GLF2351B, GLF2353B

2.5 A, High Precision Current Limit Power Switch

Product Specification

DESCRIPTION

The GLF2351B and GLF2353B are advanced technology fully integrated power switch for applications required precision output current limiting. The GLF2351B and GLF2353B features also various protection functions such as under voltage lockout, reverse current blocking (RCB), short circuit protection, and thermal shutdown.

The GLF2351B and GLF2353B provide a built-in output voltage slew rate control to limit the inrush current and voltage surges. The FLGB output pin can be used to send a signal of fault events to the system controller. The integrated thermal shutdown (TSD) insures complete protection for the switch during output current limit and short circuit conditions. The GLF2351B and GLF2353B are ideal switch for USB power supply.

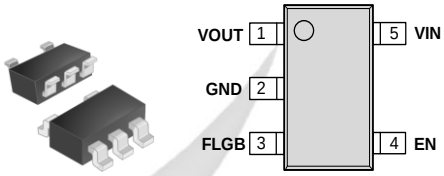
FEATURES

- Input Range: 2.5 V to 5.5 V
- Fixed Constant Output Current Limit, 2.55 A Typ
- Low R_{ON}: 40 mΩ Typ. at 5 V_{IN}, GLF2351B
  53 mΩ Typ. at 5 V_{IN}, GLF2353B
- Ultra-Low I_Q: 17 μA Typ. at 5 V_{IN}
- Ultra-Low I_{SD}: 60 nA Typ. at 5 V_{IN}
- Under Voltage Lockout Protection
- Output Voltage Slew Rate Control
- Reverse Current Blocking Protection
- Short Circuit Protection
- Deglitched Fault Flag Indication
- Integrated Output Discharge Switch
- Thermal Shutdown Protection
- IEC 62368-1: 2018 CB Certification
  No. SG SGS-00506

APPLICATIONS

- USB ports
- Notebooks
- Telecom Systems

PACKAGE

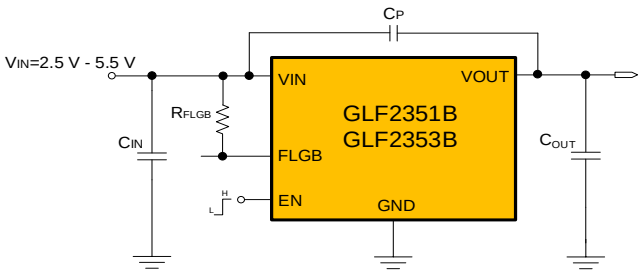


SOT23-5L

DEVICE ORDERING INFORMATION

Part Number	Top Mark	Ron (Typ) at 5V	Current Limit ILIM	Short Circuit Protection behavior	Output Discharge	EN Activity	Package
GLF2351B-T1G7	JF	40 mΩ	2.55 A Fixed	Latch off	300 Ω	High	SOT23-5L
GLF2353B-T1G7	GN	53 mΩ		Auto retry	97 Ω	High	SOT23-5L

APPLICATION DIAGRAM



Note: Cp = 1 μF is recommended to mitigate electrical noises when load current changes abruptly.

Figure 1. Typical Application

FUNCTIONAL BLOCK DIAGRAM

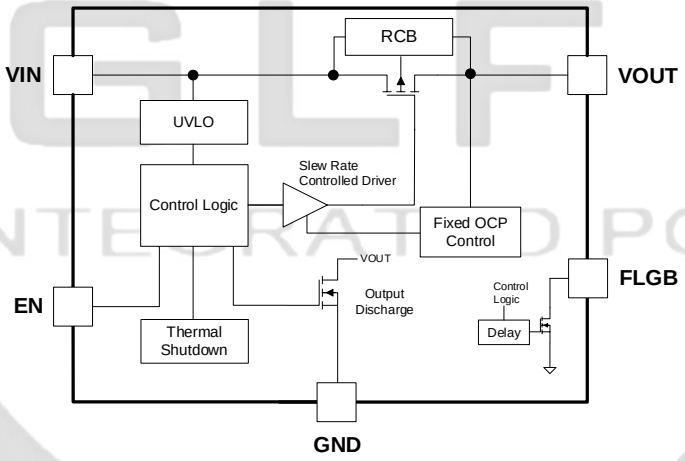


Figure 2. Functional Block Diagram

PIN CONFIGURATION

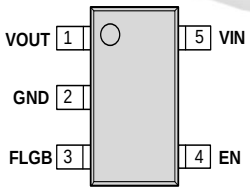


Figure 3. Package and Pin configuration

PIN DEFINITION

Pin #	Name	Description
1	VOUT	Switch Output
2	GND	Ground
3	FLGB	Flag pin goes low to indicate OCP, SCP, RCB, UVLO and TSD fault conditions
4	EN	Active high switch output enables 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 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}, V_{OUT}, V_{EN}	V_{IN}, V_{OUT}, V_{EN} to GND		- 0.3	6	V
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	± 8		kV
		Charged Device Model, JESD22-C101	± 2		

