

# Push-Pull Four Channel Driver

## FEATURES

- Output Current 1A Per Channel (600mA for L293D)
- Peak Output Current 2A Per Channel (1.2A for L293D)
- Inhibit Facility
- High Noise Immunity
- Separate Logic Supply
- Over-Temperature Protection

## DESCRIPTION

The L293 and L293D are quad push-pull drivers capable of delivering output currents to 1A or 600mA per channel respectively. Each channel is controlled by a TTL-compatible logic input and each pair of drivers (a full bridge) is equipped with an inhibit input which turns off all four transistors. A separate supply input is provided for the logic so that it may be run off a lower voltage to reduce dissipation.

Additionally the L293D includes the output clamping diodes within the IC for complete interfacing with inductive loads.

Both devices are available in 16-pin Batwing DIP packages. They are also available in Power S01C and Hermetic DIL packages.

## TRUTH TABLE

$V_i$ (each channel)	$V_{INH}^*$	$V_o$
H	H	H
L	H	L
H	L	X**
L	L	X**

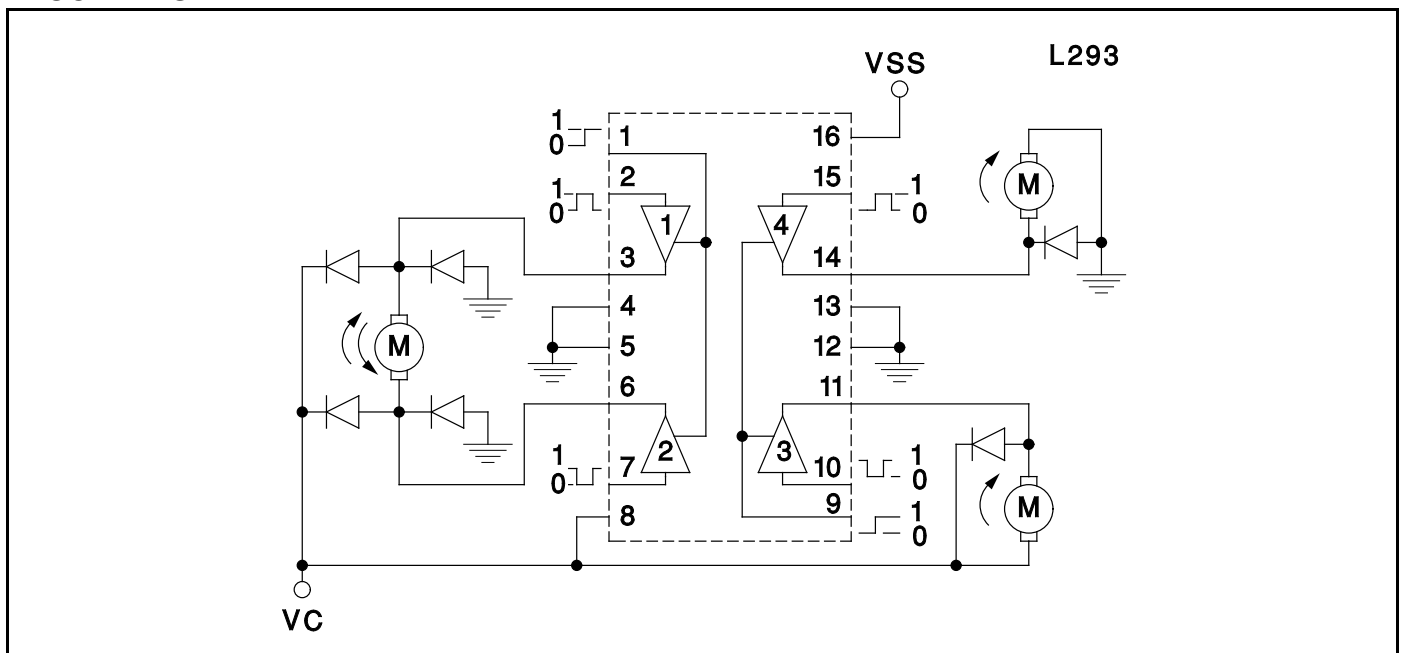
\*Relative to the considered channel

\*\*High output impedance

## ABSOLUTE MAXIMUM RATINGS

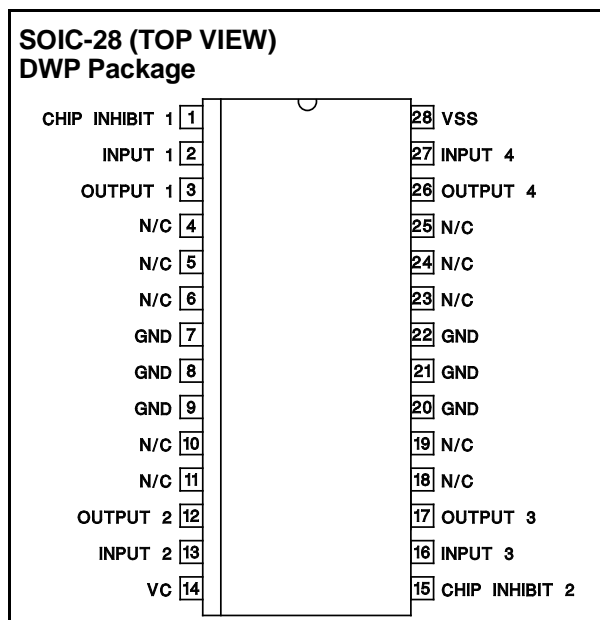
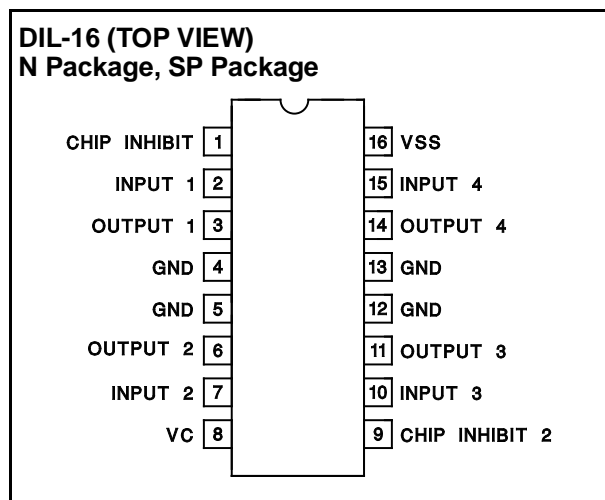
Collector Supply Voltage,  $V_c$  . . . . . 36V  
 Logic Supply Voltage,  $V_{ss}$  . . . . . 36V  
 Input Voltage,  $V_i$  . . . . . 7V  
 Inhibit Voltage,  $V_{INH}$  . . . . . 7V  
 Peak Output Current (Non-Repetitive),  $i_{OUT}$  (L293) . . . . . 2A  
 $i_{OUT}$  (L293D) . . . . . 1.2A  
 Total Power Dissipation  
 at  $T_{ground-pins} = 80^\circ C$ , N Batwing pkg, (Note) . . . . . 5W  
 Storage and Junction Temperature,  $T_{stg}, T_J$  . . . . .  $-40$  to  $+150^\circ C$   
*Note: Consult packaging section of Databook for thermal limitations and considerations of packages.*

## BLOCK DIAGRAM



Note: Output diodes are internal in L293D.

