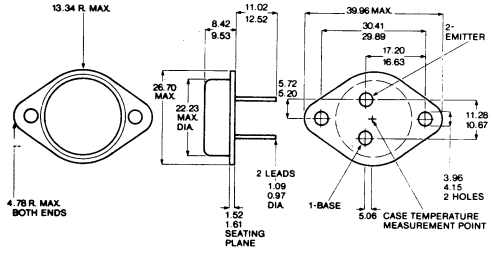
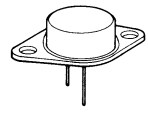
FOR POWER-AMPLIFIER AND HIGH-SPEED-SWITCHING APPLICATIONS
DESIGNED FOR COMPLEMENTARY USE WITH 2N6329, 2N6330, 2N6331

- 200 W at 25°C Case Temperature
- 30-A Rated Collector Current
- 200-mJ Reverse Energy Rating
- High SOA Capability, 20 V and 10 A

*mechanical data

THE COLLECTOR IS IN ELECTRICAL CONTACT WITH THE CASE





ALL DIMENSIONS ARE IN MILLIMETRES

ALL JEDEC TO-3 DIMENSIONS AND NOTES ARE APPLICABLE

*absolute maximum ratings at 25°C case temperature (unless otherwise noted)

	2N6326	2N6327	2N6328
Collector-Base Voltage	60 V	80 V	100 V
Collector-Emitter Voltage (See Note 1)	60 V	80 V	100 V
Emitter-Base Voltage	5 V	5 V	5 V
Continuous Collector Current	30 A		
Peak Collector Current (See Note 2)	40 A		
Continuous Base Current	10 A		
Safe Operating Areas at (or below) 25°C Case Temperature	See Figures 3 and 4		
Continuous Device Dissipation at (or below) 25°C Case Temperature (See Note 3)	200 W		
Continuous Device Dissipation at 100°C Case Temperature (See Note 3)	114 W		
Continuous Device Dissipation at (or below) 25°C Free-Air Temperature (See Note 4)	5 W		
Unclamped Inductive Load Energy (See Note 5)	200 mJ		
Operating Collector Junction Temperature Range	−65°C to 200°C		
Storage Temperature Range	−65°C to 200°C		
Terminal Temperature 1.6 mm from Case for 10 Seconds	250°C		

NOTES: 1. These values apply when the base-emitter diode is open-circuited.
2. This value applies for $t_w \leq 1$ ms, duty cycle $\leq 10\%$.
3. Derate linearly to 200°C case temperature at the rate of 1.14 W/°C or refer to Dissipation Derating Curve, Figure 5.
4. Derate linearly to 200°C free-air temperature at the rate of 28.6 mW/°C or refer to Dissipation Derating Curve, Figure 6.
5. This rating is based on the capability of the transistors to operate safely in the circuit of Figure 2. L = 20 mH, R_{BB2} = 100 Ω, V_{BB2} = 0 V, R_S = 0.1 Ω, V_{CC} = 20 V. Energy ≈ $I_C^2 L/2$.

*JEDEC registered data. This data sheet contains all applicable registered data in effect at the time of publication.

*electrical characteristics at 25°C case temperature (unless otherwise noted)

