

DESCRIPTION

The GLF1800, GLF1800A, GLF1800T and GLF1800AT are ideal diode switches featuring a low forward voltage drop. They are characterized by low quiescent current (I_Q), ultra-low shutdown current (I_{SD}), and low forward voltage drop, making them suitable replacements for conventional Schottky diodes. These attributes help reduce power consumption and enhance overall system efficiency.

The ideal diodes GLF1800, GLF1800A, GLF1800T and GLF1800AT support an input voltage range of 1.8 V to 5.5 V. The GLF1800 and GLF1800A provide a maximum continuous current of 1.0 A, while the GLF1800T and GLF1800AT provide up to 1.5 A. The GLF1800 and GLF1800A comes in the standard SOT23-5L package, whereas the GLF1800T and GLF1800AT are available in a Thin WLCSP package, making it suitable for a variety of low-voltage electronic applications.

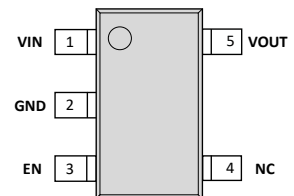
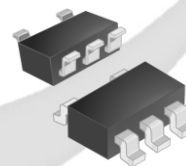
FEATURES

- Input Voltage Range: 1.8 V to 5.5 V, 6.0 V_{ABS}
- Maximum Continuous Current:
 - GLF1800 and GLF1800A: 1.0 A
 - GLF1800T and GLF1800AT: 1.5 A
- Low Forward Voltage Drop:
 - GLF1800 and GLF1800A:
 - 19 mV (Typ.) at $I_{OUT} = 100$ mA
 - 117 mV (Typ.) at $I_{OUT} = 1.0$ A
 - GLF1800T and GLF1800AT:
 - 12 mV (Typ.) at $I_{OUT} = 100$ mA
 - 73 mV (Typ.) at $I_{OUT} = 1.0$ A
 - 111 mV (Typ.) at $I_{OUT} = 1.5$ A
- Quiescent Current, I_Q :
 - 1.0 μ A (Typ.) at $V_{IN} = 1.8$ V
 - 1.1 μ A (Typ.) at $V_{IN} = 3.6$ V
 - 1.2 μ A (Typ.) at $V_{IN} = 5.5$ V
- Low Reverse Current Regardless of ON & OFF:
 - 2 nA (Typ.) at $V_{OUT} = 5.5$ V
- Reverse Bias Turn-off Response: 12 μ s (Typ.)
- Short Circuit Protection
 - Auto-Retry by Thermal Shutdown Protection

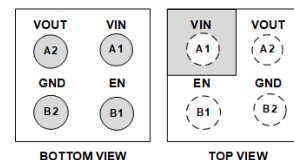
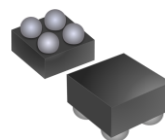
APPLICATIONS

- VR/AR Portable Applications
- Wearable Medical Devices
- Smart Meters
- AIoT Smart Devices
- Smart Glasses

PACKAGE



SOT23-5L



0.77 mm x 0.77 mm x 0.35 mm Thin WLCSP

APPLICATION DIAGRAM

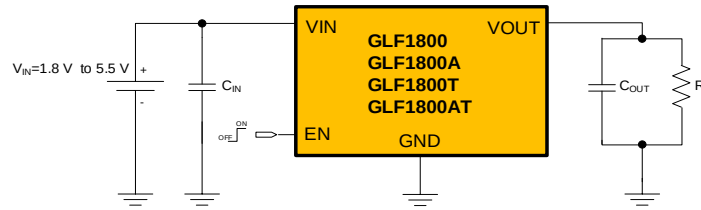
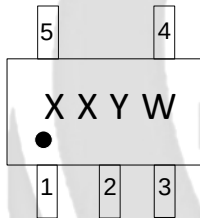


Figure 1. Application Diagram

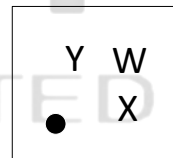
DEVICE ORDERING AND MARKING INFORMATION

Part Number	Top Mark	V _{drop} (Typ.) at 3.6 V _{IN} @ 1.0 A	EN Pin		Package	Product Status
			Activity	Internal Pull-up Resistor		
GLF1800-T17	GR	117 mV	High	No	SOT23-5L	Production
GLF1800A-T17	JH	117 mV	High	Yes	SOT23-5L	Preliminary
GLF1800T-S17	g	73 mV	High	No	Thin WLCSP	Production
GLF1800AT-S17	j	73 mV	High	Yes	Thin WLCSP	Production



SOT23-5L

Y : Year Code
W : Week Code
XX: Device Code



Thin WLCSP

Y : Year Code
W : Week Code
X : Device Code

FUNCTIONAL BLOCK DIAGRAM

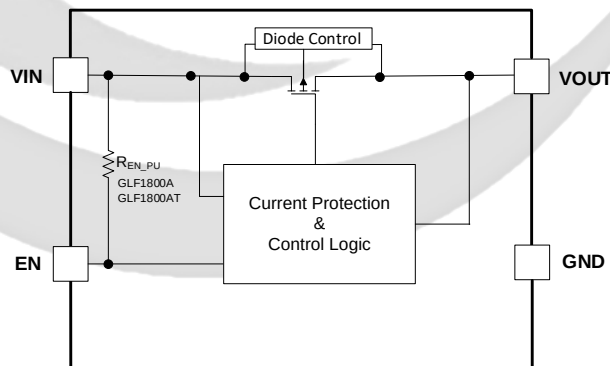


Figure 2. Functional Block Diagram

PIN CONFIGURATION

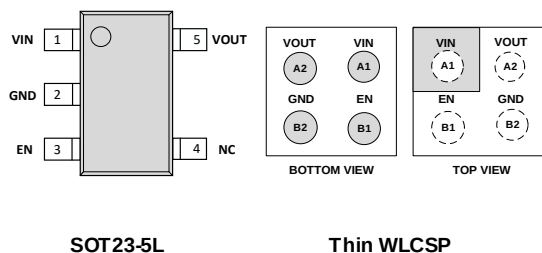


Figure 3. Packages and Pin Definition

PIN DEFINITION

Pin #		Name	Description
SOT23-5L	Thin WLCSP		
1	A1	VIN	Power input, diode anode
2	B2	GND	Ground
3	B1	EN	Control pin, active high Note: The GLF1800A and GLF1800AT EN pin has an internal pull-up resistor connected to VIN.
4	/	NC	No connection, keep this Pin floating or connect it with Ground
5	A2	VOUT	Power output, diode cathode

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 _{OUT} , V _{EN}	V _{IN} , V _{OUT} , V _{EN} to GND		- 0.3	6.0	V
I _{OUT}	Maximum Continuous Current	GLF1800 and GLF1800A		1.0	A
		GLF1800T and GLF1800AT		1.5	A
T _{STG}	Storage Temperature		- 65	150	°C
T _J	Maximum Junction Temperature			150	°C
T _A	Operating Ambient Temperature		- 40	85	°C
θ _{JA}	Thermal Resistance, Junction to Ambient	GLF1800 and GLF1800A		180	°C/W
		GLF1800T and GLF1800AT		85	°C/W
ESD	Electrostatic Discharge Capability	Human Body Model, JESD22-A114	± 4		kV
		Charged Device Model, JESD22-C101	± 2		

ELECTRICAL CHARACTERISTICS

Values are at $V_{IN} = 3.6\text{ V}$ and $T_A = 25\text{ }^{\circ}\text{C}$ unless otherwise noted.

