

DESCRIPTION

The GLF9900 is an ultra-low-power and low dropout regulator designed for battery powered smart devices.

The GLF9900 provides up to 300 mA output current with typical quiescent current of only 240 nA. The GLF9900 features an over current protection by limiting output current. When the output of the device is shorted, the output current is limited to preset level and the thermal shutdown prevents the device from the thermal runaway.

The GLF9900 is available in SOT23-5L, SOT23-3L packages.

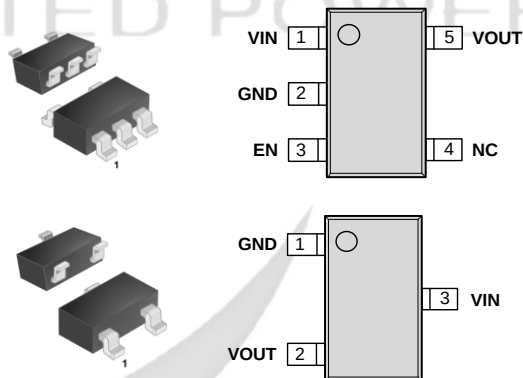
FEATURES

- Output Current:
 - GLF9900-33T1 up to 300 mA
 - GLF9900-33T3 up to 200 mA
- Ultra-Low Quiescent Current, I_Q:
 - 240 nA Typ at no load
- Output Voltage fixed 3.3 V
- Output Voltage Accuracy: $\pm 2.5\%$
- Low Dropout:
 - 144 mV Typ at 100 mA
 - 334 mV Typ at 200 mA
 - 600 mV Typ at 300 mA
- Over Current Protection and Current Foldback
- Short Circuit Protection
- Thermal Shutdown Protection
- Compatible with Ceramic Capacitor

APPLICATIONS

- Battery Powered Smart Devices
- Medical Devices
- Mobiles / Wearables / IoT Devices
- Computing / Communication Devices

PACKAGE



SOT23-5L (Suffix: T1)
SOT23-3L (Suffix: T3)

APPLICATION DIAGRAM

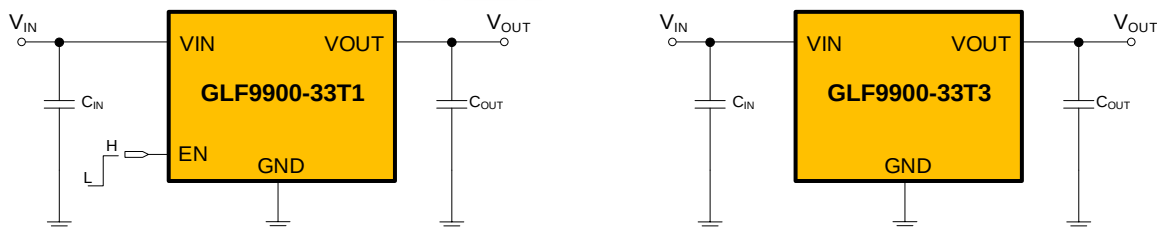


Figure 1. Typical Application

DEVICE ORDERING INFORMATION

Part Number	Top Mark	Output Voltage	Output Current	EN	Package
GLF9900-33T1G7	HK	3.3 V	300 mA	High	SOT23-5L
GLF9900-33T3G7	HJ	3.3 V	200 mA	-	SOT23-3L

FUNCTIONAL BLOCK DIAGRAM

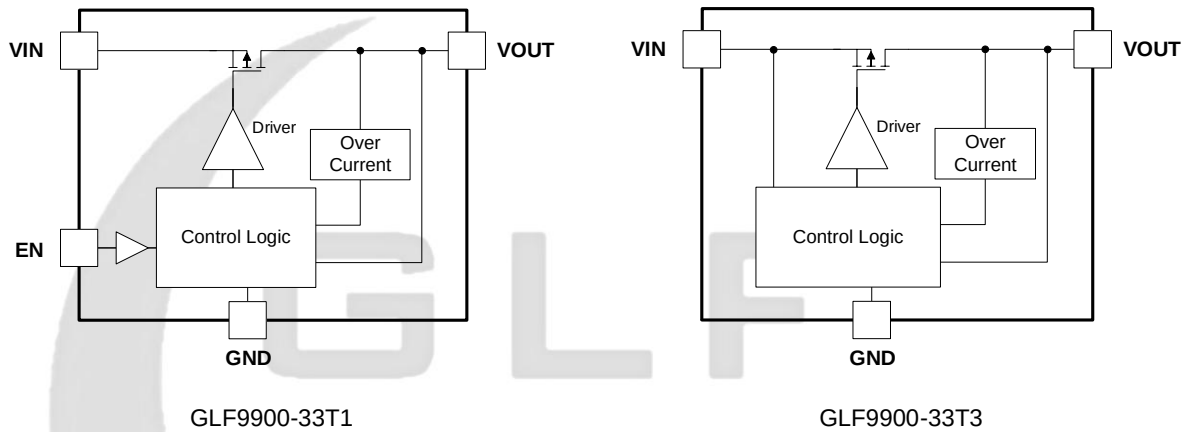
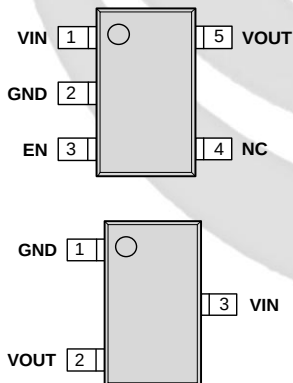