PARAMETER		TEST CONDITIONS			2N6326		2N6327		2N6328		UNIT
					MIN	MAX	MIN	MAX	MIN	MAX	
$V_{(BR)CEO}$	Collector-Emitter Breakdown Voltage	I_C = 30 mA,	I_B = 0,	See Note 6	60		80		100		V
I_{CEO}	Collector Cutoff Current	V_{CE} = 30 V,	I_B = 0			1					mA
		V_{CE} = 40 V,	I_B = 0					1			
		V_{CE} = 50 V,	I_B = 0							1	
I_{CES}	Collector Cutoff Current	V_{CE} = 60 V,	V_{BE} = 0			0.5					mA
		V_{CE} = 80 V,	V_{BE} = 0					0.5			
		V_{CE} = 100 V,	V_{BE} = 0							0.5	
		V_{CE} = 30 V,	V_{BE} = 0,	T_C = 150°C		5					
		V_{CE} = 40 V,	V_{BE} = 0,	T_C = 150°C				5			
		V_{CE} = 50 V,	V_{BE} = 0,	T_C = 150°C						5	
I_{EBO}	Emitter Cutoff Current	V_{EB} = 5 V,	I_C = 0,			0.5		0.5		0.5	mA
h_{FE}	Static Forward Current Transfer Ratio	V_{CE} = 4 V,	I_C = 5 A	See Notes 6 and 7	25		25		25		
		V_{CE} = 4 V,	I_C = 15 A		12		12		12		
		V_{CE} = 4 V,	I_C = 30 A		6	30	6	30	6	30	
V_{BE}	Base-Emitter Voltage	V_{CE} = 4 V,	I_C = 15 A	See Notes 6 and 7		2		2		2	V
		V_{CE} = 4 V,	I_C = 30 A			4		4		4	
$V_{CE(sat)}$	Collector-Emitter Voltage	I_B = 2 A,	I_C = 15 A	See Notes 6 and 7		1.5		1.5		1.5	V
		I_B = 7.5 A,	I_C = 30 A			3		3		3	
h_{fe}	Small-Signal Common-Emitter Forward Current Transfer Ratio	V_{CE} = 10 V,	I_C = 1 A,	f = 1 kHz	30		30		30		
$\|h_{fe}\|$	Small-Signal Common-Emitter Forward Current Transfer Ratio	V_{CE} = 10 V,	I_C = 1 A,	f = 1 MHz	3		3		3		

NOTES: 6. These parameters must be measured using pulse techniques. t_w = 300 μs, duty cycle ≤ 2%.
7. These parameters are measured with voltage-sensing contacts separate from the current-carrying contacts and located within 3.2 mm from the device body.

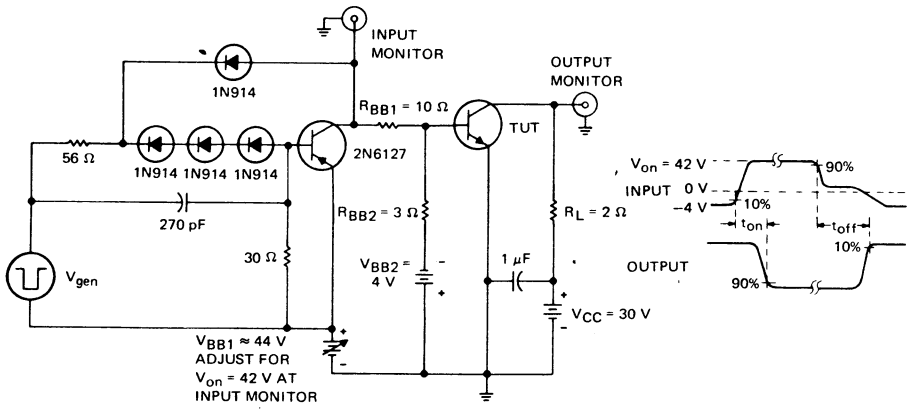
*JEDEC registered data

switching characteristics at 25°C case temperature

PARAMETER		TEST CONDITIONS†			TYP	UNIT
t_{on}	Turn-On Time	I_C = 15 A,	$I_{B(1)}$ = 2 A,	$I_{B(2)}$ = −2 A,	0.6	μs
t_{off}	Turn-Off Time	$V_{BE(off)}$ = −4 V,	R_L = 2 Ω,	See Figure 1	0.9	

†Voltage and current values shown are nominal, exact values vary slightly with transistor parameters.

