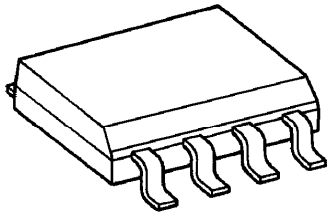
TOSHIBA INTELLIGENT POWER DEVICE
SILICON MONOLITHIC POWER MOS INTEGRATED CIRCUIT

TPD1034F

HIGH-SIDE POWER SWITCH for MOTORS, SOLENOIDS, and LAMP DRIVERS

TPD1034F is a monolithic power IC for high-side switches. The IC has a vertical MOS FET output which can be directly driven from a CMOS or TTL logic circuit (eg, an MPU). The device offers intelligent self-protection and diagnostic functions.



SOP8-P-1.27A

Weight : 0.08 g (Typ.)

FEATURES

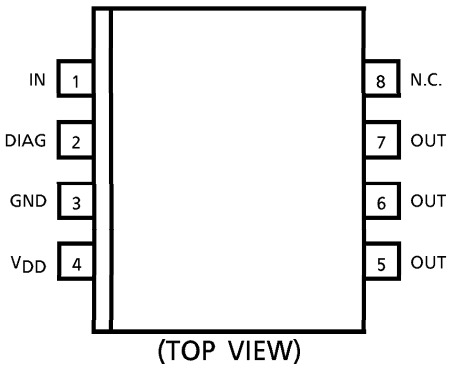
- A monolithic power IC with a new structure combining a control block (Bi-CMOS) and a vertical power MOS FET (π-MOS) on a single chip.
- One side of load can be grounded to a high-side switch.
- Can directly drive a power load from a microprocessor.
- Built-in protection against overheating and load short circuiting.
- Incorporates a diagnosis function that allows diagnosis output to be read externally at load short circuiting, opening, or overheating.
- Up to – 10V of counterelectromotive force from an L load can be applied.
- Low on resistance : R_{ON} = 80 mΩ (Max)
- Low operating current : I_{DD} = 1 mA (Typ.), at V_{DD} = 12 V, V_{IN} = 0
- 8-pin SOP package for surface mounting can be packed in tape.

(Note) : That because of its MOS structure, this product is sensitive to static electricity.

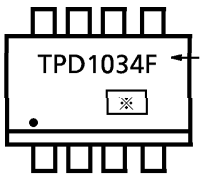
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- The information contained herein is subject to change without notice.