Figure 2. Functional Block Diagram

PIN CONFIGURATION



PIN DEFINITION

Name	Pin Number		Description
	SOT23-5L	SOT23-3L	
VIN	1	3	Regulator Input. Supply voltage for IC.
VOUT	5	2	Regulator Output.
GND	2	1	Ground
EN	3	-	Enable to control regulator output. Do not leave the EN pin floating
NC	4	-	No connection

Figure 3. SOT23-5L, SOT23-3L

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}	Each Pin Voltage Range to GND	-0.3	6	V
I _{OUT}	Maximum Continuous Output Current, GLF9900-33T3	200	Internally Limited	mA
	Maximum Continuous Output Current, GLF9900-33T1	300		
T _{STG}	Storage Junction Temperature	-65	150	°C
T _A	Operating Temperature Range	-40	85	°C
θ _{JA}	Thermal Resistance, Junction to Ambient		180	°C/W
ESD	Electrostatic Discharge Capability	Human Body Model, JESD22-A114	±2	kV
		Charged Device Model, JESD22-C101	±0.5	

ELECTRICAL CHARACTERISTICS

Values are at V_{IN} = V_{OUT(NOM)} + 1 V, C_{IN} = C_{OUT} = 1 μF, I_{OUT} = 1 mA and T_A = 25 °C unless otherwise noted.

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Units
Basic Operation						
I _Q	Quiescent Current	V _{EN} = Enable, I _{OUT} = 0 mA		240	500	nA
		V _{EN} = Enable, I _{OUT} = 0 mA, T _A = 85 °C ⁽¹⁾		280		
I _{SD}	Shutdown Current GLF9900-33T1	V _{EN} = Disable, I _{OUT} = 0 mA		120		nA
		V _{EN} = Disable, I _{OUT} = 0 mA, T _A = 85 °C ⁽¹⁾		280		
V _{OUT}	Output Voltage Accuracy		-2.5		+2.5	%
LineReg	Line Regulation	V _{OUT} +1 V ≤ V _{IN} ≤ 5.5 V, I _{OUT} = 1 mA GLF9900-33T1		0.16	1.2	%V
		V _{OUT} +1 V ≤ V _{IN} ≤ 5.5 V, I _{OUT} = 1 mA GLF9900-33T3		0.09	0.6	
LoadReg	Load Regulation	I _{OUT} = 1 mA to 200 mA		0.008	0.017	%/mA
		I _{OUT} = 1 mA to 300 mA, GLF9900-33T1		0.01	0.02	
V _{DROP}	Dropout Voltage ⁽²⁾	I _{OUT} = 100 mA		144	200	mV
		I _{OUT} = 200 mA		334	400	
		I _{OUT} = 300 mA, GLF9900-33T1		600	900	
I _{CL}	Over Current Limit		311	420	580	mA
I _{SC}	Short Circuit Current Limit	R _L = 0 Ω		490		mA
PSRR	Power Supply Rejection Ratio	f = 1 kHz, I _{OUT} = 10 mA V _{IN} = V _{OUT(NOM)} + 1 V + 200 mV _{pp} modulation		50		dB
V _{IH}	Input Logic High Voltage	V _{IN} = V _{OUT} +1 V to 5.5 V	0.6			V
V _{IL}	Input Logic Low Voltage				0.2	
I _{EN}	EN Leakage Current	V _{EN} = 5.5 V		4		nA
t _{START}	Start-Up Time ⁽¹⁾	From 50% EN to 90% V _{OUT}		220		μs
TSD	Thermal Shutdown Temperature ⁽¹⁾			150		°C
	Thermal Shutdown Hysteresis ⁽¹⁾			20		

