## 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
- TO220 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 |

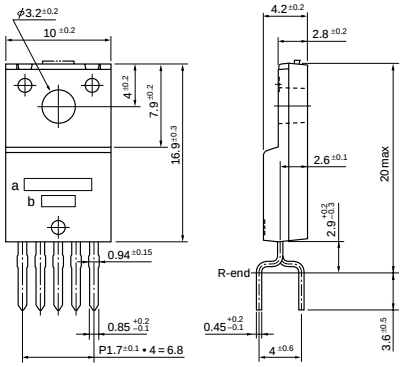
Note:

*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)

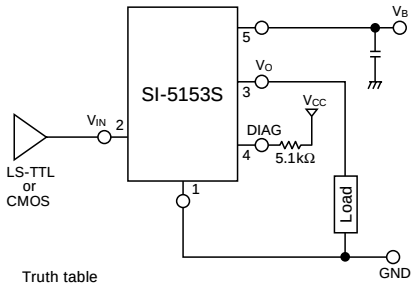



1. GND
2. $V_{IN}$
3. $V_O$
4. DIAG
5. $V_B$

a: Part No.
b: Lot No.

(Forming No. 1123)

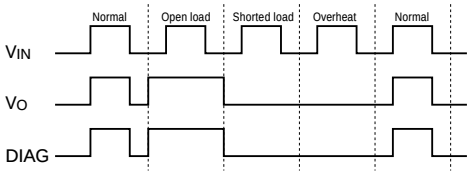
## Standard Circuit Diagram




Truth table

| $V_{IN}$ | $V_O$ |
|---|---|
| H | H |
| L | L |

## Diagnostic Function

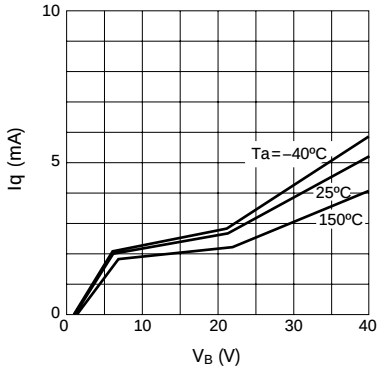



| Mode | $V_{IN}$ | $V_O$ | DIAG |
|---|---|---|---|
| Normal | L<br>H | L<br>H | L<br>H |
| Open load | L<br>H | H<br>H | H<br>H |
| Shorted load | L<br>H | L<br>L | L<br>L |
| Overheat | L<br>H | L<br>L | L<br>L |

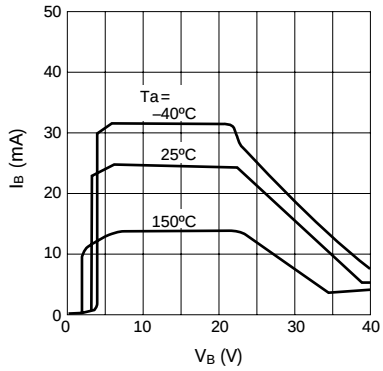
● DIAG output will be undetermined when a voltage exceeding 25V is applied to $V_B$ terminal.

