INTEGRATED
CIRCUITS
UNITRODE

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 S0IC and Hermetic DIL packages.

TRUTH TABLE

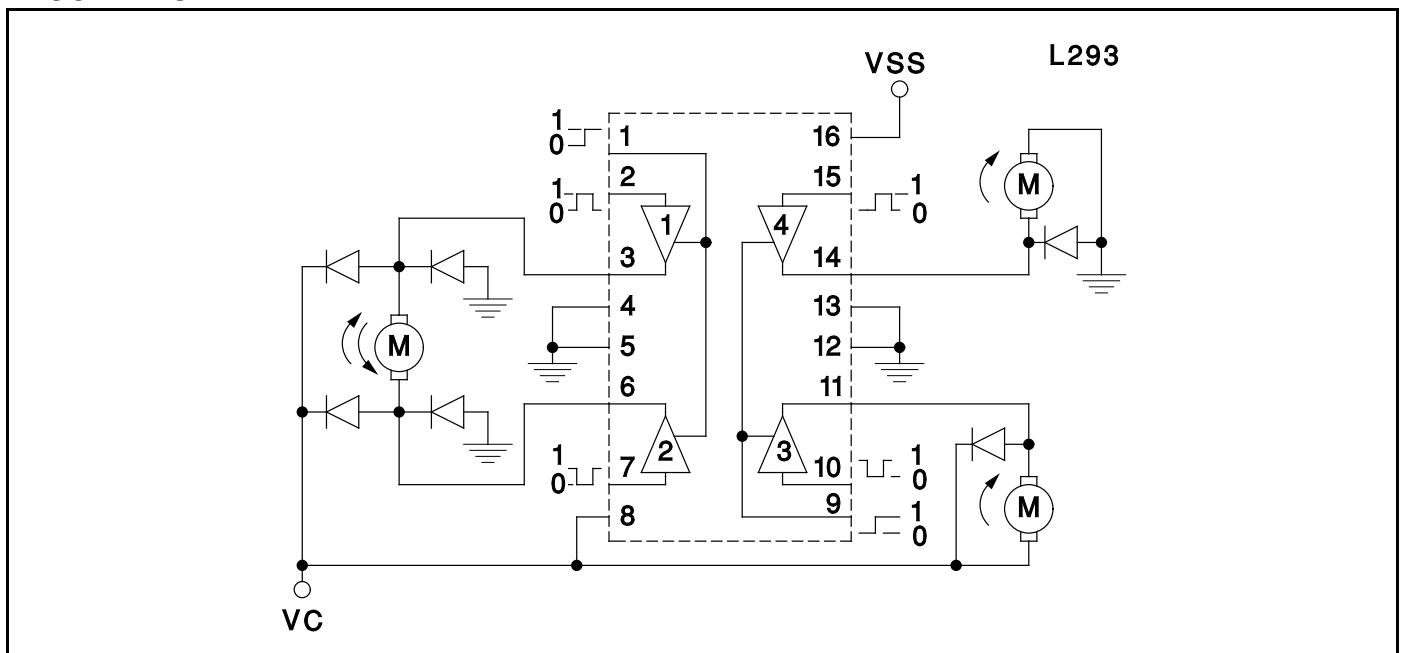| VI (each channel)	VINH*	Vo
H	H	H
L	H	L
H	L	X**
L	L	X**

*Relative to the considered channel
**High output impedence

ABSOLUTE MAXIMUM RATINGS

Collector Supply Voltage, VC 36V
Logic Supply Voltage, VSS 36V
Input Voltage, VI 7V
Inhibit Voltage, VINH 7V
Peak Output Current (Non-Repetitive), IOUT (L293) 2A
        IOUT (L293D) 1.2A
Total Power Dissipation
    at Tground-pins = 80°C, N Batwing pkg, (Note) 5W
Storage and Junction Temperature, Tstg, TJ . . . . -40 to +150°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

