GLF2201

Power Switch with Over Voltage Protection

Preliminary Specification

DESCRIPTION

The GLF2201 is an integrated over voltage protection (OVP) power switch. It has under voltage lockout, output short circuit and over temperature protection functions. The device has an internal fixed OVP threshold, and a programmable OVP threshold that can be programmed by an external resistor divider on OVLO pin. When the input voltage is higher than the OVP threshold, the internal main FET is turned off immediately to isolate the downstream loads from input power supply. The GLF2201 restore on after the input voltage lower than the OVP threshold. The device has an internal 8 ms recovery time before the device fully restore on.

The GLF2201 is available in the 2 mm x 2mm DFN package with 6 leads.

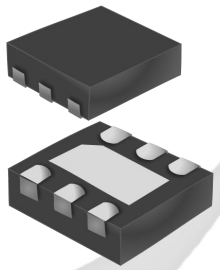
FEATURES

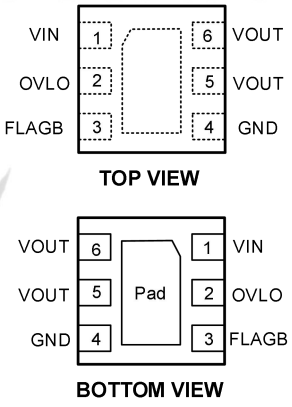
- Supply Voltage Range: 3 V to 9 V
  12 V_{ABS}
- Integrated Over Voltage Protection Threshold
  - Internal Fixed 6.8 V Typ.
  - Programmable OVP from 4 V to 7 V
- I_{OUT} Max: 3 A Output Current Capability
- Low R_{ON}: 42 mΩ Typ at 5 V_{IN}
- Low I_Q: 77 μA at 5 V_{IN}
- Under Voltage Lockout
- Short Circuit Protection
- Active Low FLAGB Indication
- Thermal Shutdown Protection
- Internal 8 ms Recovery Delay after Protection

APPLICATIONS

- Smart Portable Devices
- Low Power Sub-systems
- Smartphones and Tablets

PACKAGE





2 mm x 2 mm DFN-6L

APPLICATION DIAGRAM

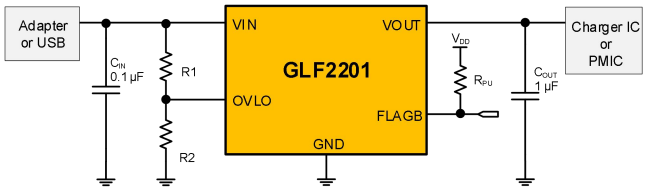


Figure 1. Programmable OVP

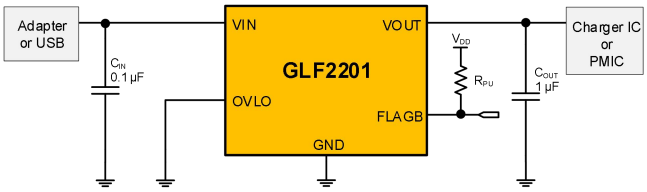


Figure 2. Fixed OVP

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ORDERING INFORMATION

Part Number	Top Mark	R_{ON} (Typ) at 5 V_{IN}	Package
GLF2201-D2G7	FM	42 mΩ	2 mm x 2 mm DFN-6L