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Units		
Basic Operation								
I _Q	Quiescent Current	V _{IN} = 1.8 V, EN = Enable, I _{OUT} = 0 mA			1		μA	
		V _{IN} = 3.6 V, EN = Enable, I _{OUT} = 0 mA			1.1	2.92		
		V _{IN} = 5.5 V, EN = Enable, I _{OUT} = 0 mA	T _A = 25 °C		1.2	2.95		
			T _A = 85 °C ⁽¹⁾		1.5			
I _{SD}	Shut Down Current (GLF1800 and GLF1800T)	V _{IN} = 1.8 V, EN = Disable, I _{OUT} = 0 mA			1		nA	
		V _{IN} = 3.6 V, EN = Disable, I _{OUT} = 0 mA			2			
		V _{IN} = 5.5 V, EN = Disable, I _{OUT} = 0 mA	T _A = 25 °C		16	90		
			T _A = 85 °C ⁽¹⁾		450			
	Shut Down Current (GLF1800A and GLF1800AT)	V _{IN} = 1.8 V, EN = Disable, I _{OUT} = 0 mA			100			
		V _{IN} = 3.6 V, EN = Disable, I _{OUT} = 0 mA			195			
		V _{IN} = 5.5 V, EN = Disable, I _{OUT} = 0 mA	T _A = 25 °C		315	450		
			T _A = 85 °C ⁽¹⁾		805			
V _{drop}	Forward Voltage Drop V _{IN} - V _{OUT} (GLF1800 and GLF1800A)	EN = Enable, I _{OUT} = 1 mA	T _A = 25 °C	3	14	25	mV	
			T _A = 85 °C ⁽¹⁾		18			
		EN = Enable, I _{OUT} = 100 mA	T _A = 25 °C	7	19	30		
			T _A = 85 °C ⁽¹⁾		24			
		EN = Enable, I _{OUT} = 500 mA	T _A = 25 °C	48	58	70		
			T _A = 85 °C ⁽¹⁾		69			
		EN = Enable, I _{OUT} = 1 A	T _A = 25 °C	98	117	130		
			T _A = 85 °C ⁽¹⁾		140			
V _{drop}	Forward Voltage Drop V _{IN} - V _{OUT} (GLF1800T and GLF1800AT)	EN = Enable, I _{OUT} = 1 mA	T _A = 25 °C	2	11.5	25	mV	
			T _A = 85 °C ⁽¹⁾		18			
		EN = Enable, I _{OUT} = 100 mA	T _A = 25 °C	3	12	30		
			T _A = 85 °C ⁽¹⁾		19			
		EN = Enable, I _{OUT} = 500 mA	T _A = 25 °C	30	43	60		
			T _A = 85 °C ⁽¹⁾		50			
		EN = Enable, I _{OUT} = 1 A	T _A = 25 °C	60	73	100		
			T _A = 85 °C ⁽¹⁾		94			
		EN = Enable, I _{OUT} = 1.5 A	T _A = 25 °C	85	111	140		
			T _A = 85 °C ⁽¹⁾		156			
I _{VIN_ON}	Reverse Current from V _{OUT} to V _{IN}	V _{IN} = 1.8 V, EN = Enable, V _{OUT} = 5.5 V	T _A = 25 °C		2	20	nA	
			T _A = 85 °C ⁽¹⁾		70			
I _{OUT_ON}	Reverse Current from V _{OUT} to GND			T _A = 25 °C		1.1	2	μA
				T _A = 85 °C ⁽¹⁾		1.5		
I _{VIN_OFF}	Leakage Current from V _{OUT} to V _{IN}	V _{IN} = 1.8 V, EN = Disable, V _{OUT} = 5.5 V	T _A = 25 °C		2	20	nA	
				T _A = 85 °C ⁽¹⁾		71		
I _{OUT_OFF}	Leakage Current from V _{OUT} to GND			T _A = 25 °C		400		600
				T _A = 85 °C ⁽¹⁾		500		

ELECTRICAL CHARACTERISTICS (CONTINUED)

Values are at $V_{IN} = 3.6\text{ V}$ and $T_A = 25\text{ }^{\circ}\text{C}$ unless otherwise noted.

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Units
V _{RB_TH}	Reverse Bias Turn-off Threshold (GLF1800T and GLF1800AT)	V _{OUT} - V _{IN} , EN = Enable		-6		mV
	Reverse Bias Turn-off Threshold (GLF1800 and GLF1800A)			-12		
T _{RB}	Reverse Bias Turn-off Delay time ⁽¹⁾	V _{OUT} - V _{IN} > V _{RB_TH} , EN = Enable Refer to Figure 23		12		μs
V _{IH}	EN Input Logic High Voltage	V _{IN} = 1.8 V to 5.5 V	1.1			V
V _{IL}	EN Input Logic Low Voltage	V _{IN} = 1.8 V to 5.5 V			0.3	
I _{EN}	EN Leakage Current	V _{EN} = 5.5 V		2	50	nA
R _{EN_PU}	EN internal pull-up resistor (GLF1800A and GLF1800AT)	V _{IN} = 5.5 V, EN pin connected to GND		19		MΩ
I _{SC}	Short Circuit Current Detection	Refer to Figure 17 and Figure 18		2.6		A
t _{SC}	Short Circuit Protection Delay Time ⁽¹⁾			70		μs
TSD ⁽¹⁾	Thermal Shutdown			150		°C
	Hysteresis			20		
Switching Characteristics ⁽²⁾						
t _{DON}	Turn-On Delay	R _L = 150 Ω, C _{OUT} = 10 μF	0.8	1.3	1.8	ms
t _R	V _{OUT} Rise Time		0.8	1.3	1.8	
t _{DOFF}	Turn-Off Delay	R _L = 150 Ω, C _{OUT} = 10 μF		0.15		
t _F	V _{OUT} Fall Time		3	3.6	4.2	