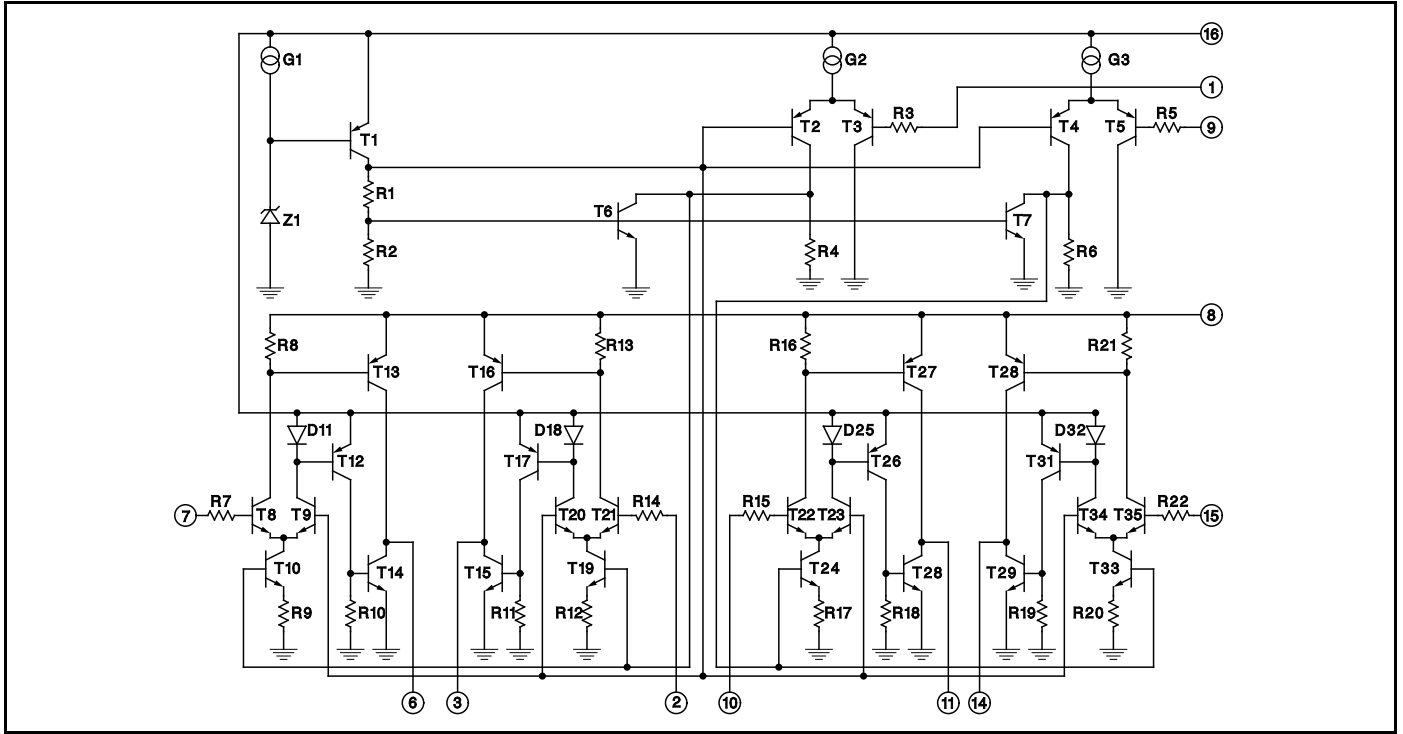
CONNECTION DIAGRAMS



**ELECTRICAL CHARACTERISTICS:** (For each channel,  $V_C = 24V$ ,  $V_{SS} = 5V$ ,  $T_{AMB} = 25^\circ C$ , unless otherwise specified;  $T_A = T_J$ )

