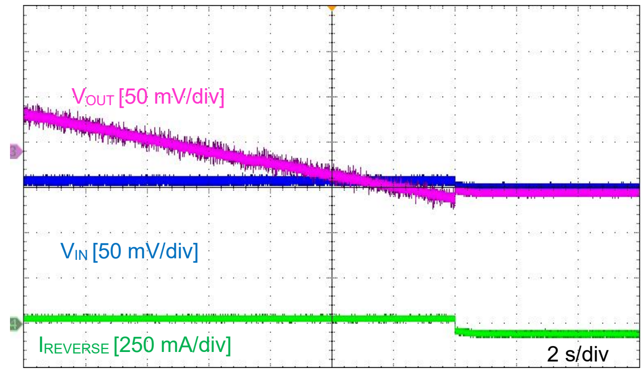


Figure 17. Reverse Current Blocking Release

V_{IN}=3.3 V, V_{OUT}=Down to 3.2 V, C_{IN}=0.1 µF, C_{OUT}=0.1 µF, R_L=150 Ω

APPLICATION INFORMATION

The GLF1200H / GLF1201H is an integrated 2 A, ultra-efficient I_QSmart™ load switch devices with a fixed slew rate control to limit the inrush current during turn on. Each device is capable of operating over a wide input voltage range from 1.5 V to 5.5 V with very low on-resistance to reduce conduction loss. In the off state, these devices consume very low leakage current to avoid unwanted standby current and save limited input power. The GLF1200H / GLF1201H is characterized for operation in the temperature range from -40 °C to 105 °C.

Input and Output Capacitor

A minimum 0.1 µF input capacitor is recommended to be placed close to the V_{IN} pin to reduce the voltage drop on the input power rail caused by transient inrush current at start-up. A higher input capacitor value can be used to further attenuate the input voltage drop. Also, a minimum 0.1 µF output capacitor is recommended to minimize voltage undershoot on the output pin during the transition when the switch is turned off. Undershoot can be caused by parasitic inductance from board traces or intentional load inductances. If load inductances do exist, use of an output capacitor can improve output voltage stability and system reliability. The C_{OUT} capacitor should be placed close to the VOUT and GND pins.

EN pin

The GLF1200H / GLF1201H can be activated by forcing EN pin high level. Note that the EN pin has an internal pull-down resistor to help pull the main switch to a known “off state” when no EN signal is applied from an external controller.