PARAMETER MEASUREMENT INFORMATION

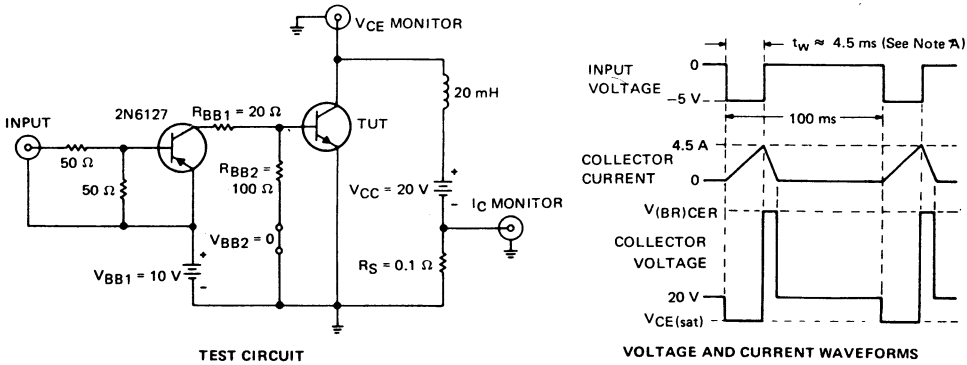


TEST CIRCUIT VOLTAGE WAVEFORMS

NOTES: A. V_{gen} is a −30-V pulse (from 0 V) into a 50-Ω termination.
B. The V_{gen} waveform is supplied by a generator with the following characteristics: $t_r \leq 15$ ns, $t_f \leq 15$ ns, Z_{out} = 50 Ω, t_w = 20 μs, duty cycle ≤ 2%.
C. Waveforms are monitored on an oscilloscope with the following characteristics: $t_r \leq 15$ ns, $R_{in} \geq 10$ MΩ, $C_{in} \leq 11.5$ pF.
D. Resistors must be noninductive types.
E. The d-c power supplies may require additional bypassing in order to minimize ringing.

FIGURE 1

INDUCTIVE LOAD SWITCHING



TEST CIRCUIT VOLTAGE AND CURRENT WAVEFORMS

NOTE A: Input pulse width is increased until I_{CM} = 4.5 A.

FIGURE 2

MAXIMUM SAFE OPERATING AREAS

MAXIMUM COLLECTOR CURRENT
vs
COLLECTOR-EMITTER VOLTAGE

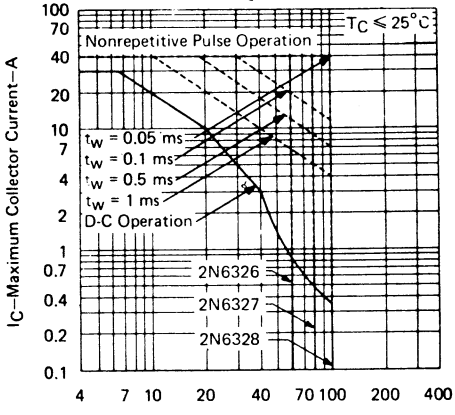


FIGURE 3

MAXIMUM COLLECTOR CURRENT
vs
UNCLAMPED INDUCTIVE LOAD

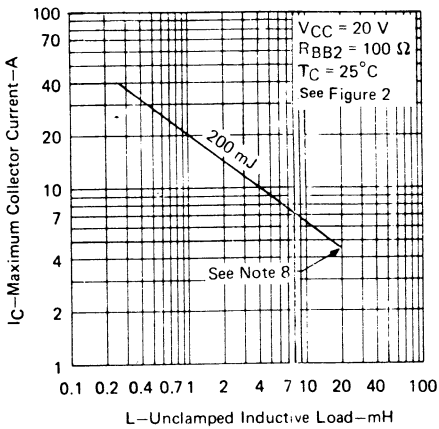


FIGURE 4

NOTE 8: Above this point the safe operating area has not been defined.

