GLF76311

Nano-Current Consumed Power On/Off Control IC

Preliminary Specification

DESCRIPTION

The GLF76311 is an ultra-thin, ultra-efficient I_QSmart™ load switch with an integrated on and off delay timer for Smart bracelet and Mobile handheld devices.

When the VBAT pin is connected to the battery, the main switch of GLF76311 is turned on, that is the default state. During the normal operation mode, pulling the SW pin to a low level for 6 seconds turns off the GLF76311 and the entire system enters the ultra-deep sleep energy-saving mode.

When the GLF76311 is off, pulling the SW pin to a low level for 3 seconds activates the GLF76311 again and the entire system enters the normal working mode.

The GLF76311 helps to reduce power consumption with the best in class R_{ON}, a breakthrough on state I_Q of only 6 nA when the switch is on and ultra-low I_{SD} of only 7 nA when switch is off. This switch can help significantly extend the system battery life in mobile devices during shipping or in extended shutdown times.

An integrated 1 ms slew rate control can also enhance system reliability by mitigating bus voltage swings during switching events, where uncontrolled switching 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 output discharge function makes the output voltage shut off safely.

The GLF76311 is available in 0.97 mm x 0.97 mm x 0.55 mm wafer level chip scale package (WLCSP).

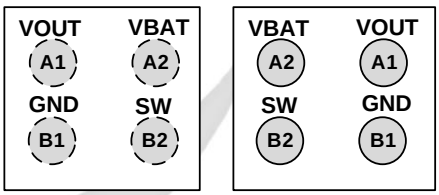
FEATURES

- Ultra-Low I_{SD} : 7 nA Typ @ 3.6 VBAT
- Ultra-Low I_Q : 6 nA Typ @ 3.6 VBAT
- Low R_{ON} : 34 mΩ Typ @ 3.6 VBAT
- I_{OUT} Max : 2 A
- Wide Input Range: 2.5 V to 5.5 V
  6 Vabs Max.
- Turn-On Delay Time, 3 s Typ.
- Turn-Off Delay Time, 6 s Typ.
- Controlled V_{OUT} Rise Time: 1 ms at 3.6 VBAT
- Integrated Output Discharge Switch When Disabled
- Operating Temperature Range: - 40 to 85 °C
- HBM: 8 kV, CDM: 2 kV
- Ultra-Small: 0.97 mm x 0.97 mm x 0.55 mm WLCSP

APPLICATIONS

- Smart Devcies
- Mobile handheld device

PACKAGE



TOP VIEW BOTTOM VIEW

0.97 mm x 0.97 mm x 0.55mm

0.5mm pitch WLCSP

DEVICE INFORMATION

Part Number	Top Mark	Turn On Delay Time	Turn Off Delay Time	V_{OUT} Discharge Switch at Off	Tape and Reel Packaging
GLF76311	CT	3 sec	6 sec	85 Ω	3000 Pieces on 7 inch reel