PIN ASSIGNMENT



MARKING

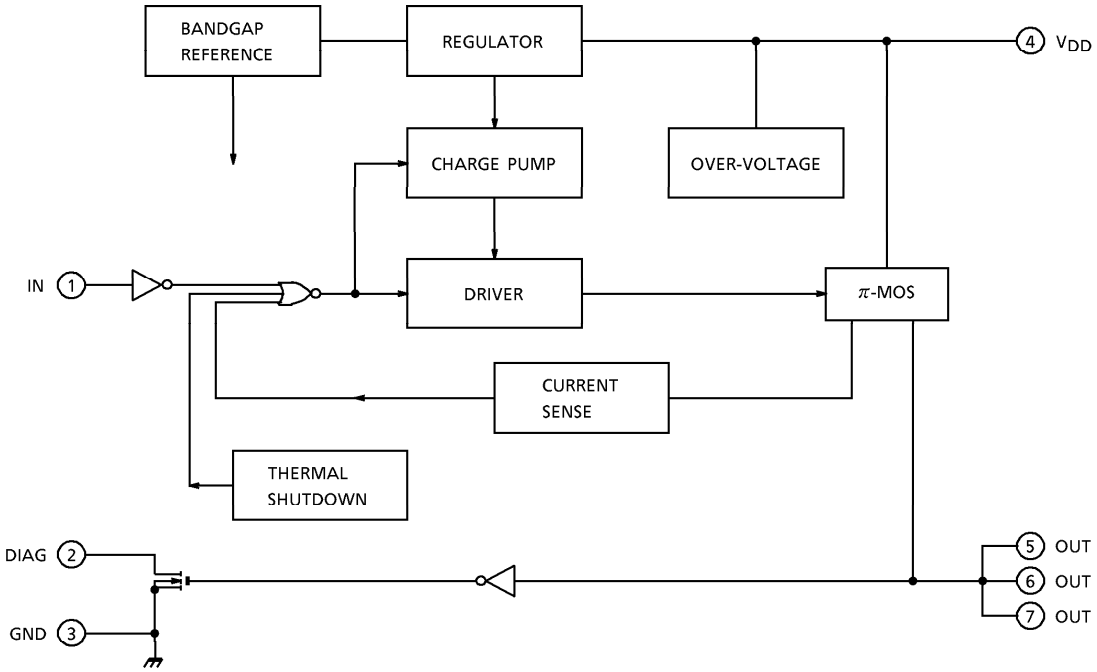


※ Lot Number

□□ Month (Starting from Alphabet A)

Year (Last Number of the Christian Era)

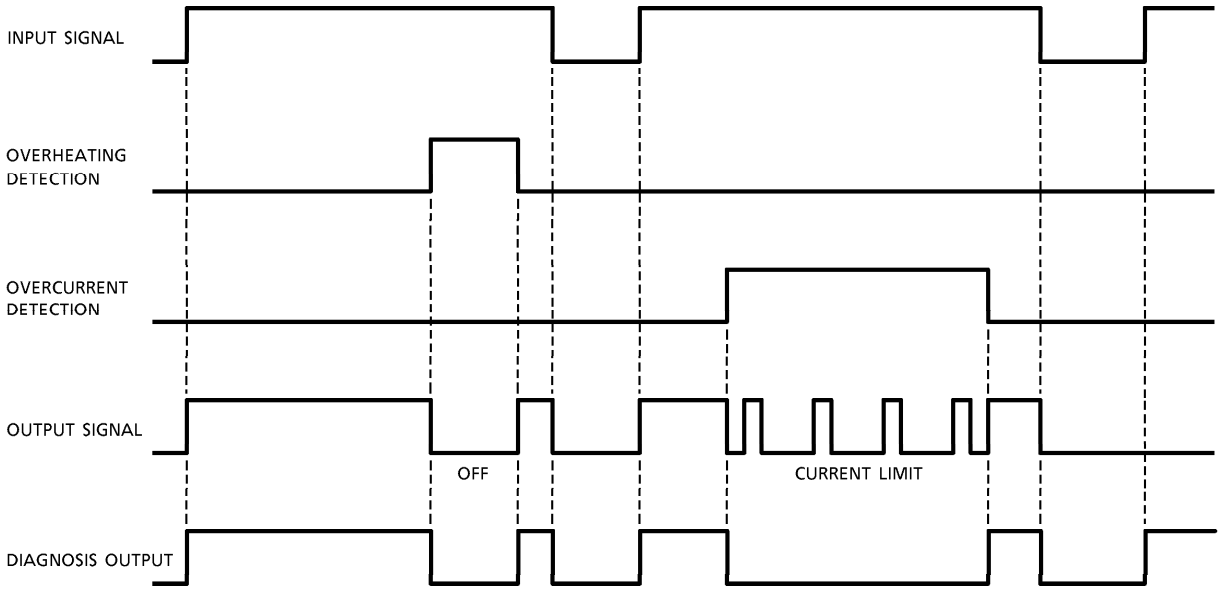
BLOCK DIAGRAM



PIN DESCRIPTION

PIN No.	SYMBOL	FUNCTION
1	IN	Input is CMOS-compatible, with pull-down resistor connected. Even if the input is open, output will not accidentally turn on.
2	DIAG	Self-diagnosis detection pin. Goes low when overheating is detected or when output is short circuited with input on (high). N-channel open drain.
3	GND	Ground pin.
4	V_{DD}	Power pin.
5, 6, 7	OUT	Output pin. When the load is short circuited and current in excess of the detection current (24A Typ.) flows to the output pin, the output automatically turns on or off.