FUNCTIONAL BLOCK DIAGRAM

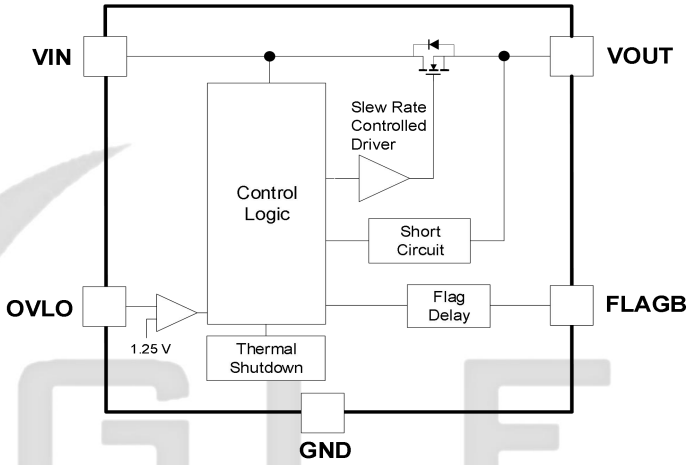

Figure 3. Functional Block Diagram

PIN CONFIGURATION

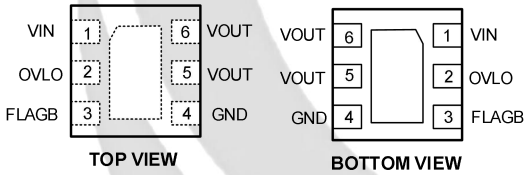

Figure 4. 2 mm x 2 mm DFN-6L

PIN DEFINITION

Pin #	Name	Description
1	VIN	Switch Input. Supply Voltage for IC.
2	OVLO	External OVP programmable pin by the resistor divider. Tie the OVLO pin to GND to use the internal fixed OVP threshold.
3	FLAGB	Open-drain output. Power good and fault flag pin.
4	GND	Ground
5, 6	VOUT	Output of main power switch
	Thermal Pad	Connect this pad to GND

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 and 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}	VIN to GND		-0.3	12	V
V_{OUT}	When the device is disabled		-0.3	7	
V_{OVLO}, V_{FLAGB}	Each Pin to GND		-0.3	6	
I_{OUT}	Maximum Continuous Switch Current			3	A
T_{STG}	Storage Junction Temperature		-65	150	°C
T_J	Operating Junction Temperature Range		-40	150	
θ_{JA}	Thermal Resistance, Junction to Ambient			80	°C/W
ESD	Electrostatic Discharge Capability	Human Body Model, JESD22-A114	6		kV
		Charged Device Model, JESD22-C101	2		

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RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Min.	Max.	Unit
V_{IN}	Supply Voltage	3	9	V
T_A	Ambient Operating Temperature	-40	+85	°C

ELECTRICAL CHARACTERISTICS

V_{IN} = 5 V, T_A = 25°C, unless otherwise noted.

Symbol	Parameter	Conditions		Min.	Typ.	Max.	Units
V_{UVLO}	Under Voltage Lockout	Turn-on, V_{IN} increasing			2.3		V
		Hysteresis			0.2		
I_Q	Input Quiescent Current	I_{OUT} = 0 mA	T_A = 25 °C		77	110	µA
			T_A = - 40 °C to 85 °C		90		
V_{OVP}	Internal OVP Trip Voltage	V_{IN} rising, V_{OVLO} = 0 V		6.1	6.8	7.3	V
		Hysteresis			0.55		
	Programmable OVP Range	V_{IN} rising, External resistor divider		4		7	
V_{OVP_SEL}	External OVP Selection Threshold	OVLO pin voltage rising		0.3			
V_{OVP_TH}	External OVP Set Threshold	OVLO pin voltage rising, Device turns off		1.1	1.25	1.4	
		Hysteresis			0.11		
t_{OVP}	OVP Response Time (1)	V_{OVLO} to 90 % of V_{OUT}			< 1		µs
R_{ON}	On-Resistance	I_{OUT} = 500 mA	T_A = 25 °C		42	55	mΩ
			T_A = - 40 °C to 85 °C		50		
V_{OUT_SC}	Output Short Circuit Detection (1)				2		V
t_{dON}	Turn-On Delay	V_{IN} > 2.3 V to V_{OUT} Rising		6	8	10	ms
V_{FLGB}	FLAGB Output Low Voltage	I_{FLGB}= 0.5 mA				50	mV
I_{FLGB}	FLAGB Output High Leakage	V_{FLGB}= 5.5 V			6		nA
t_{FLGBF}	FLAGB Assertion Delay (1)	When OVP, Short Circuit and Thermal Shutdown is triggered			2		µs
t_{FLGBR}	FLAGB De-assertion Delay (1)	Recovery from OVP, Short Circuit, UVLO and Thermal Shutdown Protection		6	8	10	ms
T_{SD}	Thermal Shutdown Protection (1)	Shutdown Temperature			150		°C
		Hysteresis			20		

Notes: 1. By design; characterized; not production tested.