APPLICATION DIAGRAM

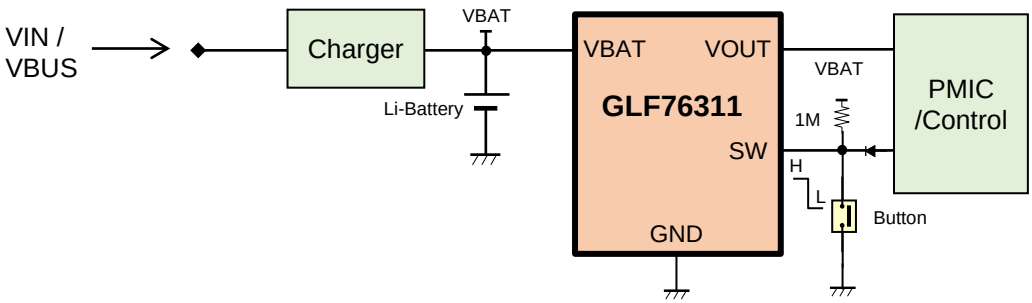


Figure 1. Typical Application

FUNCTIONAL BLOCK DIAGRAM

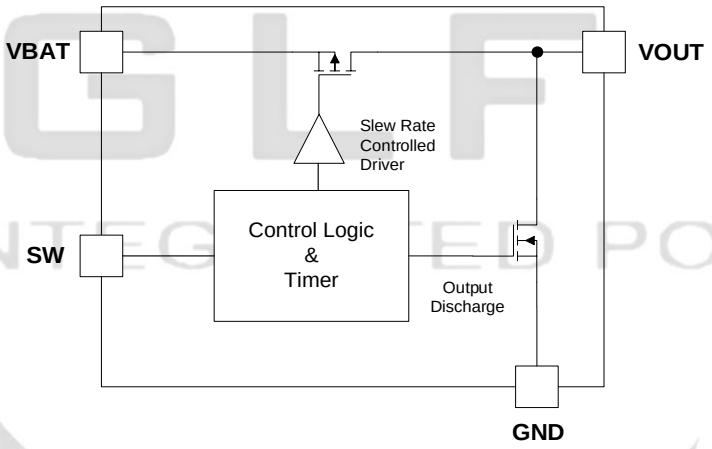


Figure 2. Functional Block Diagram

PIN CONFIGURATION

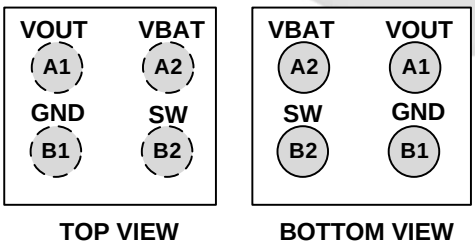


Figure 3. 0.97 mm x 0.97 mm x 0.55 mm WLCSP

PIN DEFINITION

Pin #	Name	Description
A1	VOUT	Switch Output.
A2	VBAT	Switch Input. VBAT pin is connected to the positive input of an external battery.
B1	GND	Ground
B2	SW	Switch on and off control pin. Pulling the SW pin to a low level for 6 seconds, the GLF76311 is turned off. Pulling the SW pin to a low level for 3 seconds turns on the GLF76311

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
VBAT, VOUT, SW	Each Pin Voltage Range to GND		-0.3	6	V
I_{OUT}	Maximum Continuous Switch Current			2	A
P_D	Power Dissipation at T_A = 25 °C			1.2	W
T_{STG}	Storage Junction Temperature		-65	150	°C
T_A	Operating Temperature Range		-40	85	°C
θ_{JA}	Thermal Resistance, Junction to Ambient			85	°C/W
ESD	Electrostatic Discharge Capability	Human Body Model, JESD22-A114	8		kV
		Charged Device Model, JESD22-C101	2		

RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Min.	Max.	Unit
VBAT, VOUT, SW	Supply Input and Output Voltage	2.5	5.5	V
T_A	Ambient Operating Temperature	-40	+85	°C

ELECTRICAL CHARACTERISTICS

Values are at VBAT = 3.6 V and T_A = 25 °C unless otherwise noted.

Symbol	Parameter	Conditions		Min.	Typ.	Max.	Units
Basic Operation							
I_Q	Quiescent Current	VBAT=3.6 V, I_{OUT} = 0 mA, Switch = On			6		nA
I_{SD}	Shut Down Current	VBAT=3.6 V, VOUT=GND, Switch = Off			7		
		VBAT=4.2 V, VOUT=GND, Switch = Off			10		
R_{ON}	On-Resistance	VBAT=5.5 V, I_{OUT}= 500 mA	Ta=25 °C		28		mΩ
			Ta=85 °C (1)		33		
		VBAT=4.2 V, I_{OUT}= 500 mA	Ta=25 °C		31		
			Ta=85 °C (1)		37		
		VBAT=3.6 V, I_{OUT}= 500 mA	Ta=25 °C		34		
			Ta=85 °C (1)		40		
		VBAT=3.0 V, I_{OUT}= 300 mA	Ta=25 °C		37		
R_{DSC}	Output Discharge Resistance	VOUT = Off, I_{FORCE}= 10 mA			85		Ω
V_{IH}	SW Pin Logic High Voltage	VBAT=2.5 V - 5.5 V		1.2			V
V_{IL}	SW Pin Logic Low Voltage					0.3	
ON and OFF delay time							
t_{ON-Dly}	Turn-On Delay Time (1) SW Pin Hold Time	VBAT=3.6 V, R_L = 150 Ω, C_L = 0.1 uF			3		s
$t_{OFF-Dly}$	Turn-Off Delay (1) SW Pin Hold Time				6		
t_R	VOUT Rise Time				1		ms
t_F	VOUT Fall Time (1)				25		us

