

# Surface-mount Dual Circuit High-side Power Switch Array SDH04

## 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
- $T_j = 150^\circ\text{C}$  guaranteed
- Surface-mount full-mold package

## Absolute Maximum Ratings

( $T_a = 25^\circ\text{C}$ )

Parameter	Symbol	Ratings	Unit	Conditions
Power supply voltage	$V_B$	-13 to +40	V	
Drive terminal applied voltage	$V_D$	-0.3 to $V_B$	V	
Input terminal voltage	$V_{IN}$	-0.3 to +7.0	V	
DIAG output applied voltage	$V_{DIAG}$	-0.3 to +7.0	V	
DIAG output source current	$I_{DIAG}$	3	mA	
Voltage across power supply and drive terminal	$V_{B-D}$	$V_B - 0.4$	V	
Output current	$I_O$	1.5	A	
Power dissipation	$P_D$	2.6	W	Without heatsink, all circuits operating
Junction temperature	$T_J$	-40 to +150	$^\circ\text{C}$	
Operating temperature	$T_{OP}$	-40 to +100	$^\circ\text{C}$	
Storage temperature	$T_{stg}$	-40 to +150	$^\circ\text{C}$	

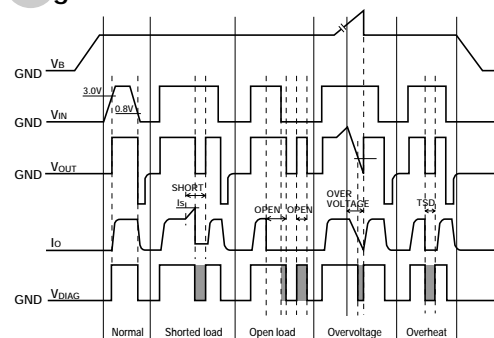
## Electrical Characteristics

( $V_{Bopr} = 14\text{V}$ ,  $T_a = 25^\circ\text{C}$  unless otherwise specified)

Parameter	Symbol	Ratings			Unit	Conditions
		min	typ	max		
Operating power supply voltage	$V_{Bopr}$	6.0		16	V	
Quiescent circuit current	$I_q$		5	12	mA	$I_O$ output
Threshold input voltage	$V_{Inth}$	0.8		3.0	V	
Input current	Hi output	$I_{IN}$		1.0	mA	$V_{IN} = 5\text{V}$
	Lo output	$I_{IN}$	0	100	$\mu\text{A}$	$V_{IN} = 0\text{V}$
Saturation voltage of output transistor	$V_{CE(sat)}$			0.5	V	$I_O \leq 1.0\text{A}$ , $V_{Bopr} = 6$ to $16\text{V}$
Output terminal sink current	$I_{O(off)}$			2.0	mA	$V_O = 0\text{V}$ , $V_{IN} = 0\text{V}$
Saturation voltage of DIAG output	$V_{DL}$			0.3	V	$I_{DIAG} = 3\text{mA}$
Leak current of DIAG output	$I_{DGH}$			100	$\mu\text{A}$	$V_{DIAG} = 5\text{V}$
Open load detection resistor	$R_{open}$	1		30	k $\Omega$	
Overcurrent protection starting current	$I_S$	1.6			A	$V_O = V_{Bopr} - 1.9\text{V}$
Thermal protection starting temperature	$T_{TSD}$	150			$^\circ\text{C}$	$V_{Bopr} \approx 6\text{V}$
Output transfer time	$T_{ON}$		8	30	$\mu\text{s}$	$I_O = 1\text{A}$
	$T_{OFF}$		15	30	$\mu\text{s}$	$I_O = 1\text{A}$
DIAG output transfer time	$T_{PLH}$		10	30	$\mu\text{s}$	$I_O = 1\text{A}$
	$T_{PHL}$		15	30	$\mu\text{s}$	$I_O = 1\text{A}$

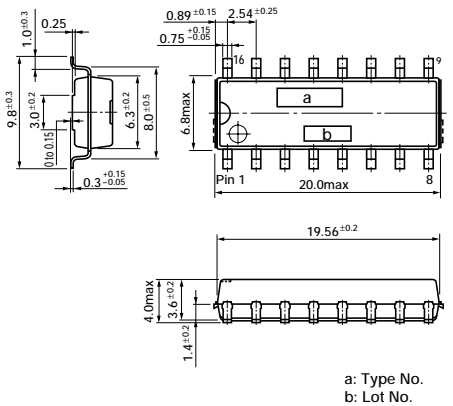
Note: \* The rule of protection against reverse connection of power supply is  $V_B = -13\text{V}$ , one minute (all terminals except,  $V_B$  and GND, are open).