THERMAL INFORMATION

CASE TEMPERATURE
DISSIPATION DERATING CURVE

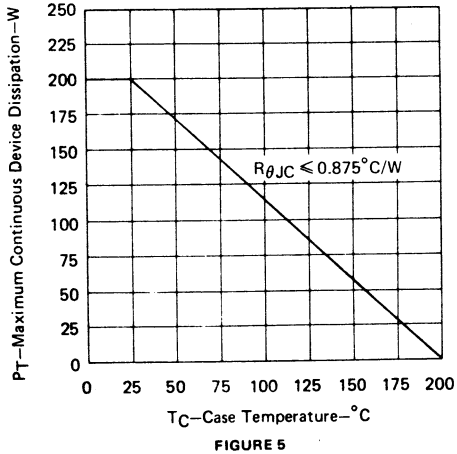


FIGURE 5

FREE-AIR TEMPERATURE
DISSIPATION DERATING CURVE

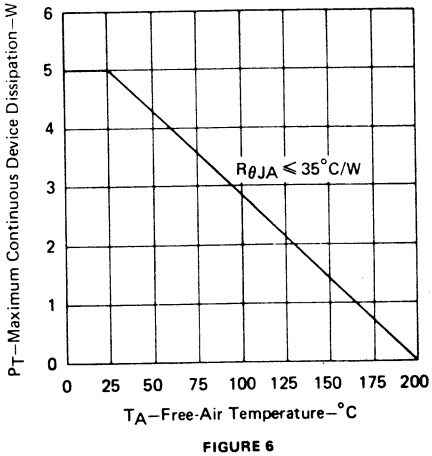


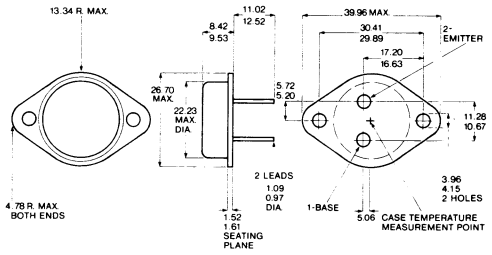
FIGURE 6

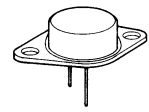
FOR POWER-AMPLIFIER AND HIGH-SPEED-SWITCHING APPLICATIONS
DESIGNED FOR COMPLEMENTARY USE WITH 2N6326, 2N6327, 2N6328

- 200 W at 25°C Case Temperature
- 30-A Rated Collector Current
- 200-mJ Reverse Energy Rating
- High SOA Capability, 20 V and 10 A

*mechanical data

THE COLLECTOR IS IN ELECTRICAL CONTACT WITH THE CASE





ALL DIMENSIONS ARE IN MILLIMETRES

ALL JEDEC TO-3 DIMENSIONS AND NOTES ARE APPLICABLE

***absolute maximum ratings at 25°C case temperature (unless otherwise noted)**

	2N6329	2N6330	2N6331
Collector-Base Voltage	−60 V	−80 V	−100 V
Collector-Emitter Voltage (See Note 1)	−60 V	−80 V	−100 V
Emitter-Base Voltage	−5 V	−5 V	−5 V
Continuous Collector Current	−30 A		
Peak Collector Current (See Note 2)	−40 A		
Continuous Base Current	−10 A		
Safe Operating Areas at (or below) 25°C Case Temperature	See Figures 3 and 4		
Continuous Device Dissipation at (or below) 25°C Case Temperature (See Note 3)	200 W		
Continuous Device Dissipation at 100°C Case Temperature (See Note 3)	114 W		
Continuous Device Dissipation at (or below) 25°C Free-Air Temperature (See Note 4)	5 W		
Unclamped Inductive Load Energy (See Note 5)	200 mJ		
Operating Collector Junction Temperature Range	−65°C to 200°C		
Storage Temperature Range	−65°C to 200°C		
Terminal Temperature 1.6mm from Case for 10 Seconds	250°C		

NOTES: 1. These value apply when the base-emitter diode is open-circuited.
2. This value applies for $t_w \leq 1$ ms, duty cycle $\leq 10\%$.
3. Derate linearly to 200°C case temperature at the rate of 1.14 W/°C or refer to Dissipation Derating Curve, Figure 5.
4. Derate linearly to 200°C free-air temperature at the rate of 28.6 mW/°C or refer to Dissipation Derating Curve, Figure 6.
5. This rating is based on the capability of the transistors to operate safely in the circuit of Figure 2. L = 20 mH, R_{BB2} = 100 Ω, V_{BB2} = 0 V, R_S = 0.1 Ω, V_{CC} = 20 V. Energy ≈ $I_C^2 L/2$.

*JEDEC registered data. This data sheet contains all applicable registered data in effect at the time of publication.

*electrical characteristics at 25°C case temperature (unless otherwise noted)