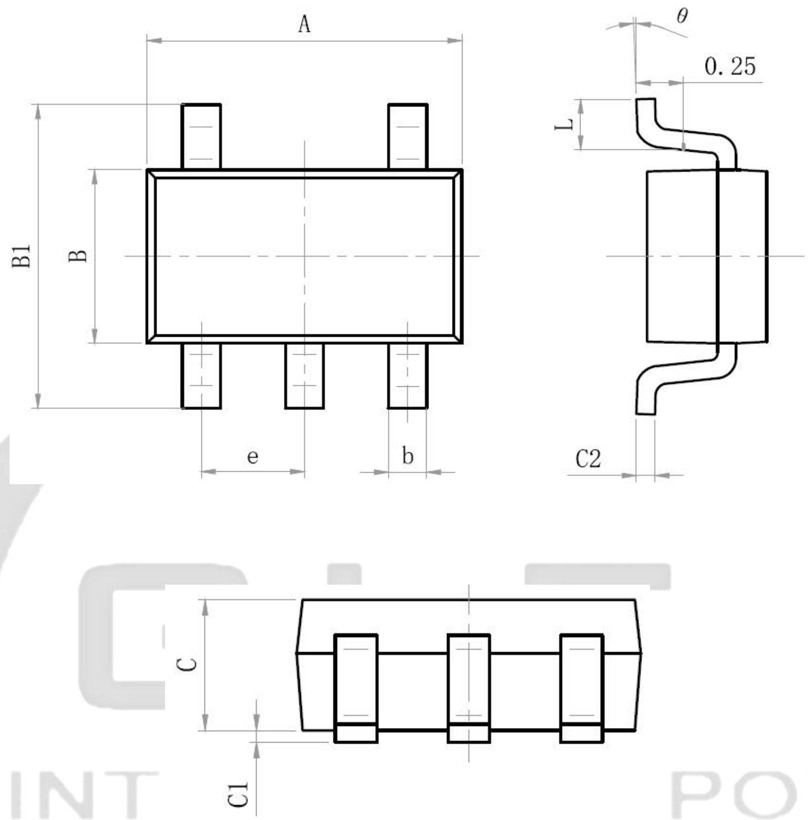
True Reverse Current Blocking

The GLF1200H / GLF1201H has a built-in reverse current blocking protection which always monitors the output voltage level regardless of the status of EN pin to check if it is greater than the input voltage. When the output voltage goes beyond the input voltage by the RCB protection threshold voltage (V_{RCV_TH}), the reverse current blocking function block turns off the switch. Note that some reverse current can occur until the V_{RCB} is triggered. The main switch will resume normal operation when the output voltage drops below the input source by the RCB protection release voltage (V_{RCV_RL}).

Output Discharge Function

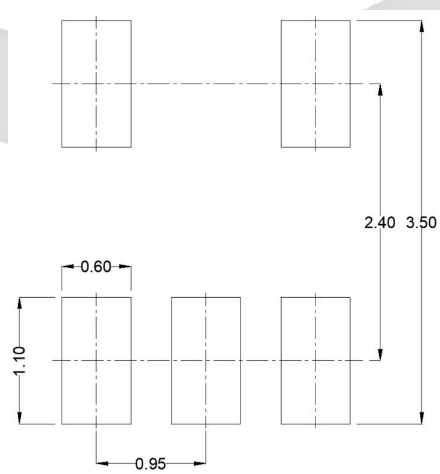
The GLF1201H has an internal discharge N-channel FET switch on the VOUT pin. When EN signal turns the main power FET to an off state, the N-channel switch turns on to discharge an output capacitor quickly.

PACKAGE OUTLINE



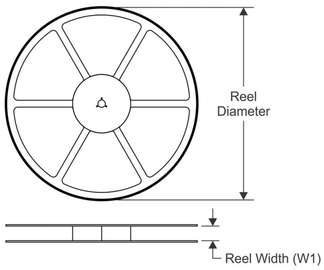
Size / Mark	Min(mm)	Max(mm)	Size / Mark	Min(mm)	Max(mm)
A	2.82	3.02	C	1.05	1.15
e	0.95 (BSC)		C1	0.03	0.15
b	0.28	0.45	C2	0.12	0.23
B	1.50	1.70	L	0.35	0.55
B1	2.60	3.00	θ	0°	8°