DIL-16 (TOP VIEW)
N Package, SP Package

CHIP INHIBIT 1		16 VSS
INPUT 1 2		15 INPUT 4
OUTPUT 1 3		14 OUTPUT 4
GND 4		13 GND
GND 5		12 GND
OUTPUT 2 6		11 OUTPUT 3
INPUT 2 7		10 INPUT 3
VC 8		9 CHIP INHIBIT 2

SOIC-28 (TOP VIEW)
DWP Package

CHIP INHIBIT 1 1		28 VSS
INPUT 1 2		27 INPUT 4
OUTPUT 1 3		26 OUTPUT 4
N/C 4		25 N/C
N/C 5		24 N/C
N/C 6		23 N/C
GND 7		22 GND
GND 8		21 GND
GND 9		20 GND
N/C 10		19 N/C
N/C 11		18 N/C
OUTPUT 2 12		17 OUTPUT 3
INPUT 2 13		16 INPUT 3
VC 14		15 CHIP INHIBIT 2

ELECTRICAL CHARACTISTICS: (For each channel, V_C = 24V, V_{SS} = 5V, T_{AMB} = 25°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} ≤ 7V	2.3		V_{SS}	V
		V_{SS} ≥ 7V	2.3		7	V
Low Voltage Input Current	I_{IL}	V_I = 0V			-10	µA
High Voltage Input Current	I_{IH}	V_I = 4.5V		30	100	µA
Inhibit Low Voltage	$V_{INH, L}$		-0.3		1.5	V
Inhibit High Voltage	$V_{INH, H}$	V_{SS} ≤ 7V	2.3		V_{SS}	V
		V_{SS} >7V	2.3		7	V
Low Voltage Inhibit Current	$V_{INH, L}$			-30	-100	µA
High Voltage Inhibit Current	$V_{INH, H}$				10	µA
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
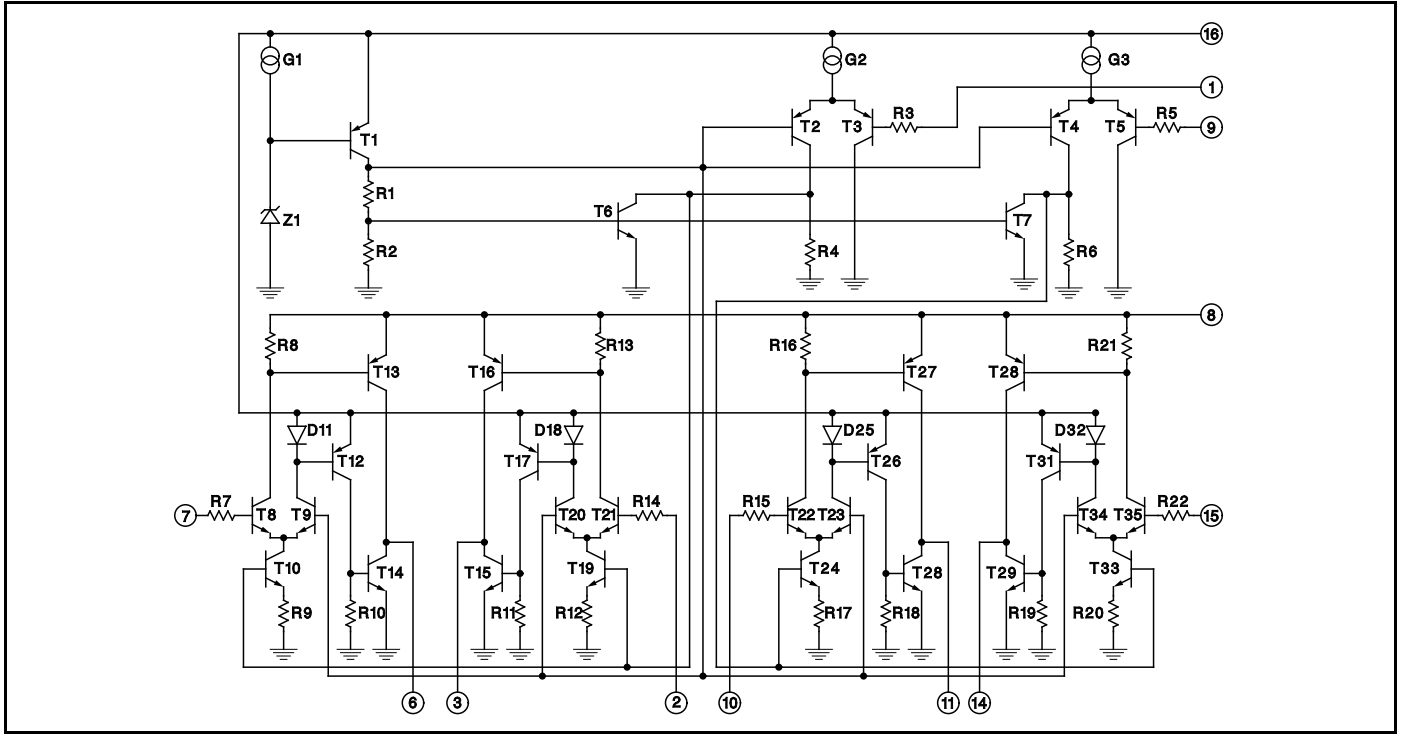
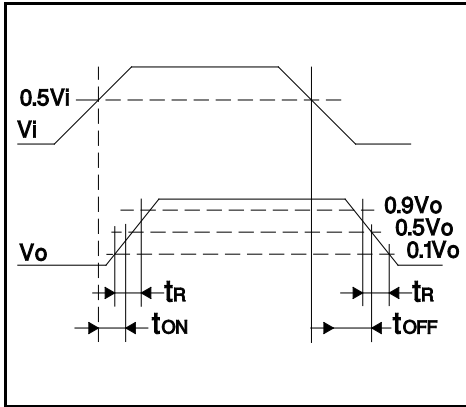## APPLICATION INFORMATION