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

TIMING DIAGRAMS AND INPUT CONDITION

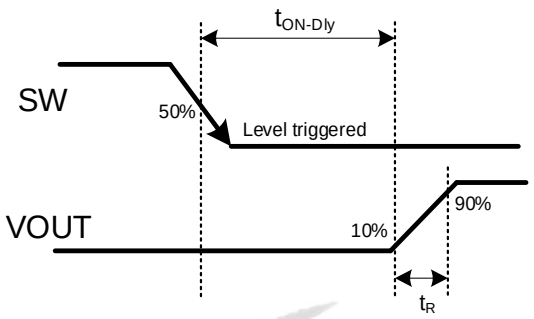


Figure 4. Power-On by SW Pin

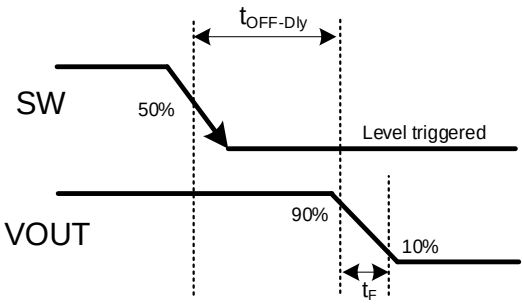


Figure 5. Power-Off by SW Pin

Table 1. VOUT Sates by Input Conditions

Function	VBAT	SW	Delay Time (Hold time)	VOUT Action
Default State	Initially VBAT applied	X	NA	VOUT=VBAT
Power-Off into Deep Sleep	VBAT applied	Hold Low for 6 s	$t_{OFF-Dly}$= 6 s	VBAT to GND
Power-On	VBAT applied	Hold Low for 3 s	t_{ON-Dly} = 3 s	GND to VBAT