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNITS
Collector Supply Voltage	$V_C$				36	V
Logic Supply Voltage	$V_{SS}$		4.5		36	V
Collector Supply Current	$I_C$	$V_I = L, I_O = 0, V_{INH} = H$		2	6	mA
		$V_I = H, I_O = 0, V_{INH} = H$		16	24	mA
		$V_{INH} = L$			4	mA
Total Quiescent Logic Supply Current	$I_{SS}$	$V_I = L, I_O = 0, V_{INH} = H$		44	60	mA
		$V_I = H, I_O = 0, V_{INH} = H$		16	22	mA
		$V_{INH} = L$		16	24	mA
Input Low Voltage	$V_{IL}$		-0.3		1.5	V
Input High Voltage	$V_{IH}$	$V_{SS} \leq 7V$	2.3		$V_{SS}$	V
		$V_{SS} \geq 7V$	2.3		7	V
Low Voltage Input Current	$I_{IL}$	$V_I = 0V$			-10	$\mu A$
High Voltage Input Current	$I_{IH}$	$V_I = 4.5V$		30	100	$\mu A$
Inhibit Low Voltage	$V_{INH, L}$		-0.3		1.5	V
Inhibit High Voltage	$V_{INH, H}$	$V_{SS} \leq 7V$	2.3		$V_{SS}$	V
		$V_{SS} > 7V$	2.3		7	V
Low Voltage Inhibit Current	$V_{INH, L}$			-30	-100	$\mu A$
High Voltage Inhibit Current	$V_{INH, H}$				10	$\mu A$
Source Output Saturation Voltage	$V_{CEsatH}$	$I_O = -1A$ (-0.6A for L293D)		1.4	1.8	V
Sink Output Saturation Voltage	$V_{CEsatL}$	$I_O = 1A$ (0.6A for L293D)		1.2	1.8	V
Clamp Diode Forward Voltage (L293D only)	$V_F$	$I_F = 0.6A$		1.3		V
Rise Time	$T_R$	0.1 to 0.9 $V_O$ (See Figure 1)		100		ns
Fall Time	$T_F$	0.9 to 0.1 $V_O$ (See Figure 1)		350		ns
Turn-on Delay	$T_{ON}$	0.5 $V_I$ to 0.5 $V_O$ (See Figure 1)		750		ns
Turn-off Delay	$T_{OFF}$	0.5 $V_I$ to 0.5 $V_O$ (See Figure 1)		200		ns