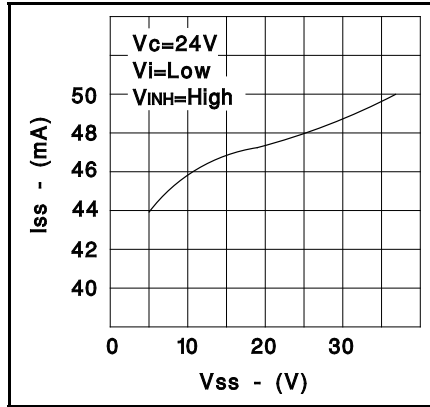**Figure 1: Switching Times**

Figure 2: Quiescent Logic Supply Current vs Logic Supply Voltage
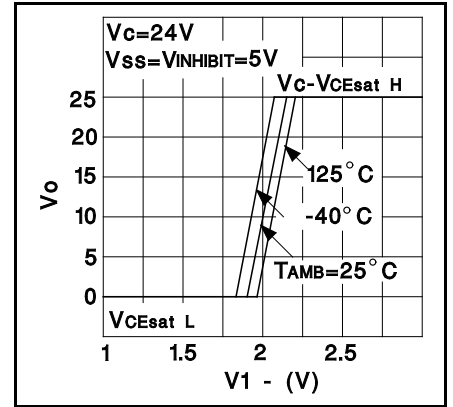

Figure 3: Output Voltage vs Input Voltage
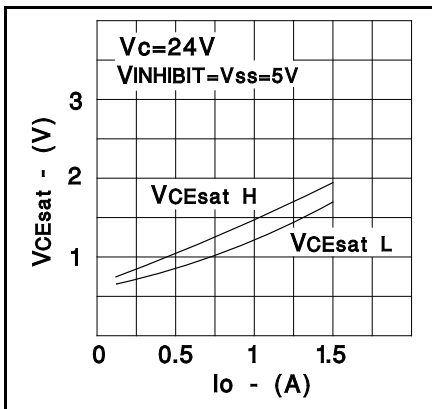