## Diagnostic Function

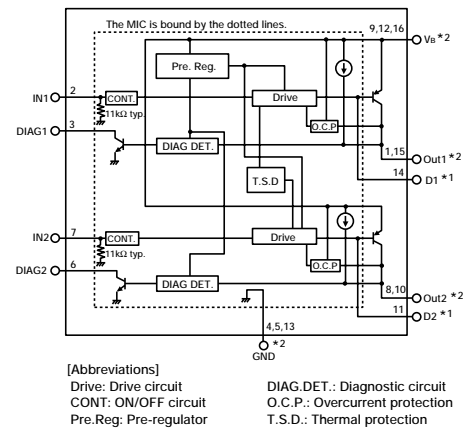


ERROR SIGNAL for CPU

## External Dimensions (unit: mm) SMD-16A



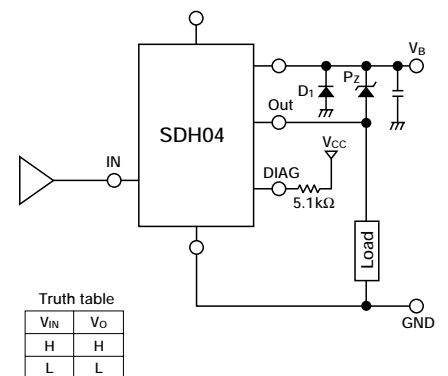
## Equivalent Circuit Diagram



[Abbreviations]  
 Drive: Drive circuit  
 CONT: ON/OFF circuit  
 Pre.Reg: Pre-regulator  
 DIAG.DET.: Diagnostic circuit  
 O.C.P.: Overcurrent protection  
 T.S.D.: Thermal protection

- \*1. The base terminal (D terminal) is connected to the output transistor base. It is also connected to the control monolithic IC. Do not, therefore, apply an external voltage in operation.
- \*2. SDH04 have two or three terminals of the same function ( $V_B$ , Out1, Out2, GND). The terminals of the same function must be shorted at a pattern near the product.

## Standard Circuit Diagram

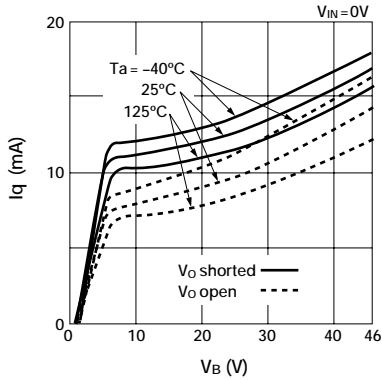


Truth table

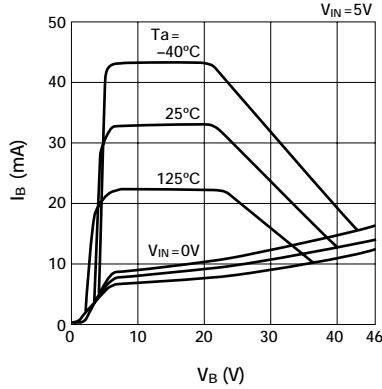
$V_{IN}$	$V_O$
H	H
L	L

Note 1: A pull-down resistor (11 k $\Omega$  typ.) is connected to the IN terminal. Your turns "L" when a high impedance is connected to the IN terminal in series.

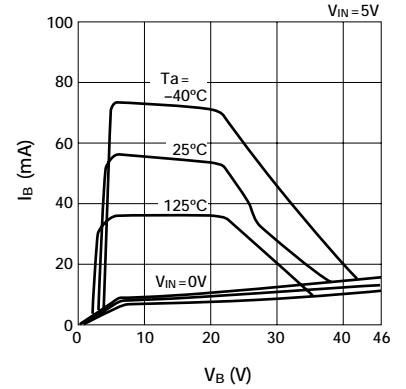
■ Quiescent Circuit Current (dual circuit)