PARAMETER		TEST CONDITIONS			2N6329	2N6330	2N6331	UNIT
					MIN MAX	MIN MAX	MIN MAX	
$V_{(BR)CEO}$	Collector-Emitter Breakdown Voltage	I_C = −30 mA,	I_B = 0,	See Note 6	−60	−80	−100	V
I_{CEO}	Collector Cutoff Current	V_{CE} = −30 V,	I_B = 0		−1			mA
		V_{CE} = −40 V,	I_B = 0			−1		
		V_{CE} = −50 V,	I_B = 0				−1	
I_{CES}	Collector Cutoff Current	V_{CE} = −60 V,	V_{BE} = 0		−0.5			mA
		V_{CE} = −80 V,	V_{BE} = 0			−0.5		
		V_{CE} = −100 V,	V_{BE} = 0				−0.5	
		V_{CE} = −30 V,	V_{BE} = 0,	T_C = 150°C	−5			
		V_{CE} = −40 V,	V_{BE} = 0,	T_C = 150°C		−5		
		V_{CE} = −50 V,	V_{BE} = 0,	T_C = 150°C			−5	
I_{EBO}	Emitter Cutoff Current	V_{EB} = −5 V,	I_C = 0,		−0.5	−0.5	−0.5	mA
h_{FE}	Static Forward Current Transfer Ratio	V_{CE} = −4 V,	I_C = −5 A	See Notes 6 and 7	25	25	25	
		V_{CE} = −4 V,	I_C = −15 A		12	12	12	
		V_{CE} = −4 V,	I_C = −30 A		6 30	6 30	6 30	
V_{BE}	Base-Emitter Voltage	V_{CE} = −4 V,	I_C = −15 A	See Notes 6 and 7	−2	−2	−2	V
		V_{CE} = −4 V,	I_C = −30 A		−4	−4	−4	
$V_{CE(sat)}$	Collector-Emitter Voltage	I_B = −2 A,	I_C = −15 A	See Notes 6 and 7	−1.5	−1.5	−1.5	V
		I_B = −7.5 A,	I_C = −30 A		−3	−3	−3	
h_{fe}	Small-Signal Common-Emitter Forward Current Transfer Ratio	V_{CE} = −10 V,	I_C = −1 A,	f = 1 kHz	30	30	30	
h_{fe}	Small-Signal Common-Emitter Forward Current Transfer Ratio	V_{CE} = −10 V,	I_C = −1 A,	f = 1 MHz	3	3	3	

NOTES: 6. These parameters must be measured using pulse techniques. t_w = 300 μs; duty cycle ≤ 2%.
7. These parameters are measured with voltage-sensing contacts separate from the current-carrying contacts and located within 3.2 mm from the device body.

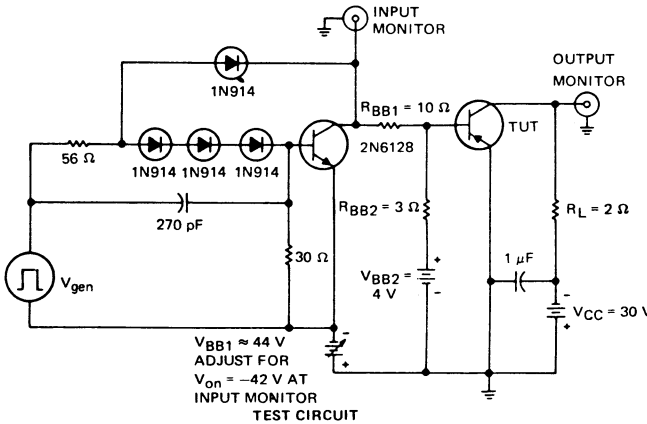
*JEDEC registered data

switching characteristics at 25°C case temperature

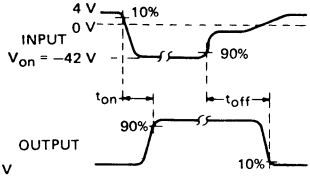
PARAMETER		TEST CONDITIONS†			TYP	UNIT
t_{on}	Turn-On Time	I_C = −15 A,	$I_{B(1)}$ = −2 A,	$I_{B(2)}$ = 2 A,	0.6	μs
t_{off}	Turn-Off Time	$V_{BE(off)}$ = 4 V,	R_L = 2 Ω,	See Figure 1	0.9	

†Voltage and current values shown are nominal, exact values vary slightly with transistor parameters.