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TYPICAL PERFORMANCE CHARACTERISTICS

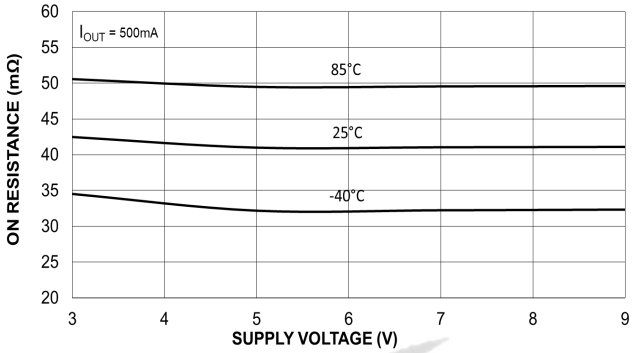

Figure 5. On-Resistance vs. Supply Voltage

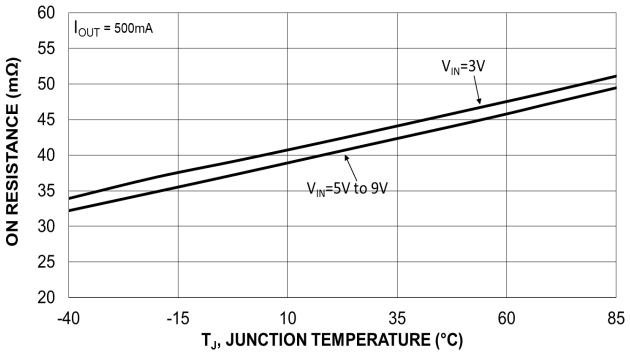

Figure 6. On-Resistance vs. Temperature

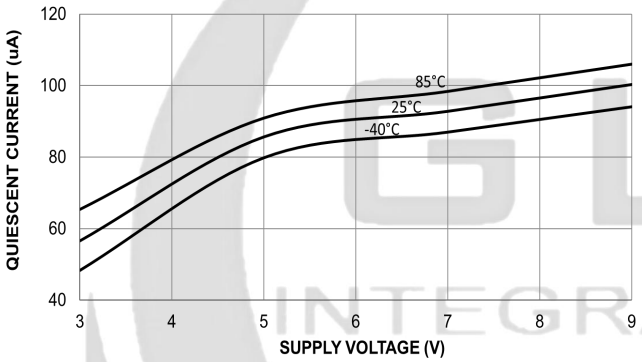

Figure 7. Quiescent Current vs. Supply Voltage

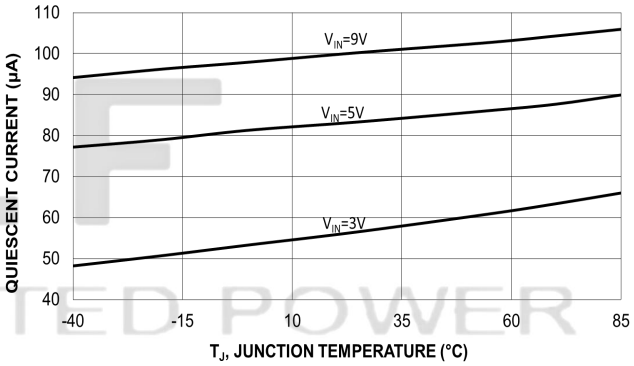

Figure 8. Quiescent Current vs. Temperature

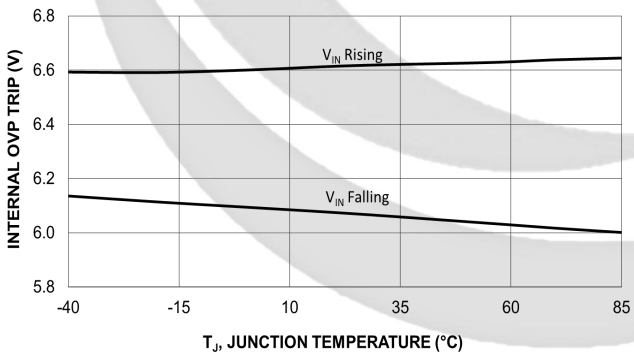

Figure 9. Internal OVP Trip Voltage vs. Temperature

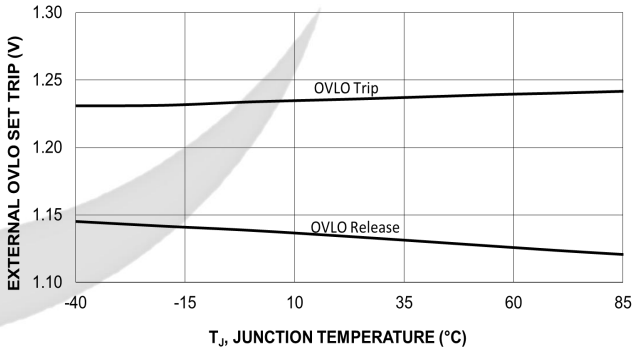

Figure 10. External OVP Set Threshold vs. Temperature

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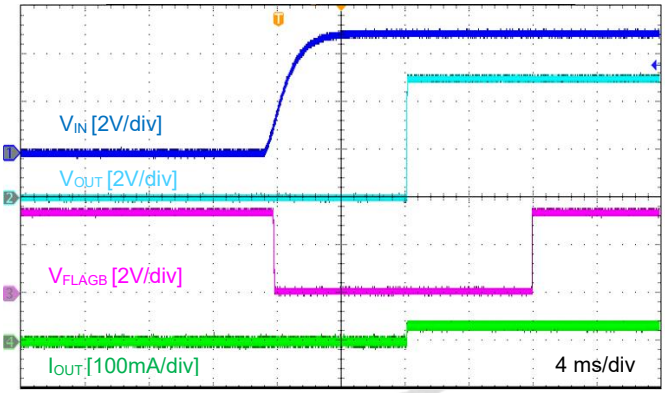

Figure 11. Power On
V_{IN}=5 V, V_{DD}=3.3 V, C_{IN}= 1 µF, C_{OUT}=10 µF, R_L=150 Ω