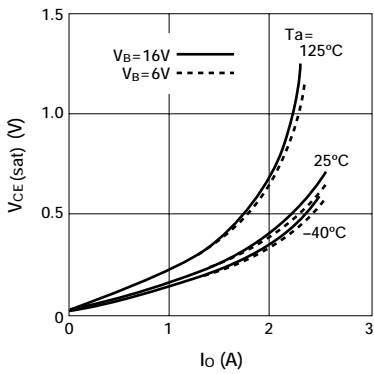
■ Circuit Current (single circuit)



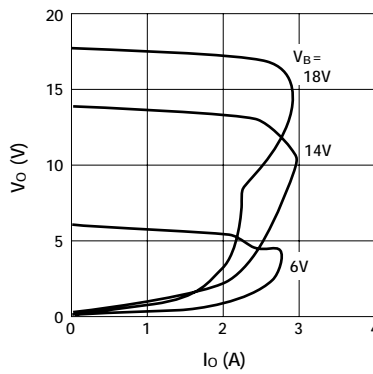
■ Circuit Current (dual circuit)



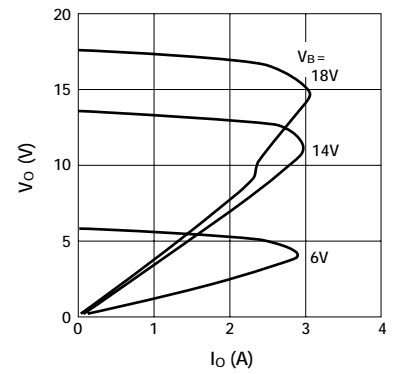
■ Saturation Voltage of Output Transistor



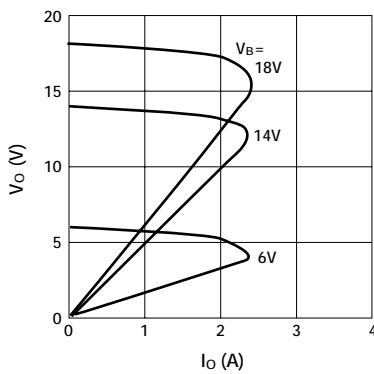
■ Overcurrent Protection Characteristics ( $T_a = -40^\circ C$ )



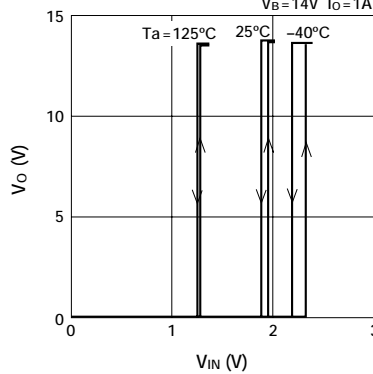
■ Overcurrent Protection Characteristics ( $T_a = 25^\circ C$ )



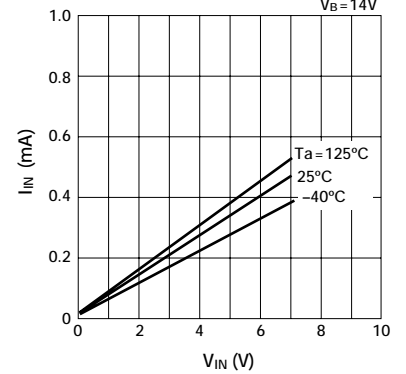
■ Overcurrent Protection Characteristics ( $T_a = 125^\circ C$ )



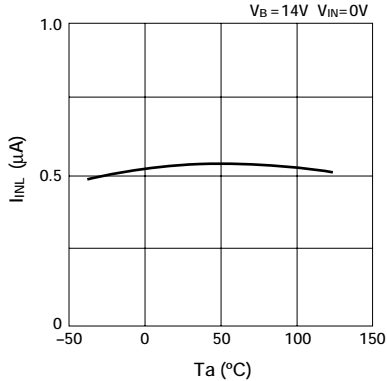
■ Threshold Characteristics of Input Voltage



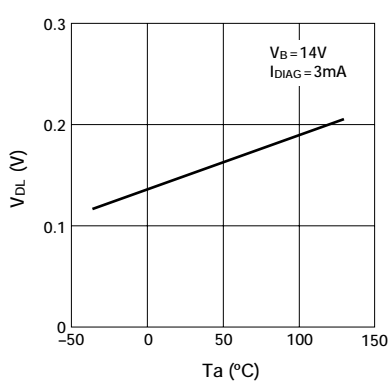
■ Input Terminal Source Current



■ Input Terminal Sink Current



■ Saturation Voltage of DIAG Output



■ Thermal Protection Characteristics

