

8961726 TEXAS INSTR (OPTO)

62C 36587 D

T-33-23

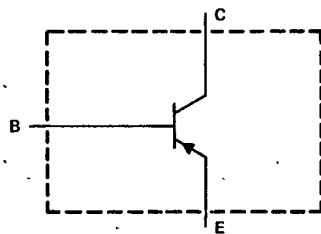
2N4398, 2N4399

P-N-P SILICON POWER TRANSISTORS

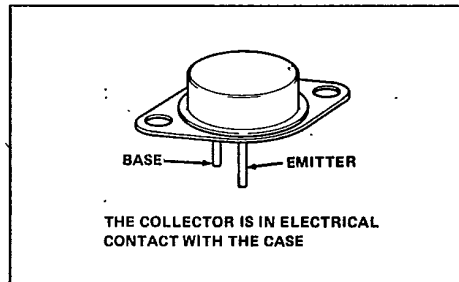
REVISED OCTOBER 1984

- Designed for Complementary Use With 2N5301, 2N5302
- 200 W at 25°C Case Temperature
- 30 A Continuous Collector Current
- Min f_T of 4 MHz at 10 V, 1 A
- Designed for Use in Power Amplifier and High-Speed Switching Applications

device schematic



TO-3 PACKAGE



2N Devices

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

	2N4398	2N4399
*Collector-base voltage	-40 V	-60 V
*Collector-emitter voltage ($V_{BE} = 1.5 V$)	-40 V	-60 V
*Collector-emitter voltage ($I_B = 0$)	-40 V	-60 V
*Emitter-base voltage		-5 V
*Continuous collector current		-30 A
*Peak collector current (see Note 1)		-50 A
*Continuous base current		-7.5 A
*Peak base current (see Note 1)		-15 A
Safe operating areas at (or below) 25°C case temperature		See Figure 6
*Continuous device dissipation at (or below) 25°C case temperature (see Note 2)		200 W
Continuous device dissipation at (or below) 25°C free-air temperature (see Note 3)		5 W
*Operating collector junction and storage temperature range		-65°C to 200°C
*Lead temperature 1.6 mm (0.0625 inch) from case for 10 seconds		235°C

- NOTES: 1. This value applies for $t_W \leq 0.3$ ms, duty cycle $\leq 10\%$.
 2. Derate linearly to 200°C case temperature at the rate of 1.15 W/°C.
 3. Derate linearly to 200°C free-air temperature at the rate of 28.6 mW/°C.

*JEDEC registered data.

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2N4398, 2N4399
P-N-P SILICON POWER TRANSISTORS

2N Devices

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

PARAMETER	TEST CONDITIONS	2N4398			2N4399			UNIT
		MIN	TYP	MAX	MIN	TYP	MAX	
V(BR)CEO	I _C = -0.2 A, I _B = 0, See Note 4	-40			-60			V
I _{CBO}	V _{CB} = -40 V, I _E = 0			-1				mA
	V _{CB} = -60 V, I _E = 0					-1		
I _{CEO}	V _{CE} = -40 V, I _B = 0			-5				mA
	V _{CE} = -60 V, I _B = 0					-5		
I _{CEV}	V _{CE} = -40 V, V _{BE} = 1.5 V			-5				mA
	V _{CE} = -60 V, V _{BE} = 1.5 V					-5		
	V _{CE} = -30 V, V _{BE} = 1.5 V, T _C = 150°C			-10		-10		
I _{EBO}	V _{EB} = -5 V, I _C = 0			-5				mA
h _{FE}	V _{CE} = -2 V, I _C = -1 A, See Notes 4 and 5	40			40			/
	V _{CE} = -4 V, I _C = -15 A, See Notes 4 and 5	15		60	15		60	
	V _{CE} = -4 V, I _C = -30 A, See Notes 4 and 5	5			5			
V _{BE}	I _B = -1.5 A, I _C = -15 A, See Notes 4 and 5			-1.85			-1.85	V
	V _{CE} = -2 V, I _C = -15 A, See Notes 4 and 5			-1.7			-1.7	
	V _{CE} = -4 V, I _C = -30 A, See Notes 4 and 5			-3			-3	
V _{CE(sat)}	I _B = -1 A, I _C = -10 A, See Notes 4 and 5			-0.75			-0.75	V
	I _B = -1.5 A, I _C = -15 A, See Notes 4 and 5			-1			-1	
	I _B = -6 A, I _C = -30 A, See Notes 4 and 5			-4			-4	
h _{fe}	V _{CE} = -10 V, I _C = -1 A, f = 1 kHz	40			40			
h _{fe}	V _{CE} = -10 V, I _C = -1 A, f = 1 MHz	4			4			