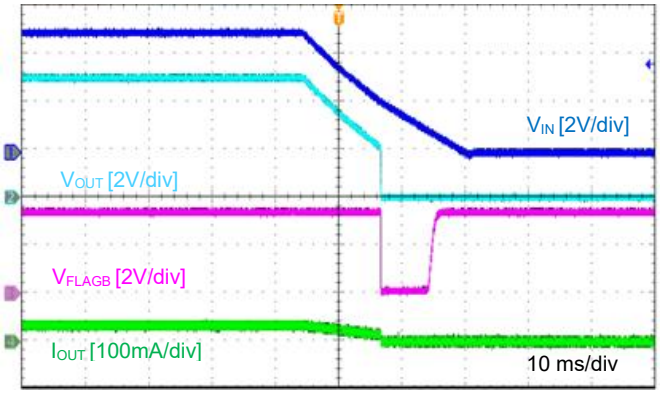

Figure 12. Power Off
V_{IN}=5 V, V_{DD}=3.3 V, C_{IN}= 1 µF, C_{OUT}=10 µF, R_L=150 Ω

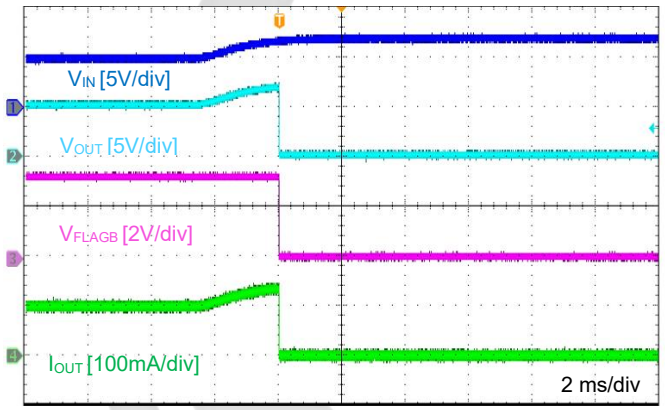

Figure 13. OVP Trigger Response
V_{IN}=5 V to 7 V, V_{DD}=3.3 V, C_{IN}=C_{OUT}=1 µF, R_L=50 Ω

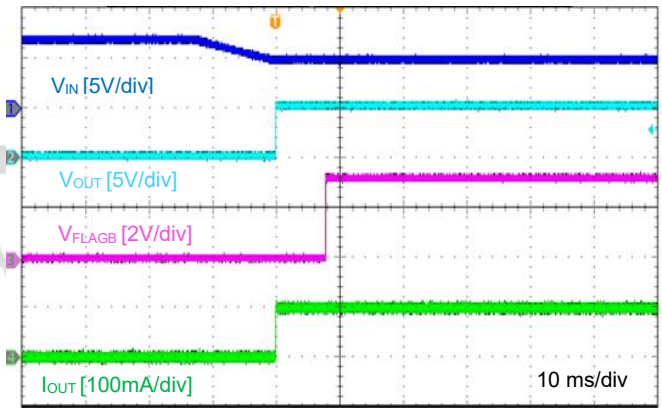

Figure 14. OVP Recovery Response
V_{IN}=7 V to 5 V, V_{DD}=3.3 V, C_{IN}=C_{OUT}=1 µF, R_L=50 Ω

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APPLICATION INFORMATION

The GLF2201 is an integrated over voltage protection (OVP) power switch. It has under voltage lockout, output short-circuit, and over-temperature protection. It can help engineers easily solve the damage to the load due to the over voltage from the input power supply.