TIMING CHART



TRUTH TABLE

INPUT SIGNAL	OUTPUT SIGNAL	DIAGNOSIS OUTPUT	STATE
H	H	H	Normal
L	L	L	
H	L	L	Load short circuited
L	L	L	
H	H	H	Load open
L	H	H	
H	L	L	Overheating
L	L	L	

MAXIMUM RATINGS (Ta = 25°C)

CHARACTERISTIC		SYMBOL	RATING	UNIT
Drain-source Voltage		V_{DS}	60	V
Supply Voltage	DC	$V_{DD\ (1)}$	25	V
	Pulse	$V_{DD\ (2)}$	60 (Rs = 1 Ω, τ = 250 ms)	V
Input Voltage	DC	$V_{IN\ (1)}$	−0.5~12	V
	Pulse	$V_{IN\ (2)}$	$V_{DD\ (1)}$ + 1.5 (t = 100 ms)	V
Diagnosis Output Voltage		V_{DIAG}	−0.5~25	V
Output Current		I_O	Internally Limited	A
Input Current		I_{IN}	±10	mA
Diagnosis Output Current		I_{DIAG}	5	mA
Power Dissipation (Ta = 25°C)		P_D	1.4 (Note 1)	W
			2.4 (Note 2)	
Operating Temperature		T_{opr}	−40~110	°C
Junction Temperature		T_j	150	°C
Storage Temperature		T_{stg}	−55~150	°C
Lead Temperature / time		T_{SOL}	275 (5 s), 260 (10 s)	°C

THERMAL RESISTANCE

CHARACTERISTIC	SYMBOL	TEST CONDITION	UNIT
Thermal Resistance	$R_{th\ (j\text{-}a)}$	89.3 (Note 1)	°C / W
		52.1 (Note 2)	

(Note 1) : Mounted on glass epoxy board (1 inch^2 × 0.8 t) (DC)
(Note 2) : Mounted on glass epoxy board (1 inch^2 × 0.8 t) ($t_W \leqq 10$ s)

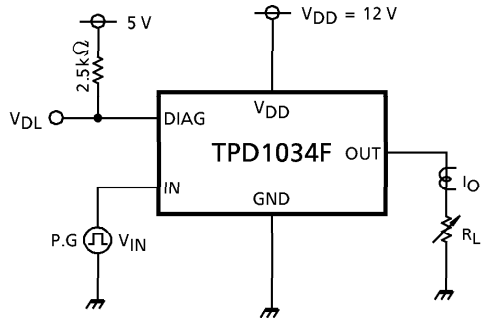
ELECTRICAL CHARACTERISTICS (Unless otherwise specified, Tc = −40~110°C, V_{DD} = 8~18 V)

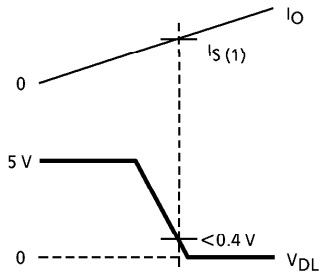
CHARACTERISTIC		SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN	TYP.	MAX	UNIT
Operating Supply Voltag		$V_{DD\ (OPR)}$	—	—	5	12	18	V
Current Dissipation		I_{DD}	—	V_{DD} = 12 V, V_{IN} = 0	—	1	5	mA
Input Voltage		V_{IH}	—	V_{DD} = 12 V, I_O = 8 A	3.5	—	—	V
		V_{IL}	—	V_{DD} = 12 V, I_O = 1.2 mA	—	—	1.5	V
Input Current		$I_{IN\ (1)}$	—	V_{DD} = 12 V, V_{IN} = 5 V	—	50	200	μA
		$I_{IN\ (2)}$	—	V_{DD} = 12 V, V_{IN} = 0	−0.2	—	0.2	μA
On Voltage		$V_{DS\ (ON)}$	—	V_{DD} = 12 V, I_O = 8 A, Tc = 25°C	—	—	0.64	V
On Resistance		$R_{DS\ (ON)}$	—	V_{DD} = 12 V, I_O = 8 A, Tc = 25°C	—	—	0.08	Ω
Output Leakage Current		I_{OL}	—	V_{DD} = 18 V, V_{IN} = 0	—	—	1.2	mA
Diagnosis Output Voltage	"L" Level	V_{DL}	—	V_{DD} = 12 V, I_{DL} = 2 mA	—	—	0.4	V
Diagnosis Output Current	"H" Level	I_{DH}	—	V_{DD} = 18 V, V_{DH} = 18 V	—	—	10	μA
Overcurrent Detection		$I_{S\ (1)}$ (Note 3)	1	V_{DD} = 12 V, Tc = 25°C	8	12	—	A
		$I_{S\ (2)}$ (Note 4)	2		15	24	—	A
Overheating Detection	Temperature	Ts	—	—	150	160	200	°C
	Hysteresis	ΔTs	—		—	10	—	°C
Open Detection Resistance		R_{ops}	—	V_{DD} = 8 V	1	50	100	kΩ
Switching Time		t_{ON}	3	V_{DD} = 12 V, R_L = 5 Ω, Tc = 25°C	10	200	—	μs
		t_{OFF}	3		10	30	—	μs