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

2. Dropout voltage defined as V_{IN} – V_{OUT} when output drops 2 % from the nominal output.

TYPICAL PERFORMANCE CHARACTERISTICS

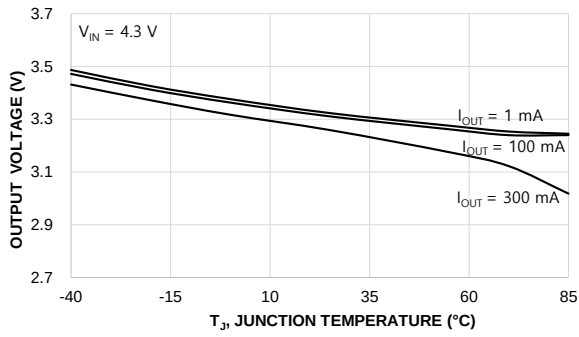


Figure 4. Output Voltage vs. Temperature
GLF9900-33T1

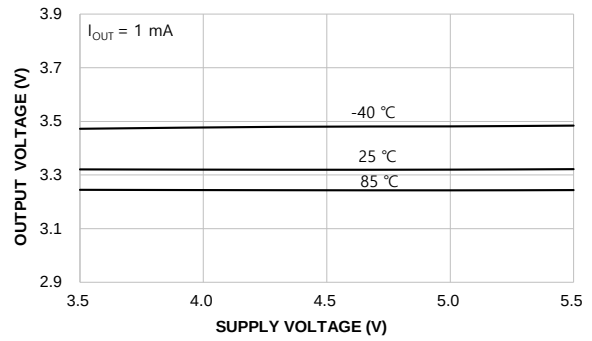


Figure 5. Output Voltage vs. Supply Voltage
GLF9900-33T1

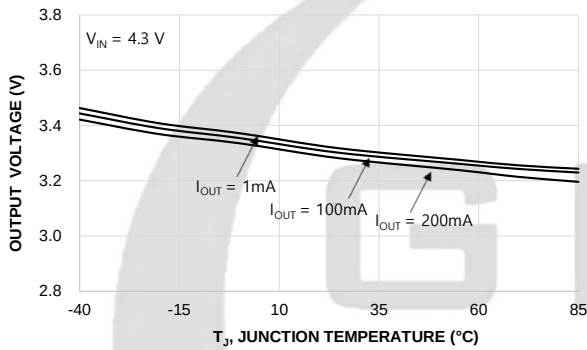


Figure 6. Output Voltage vs. Temperature
GLF9900-33T3

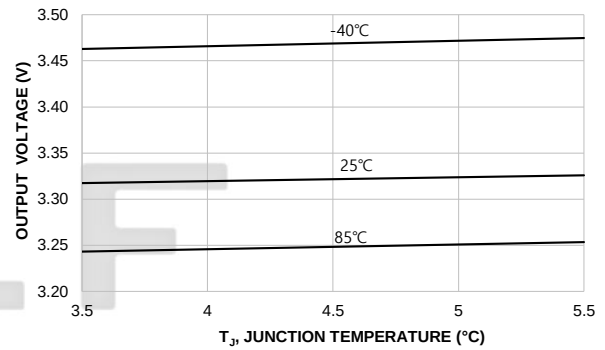


Figure 7. Output Voltage vs. Supply Voltage
GLF9900-33T3

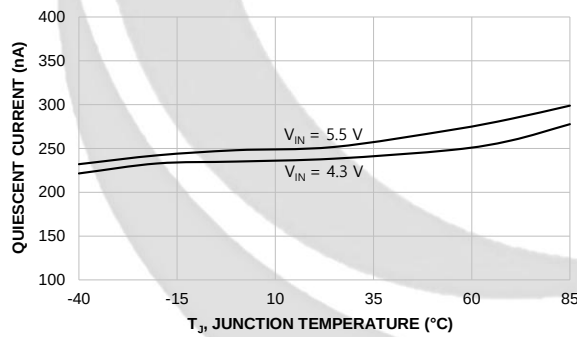


Figure 8. Quiescent Current vs. Temperature

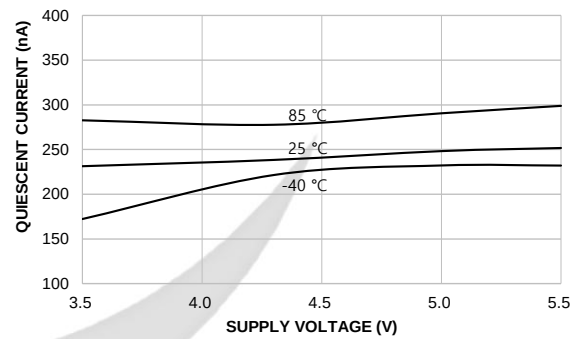


Figure 9. Quiescent Current vs. Supply Voltage

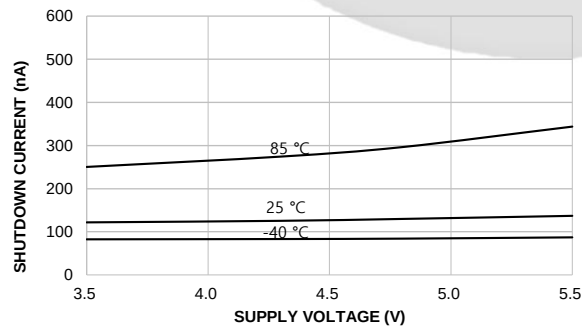


Figure 10. Shutdown Current vs. Supply Voltage
GLF9900-33T1 Only

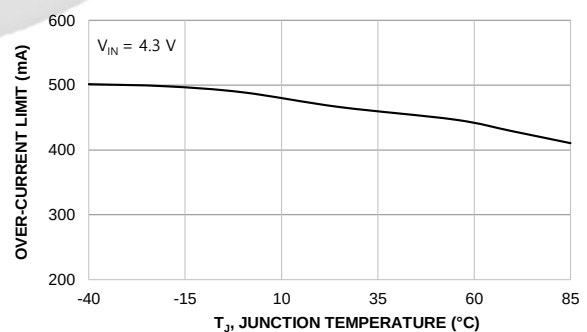


Figure 11. Over Current Limit vs. Temperature

TYPICAL PERFORMANCE CHARACTERISTICS (CONTINUED)

V_{IN} = V_{OUT} + 1V, I_{OUT} = 1 mA, V_{OUT} = 3.3 V, C_{IN} = C_{OUT} = 1 μF, T_J = 25 °C, unless otherwise specified (Figure 12 to Figure 17)