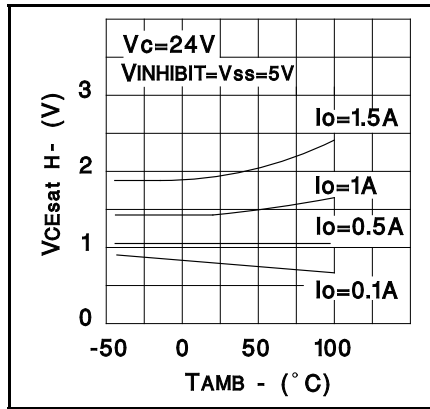**Figure 4: L293 Saturation vs Output Currrent**

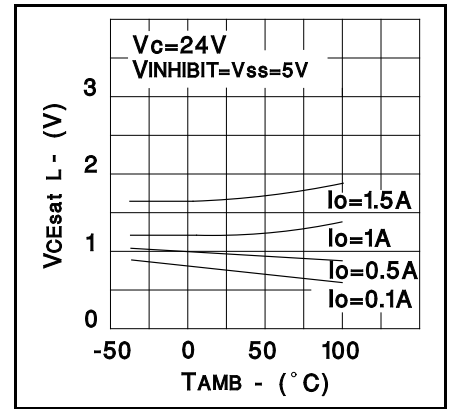**Figure 5: L293 Source Saturation vs Ambient Temperature**

Figure 6: L293 Sink Saturation Voltage vs Ambient Temperature

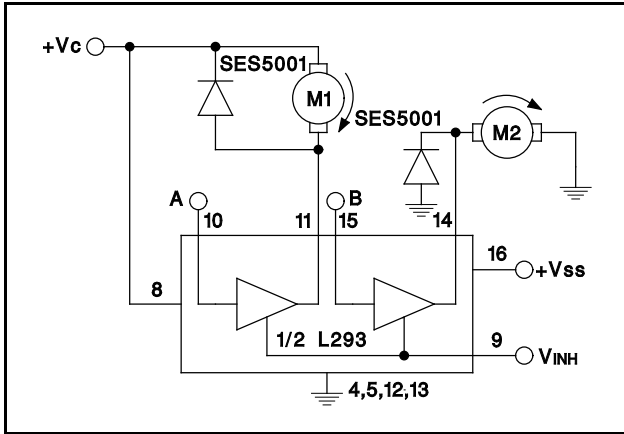*NOTE: For L293D curves, multiply output current by 0.6.*

APPLICATION INFORMATION (Cont.)

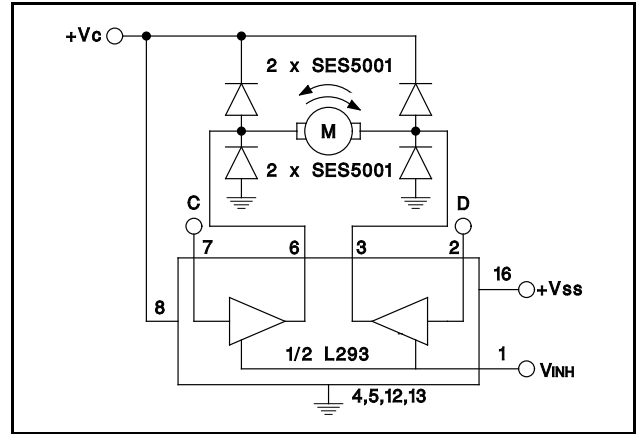**Figure 7: DC Motor Controls (with Connection to Ground and to Supply Voltage)**