- NOTES: 4. These parameters must be measured using pulse techniques, t_w = 300 μs, duty cycle < 2%.
5. These parameters are measured with voltage-sensing contacts separate from the current-carrying contacts.

thermal characteristics

PARAMETER	MIN	TYP	MAX	UNIT
R _{θJC}		0.875		°C/W
R _{θJA}		35		°C/W

resistive-load switching characteristics at 25°C case temperature (unless otherwise noted)

PARAMETER	TEST CONDITIONS†	MIN	TYP	MAX	UNIT
t _r	I _C = -10 A, I _{B1} = -1 A, V _{BE(off)} = 2 V, R _L = 3 Ω, See Figure 1		0.4		μs
t _s	I _C = -10 A, I _{B1} = -1 A, I _{B2} = 1 A, R _L = 3 Ω, See Figure 2		1.5		μs
t _f			0.6		μs

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

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PARAMETER MEASUREMENT INFORMATION

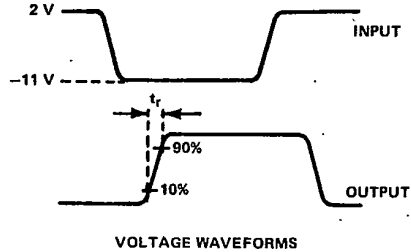
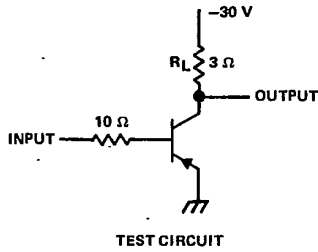


FIGURE 1. RESISTIVE-LOAD SWITCHING - RISE TIME

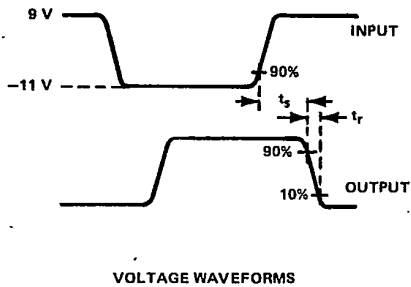
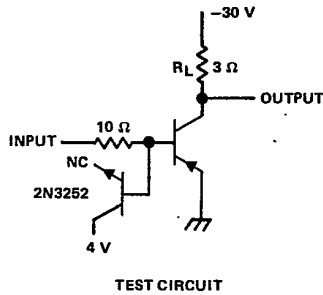


FIGURE 2. RESISTIVE-LOAD SWITCHING - STORAGE AND FALL TIMES

- NOTES: A. The input waveforms are supplied by a generator with the following characteristics: $t_r \leq 20$ ns, $t_f \leq 20$ ns, $Z_{out} = 50 \Omega$, $t_w = 10 \mu s$ to $100 \mu s$, duty cycle $\leq 2\%$.
 B. Waveforms are monitored on an oscilloscope with the following characteristics: $t_r \leq 20$ ns, $R_{in} \geq 10$ k Ω , $C_{in} \leq 11.5$ pF.
 C. Resistors must be noninductive types.
 D. The d-c power supplies may require additional bypassing in order to minimize ringing.