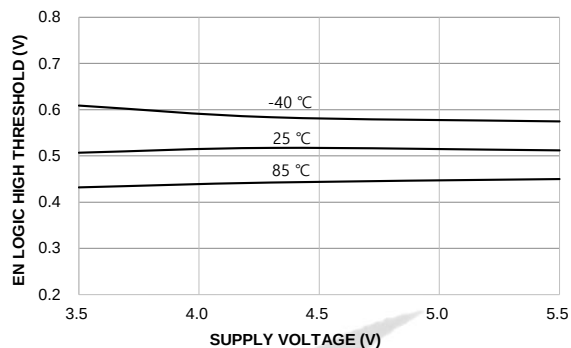


Figure 12. EN Logic High Threshold vs. Supply Voltage

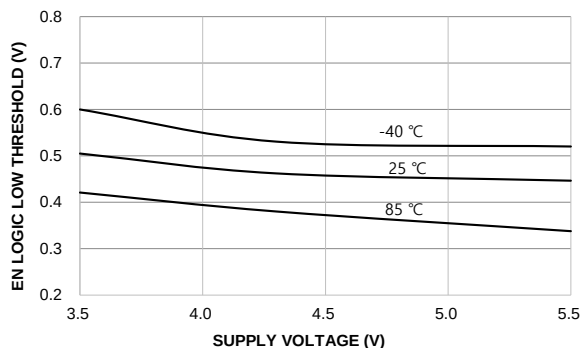


Figure 13. EN Logic Low Threshold vs. Supply Voltage

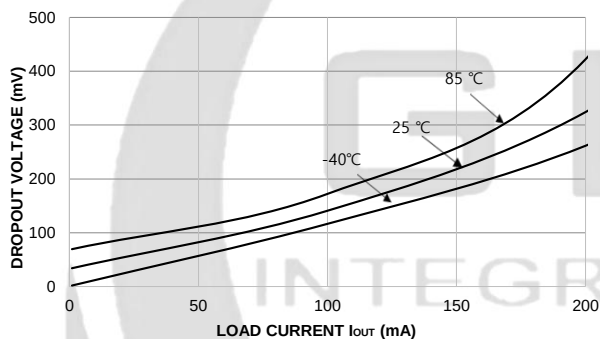


Figure 14. Dropout Voltage vs. Load Current
GLF9900-33T3

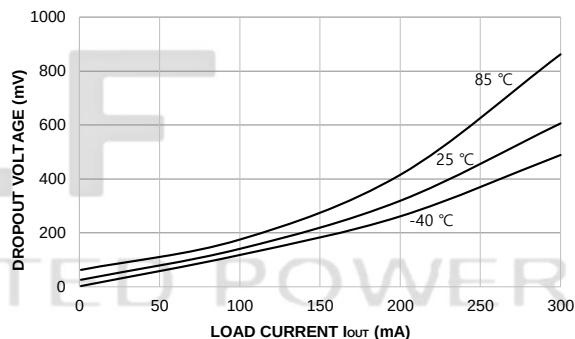


Figure 15. Dropout Voltage vs. Load Current
GLF9900-33T1

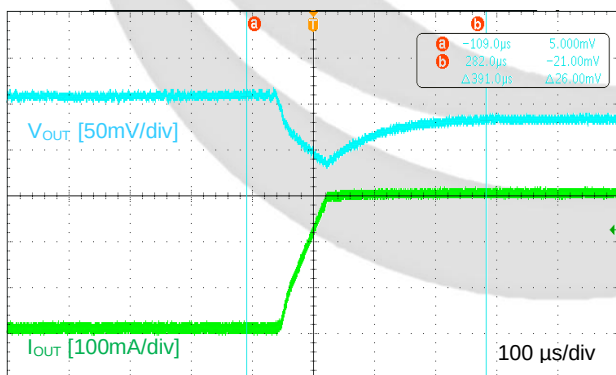


Figure 16. Load Transient, I_{OUT} = From 1 mA to 300 mA

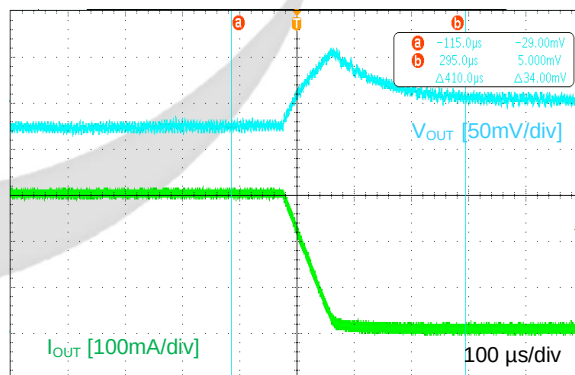


Figure 17. Load Transient, I_{OUT} = From 300 mA to 1 mA

TYPICAL PERFORMANCE CHARACTERISTICS (CONTINUED)