(Note 3) : $I_{S\ (1)}$ Overcurrent detection value when load is short circuited and V_{IN} = "L" → "H"
(Note 4) : Overcurrent detection value when load current is increased while V_{IN} = "H"

TEST CIRCUIT 1

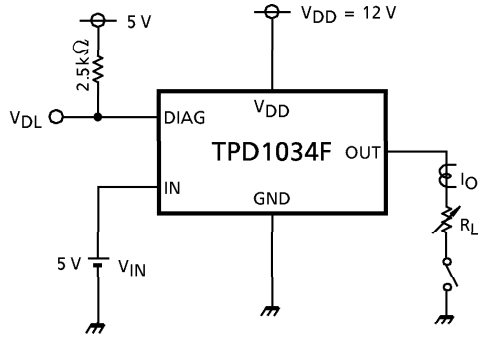
Over-voltage detection

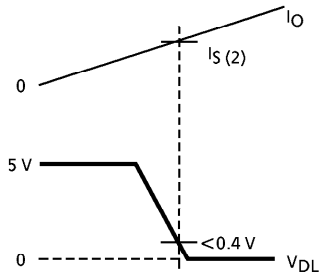




TEST CIRCUIT 2

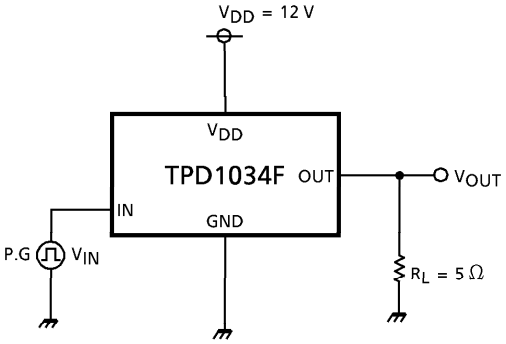
Over-voltage detection

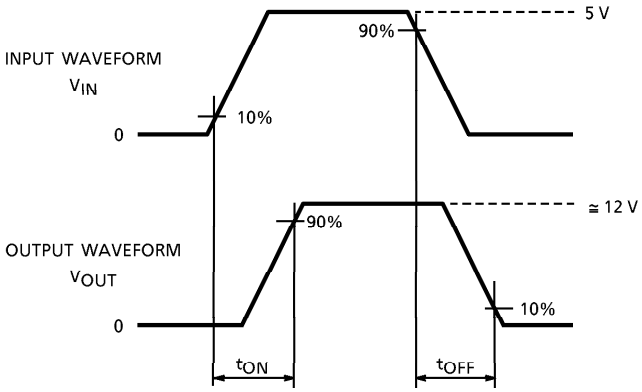




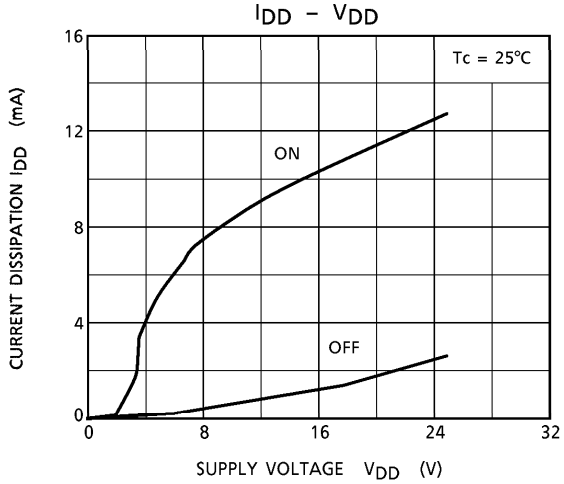
TEST CIRCUIT 3

Switching time

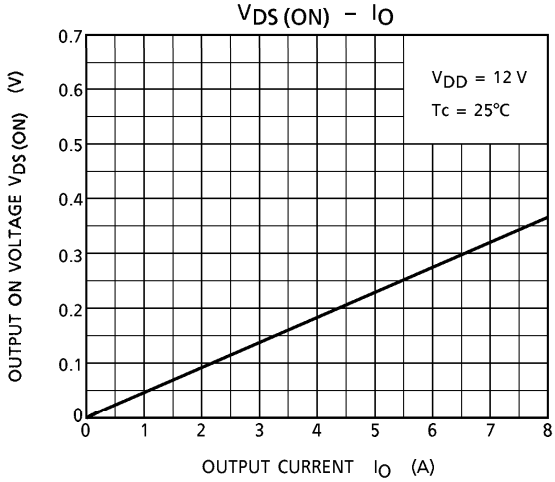