Recommended Footprint

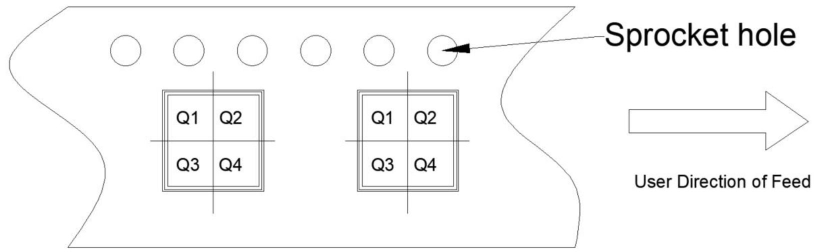


TAPE AND REEL INFORMATION

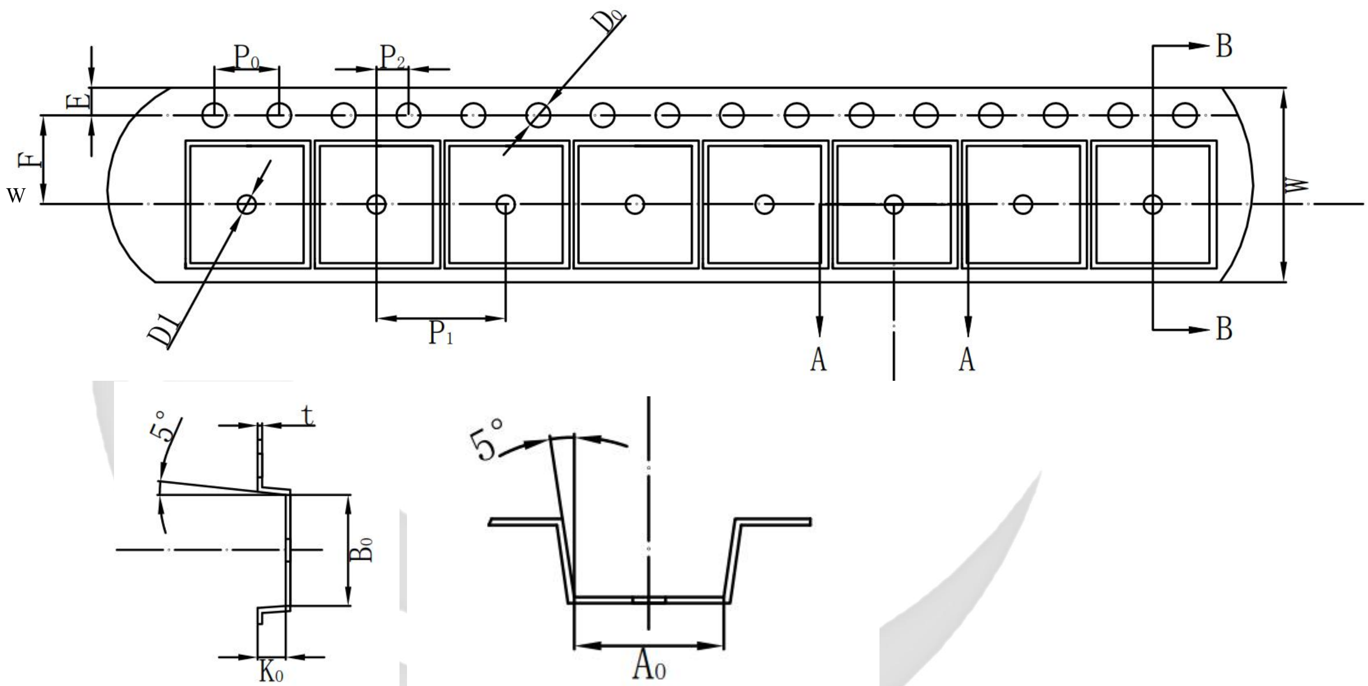
REEL DIMENSIONS



QUADRANT ASSIGNMENTS PIN 1 ORIENTATION TAPE



TAPE DIMENSIONS



Device	Package	Pins	SPQ	Reel Diameter (mm)	Reel Width W1	A0	B0	K0	P1	W	Pin1
GLF1200H-T1G7	SOT23-5	5	3000	178	9	3.25	3.30	1.38	4	8	Q3
GLF1201H-T1G7	SOT23-5	5	3000	178	9	3.25	3.30	1.38	4	8	Q3

Remark:

A0: Dimension designed to accommodate the component width

B0: Dimension designed to accommodate the component length

C0: Dimension designed to accommodate the component thickness

W: Overall width of the carrier tape

P1: Pitch between successive cavity centers

SPECIFICATION DEFINITIONS

Document Type	Meaning	Product Status
Target Specification	This is a target specification intended to support exploration and discussion of critical needs for a proposed or target device. Spec limits including typical, minimum, and maximum values are desired, or target, limits. GLF reserves the right to change limits at any time without warning or notification. A target specification in no way guarantees future production of the device in question.	Design / Development
Preliminary Specification	This is a draft version of a product specification. The specification is still under internal review and subject to change. GLF reserves the right to change the specification at any time without warning or notification. A preliminary specification in no way guarantees future production of the device in question.	Qualification
Product Specification	This document represents the anticipated production performance characteristics of the device.	Production

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