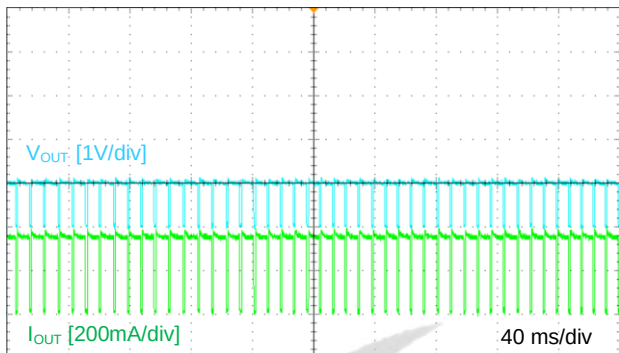


Figure 18. Over Current and Thermal Shutdown, $R_L = 3 \Omega$

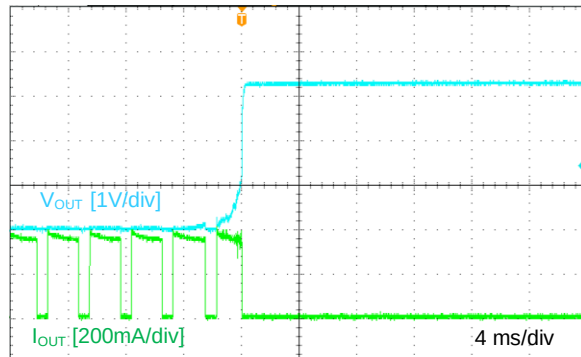


Figure 19. V_{OUT} short to GND and Release Response

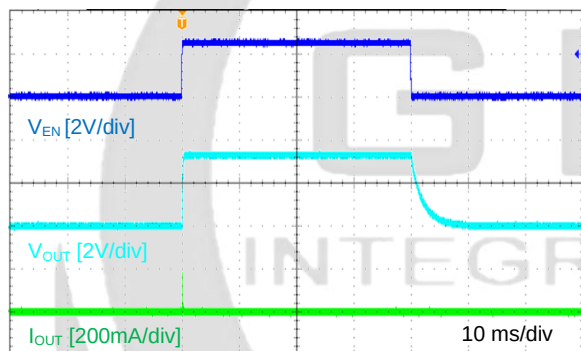


Figure 20. Turn-On and Off Response, No Load

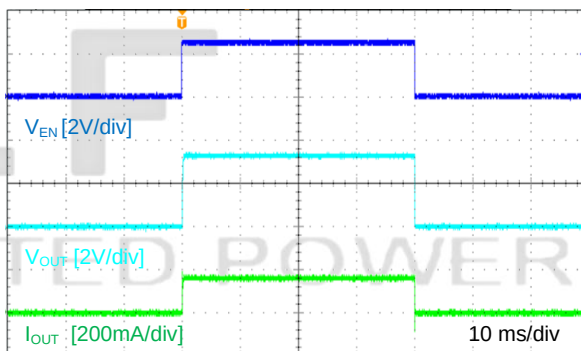


Figure 21. Turn-On and Off Response, $R_L = 20 \Omega$

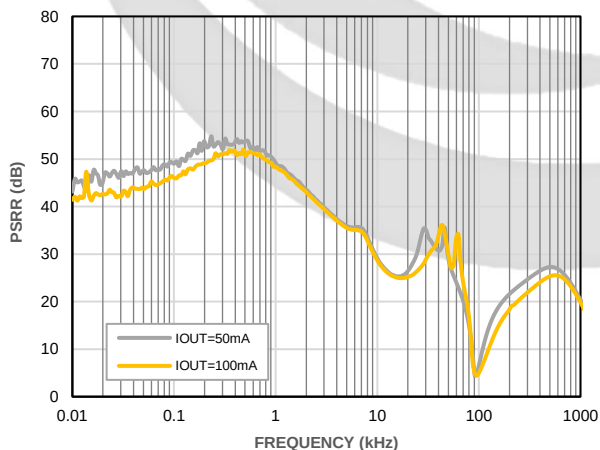


Figure 22. PSRR vs. Frequency, GLF9900-33T1

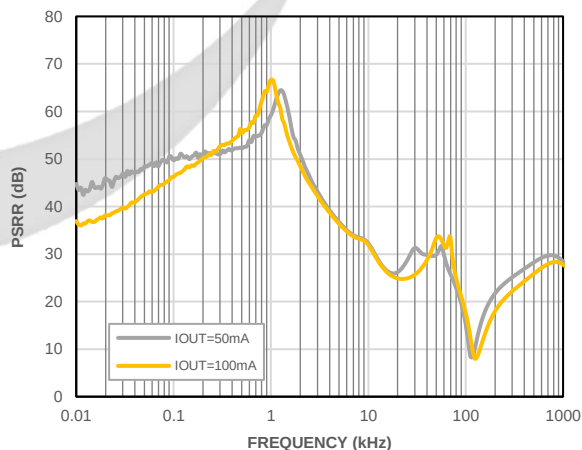


Figure 23. PSRR vs. Frequency, GLF9900-33T3

APPLICATION INFORMATION

The GLF9900 is a low quiescent current, low dropout voltage regulator capable of driving up to 300 mA load current. It is designed to provide excellent performance with low power for portable and battery powered applications.

Input and Output Capacitor

A 1.0 μ F ceramic capacitor on the VIN and VOUT pins respectively is recommended for this device. It should be placed as close to the device as possible with short traces to filter any input noise. A larger value capacitance can improve performance in noisy environments.

Enable Pin

The GLF9900-33T1 can be activated by EN pin high level. Note that the EN pin is not allowed to be floating.

Thermal Shutdown

The device contains a thermal shutdown protection circuit to disable the device when the junction temperature (T_J) of the GLF9900 rises to TSD (Thermal Shutdown) threshold, 150 °C. Thermal shutdown hysteresis assures that the device is released from the TSD when the temperature falls to the thermal shutdown hysteresis level by 20 °C.

Current Limit and Short Circuit Protection

At over current conditions, the GLF9900 controls the gate voltage of the main PMOS and starts limiting the output current to 360 mA minimum. As the over-current situations continues, the output current is reduced gradually to ensure the device operating within the safe junction temperature. When the output of the GLF9900 is shorted to ground, the device sets the output current at 400 mA immediately. When the short circuit condition maintains and the junction temperature exceeds the TSD (Thermal Shutdown) threshold, 150 °C, the GLF9900 is turned off immediately. After the junction temperature cools down below the TSD hysteresis, the GLF9900 resumes normal operation.