ELECTRICAL CHARACTERISTICS

Values are at V_{IN} = 5.0 V and T_A = 25 °C. Unless otherwise noted

Symbol	Parameter	Conditions		Min.	Typ.	Max.	Units
Basic Operation							
V_{IN}	Supply Voltage			2.5		5.5	V
I_Q	Quiescent Current	V_{EN}= High, I_{OUT}= 0 mA			17	25	µA
I_{SD}	Shutdown Current	V_{EN}= Low, I_{OUT}= 0 mA			60	100	nA
R_{ON}	On-Resistance	V_{IN}= 5.0 V, I_{OUT}= 500 mA, GLF2351B	T_A= 25 °C		40	50	mΩ
			T_A= 85 °C (1)		48		
		V_{IN}= 3.3 V, I_{OUT}= 500 mA, GLF2351B	T_A= 25°C		46	56	
			T_A= 85 °C (1)		55		
		V_{IN}= 5.0 V, I_{OUT}= 500 mA, GLF2353B	T_A= 25 °C		53	61	
			T_A= 85 °C (1)		61		
		V_{IN}= 3.3 V, I_{OUT}= 500 mA, GLF2353B	T_A= 25 °C		60	66	
			T_A= 85 °C (1)		68		
R_{DSC}	Output Discharge Resistance	V_{EN}= Low , I_{FORCE}= 10 mA, GLF2351B			300		Ω
		V_{EN}= Low , I_{FORCE}= 10 mA, GLF2353B			97	120	
V_{IH}	EN Input Logic High Voltage	V_{IN}= 2.5 V to 5.5 V		1.2			V
V_{IL}	EN Input Logic Low Voltage	V_{IN}= 2.5 V to 5.5 V				0.6	V
R_{EN}	EN pull down resistance	Internal Resistance, GLF2351B			10	13	MΩ
I_{EN}	EN Source or Sink Current	V_{EN}= 5.5 V, GLF2351B			0.5	0.8	µA
V_{FLGB}	FLGB Output Low Voltage	I_{FLGB}= 0.5 mA				100	mV
I_{FLGB}	FLGB Output High Leakage	V_{FLGB}= 5.5 V				50	nA
t_{FLGB}	FLGB Output Delay Time (1)	Delay time for assertion at over current			8		ms
		Delay time for assertion at short circuit and thermal shutdown conditions			120		µs
Protection							
V_{UVLO}	Under Voltage Lockout Voltage	Input Rising			2.3		V
		Input Falling			2.1		V
I_{LIM}	Over Current Limit			2.35	2.55	2.75	A
I_{SC}	Short Circuit Current Detection (1)				4.6		A
V_{RCB_TH}	Reverse Current Blocking Protection Trip Voltage	V_{OUT} - V_{IN}			35		mV
V_{RCB_RL}	Reverse Current Blocking Protection Release Voltage	V_{IN} - V_{OUT}			22		mV
I_{RCB}	Reverse Current Blocking Protection Leakage	V_{OUT} – V_{IN} > V_{RCB}				1	µA
TSD	Thermal Shutdown Threshold				140		°C
Hyst	Thermal Shutdown Release Hysteresis				20		°C

ELECTRICAL CHARACTERISTICS (Continued)

Values are at V_{IN} = 5.0 V and T_A = 25 °C. Unless otherwise noted

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Units
Switching Characteristics (2)						
t_{dON}	Turn-On Delay	R_{OUT}= 150 Ω, C_{OUT}= 1.0 µF		160		µs
t_R	V_{OUT} Rise Time			590		
t_{dOFF}	Turn-Off Delay			16		
t_F	V_{OUT} Fall Time	R_{OUT}= 150 Ω, C_{OUT}= 1.0 µF, GLF2351B		200		
		R_{OUT}= 150 Ω, C_{OUT}= 1.0 µF, GLF2353B		118		

Notes: 1. By design; characterized; not production tested.
2. Switching Timing Diagram.