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

2. $t_{ON} = t_{DON} + t_R$, $t_{OFF} = t_{DOFF} + t_F$

TIMING DIAGRAM

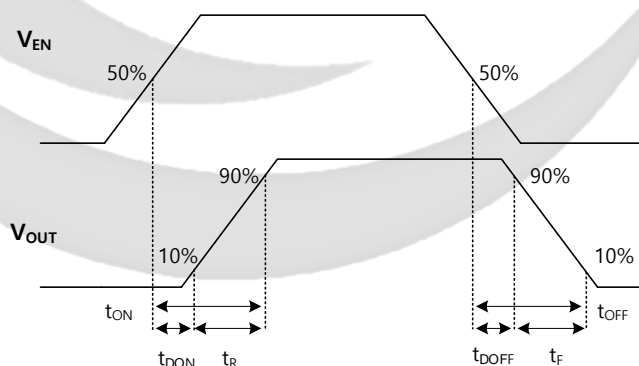


Figure 4. Timing Diagram

TYPICAL PERFORMANCE CHARACTERISTICS

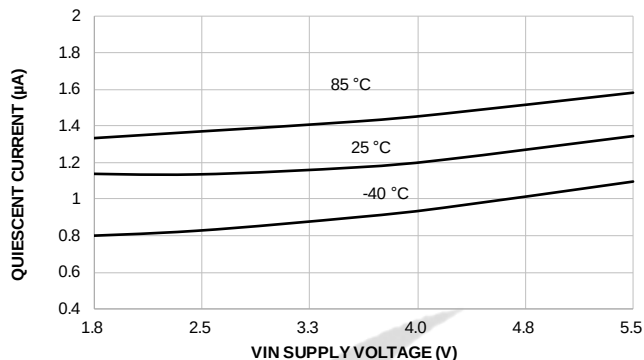


Figure 5. Quiescent Current vs. Supply Voltage

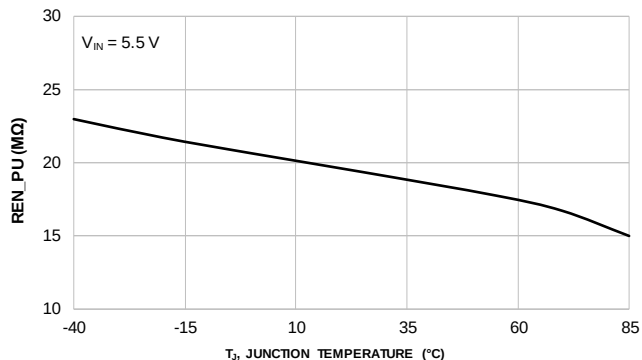


Figure 6. EN Internal Pull-up Resistor vs. Temperature
GLF1800A and GLF1800AT

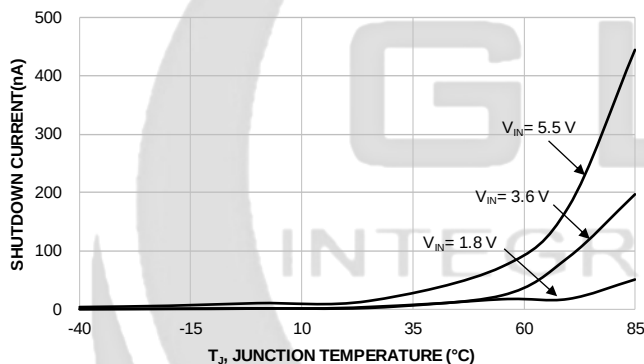


Figure 7. Shutdown Current vs. Supply Voltage
GLF1800 and GLF1800T

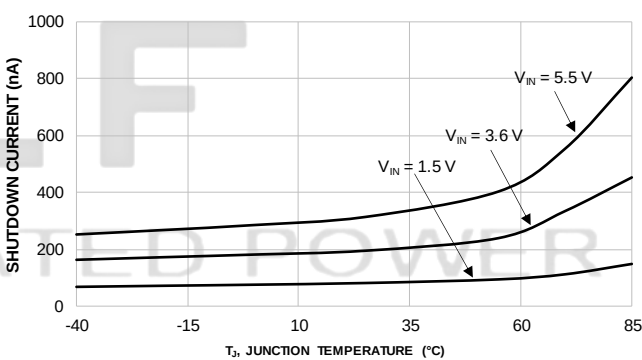


Figure 8. Shutdown Current vs. Temperature
GLF1800A and GLF1800AT

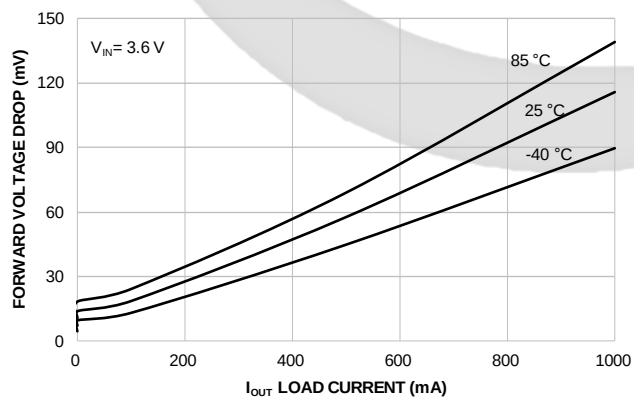


Figure 9. Forward Voltage Drop vs. Load Current,
GLF1800 and GLF1800A

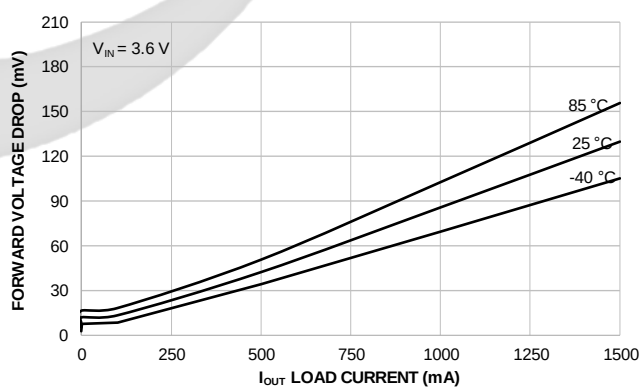


Figure 10. Forward Voltage Drop vs. Load Current,
GLF1800T and GLF1800AT

TYPICAL PERFORMANCE CHARACTERISTICS (CONTINUED)