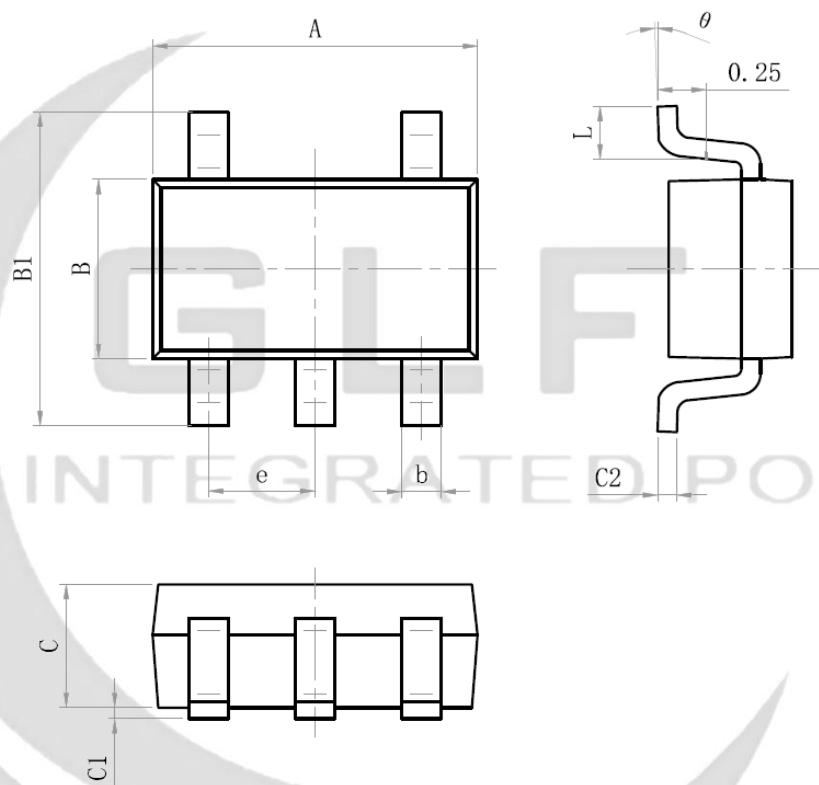
Board Layout

All traces should be as short as possible to minimize parasitic inductance effects. Wide traces for VIN, VOUT, and GND will help reduce signal degradation and parasitic effects during dynamic operation as well as improve the thermal performance at high load current.