Note) 1. X = Don't Care

TYPICAL PERFORMANCE CHARACTERISTICS

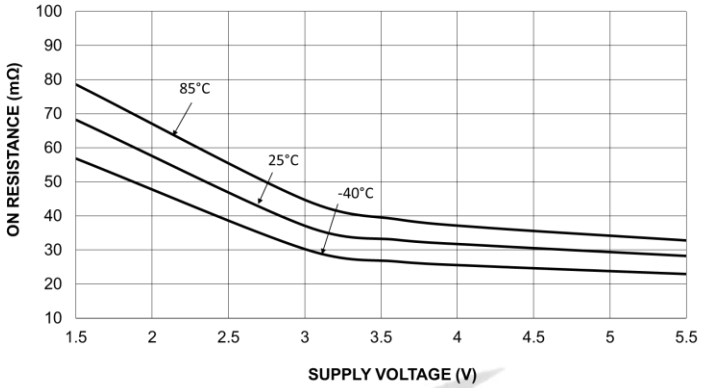


Figure 6. On-Resistance vs. Supply Voltage

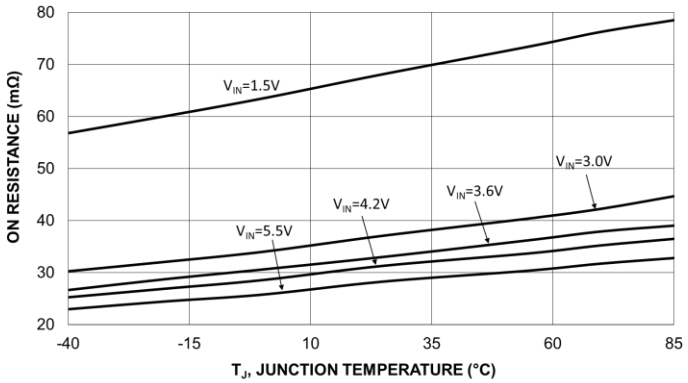


Figure 7. On-Resistance vs. Temperature

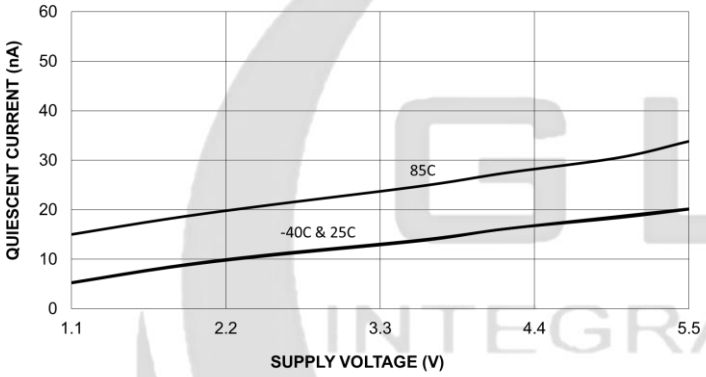


Figure 8. Quiescent Current vs. Supply Voltage

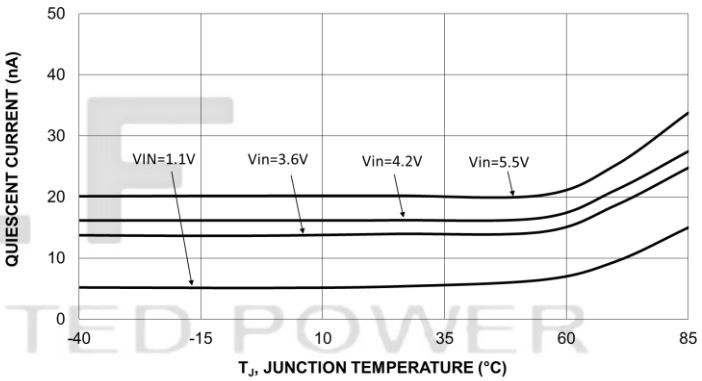


Figure 9. Quiescent Current vs. Temperature

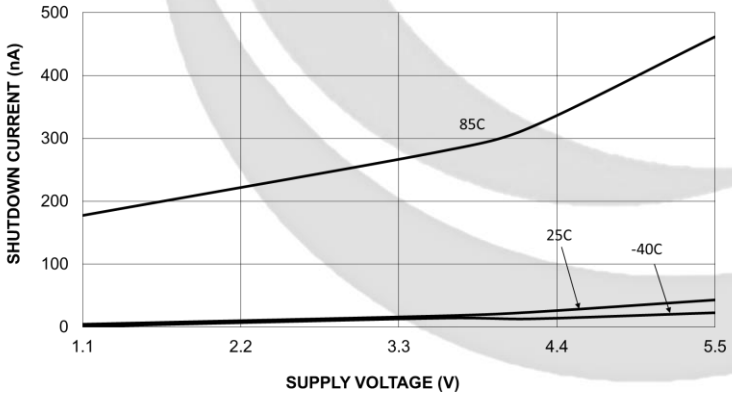


Figure 10. Shut Down Current vs. Supply Voltage

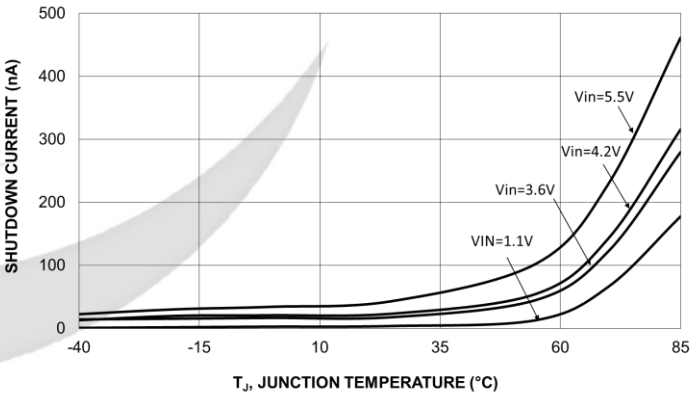


Figure 11. Shut Down current vs. Temperature

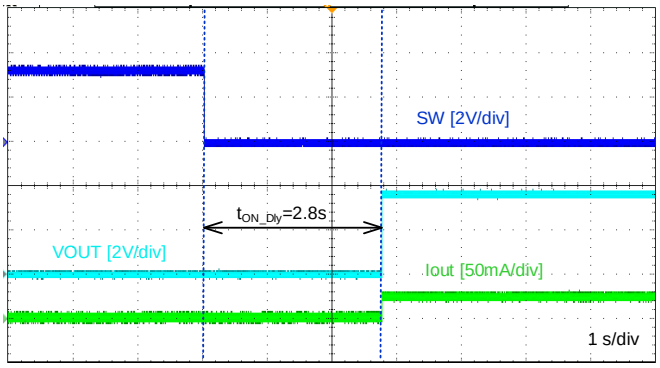


Figure 12. Turn-On Delay time

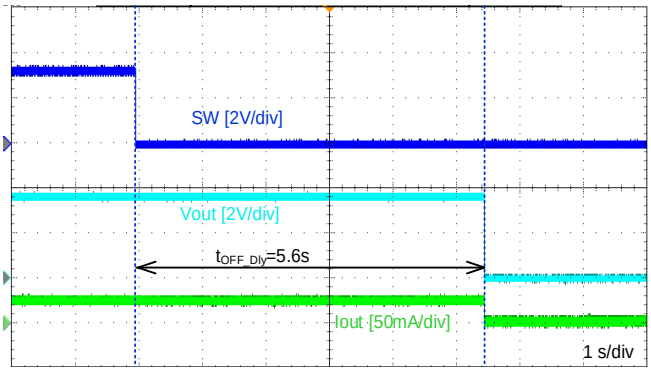


Figure 13. Turn-Off Delay time

APPLICATION INFORMATION

The GLF76311 is an integrated load switch with the switch on and off delay mode which is optimized to significantly extend the battery life in smart IoT devices and handheld mobile devices during long period of shipping or off mode. Typical applications are shown in Fig.1 and Fig. 2.

