High-side Power Switch with Diagnostic Function and Built-in Zener Diode SI-5153S

Features

- Built-in diagnostic function to detect short and open circuiting of loads and output status signals
- Low saturation PNP transistor use
- Allows direct driving using LS-TTL and C-MOS logic levels
- Built-in overcurrent and thermal protection circuits
- Built-in protection against reverse connection of power supply
- Tj = 150ºC guaranteed
- Built-in Zener diode
- TO-220 equivalent full-mold package not require insulation mica

Absolute Maximum Ratings (Ta=25ºC)

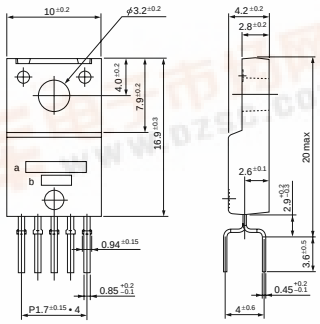
Parameter	Symbol	Ratings	Unit	Conditions
Power supply voltage	V_B	–13 to +40	V	
Input terminal voltage	V_{IN}	–0.3 to V_B	V	
DIAG terminal voltage	V_{DIAG}	6	V	
Collector-emitter voltage	V_{CE}	V_B — V_Z	V	Refer to "Surge clamp voltage" in Electrical Characteristics
Output current	I_O	2.04	A	
Power Dissipation	P_{D1}	22	W	With infinite heatsink (Tc=25ºC)
	P_{D2}	1.8	W	Stand-alone without heatsink
Junction temperature	Tj	–40 to +150	ºC	
Operating temperature	T_{OP}	–40 to +100	ºC	
Storage temperature	Tstg	–40 to +150	ºC	

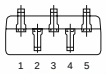
Electrical Characteristics (Ta=25ºC unless otherwise specified)

Parameter		Symbol	Ratings min	Ratings typ	Ratings max	Unit	Conditions
Operating power supply voltage		V_{Bopr}	6.0		30	V	
Quiescent circuit current		Iq		5	12	mA	V_{Bopr}=14V, V_{IN}=0V
Saturation voltage of output transistor		$V_{CE\,(sat)}$			0.47	V	I_O≦2.05A, V_{Bopr}=6 to 16V
Output leak current		$I_{O,\,leak}$			2	mA	V_{CEO}=16V, V_{IN}=0V
Input voltage	Output ON	V_{IH}	2.0		V_B	V	V_{Bopr}=6 to 16V
	Output OFF	V_{IL}	–0.3		0.8	V	V_{Bopr}=6 to 16V
Input current	Output ON	I_{IH}			1	mA	V_{IN}=5V
	Output OFF	I_{IL}	–0.1			mA	V_{IN}=0V
Overcurrent protection starting current		I_S	2.05			A	V_{Bopr}=14V, V_O=V_{Bopr}–1.5V
Thermal protection starting temperature		T_{TSD}	150			ºC	V_{Bopr}≧6V
Open load detection resistor		Ropen			30	kΩ	V_{Bopr}=6 to 16V
Output transfer time		T_{ON}		8	30	µS	V_{Bopr}=14V, I_O=1A
		T_{OFF}		15	30	µS	V_{Bopr}=14V, I_O=1A
DIAG output voltage		V_{DH}	4.5		6	V	V_{CC}=6V, V_{Bopr}=6 to 16V
		V_{DL}			0.3	V	V_{CC}=6V, V_{Bopr}=6 to 16V, I_{DO}=2mA
DIAG output transfer time		T_{PLH}			30	µS	V_{Bopr}=14V, I_O=1A
		T_{PHL}			30	µS	V_{Bopr}=14V, I_O=1A
Minimum load inductance		L	1			mH	
Surge clamp voltage	*1	V_Z	28	34	40	V	I_C=5mA

Note:
*1. The Zener diode for surge clamping has an energy capability of 140 mJ (single pulse).
* The rule of protection against reverse connection of power supply is V_B= –13V, one minute.
* This driver is exclusively used for ON/OFF control.

External Dimensions (unit: mm)



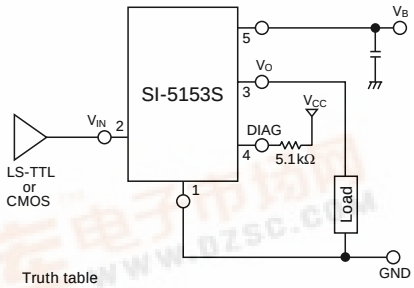


1. GND
2. V_{IN}
3. V_O
4. DIAG
5. V_B

a: Type No.
b: Lot No.

(Forming No. 1111)

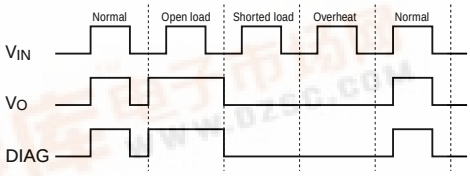
Standard Circuit Diagram



Truth table

V_{IN}	V_O
H	H
L	L

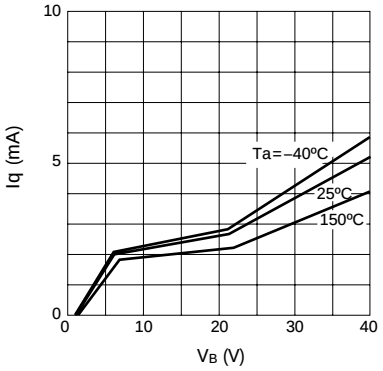
Diagnostic Function



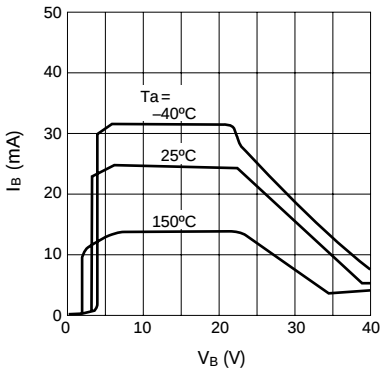
Mode	V_{IN}	V_O	DIAG
Normal	L H	L H	L H
Open load	L H	H H	H H
Shorted load	L H	L L	L L
Overheat	L H	L L	L L

● DIAG output will be undetermined when a voltage exceeding 25V is applied to V_B terminal.