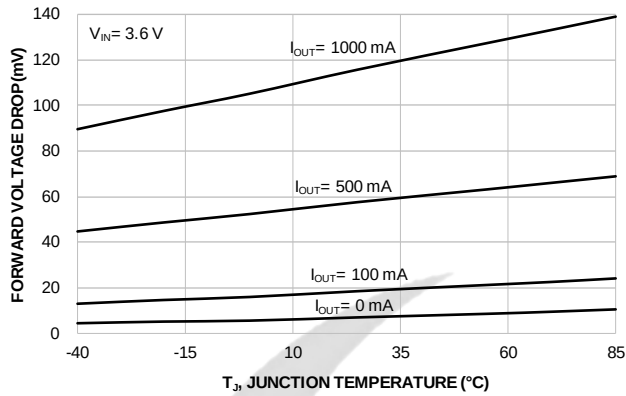


**Figure 11. Forward Voltage Drop vs. Temperature,
GLF1800 and GLF1800A**

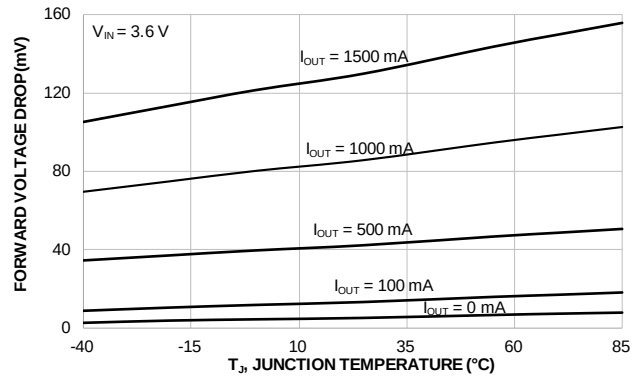


**Figure 12. Forward Voltage Drop vs. Temperature,
GLF1800T and GLF1800AT**

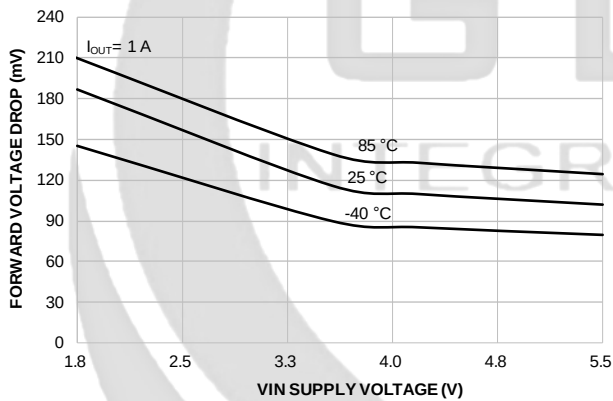


**Figure 13. Forward Voltage Drop vs. Supply Voltage
(High Output Current, GLF1800 and GLF1800A)**

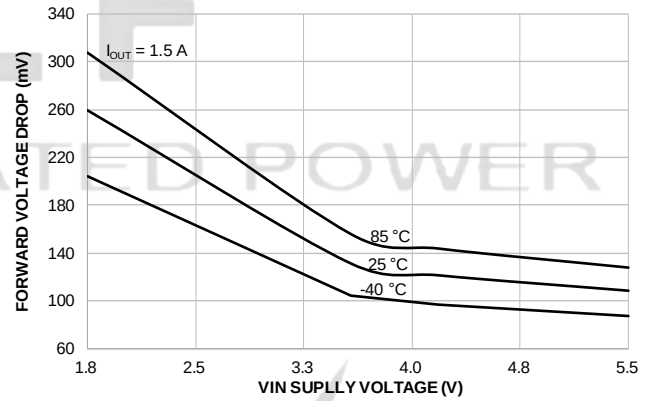


**Figure 14. Forward Voltage Drop vs. Supply Voltage
(High Output Current, GLF1800T and GLF1800AT)**

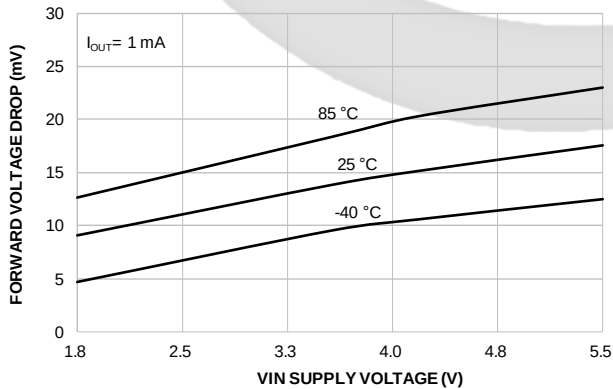


Figure 15. Forward Voltage Drop vs. Supply Voltage

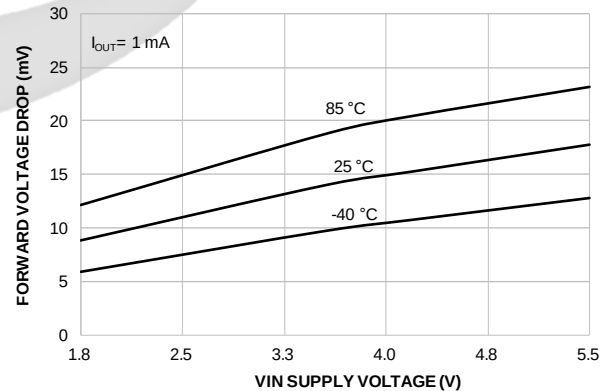


Figure 16. Forward Voltage Drop vs. Supply Voltage

(Low Output Current, GLF1800 and GLF1800A)

(Low Output Current, GLF1800T and GLF1800AT)

TYPICAL PERFORMANCE CHARACTERISTICS (CONTINUED)