V_{INH}	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

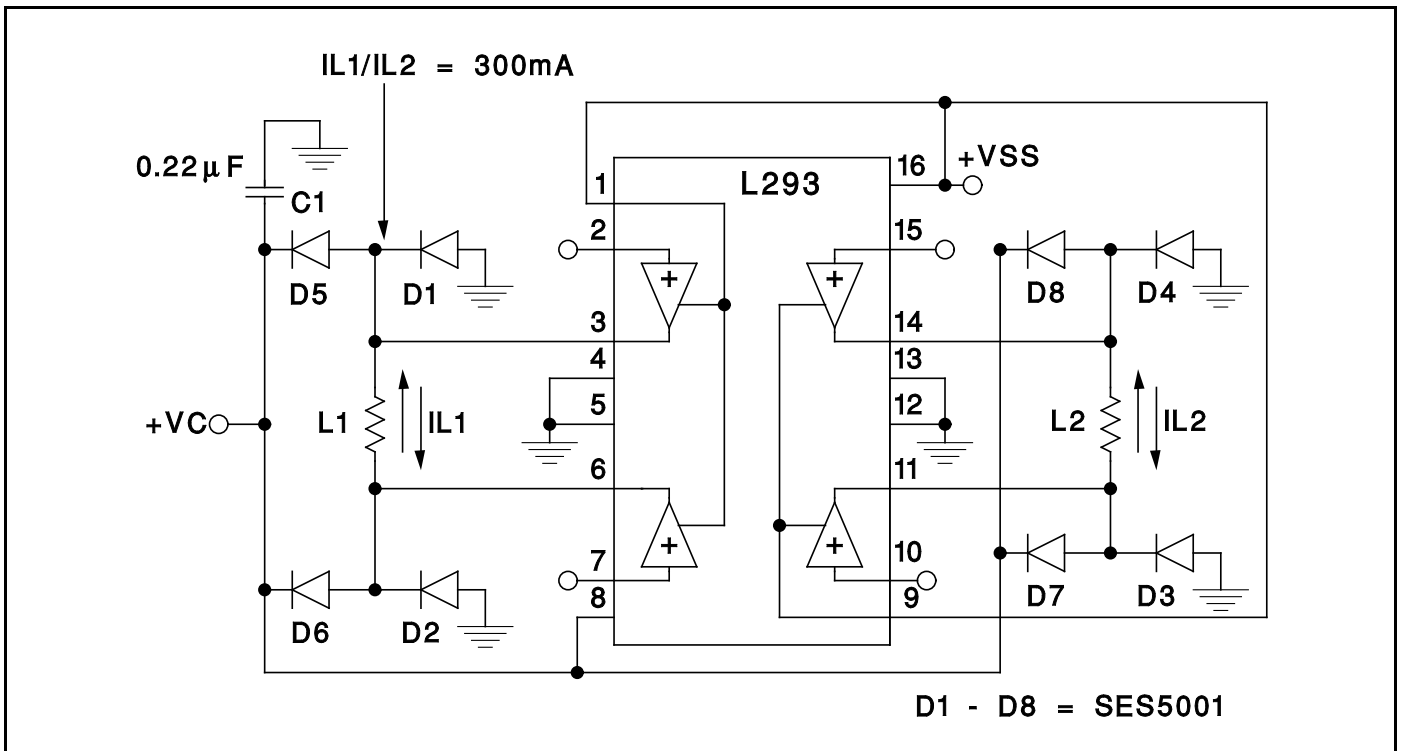*L = Low   H = High   X = Don't Care*

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 θ_{JA} as a function of the side "I" of two equal square copper areas having a thickness of 35µ (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.
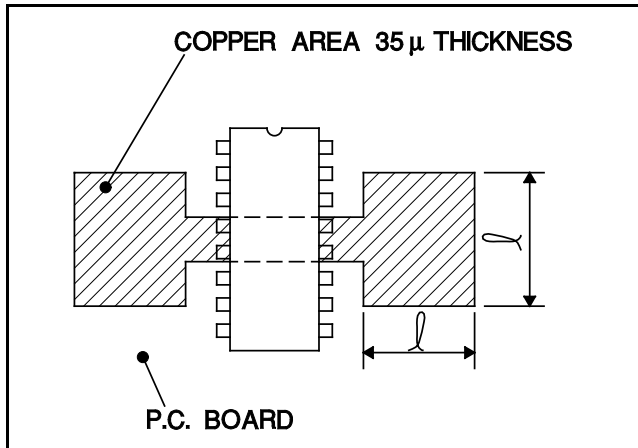