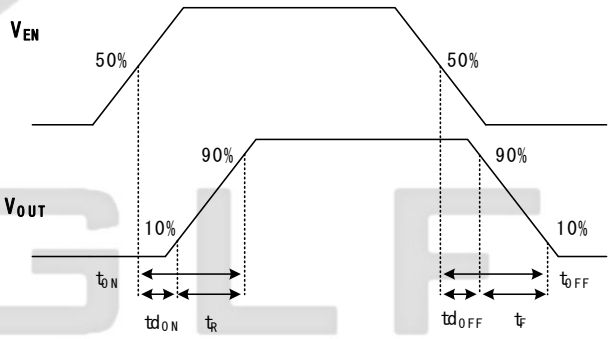


Figure 4. Switching Timing Diagram

TYPICAL PERFORMANCE CHARACTERISTICS

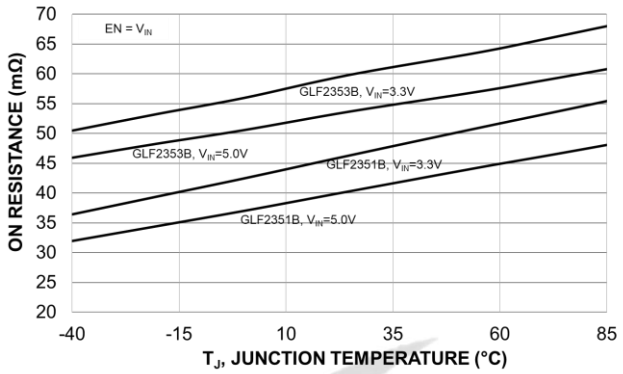


Figure 5. On-Resistance vs. Temperature

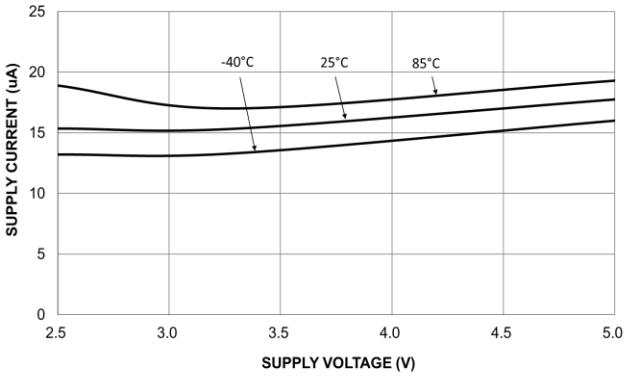


Figure 6. Quiescent Current vs. Supply Voltage

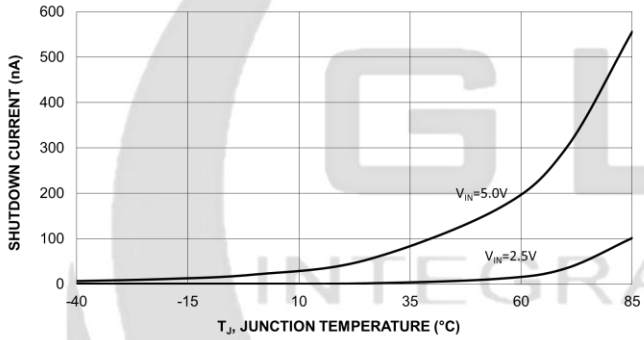


Figure 7. Shutdown Current vs. Temperature

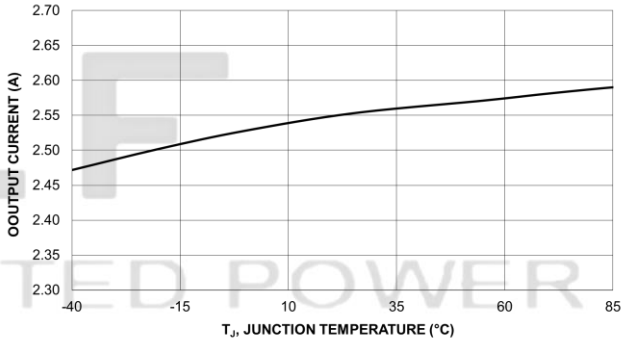


Figure 8. Over Current Limit vs. Temperature

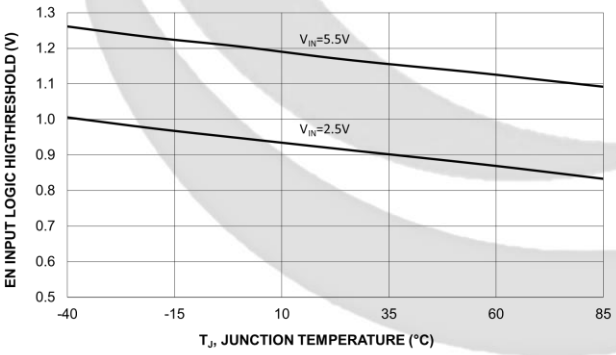


Figure 9. EN Input Logic High Threshold

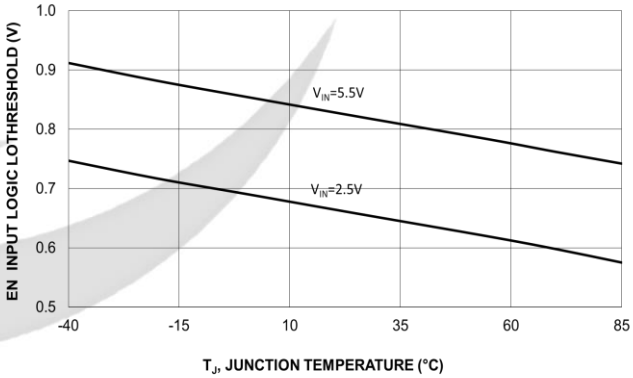