Power-On

- When the VBAT pin is connected to the battery, the main switch of GLF76311 is turned on. That is the default state.
- When the main switch of GLF76311 is turned off and the system is disabled, press the button and hold the SW pin low for the hold time, $t_{ON\text{-}Dly}$ = 3 seconds, to turn on the main switch to wake up the downstream system.

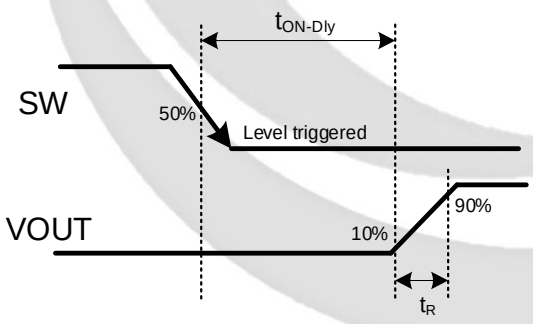


Figure 14. Power-On by SW Pin

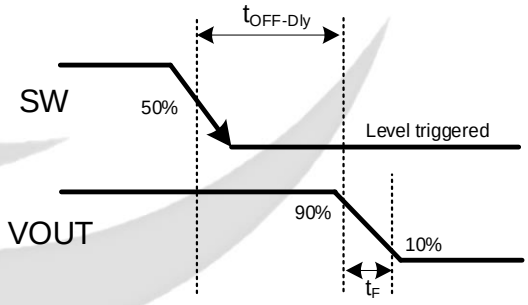


Figure 15. Power-Off by SW Pin

Power Off

When the main switch of GLF76311 is turned on, press the button and hold the SW pin low for the hold time, $t_{OFF\text{-}Dly}$ = 6 seconds, to turn off the main switch. This will allow the device to enter the deep sleep mode by disconnecting the downstream system from the battery and consume only 7 nA in standby current.