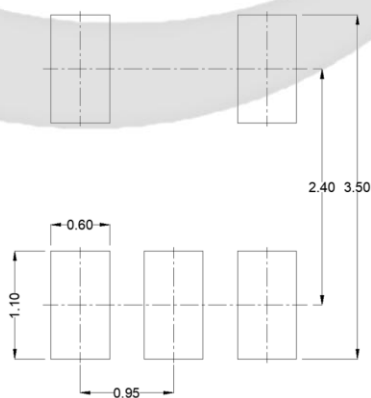
PACKAGE OUTLINE

SOT23-5L

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°

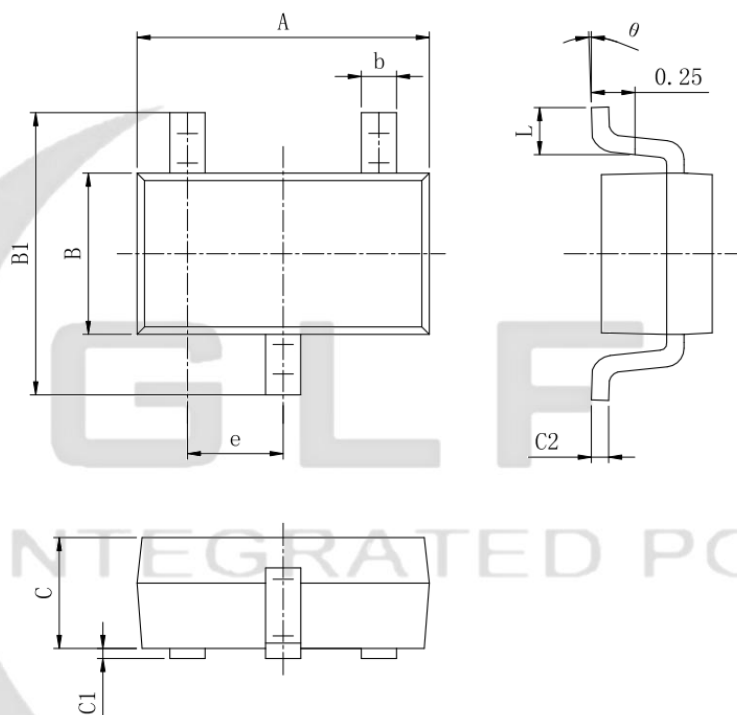


Recommended Footprint

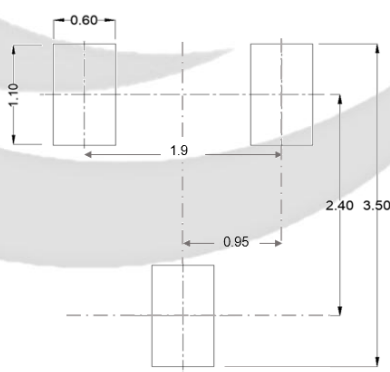


SOT23-3L

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

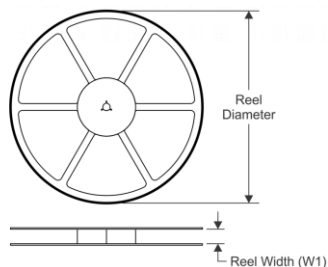


PACKAGING INFORMATION

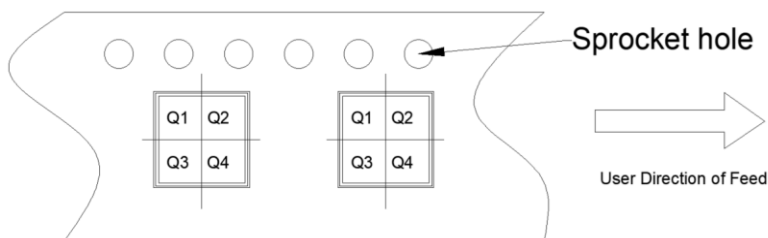
Part Number	Package	Pins	Top Mark	Moisture Sensitivity Level	Environmental Information
GLF9900-33T1G7	SOT23-5L	5	HK	MSL3	ROHS+HF
GLF9900-33T3G7	SOT23-3L	3	HJ		