Figure 10. EN Input Logic Low Threshold

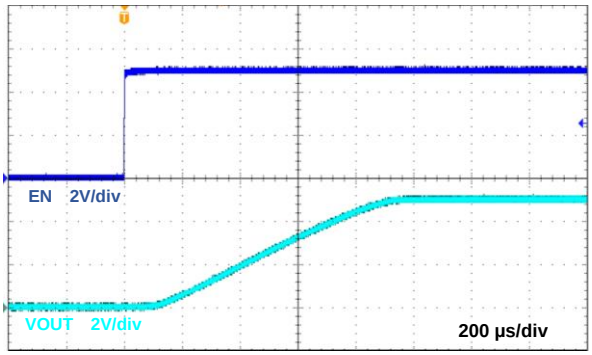


Figure 11. Turn-On Response, GLF2351B
V_{IN}=5.0 V, C_{IN}=C_{OUT}=1.0 µF, R_L=150 Ω

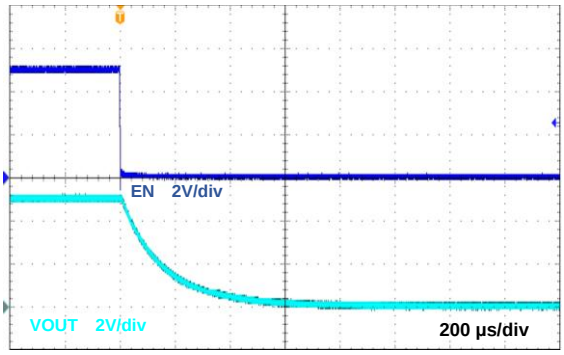


Figure 12. Turn-Off Response, GLF2351B
V_{IN}=5.0 V, C_{IN}=C_{OUT}=1.0 µF, R_L=150 Ω

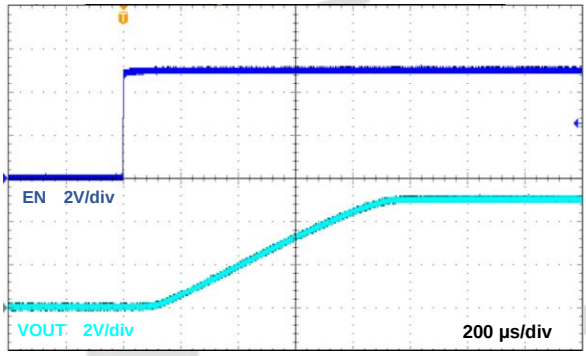


Figure 13. Turn-On Response, GLF2353B
V_{IN}=5.0 V, C_{IN}=C_{OUT}=1.0 µF, R_L=150 Ω

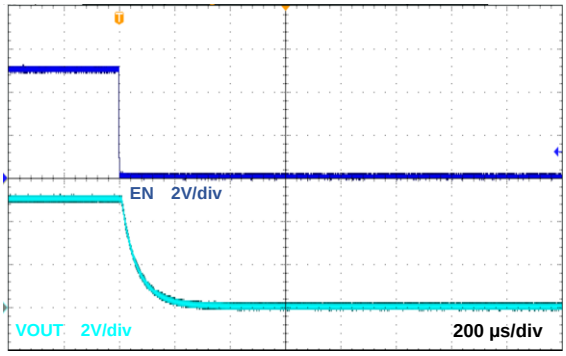


Figure 14. Turn-Off Response, GLF2353B
V_{IN}=5.0 V, C_{IN}=C_{OUT}=1.0 µF, R_L=150 Ω