Under Voltage Lockout (UVLO)

The device will keep off until the input voltage reaches the UVLO which is the turn on threshold. A built-in hysteresis can avoid the on and off cycling which caused by input voltage droop during turn on.

Over Voltage Lockout Protection

The GLF2201 provides an internal fixed OVP threshold (6.8 V) and a programmable OVP threshold that can be programmed by an external resistor divider. To select the internal fixed OVP, the OVLO pin must be tied to GND to ensure its voltage is lower than 300 mV which is the external OVP selection threshold (V_{OVP_SEL}). When the voltage at the OVLO pin is higher than the V_{OVP_SEL}, the device automatically selects the external OVP threshold voltage set by the external resistor divider.

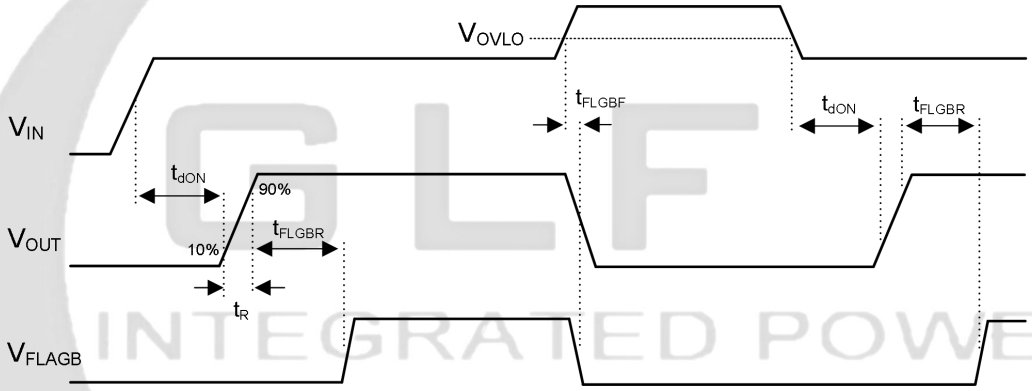

Figure 15. Timing for OVP Trip

The external OVP threshold is calculated by the following equation. R1 and R2 are the voltage divider in the application diagram. Recommend R2 is lower than 1 MΩ.

$$V_{OVLO} = V_{OVP_TH} \times (1 + R1/R2)$$

Fault Flag Response

The output of the open drain FLAGB pin should be connected to the system I/O rail through a pull-up resistor. If the input voltage is maintained between UVLO and OVLO for 16 ms, the FLAGB pin will be pulled high to indicate the switch is on with a good power input. The FLAGB pin will be driven to low, after 2 μs assertion delay (t_{FLGBF}), if any of fault conditions happen, such as output short-circuit, UVLO, over voltage and thermal shutdown. The FLAGB pin remains on low for 16 ms which is the 8 ms turn-on delay time (t_{dON}) plus the 8 ms FLAGB de-assertion delay time (t_{FLGBR}). After fault condition is removed, and then the FLAGB pin will be pulled to high again.

Thermal Shutdown Protection

The integrated main FET is turned off when the junction temperature exceeds 150 °C which is the thermal shutdown temperature. The device will restore on after the junction temperature cools down to 20 °C lower than the shutdown temperature. The FLAGB pin is pulled low during the period of over temperature shutdown.

Short Circuit Protection

The short circuit protection (SCP) circuit protects the GLF2201 device from a heavy load or an output shorted to ground. The SCP circuit monitors the output voltage, and once the output voltage falls to 2V (V_{OUT_SC}), the SCP function is triggered and the power switch is turned off immediately. After the short circuit is released, the device will automatically re-start after 8 ms recovery delay time (t_{dON}), and the device will back to the normal operation.

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Input Capacitor

A minimum 0.1 μF input capacitor is recommended to place close to the VIN pin to reduce the voltage drop on the input power rail, which caused by transient inrush current at start-up. A higher input capacitance value is better to attenuate the input voltage drop.