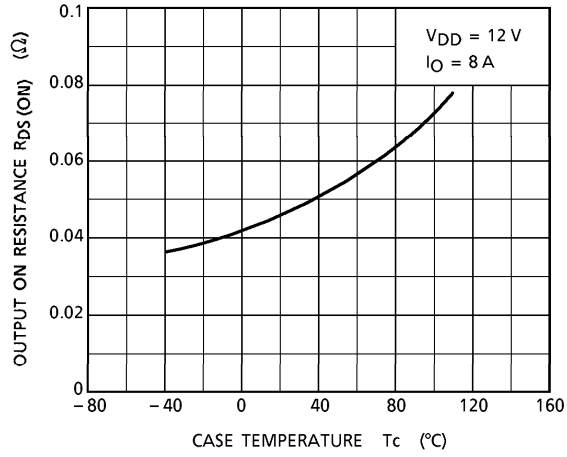
I_{DD} – V_{DD}



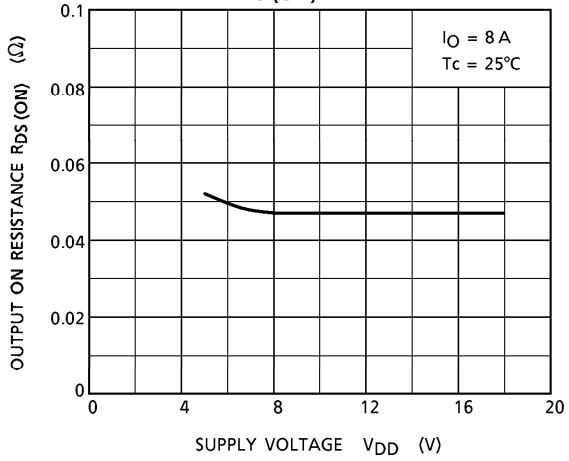
$V_{DS\ (ON)}$ – I_O



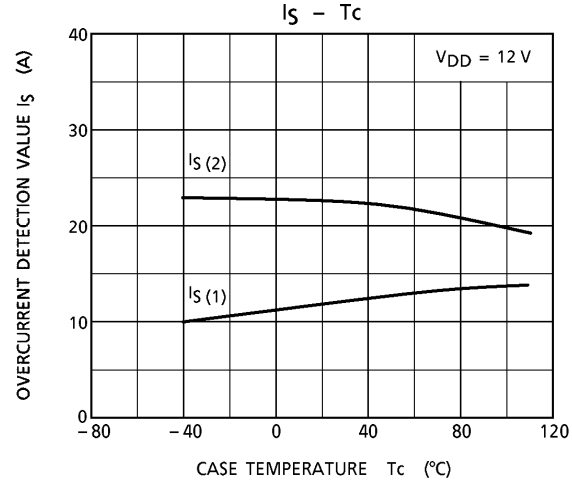
$R_{DS\ (ON)}$ – Tc



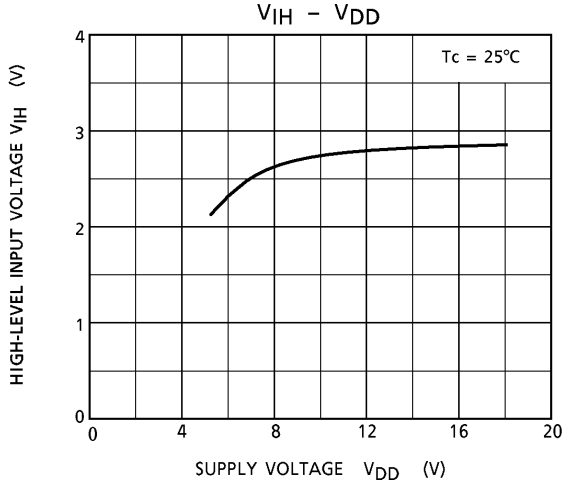
$R_{DS\ (ON)}$ – V_{DD}

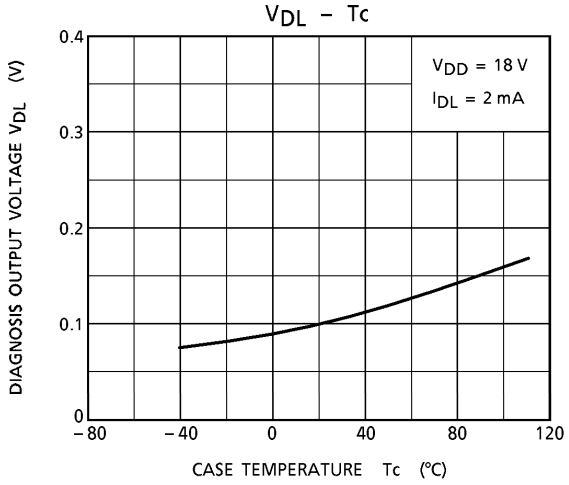