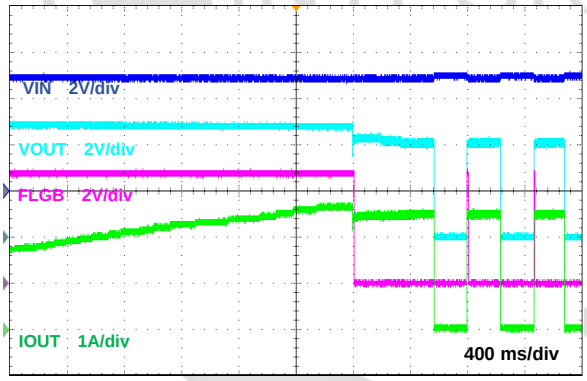


Figure 15. Current Limit Response
V_{IN}=5.0 V, C_{IN}=C_{OUT}=1.0 µF

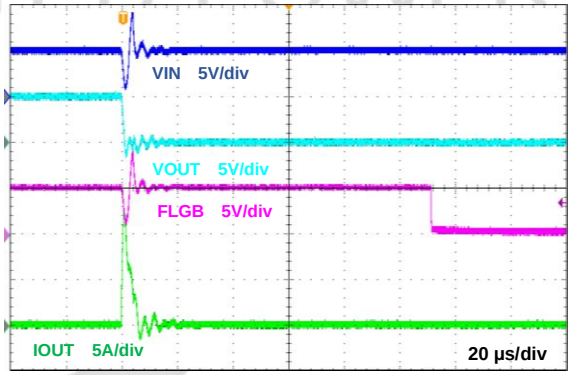


Figure 16. Short Circuit Response, GLF2351B
V_{IN}=5.0 V, C_{IN}=C_{OUT}=1.0 µF, R_L=0 Ω