## Electrical Characteristics

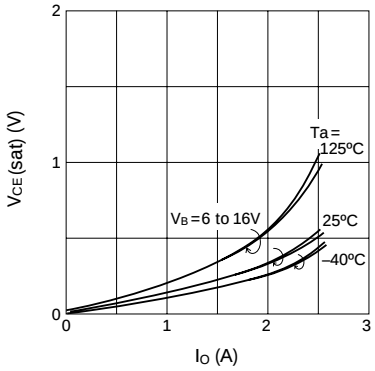
■ Quiescent Circuit Current



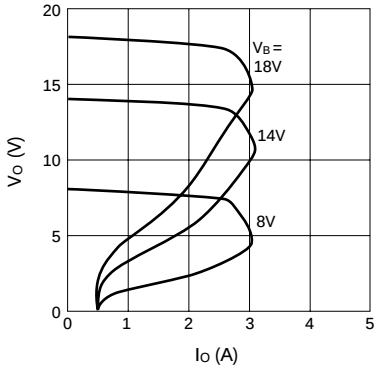

■ Circuit Current



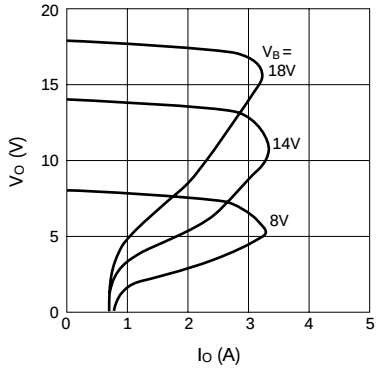

■ Saturation Voltage of Output Transistor



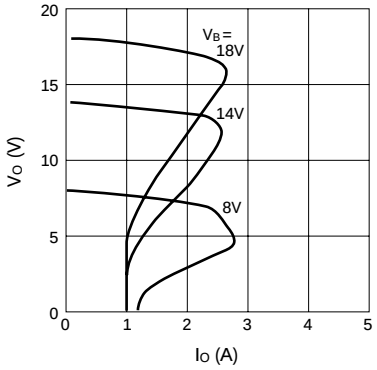

■ Overcurrent Protection Characteristics (Ta=–40ºC)



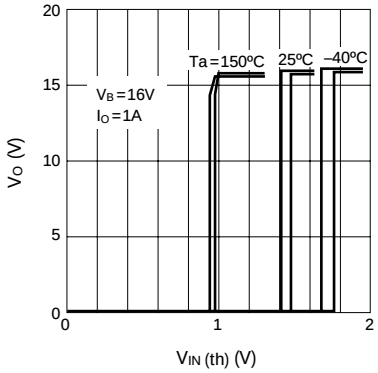

■ Overcurrent Protection Characteristics (Ta=25ºC)



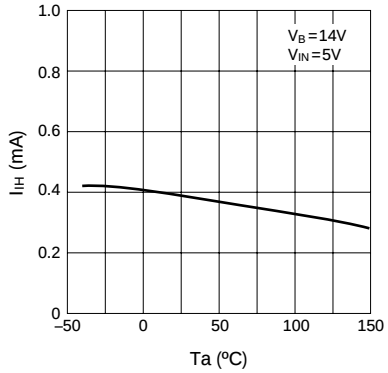

■ Overcurrent Protection Characteristics (Ta=125ºC)



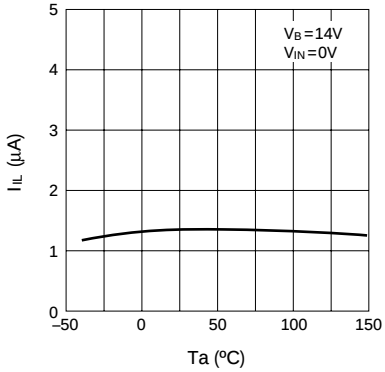

■ Threshold Characteristics of Input Voltage



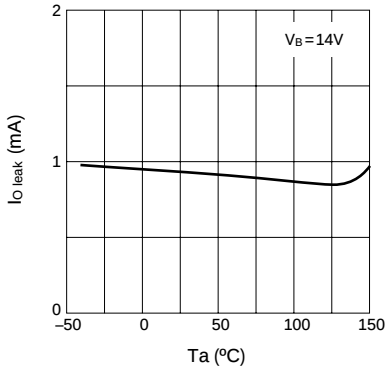

■ Input Current (Output ON)



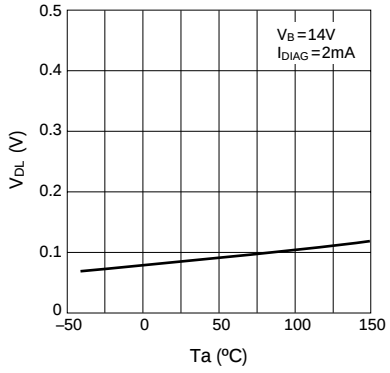

■ Input Current (Output OFF)




■ Output Terminal Leak Current




■ Saturation Voltage of DIAG Output




■ Thermal Protection Characteristics