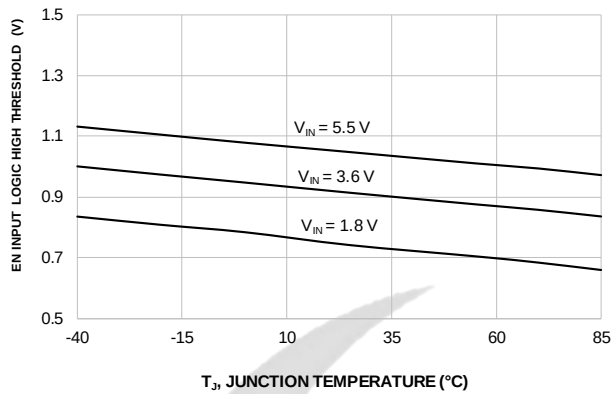


Figure 17. EN Input Logic High Threshold vs. Temperature

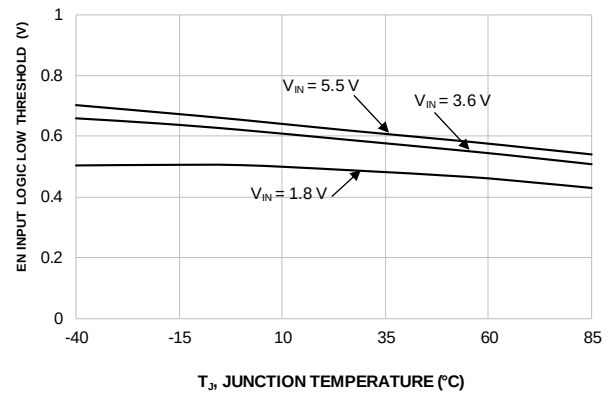


Figure 18. EN Input Logic Low Threshold vs. Temperature

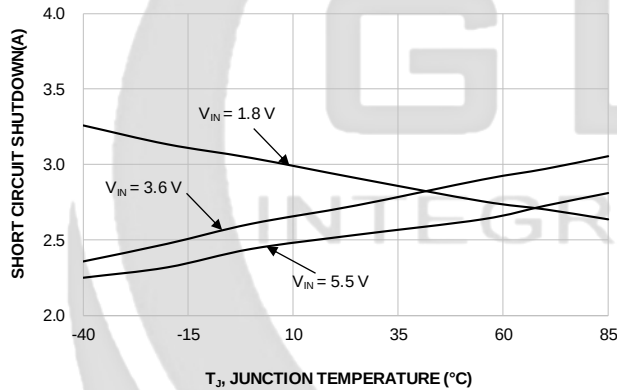


Figure 19. Short Circuit Current vs. Temperature,
GLF1800 and GLF1800A

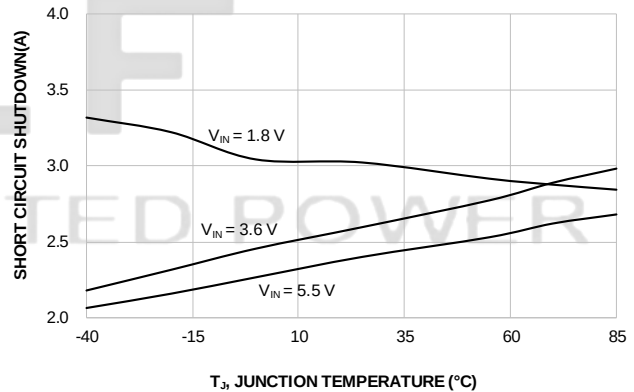


Figure 20. Short Circuit Current vs. Temperature,
GLF1800T and GLF1800AT

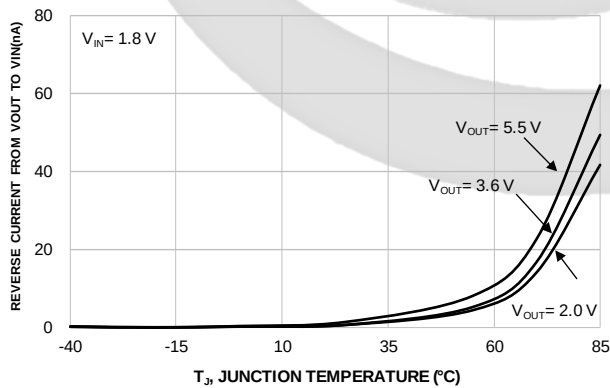


Figure 21. Reverse Current from VOUT To VIN vs.
Temperature

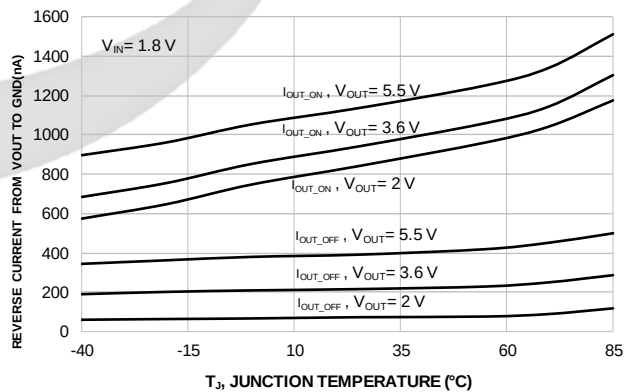


Figure 22. Reverse Current from VOUT To GND vs.
Temperature

TYPICAL PERFORMANCE CHARACTERISTICS (CONTINUED)

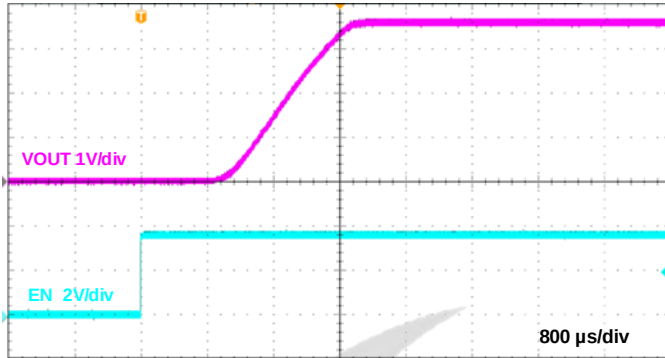


Figure 23. Turn-On Response

$V_{IN}=3.6\text{ V}$, $C_{IN}=1.0\text{ }\mu\text{F}$, $C_{OUT}=10\text{ }\mu\text{F}$, $R_L=150\text{ }\Omega$

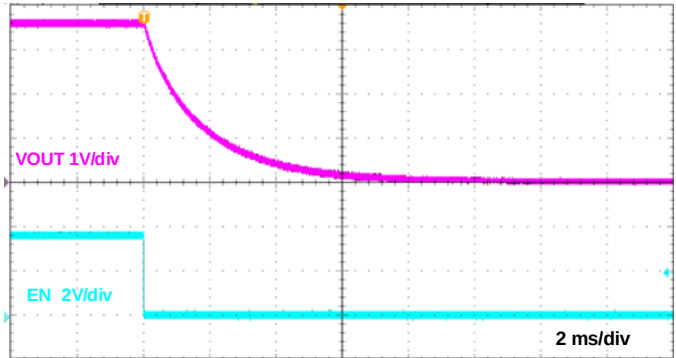


Figure 24. Turn-Off Response

$V_{IN}=3.6\text{ V}$, $C_{IN}=1.0\text{ }\mu\text{F}$, $C_{OUT}=10\text{ }\mu\text{F}$, $R_L=150$

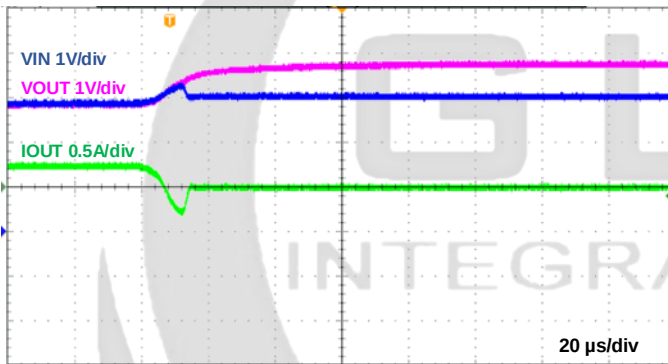


Figure 25. Reverse Bias Turn Off Response

$V_{IN}=3.0\text{ V}$, $C_{IN}=1.0\text{ }\mu\text{F}$, $C_{OUT}=10\text{ }\mu\text{F}$, V_{OUT} From 3.0 V to 3.8 V