2
2N Devices

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2N4398, 2N4399
P-N-P SILICON POWER TRANSISTORS

2
2N Devices

TYPICAL CHARACTERISTICS

STATIC FORWARD CURRENT TRANSFER RATIO
VS
COLLECTOR CURRENT

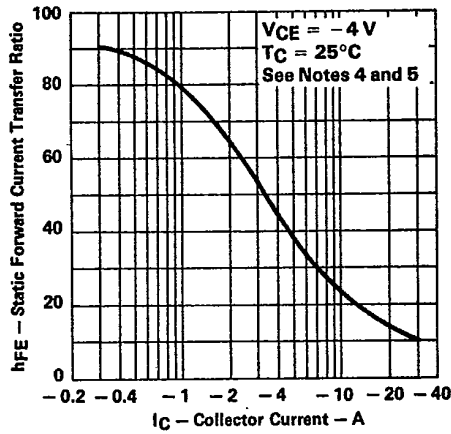


FIGURE 3

BASE-EMITTER VOLTAGE
VS
COLLECTOR CURRENT

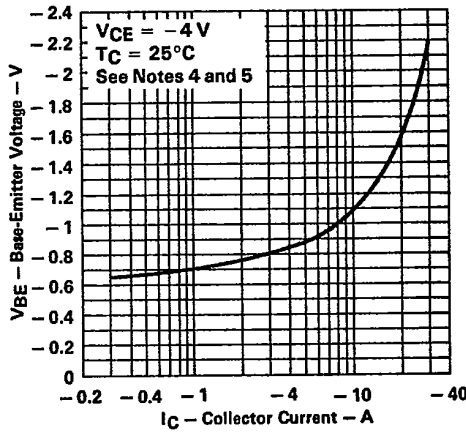


FIGURE 4

COLLECTOR-EMITTER SATURATION VOLTAGE
VS
COLLECTOR CURRENT

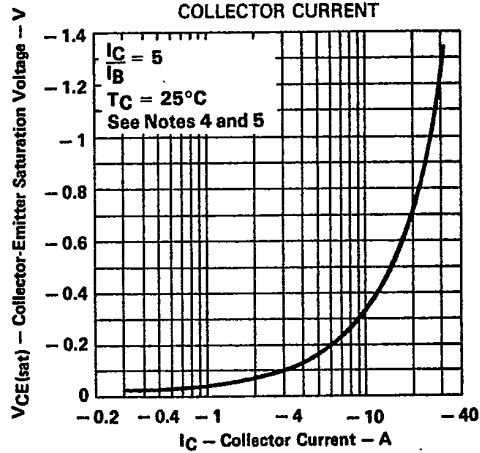


FIGURE 5

- NOTES: 4. These parameters must be measured using pulse techniques, $t_w = 300 \mu s$, duty cycle $\leq 2\%$.
5. These parameters are measured with voltage-sensing contacts separate from the current-carrying contacts.

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7-33-25

2N4398, 2N4399

P-N-P SILICON POWER TRANSISTORS

MAXIMUM SAFE OPERATING AREA
FORWARD-BIAS SAFE OPERATING AREA

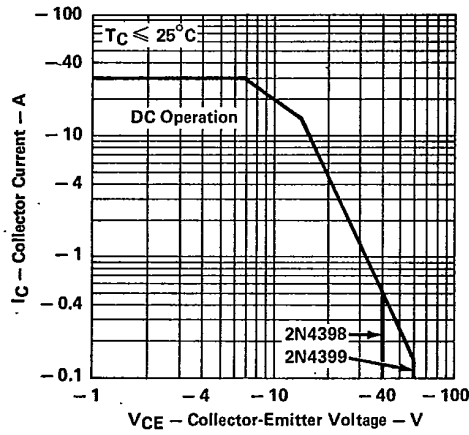


FIGURE 6

2

2N Devices