Output Discharge Function

The GLF76311 has an internal discharge switch on VOUT. It is activated to discharge an output capacitor quickly when the main switch is turned off. During the off mode, the discharge switch remains in the on state holding the VOUT to GND. When the main switch is enabled, the output discharge switch is turned off.

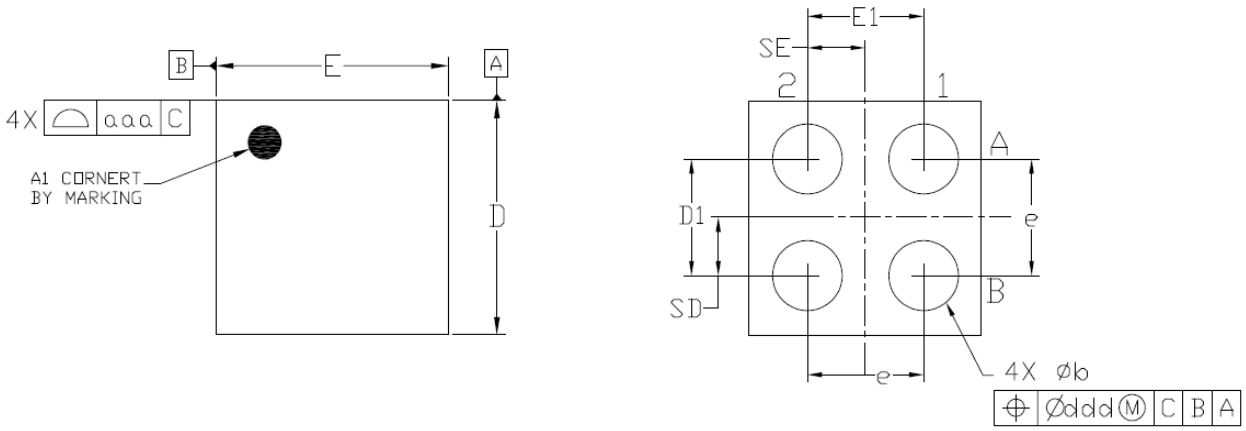
Input Capacitor

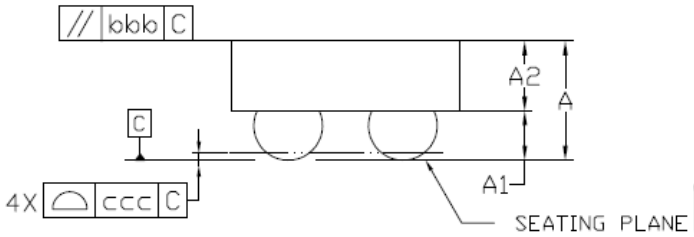
A 0.1uF capacitor is recommended to be placed close to the VBAT pin to reduce the voltage drop on the input power rail caused by transient inrush current at start-up. A higher input capacitor value can be used to further attenuate the input voltage drop.

Output Capacitor

A 0.1uF output capacitor is recommended to mitigate voltage undershoot on 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, 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.

PACKAGE OUTLINE





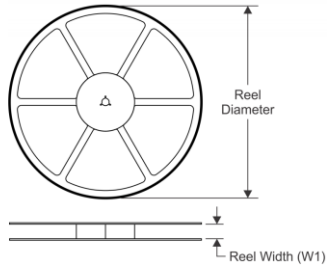
Dimensional Ref.			
REF.	Min.	Nom.	Max.
A	0.500	0.550	0.600
A1	0.225	0.250	0.275
A2	0.275	0.300	0.325
D	0.955	0.970	0.985
E	0.955	0.970	0.985
D1	0.450	0.500	0.550
E1	0.450	0.500	0.550
b	0.260	0.310	0.360
e	0.500 BSC		
SD	0.250 BSC		
SE	0.250 BSC		
Tol. of Form&Position			
aaa	0.10		
bbb	0.10		
ccc	0.05		
ddd	0.05		