**SCHEMATIC DIAGRAM**



**APPLICATION INFORMATION**

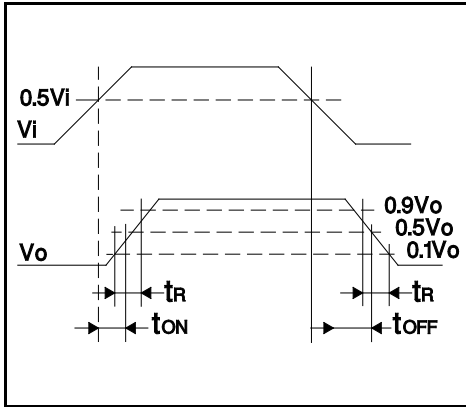


Figure 1: Switching Times

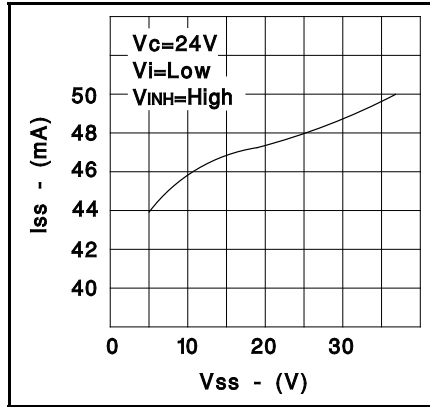


Figure 2: Quiescent Logic Supply Current vs Logic Supply Voltage

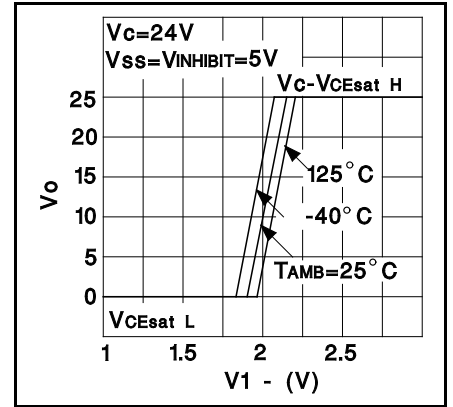


Figure 3: Output Voltage vs Input Voltage

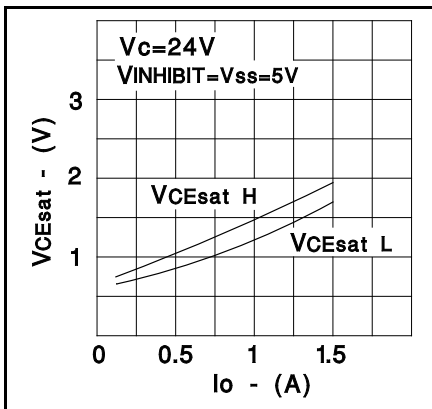


Figure 4: L293 Saturation vs Output Current

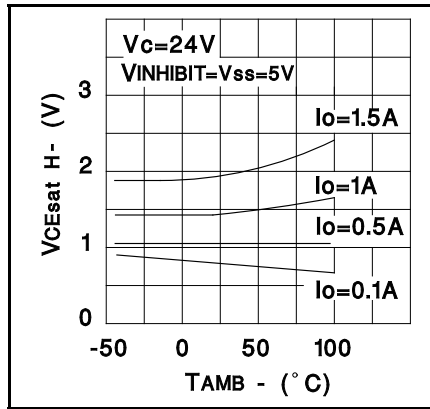


Figure 5: L293 Source Saturation vs Ambient Temperature

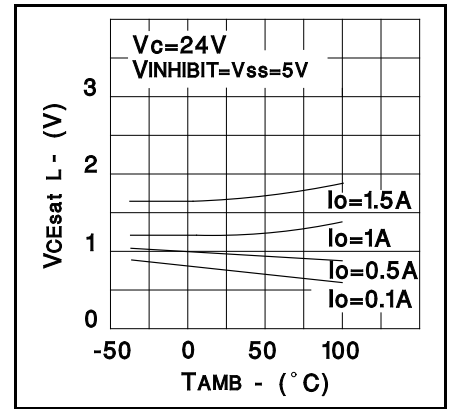


Figure 6: L293 Sink Saturation Voltage vs Ambient Temperature

NOTE: For L293D curves, multiply output current by 0.6.

APPLICATION INFORMATION (Cont.)

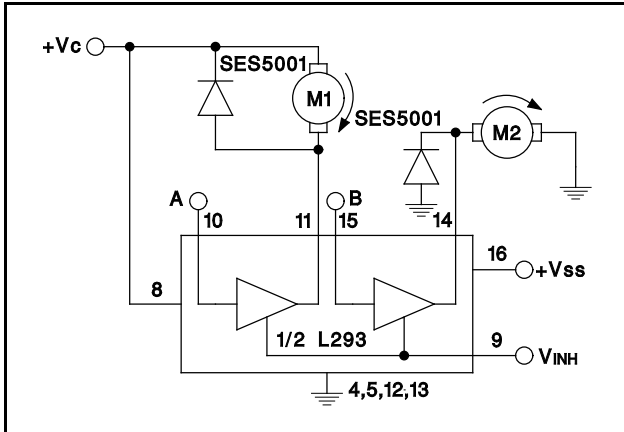


Figure 7: DC Motor Controls (with Connection to Ground and to Supply Voltage)

VINH	A	M1	B	M2
H	H	Fast Motor Stop	H	Run
H	L	Run	L	Fast Motor Stop
L	X	Free Running Motor Stop	X	Free Running Motor Stop

L = Low H = High X = Don't Care

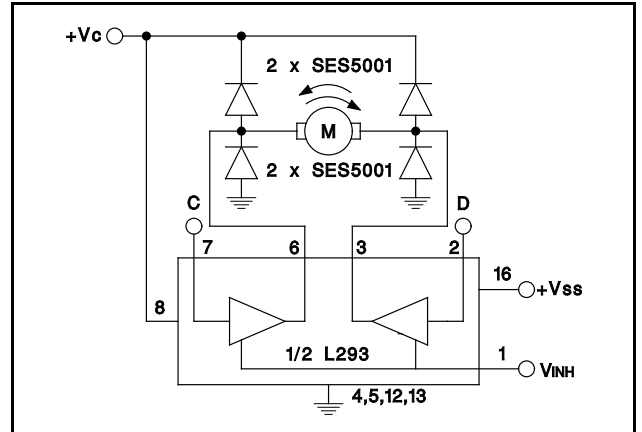


Figure 8: Bidirectional DC Motor Control

INPUTS		FUNCTION
VINH = H	C = H; D = L	Turn Right
	C = L; D = H	Turn Left
	C = D	Fast Motor Stop
VINH = L	C = X; D = X	Free Running Motor Stop