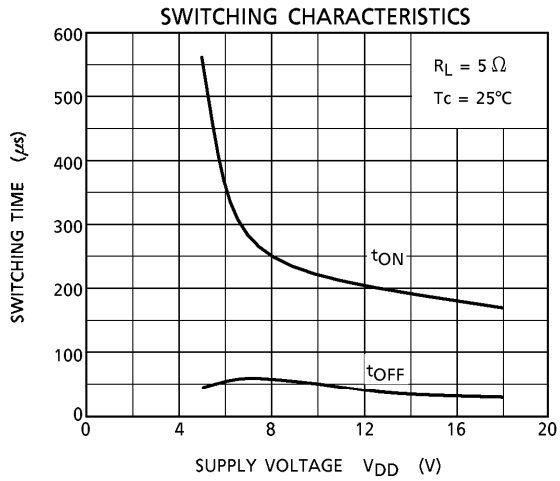
I_S – Tc

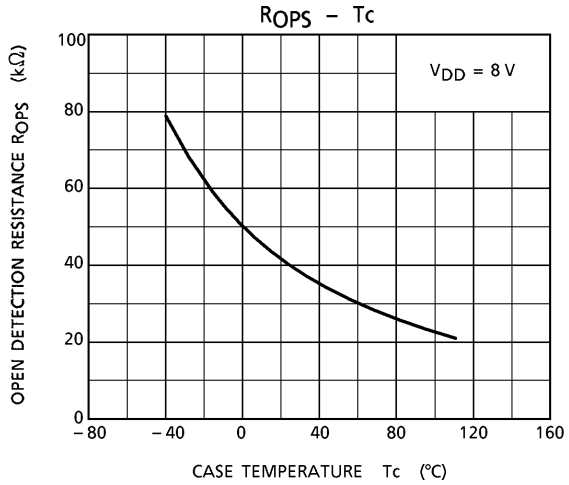


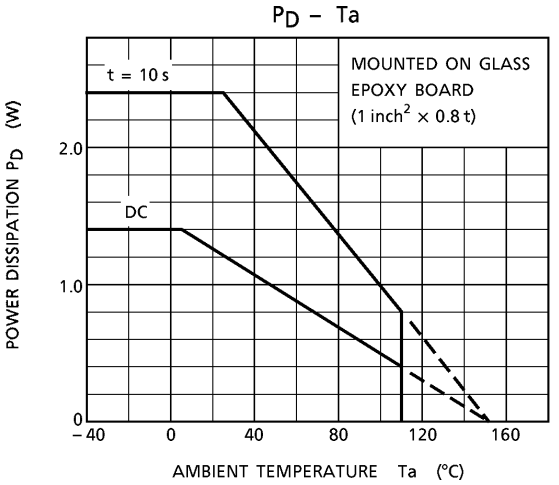
V_{IH} – V_{DD}

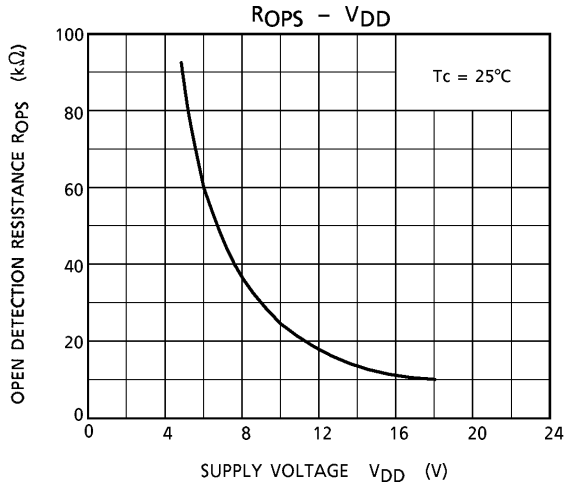






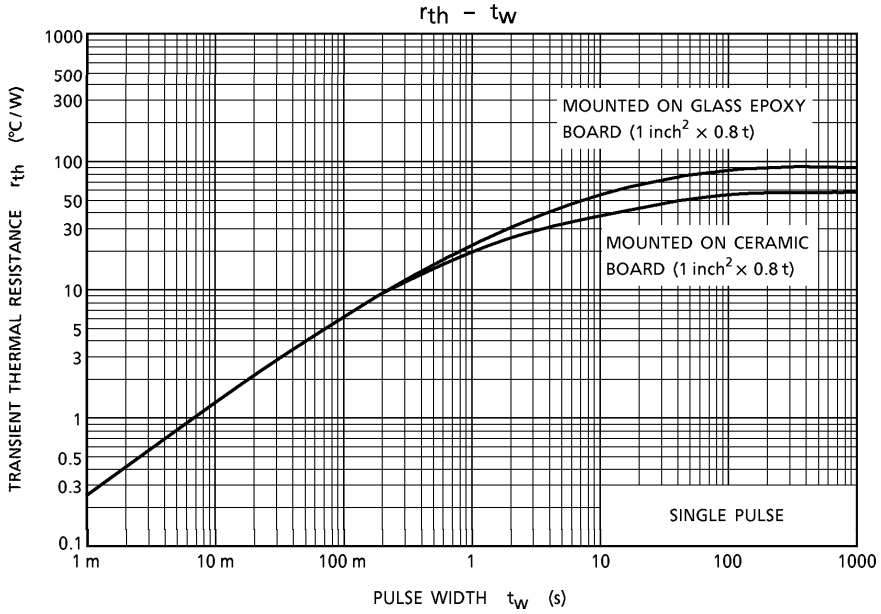






PRECAUTION :