Output Capacitor

a minimum 1 μF output capacitor is recommended to minimize voltage undershoot happened at the output pin when the switch is turned off. Undershoot can be caused by parasitic inductance from board traces or intentional load inductances. If load inductances exist, an output capacitor can improve the output voltage stability and system reliability. The C_{OUT} capacitor must be placed to the VOUT and GND pins as close as possible.

Board Layout

All the external components should be placed to GLF2201 as close as possible. All traces should be as short as possible to minimize parasitic inductance. Wide traces of VIN, VOUT and GND can reduce parasitic effects under dynamic operations to improve thermal performance at high current loading.

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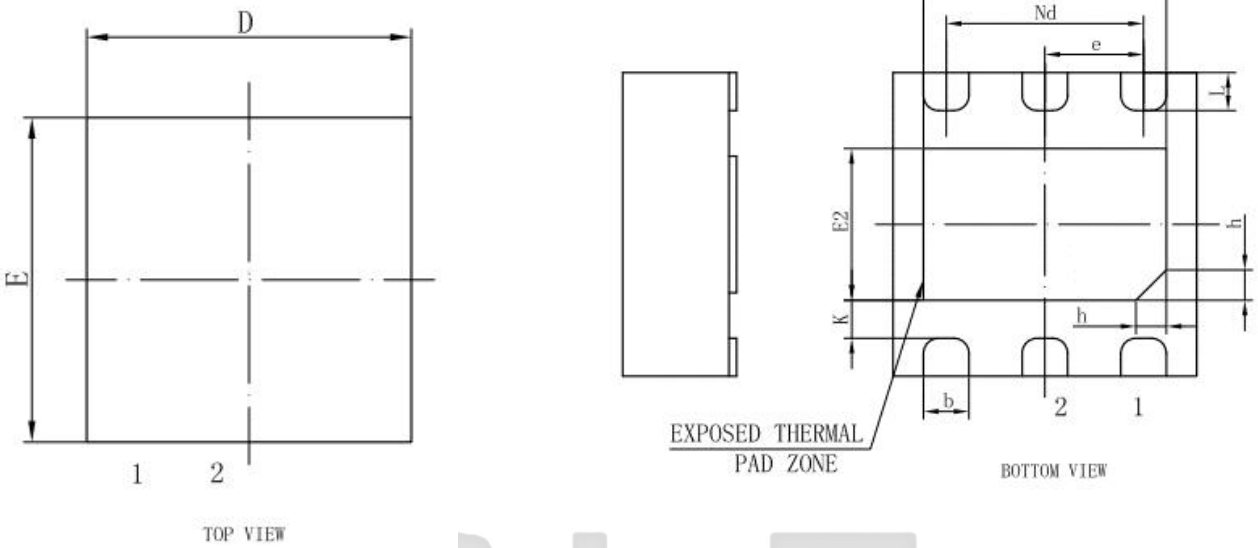
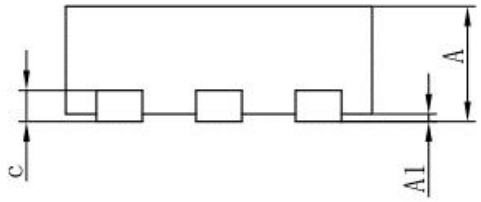
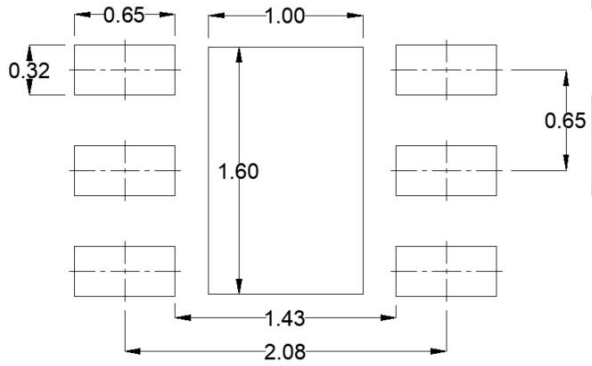
PACKAGE OUTLINE





SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	0. 70	0.75	0. 80
A1	0	0. 02	0. 05
b	0. 25	0.30	0. 35
c	0.18	0.20	0.25
D	1. 90	2. 00	2. 10
D2	1. 50	1. 60	1. 70
e	0. 65BSC		
Nd	1. 30BSC		
E	1. 90	2. 00	2. 10
E2	0. 90	1. 00	1. 10
K	0. 20	–	–
L	0. 20	0.25	0. 30
h	0. 15	0. 20	0. 25