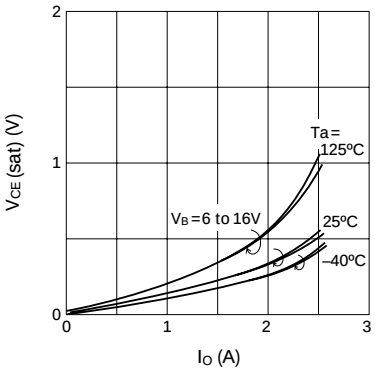
■ Quiescent Circuit Current



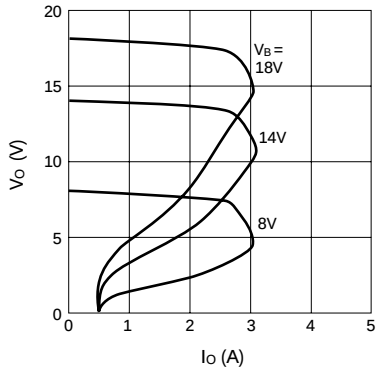
■ Circuit Current



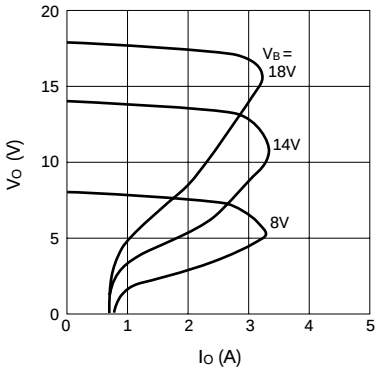
■ Saturation Voltage of Output Transistor



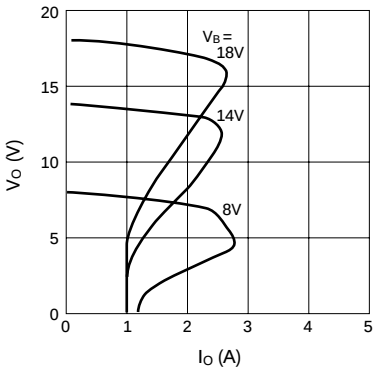
■ Overcurrent Protection Characteristics (Ta=–40ºC)



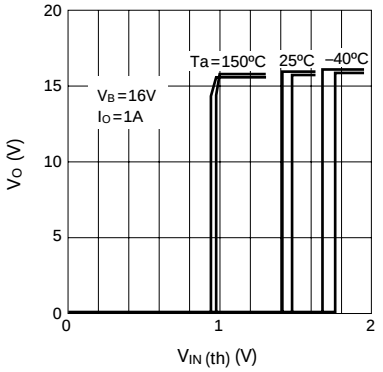
■ Overcurrent Protection Characteristics (Ta=25ºC)



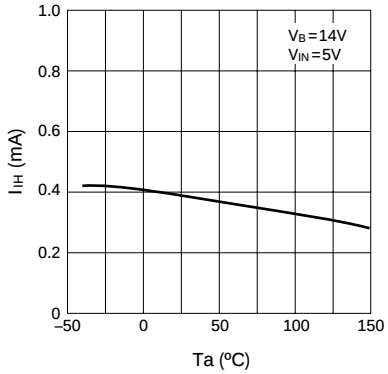
■ Overcurrent Protection Characteristics (Ta=125ºC)



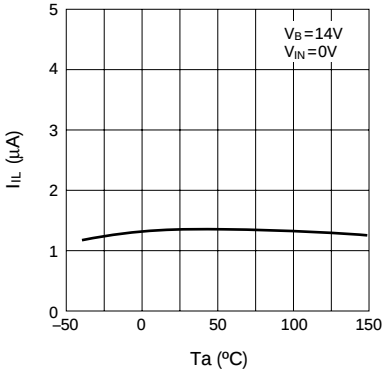
■ Threshold Characteristics of Input Voltage



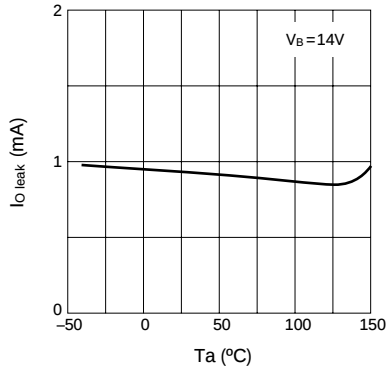
■ Input Current (Output ON)



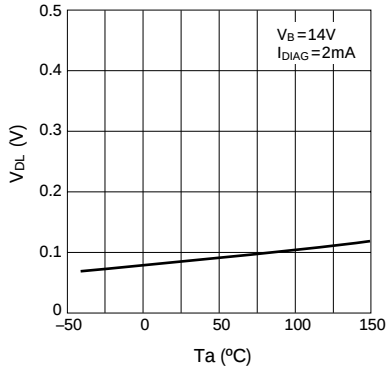
■ Input Current (Output OFF)



■ Output Terminal Leak Current



■ Saturation Voltage of DIAG Output



■ Thermal Protection Characteristics