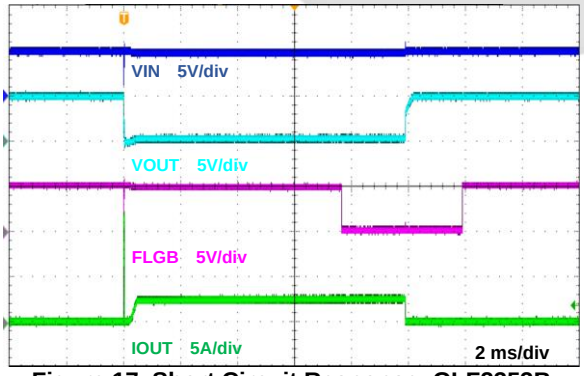


Figure 17. Short Circuit Response, GLF2353B
V_{IN}=5.0 V, C_{IN}=C_{OUT}=1.0 µF

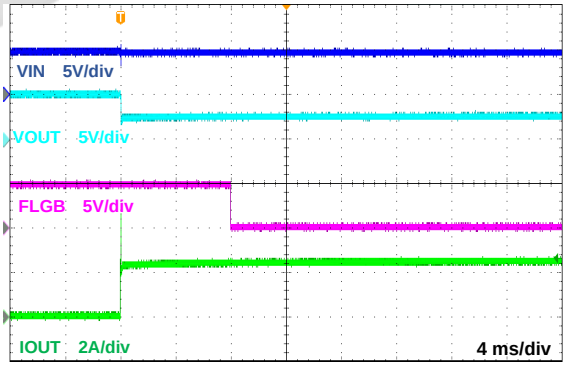


Figure 18. FLGB Response with OCP
V_{IN}=5.0 V, C_{IN}=C_{OUT}=1.0 µF

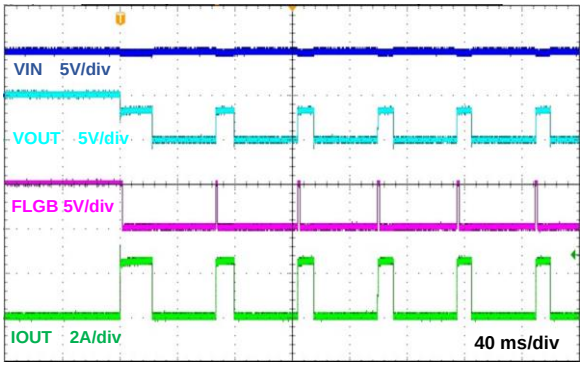


Figure 19. Thermal Shutdown Response
V_{IN}=5.0 V, C_{IN}=C_{OUT}=1.0 µF

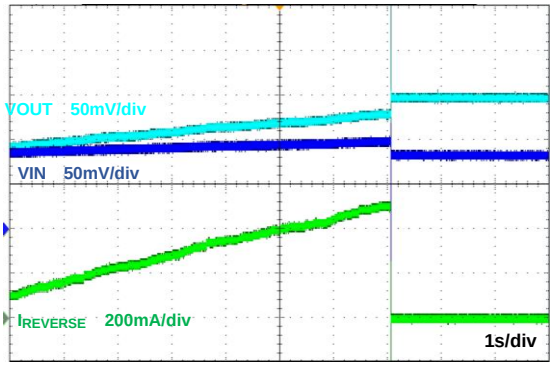


Figure 20. Reverse Current Blocking Threshold
V_{IN}=3.3 V, V_{OUT}=Up to 3.4 V, C_{IN}=C_{OUT}=1.0 µF

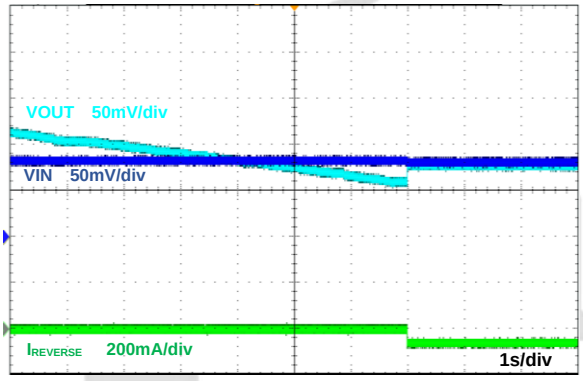


Figure 21. Reverse Current Blocking Release
V_{IN}=3.3 V, V_{OUT}=Down to 3.2 V, C_{IN}=C_{OUT}=1.0 µF

APPLICATION INFORMATION

The GLF2351B and GLF2353B are advanced technology fully integrated power switch for applications required for precision output current limiting. It features also various protection functions such as under voltage lockout, reverse current blocking (RCB), short circuit protection, and thermal shutdown.

Current Limiting and Short Circuit Protection

The GLF2351B and GLF2353B limit the output current at 2.55 A at an output over current condition. During the constant current-limit condition, the junction temperature of the GLF2351B and GLF2353B increases. The thermal shutdown protection (TSD) turns off the device when the junction temperature exceeds 140 °C. As the junction temperature cools down to 120 °C, the device is turned on again. The short circuit protection GLF2351B will take action immediately to shut down the device once a short circuit on the output node is detected. The device remains off until power is cycled or the EN pin is toggled. The short circuit protection GLF2353B enter the Auto retry logic until the short circuit is removed, the VOUT will automatically return to normal.

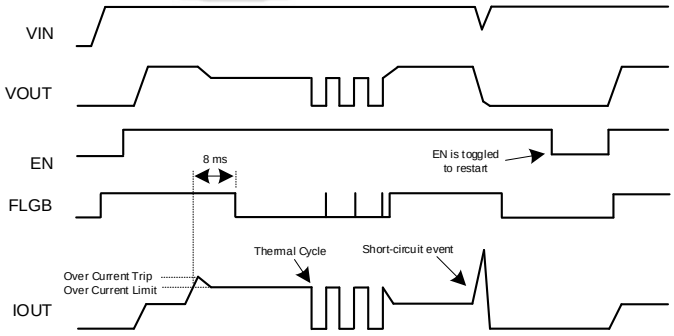


Figure 22. Over Current and Short Circuit Protection, GLF2351B

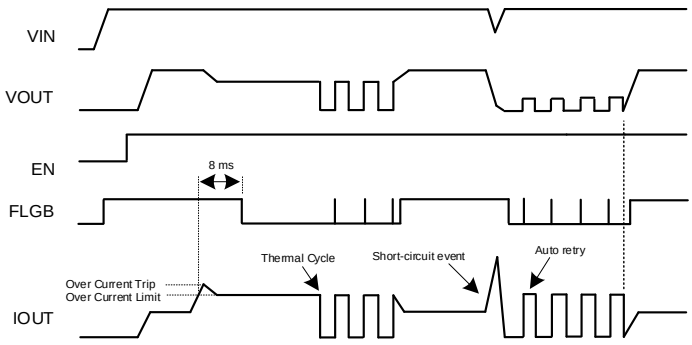


Figure 23. Over Current and Short Circuit Protection, GLF2353B

Reverse Current Blocking

The GLF2351B and GLF2353B have 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 reverse current blocking protection threshold voltage (V_{RCB_TH}), the reverse current blocking function block turns off the switch. Note that some reverse current can occur until the V_{RCB_TH} is triggered. The main switch will resume normal operation when the output voltage drops below the input source by the reverse current blocking protection release voltage (V_{RCB_RL}).