PARAMETER MEASUREMENT INFORMATION



TEST CIRCUIT

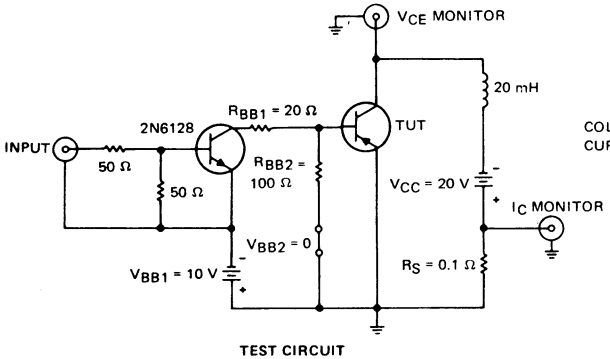


VOLTAGE WAVEFORMS

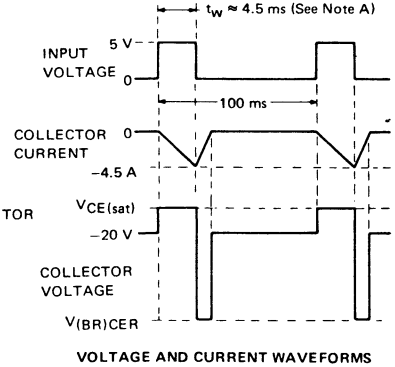
NOTES: A. V_{gen} is a 30-V pulse (from 0 V) into a 50-Ω termination.
B. The V_{gen} waveform is supplied by a generator with the following characteristics: $t_r \leq 15$ ns, $t_f \leq 15$ ns, Z_{out} = 50 Ω, t_w = 20 μs, duty cycle ≤ 2%.
C. Waveforms are monitored on an oscilloscope with the following characteristics: $t_r \leq 15$ ns, $R_{in} \geq 10$ MΩ, $C_{in} \leq 11.5$ pF.
D. Resistors must be noninductive types.
E. The d-c power supplies may require additional bypassing in order to minimize ringing.

FIGURE 1

INDUCTIVE LOAD SWITCHING



TEST CIRCUIT



VOLTAGE AND CURRENT WAVEFORMS

NOTE A: Input pulse width is increased until I_{CM} = −4.5 A.

FIGURE 2

MAXIMUM SAFE OPERATING AREAS

MAXIMUM COLLECTOR CURRENT
vs
COLLECTOR-EMITTER VOLTAGE

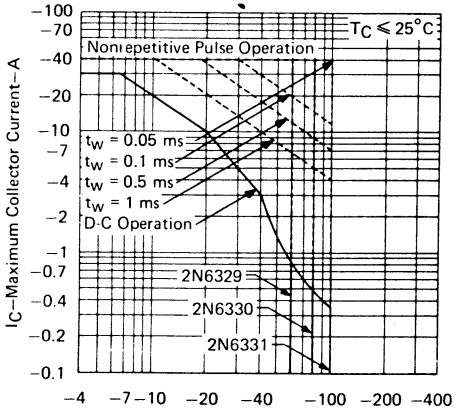


FIGURE 3

MAXIMUM COLLECTOR CURRENT
vs
UNCLAMPED INDUCTIVE LOAD

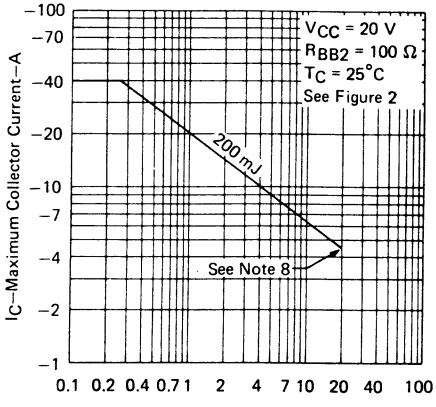


FIGURE 4

NOTE 8: Above this point the safe operating area has not been defined.

THERMAL INFORMATION

CASE TEMPERATURE
DISSIPATION DERATING CURVE

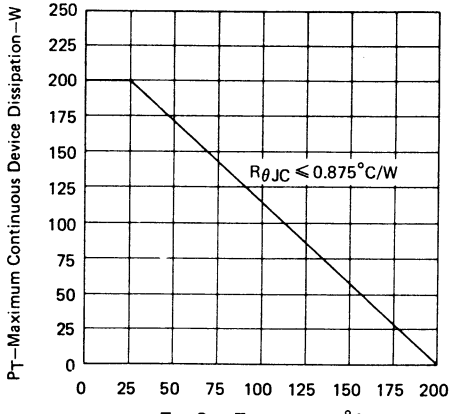


FIGURE 5

FREE-AIR TEMPERATURE
DISSIPATION DERATING CURVE

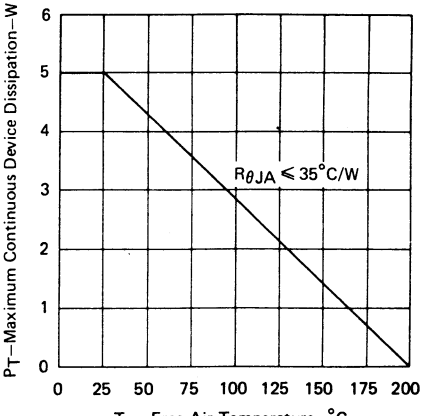


FIGURE 6