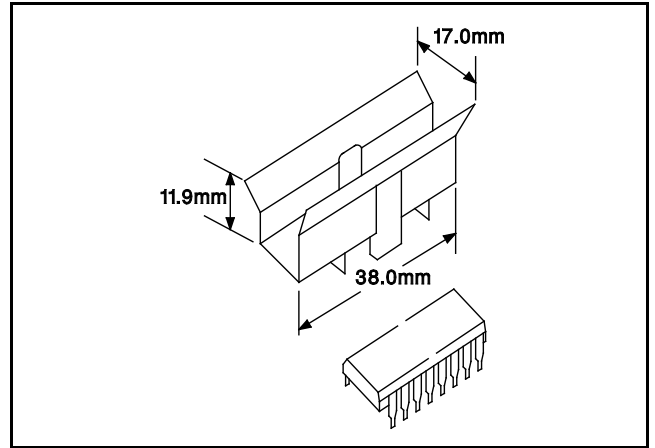**Figure 10: Example of P.C. Board Copper Area which is used as Heatsink**

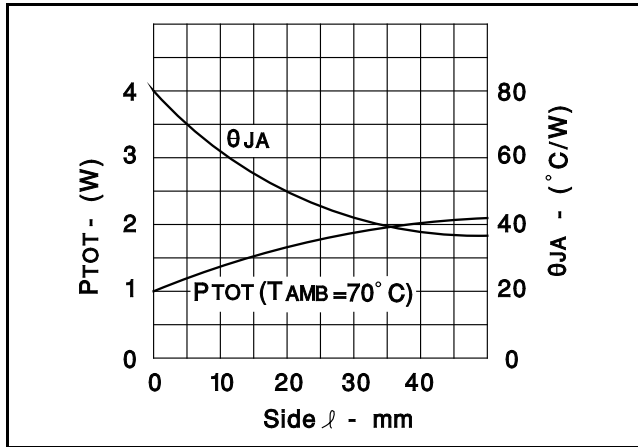**Figure 11: External Heatsink Mounting Example (θ_{JA} = 25°C/W)**

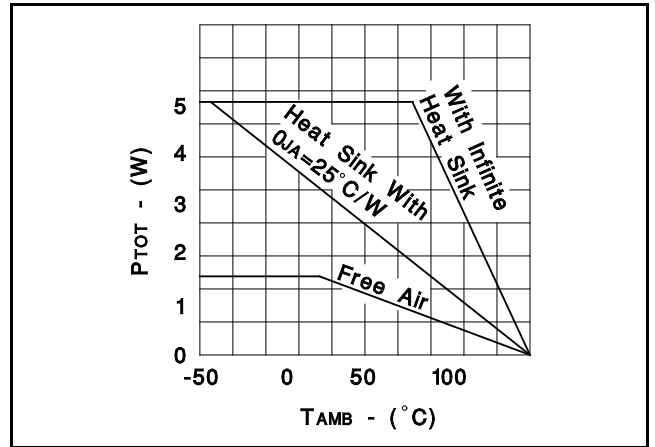**Figure 12: Maximum Package Power and Junction to Ambient Thermal Resistance**

Figure 13: Maximum Allowable Power Dissipation vs Ambient Temperature