Fault Flag Response

The output of the open drain FLGB pin goes active low for any of following fault conditions: output current limit, output short-circuit, reverse current blocking, or thermal shutdown. The GLF2351B and GLF2353B are designed to avoid false FLGB reporting by using an internal 8 ms deglitch delay for the current limit condition and 120 µs delay for the short circuit and over temperature conditions. The FLGB output remains low until over-current or over-temperature condition is removed. When short circuit fault conditions occur, the device is latched-off and the FLGB output remains low. The FLGB signal is de-asserted once device power is cycled or the EN pin is toggled and the device resumes normal operation.

EN pin

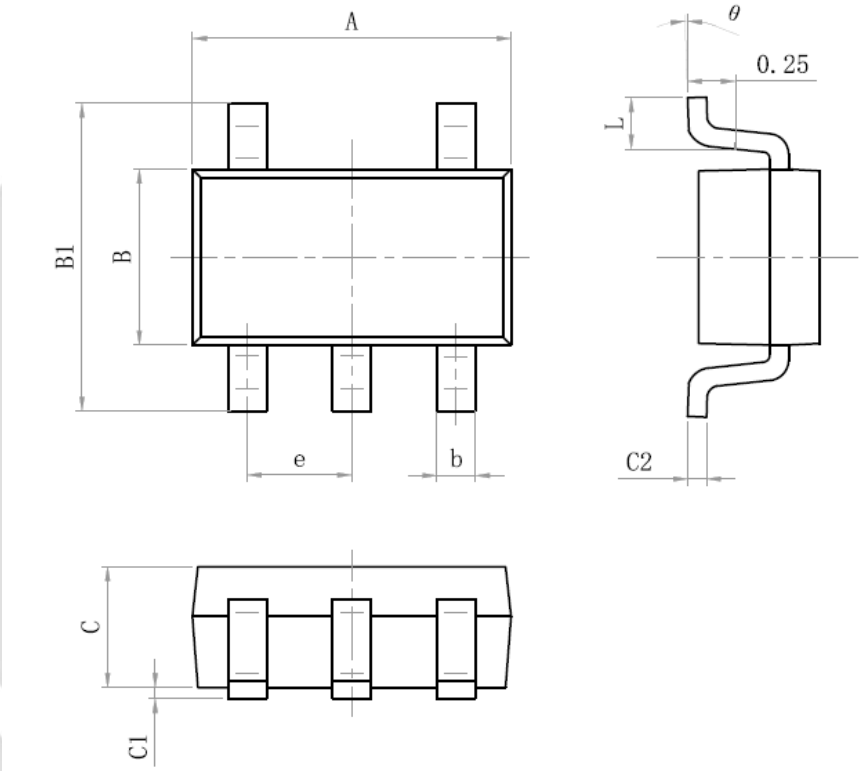
The GLF2351B and GLF2353B can be activated by EN pin high. Only GLF2351B has an internal pull-down resistor on the EN pin to maintain a reliable status without a signal from an external controller.

Input and Output Capacitor

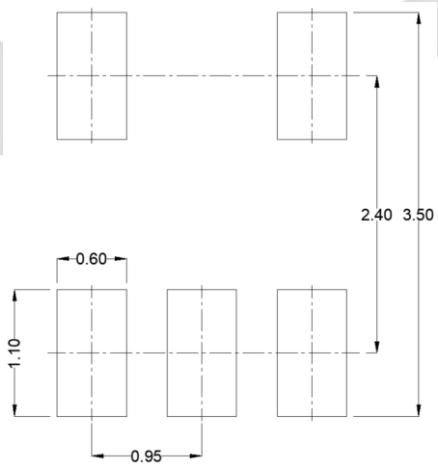
A minimum 1 µF input capacitor is recommended to be placed close to the V_{IN} pin to reduce the voltage drop on the input power rail caused by transient inrush current at start-up. A higher input capacitor value can be used to further attenuate the input voltage drop. Also, a minimum 1 µF output capacitor 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.