TAPE AND REEL INFORMATION

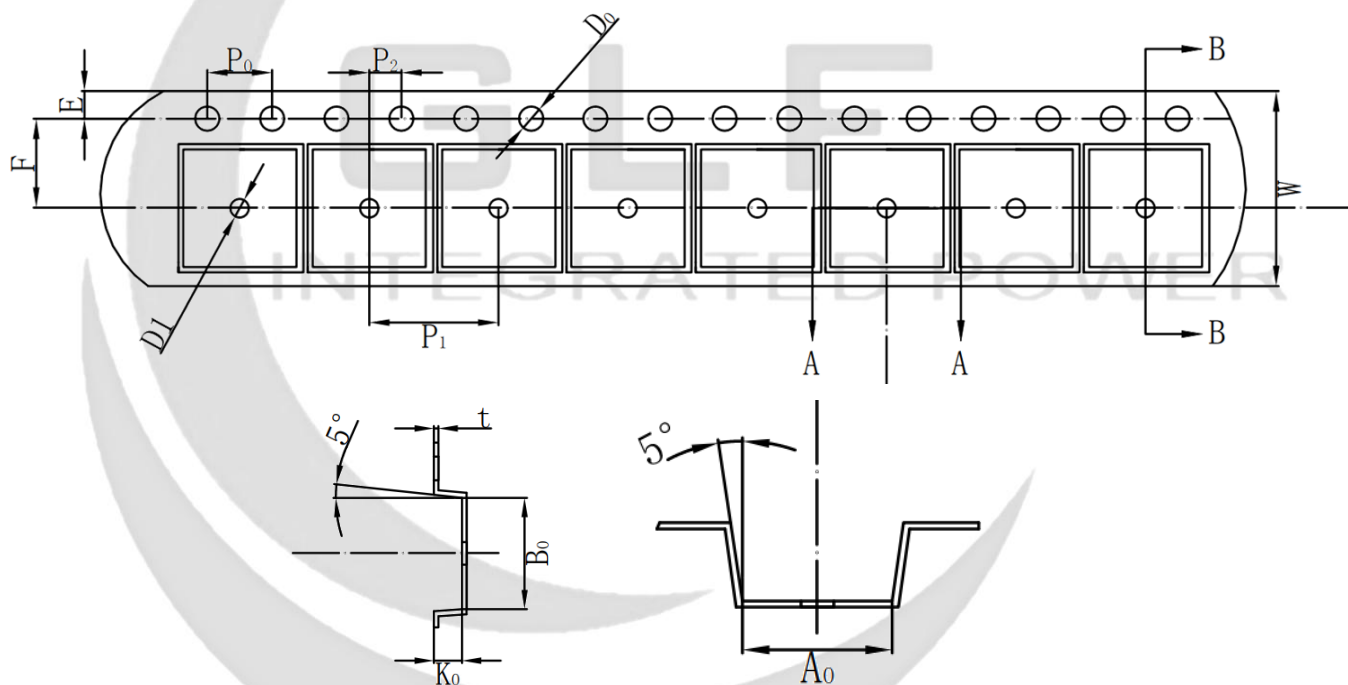
REEL DIMENSIONS



QUADRANT ASSIGNMENTS PIN 1 ORIENTATION TAPE



TAPE DIMENSIONS



Device	Package	Pins	SPQ	Reel Diameter (mm)	Reel Width W1	A0	B0	K0	P1	W	Pin1
GLF9900-33T1G7	SOT23-5L	5	3000	178	9	3.25	3.30	1.38	4	8	Q3
GLF9900-33T3G7	SOT23-3L	3	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

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 anticipated production performance characteristics of the device.	Production

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