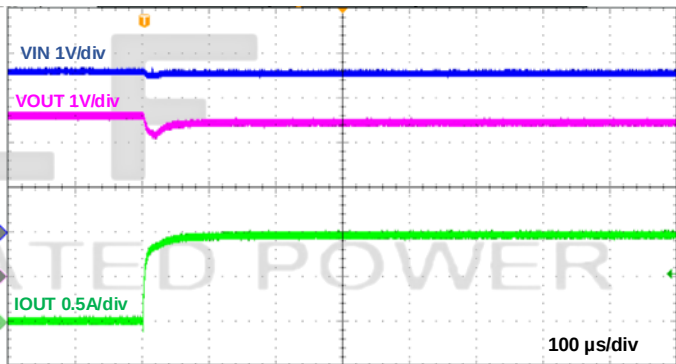


Figure 26. Dynamic Load Current Response

$V_{IN}=3.6\text{ V}$, $C_{IN}=1.0\text{ }\mu\text{F}$, $C_{OUT}=10\text{ }\mu\text{F}$, I_{OUT} From 0 A to 1 A

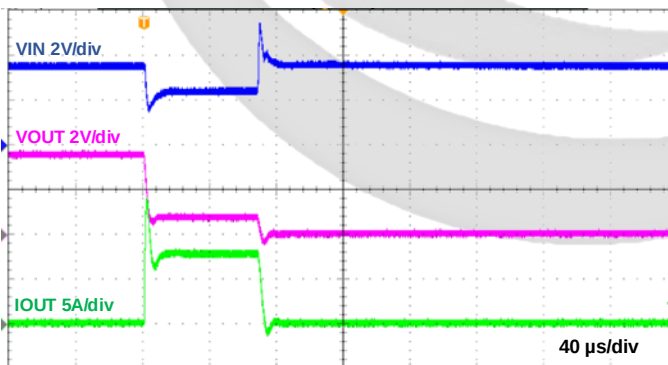


Figure 27. Short Circuit Response

$V_{IN}=3.6\text{ V}$, $C_{IN}=1.0\text{ }\mu\text{F}$, $C_{OUT}=10\text{ }\mu\text{F}$, R_L From Open to Short

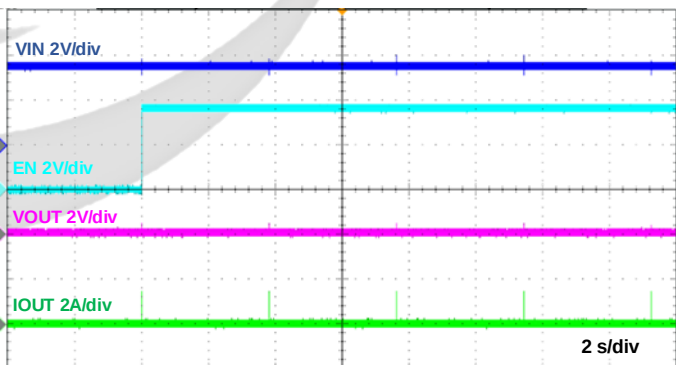


Figure 28. Short Circuit Start-up

$V_{IN}=3.6\text{ V}$, $C_{IN}=1.0\text{ }\mu\text{F}$, $C_{OUT}=10\text{ }\mu\text{F}$, V_{OUT} Short to GND

APPLICATION INFORMATION

GLF1800, GLF1800A, GLF1800T and GLF1800AT are devices similar to ideal diode. Like conventional diodes, they can block reverse current when reverse-biased. With high load current, the maximum forward voltage drop of a conventional diode is about 300 mV to 500 mV, and they consume a significant power. However, the device has a forward voltage drop of 117 mV (GLF1800 and GLF1800A) and 77mV (GLF1800T and GLF1800AT) at a 1.0 A load current. This greatly reduces power consumption and self-heating.

Thermal Shutdown and Short Circuit Protection

Both GLF1800, GLF1800A, GLF1800T and GLF1800AT have thermal shutdown protection. When the junction temperature exceeds TSD, the device will turn off the internal MOSFET to protect itself from damage due to overheating. When the junction temperature drops below the TSD hysteresis, the device will return to normal operation. When the output current of the device exceeds the short-circuit detection threshold (I_{SC}) of 2.6 A Typ, the device will enter retry protection logic after a delay (t_{SC}) of 70 μ s Typ, the period of the retry logic is about 800 ms. If the GLF1800, GLF1800A, GLF1800T and GLF1800AT continue to operate in the retry state, they may eventually trigger thermal shutdown due to the junction temperature exceeding the TSD threshold.

Input and Output Capacitor

A minimum 1.0 μ F input and output capacitor is recommended to be placed close to the VIN pin and VOUT pin to reduce the voltage drop on the input power rail caused by transient inrush current at start-up. A 10 μ F output capacitance is recommended, higher input and output capacitor value can be used to further attenuate the input voltage drop. If load inductances do exist, use of an output capacitor can improve output voltage stability and system reliability.

Application Example

When using GLF1800, GLF1800A, GLF1800T or GLF1800AT to supply power to a load together with other power sources (Figure 29), it is recommended to keep the EN of the GLF1800, GLF1800A, GLF1800T and GLF1800AT enabled, or disable EN after turning on the other power source. This will prevent voltage drops during the power switching from affecting the load.

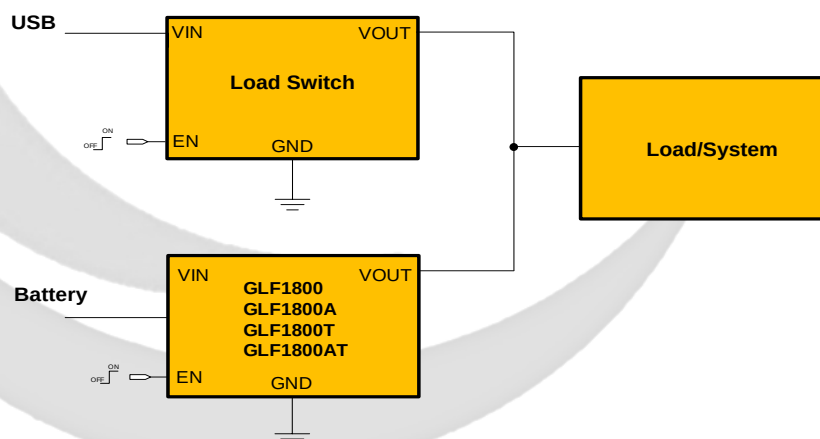
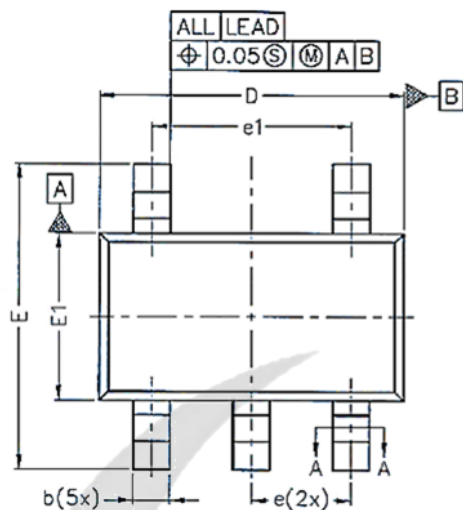
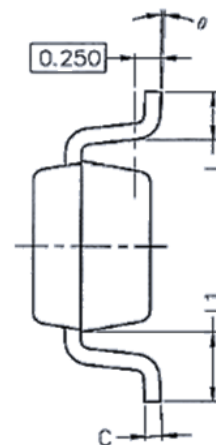