Recommended Footprint



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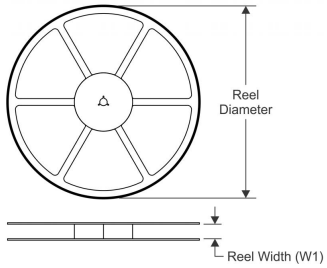
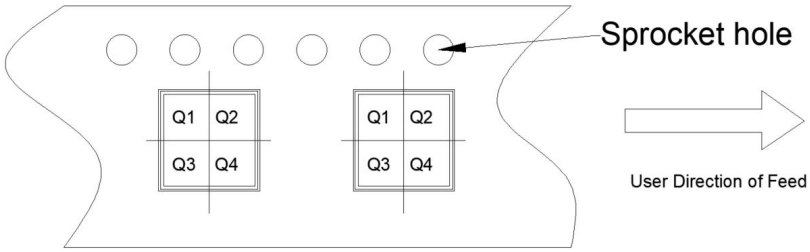
TAPE AND REEL INFORMATION

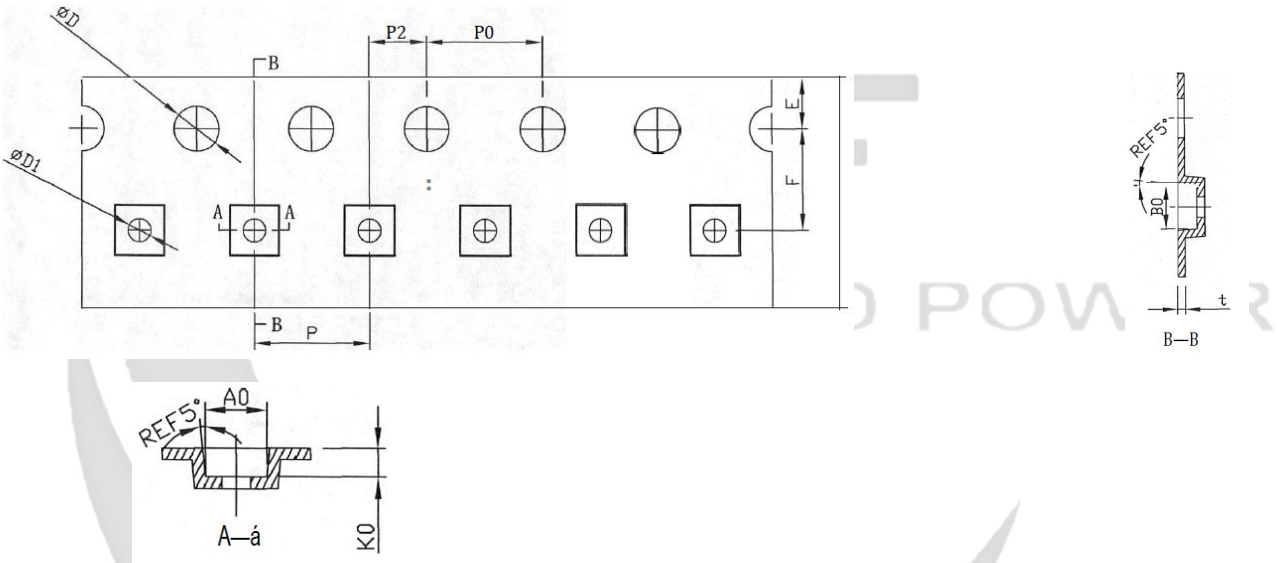
REEL DIMENSIONS



QUADRANT ASSIGNMENTS PIN 1 ORIENTATION TAPE



TAPE DIMENSIONS



Device	Package	Pins	SPQ	Reel Diameter (mm)	Reel Width W1	A0	B0	K0	P	W	Pin1
GLF2201-D2G7	DFN2x2	6	3000	178	8.6	2.15	2.15	0.88	4	8	Q1

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

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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. Parameters including the typical, minimum, and maximum values are desired, or target. GLF reserves the right to change contents at any time without warning or notification. A target specification will not guarantee the future production of the device.	Design / Development
Preliminary Specification	This is a draft version of a product specification which is 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 will not guarantee the future production of the device.	Qualification
Product Specification	This document represents the characteristics of the device.	Production

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