L = Low H = High X = Don't Care

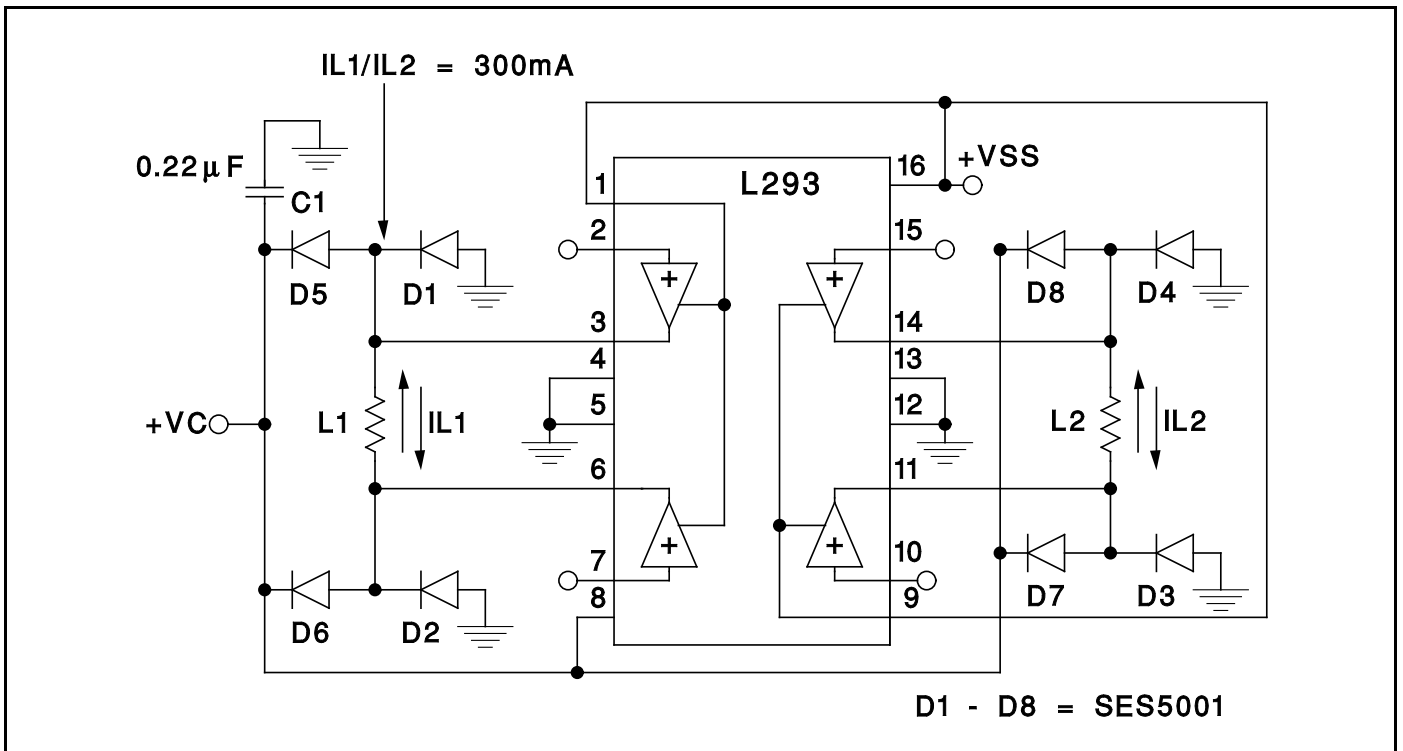


Figure 9: Bipolar Stepping Motor Control

**MOUNTING INSTRUCTIONS**

The Rthj-amp of the L293 can be reduced by soldering the GND pins to a suitable copper area of the printed circuit board or to an external heatsink.

The diagram of Figure 13 shows the maximum package power Ptot and the  $\theta_{JA}$  as a function of the side "l" of two equal square copper areas having a thickness of 35 $\mu$  (see

Figure 10). In addition, it is possible to use an external heatsink (see Figure 11).

During soldering the pins' temperature must not exceed 260°C and the soldering time must not be longer than 12 seconds.

The external heatsink or printed circuit copper area must be connected to electrical ground.