Figure 29. Application Example

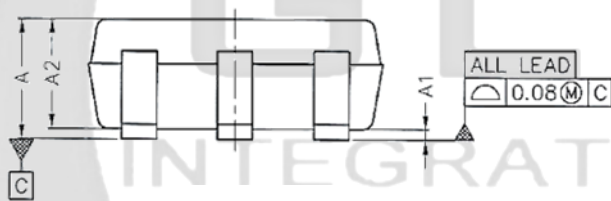
PACKAGE OUTLINE (SOT23-5L)



TOP VIEW

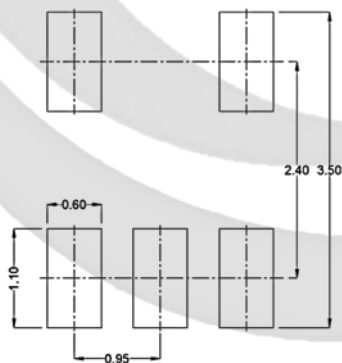


SIDE VIEW



FRONT VIEW

Recommended Footprint

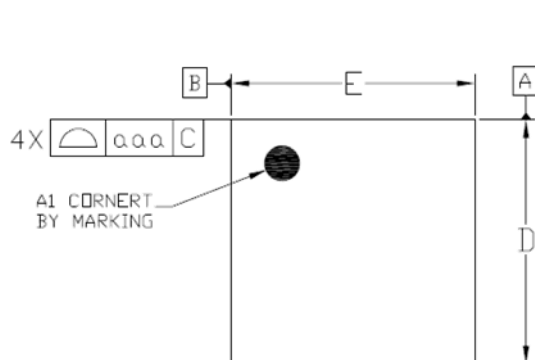


REF.	Dimensions Ref.		
	Min.	Nom.	Max.
A	-	-	1.25
A1	0.03	0.08	0.15
A2	1.05	1.10	1.15
b	0.27	-	0.35
b1	0.26	0.285	0.31
c	0.135	-	0.23
c1	0.127	0.152	0.178
D	2.82	2.92	3.02
E	2.60	2.90	3.00
E1	1.50	1.62	1.70
e	0.95 BSC		
e1	1.90 BSC		
L	0.35	0.45	0.55
L1	0.49	0.64	0.79
Θ	0°	-	8°

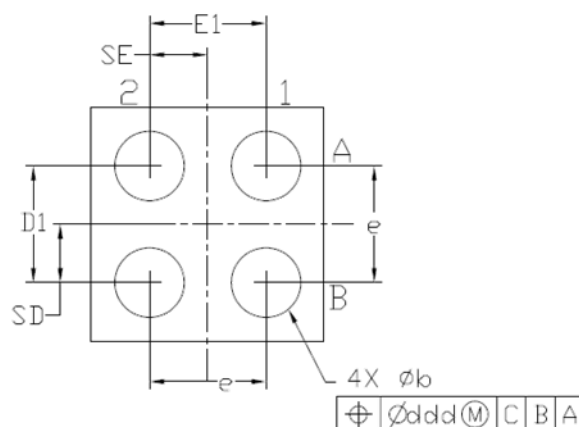
PACKAGING INFORMATION

Part Number	Package	Pins	Top Mark	Moisture Sensitivity Level	Environmental Information
GLF1800-T17	SOT23-5L	5	GR	MSL3	ROHS+HF
GLF1800A-T17	SOT23-5L	5	JH	MSL3	ROHS+HF

PACKAGE OUTLINE (Thin WLCSP)



TOP VIEW

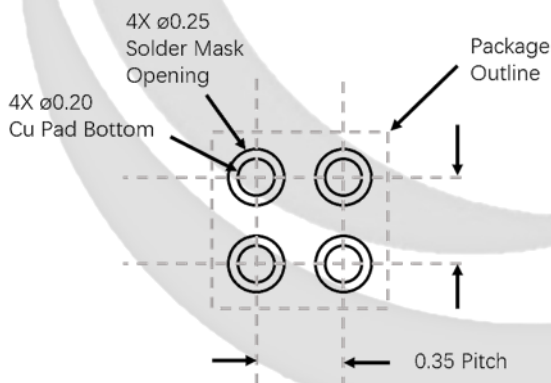


BOTTOM VIEW



SIDE VIEW

Recommended Footprint



Notes

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

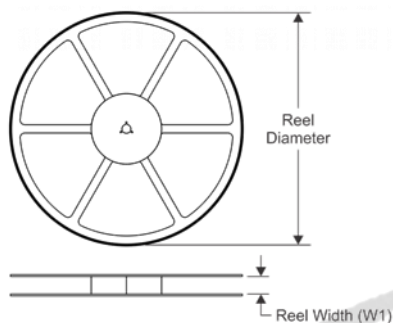
REF.	Dimensions Ref.		
	Min.	Nom.	Max.
A	0.310	0.350	0.390
A1	0.050	0.060	0.070
A2	0.240	0.265	0.290
A3	0.020	0.025	0.030
D	0.755	0.770	0.785
E	0.755	0.770	0.785
D1	0.300	0.350	0.400
E1	0.300	0.350	0.400
b	0.165	0.200	0.235
e	0.350 BSC		
SD	0.175 BSC		
SE	0.175 BSC		
Tol. of Form & Position			
aaa	0.10		
bbb	0.10		
ccc	0.05		
ddd	0.05		

PACKAGING INFORMATION

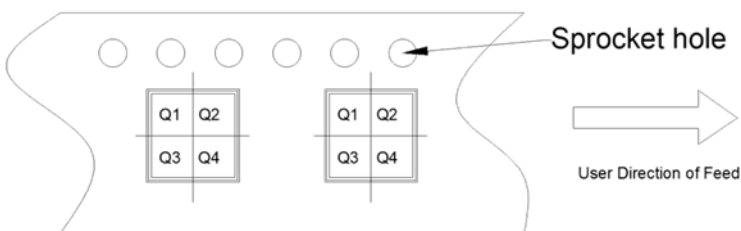
Part Number	Package	Pins	Top Mark	Moisture Sensitivity Level	Environmental Information
GLF1800T-S17	Thin WLCSP	4	g	MSL1	ROHS+HF
GLF1800AT-S17	Thin WLCSP	4	j	MSL1	ROHS+HF

TAPE AND REEL DIMENSIONS (SOT23-5L)