Notes

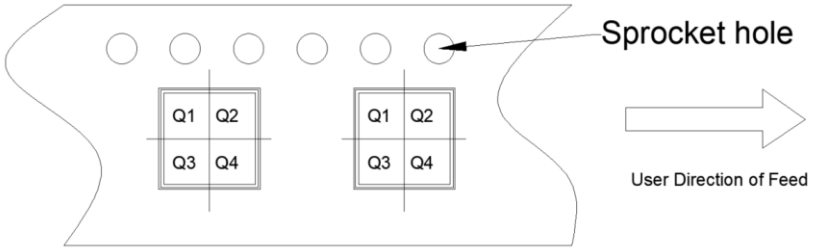
1. All DIMENSIONS ARE IN MILLIMETERS (ANGLES IN DEGREES).
2. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M-1994.

TAPE AND REEL INFORMATION

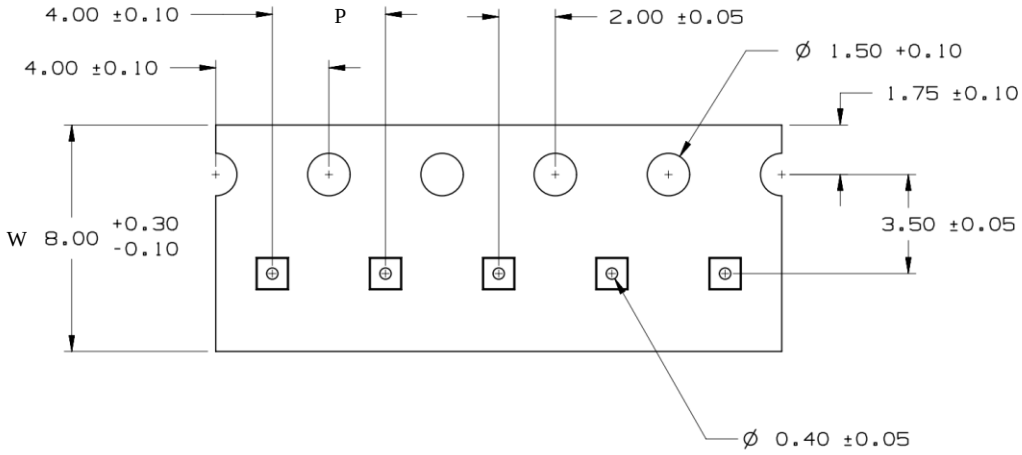
REEL DIMENSIONS

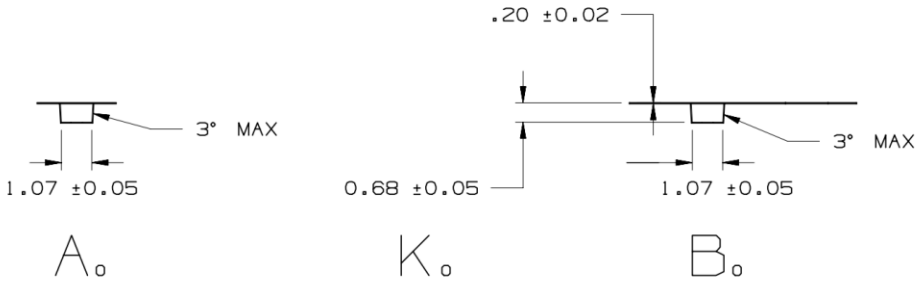


QUADRANT ASSIGNMENTS PIN 1 ORIENTATION TAPE



TAPE DIMENSIONS





Device	Package	Pins	SPQ	Reel Diameter(mm)	Reel Width W1	A0	B0	K0	P	W	Pin1
GLF76311	WLCSP	4	3000	180	9	1.07	1.07	0.68	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

P: 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 or producability 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 or producability of the device in question.	Qualification
Product Specification	This document represents the anticipated production performance characteristics of the device.	Production

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