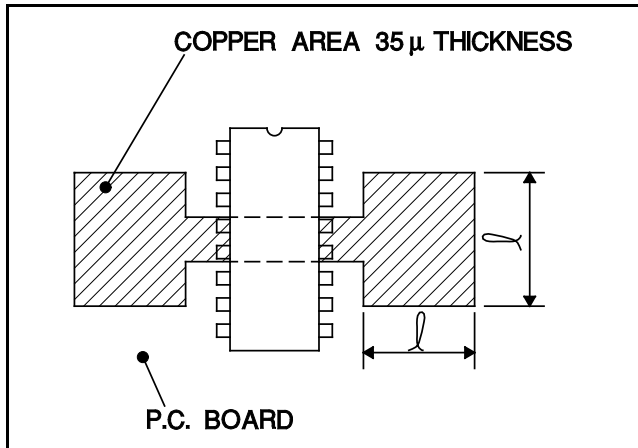


Figure 10: Example of P.C. Board Copper Area which is used as Heatsink

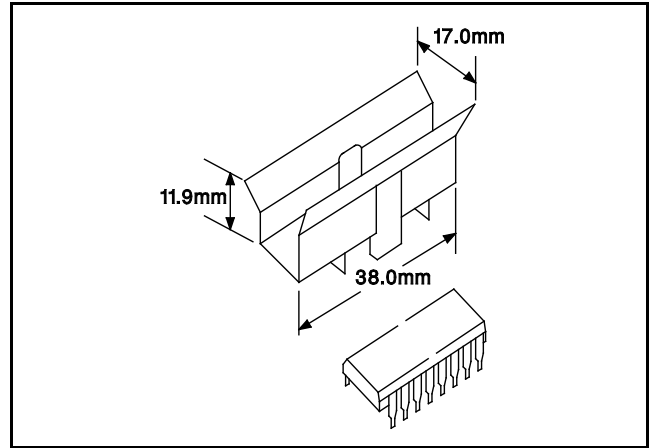


Figure 11: External Heatsink Mounting Example ( $\theta_{JA} = 25^\circ\text{C/W}$ )

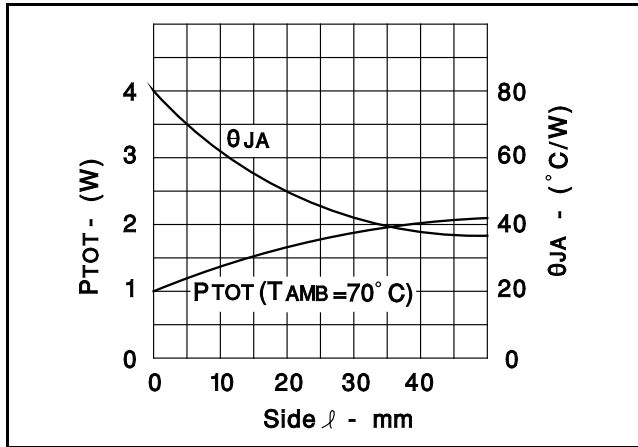


Figure 12: Maximum Package Power and Junction to Ambient Thermal Resistance

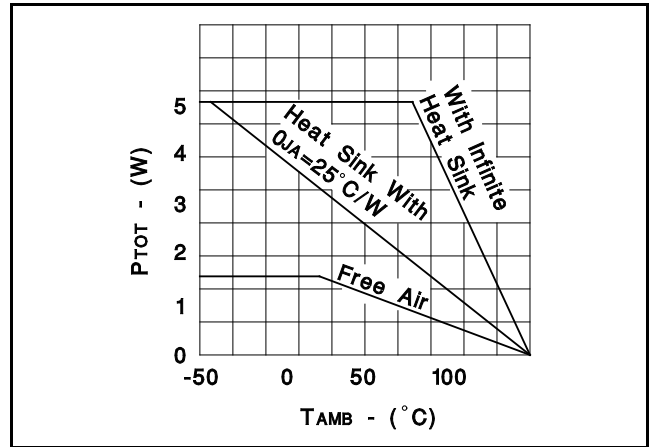


Figure 13: Maximum Allowable Power Dissipation vs Ambient Temperature