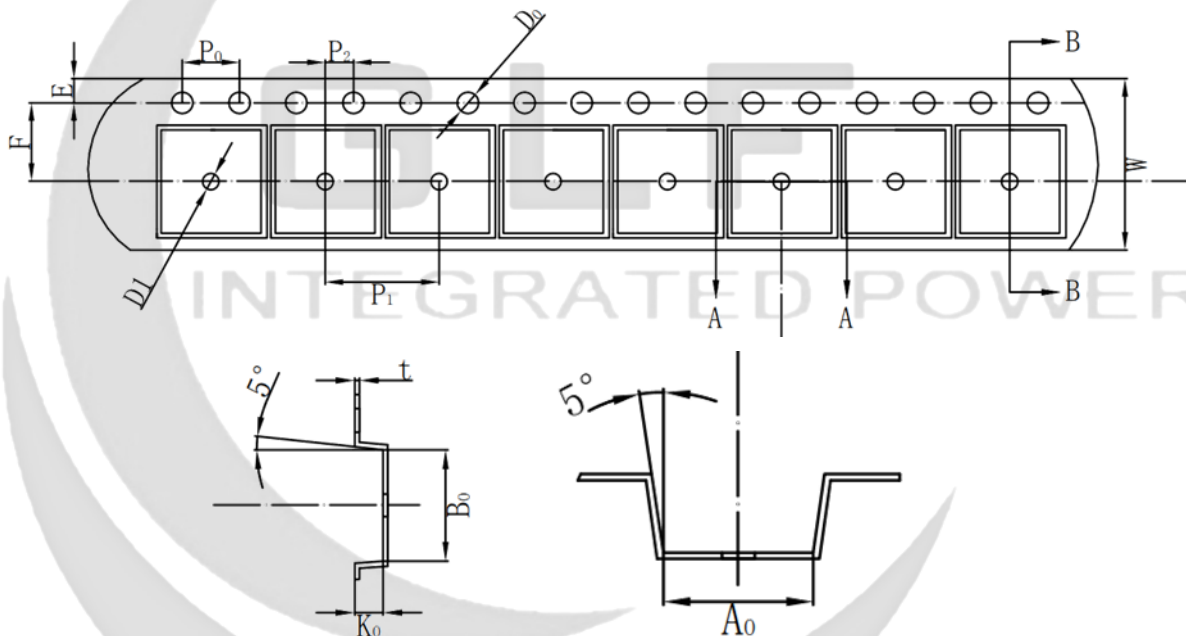
REEL DIMENSIONS



QUADRANT ASSIGNMENTS PIN 1 ORIENTATION TAPE



TAPE DIMENSIONS



Device	Package	Pins	SPQ	Reel Diameter (mm)	Reel Width W1	A0	B0	K0	P1	W	Pin1
GLF1800-T17	SOT23-5	5	3000	178	9	3.25	3.30	1.38	4	8	Q3
GLF1800A-T17	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

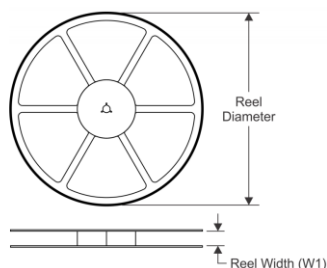
K0: Dimension designed to accommodate the component thickness

W: Overall width of the carrier tape

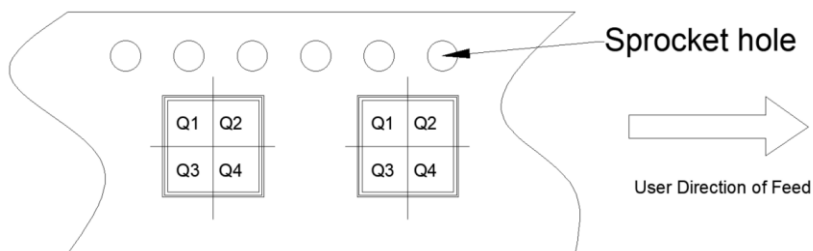
P1: Pitch between successive cavity centers

TAPE AND REEL INFORMATION (WLCSP)

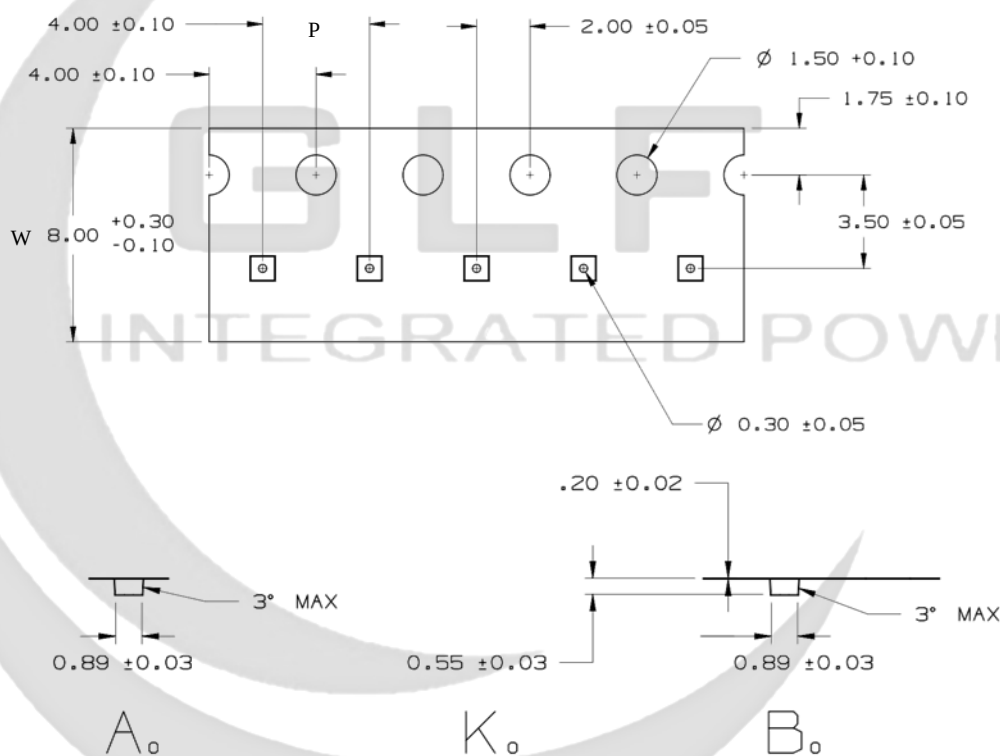
REEL DIMENSIONS



QUADRANT ASSIGNMENTS PIN 1 ORIENTATION TAPE



TAPE DIMENSIONS



Device	Package	Pins	SPQ	Reel Diameter (mm)	Reel Width W1	A0	B0	K0	P	W	Pin1
GLF1800T-S17	Thin WLCSP	4	4000	180	9	0.89	0.89	0.55	4	8	Q1
GLF1800AT-S17	Thin WLCSP	4	4000	180	9	0.89	0.89	0.55	4	8	Q1

Remark:

A0: Dimension designed to accommodate the component width

B0: Dimension designed to accommodate the component length

K0: 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. 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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