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°

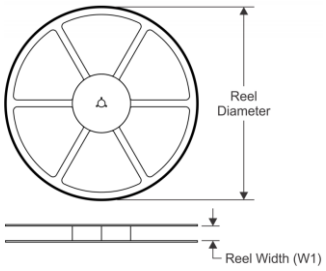


Recommended Footprint

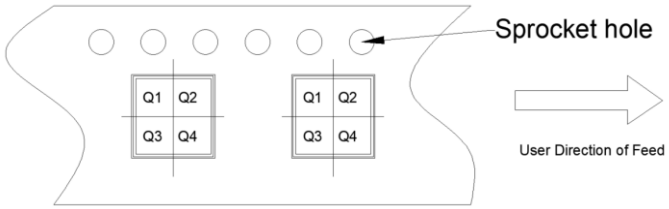


TAPE AND REEL INFORMATION

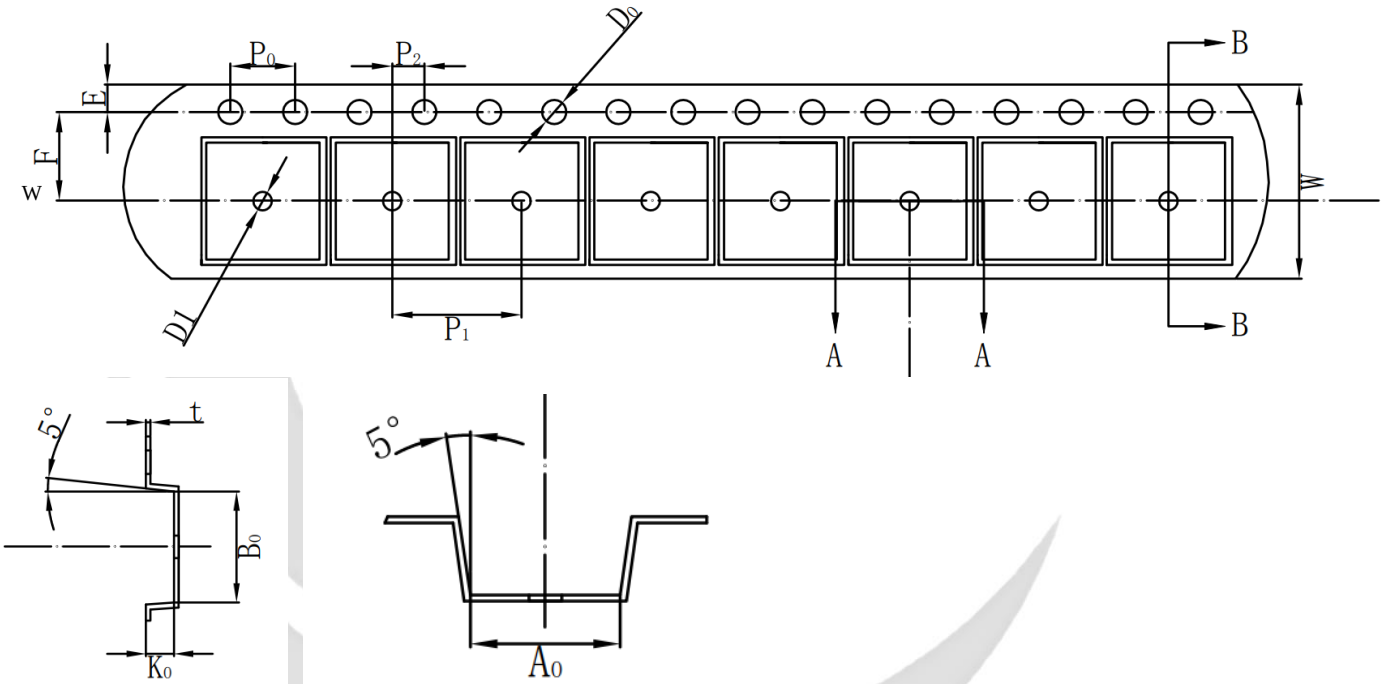
REEL DIMENSIONS



QUADRANT ASSIGNMENTS PIN 1 ORIENTATION TAPE



TAPE DIMENSIONS



Device	Package	Pins	SPQ	Reel Diameter (mm)	Reel Width W1	A0	B0	K0	P1	W	Pin1
GLF2351B-T1G7	SOT23-5	5	3000	178	9	3.25	3.30	1.38	4	8	Q3
GLF2353B-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. 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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