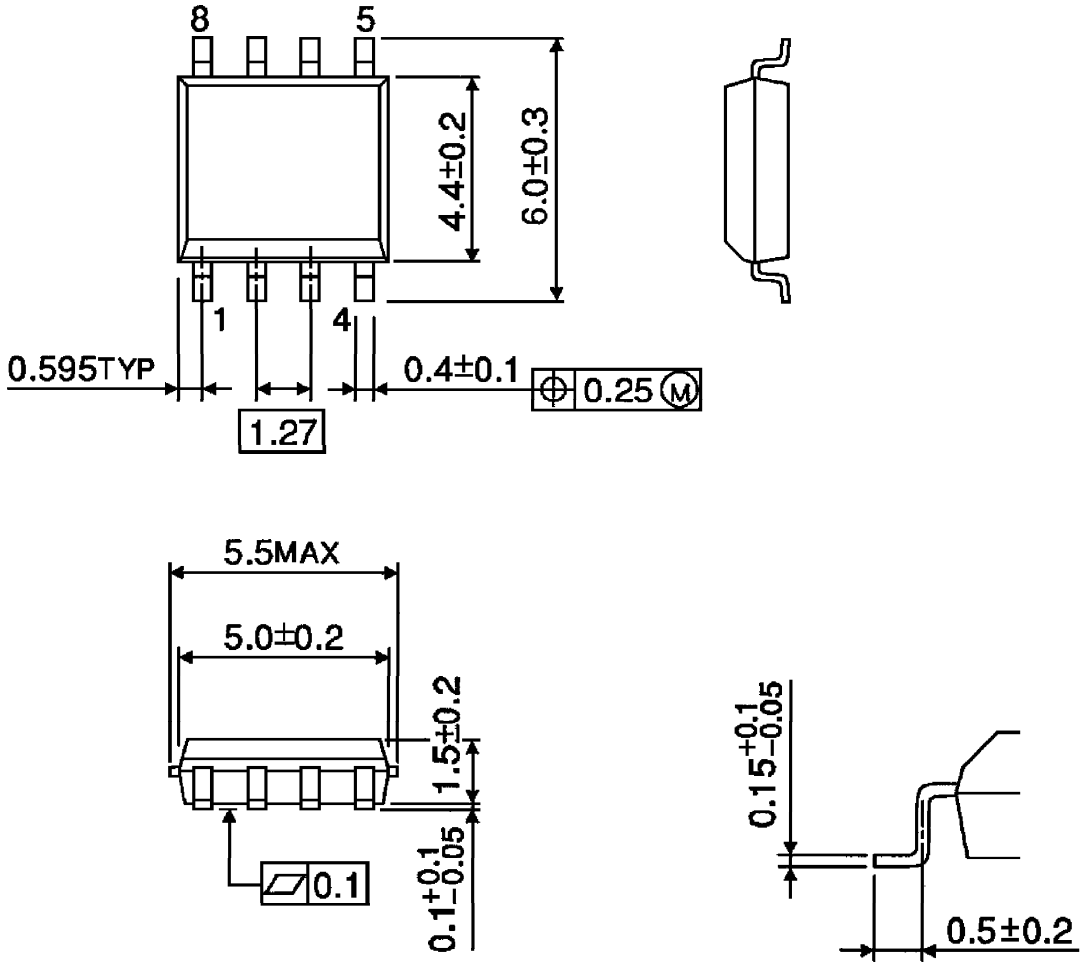
1. Since protection for, for example, reverse connection of the battery is not provided, provide protection using external circuits.


r_{th} – t_W
TRANSIENT THERMAL RESISTANCE r_{th} (°C/W)
1000
500
300
100
50
30
10
5
3
1
0.5
0.3
0.1
MOUNTED ON GLASS EPOXY BOARD (1 inch² × 0.8 t)
MOUNTED ON CERAMIC BOARD (1 inch² × 0.8 t)
SINGLE PULSE
1 m
10 m
100 m
1
10
100
1000
PULSE WIDTH t_W (s)

PACKAGE DIMENSIONS

SOP8-P1.27A

Unit : mm



Weight : 0.08 g (Typ.)