

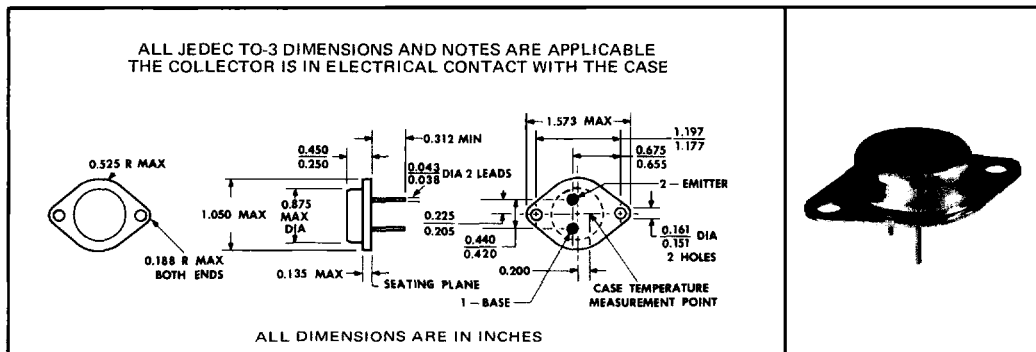
# TYPES 2N5869, 2N5870 N-P-N SINGLE-DIFFUSED SILICON POWER TRANSISTORS

TYPES 2N5869, 2N5870  
BULLETIN NO. DLS-7111822, DECEMBER 1971

FOR POWER-AMPLIFIER AND HIGH-SPEED-SWITCHING APPLICATIONS  
DESIGNED FOR COMPLEMENTARY USE WITH 2N5867, 2N5868

- 87.5 Watts at 25°C Case Temperature
- 5-A Rated Continuous Collector Current
- Min  $f_T$  of 4 MHz at 10 V, 0.25 A
- 62.5-mJ Reverse Energy Rating

**\*mechanical data**



5

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

	2N5869	2N5870
Collector-Base Voltage	60 V*	80 V*
Collector-Emitter Voltage (See Note 1)	60 V*	80 V*
Emitter-Base Voltage	5 V*	5 V*
Continuous Collector Current		
Peak Collector Current (See Note 2)	← 7 A →	
Continuous Base Current	← 1 A* →	
Safe Operating Area at (or below) 25°C Case Temperature	See Figure 1	
Continuous Device Dissipation at (or below) 25°C Case Temperature (See Note 3)	← 87.5 W* →	
Continuous Device Dissipation at (or below) 25°C Free-Air Temperature (See Note 4)	← 5 W →	
Unclamped Inductive Load Energy (See Note 5)	← 62.5 mJ →	
Operating Collector Junction Temperature Range	← -65°C to 200°C* →	
Storage Temperature Range	← -65°C to 200°C* →	
Terminal Temperature 1/16 Inch 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 0.5 mW/°C.  
 4. Derate linearly to 200°C free-air temperature at the rate of 28.6 mW/°C.  
 5. This rating is based on the capability of the transistors to operate safely in the unclamped-inductive load circuit of Section 3.2 of the forthcoming JEDEC publication *Suggested Standards on Power Transistors*. † L = 20 mH,  $R_{BB1} = 20 \Omega$ ,  $R_{BB2} = 100 \Omega$ ,  $V_{BB1} = 10$  V,  $V_{BB2} = 0$  V,  $R_L = 0.1 \Omega$ ,  $V_{CC} = 10$  V,  $I_{CM} = 2.5$  A. Energy  $\approx I_C^2 L/2$ .

\*JEDEC registered data. This data sheet contains all applicable registered data in effect at the time of publication.  
 †Texas Instruments guarantees this value in addition to the JEDEC registered value which is also shown.  
 ‡This circuit appears on page 5-1 of this data book.

# TYPES 2N5869, 2N5870

## N-P-N SINGLE-DIFFUSED SILICON POWER TRANSISTORS

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

PARAMETER	TEST CONDITIONS	2N5869		2N5870		UNIT
		MIN	MAX	MIN	MAX	
V(BR)CEO Collector-Emitter Breakdown Voltage	I <sub>C</sub> = 100 mA, I <sub>B</sub> = 0, See Note 6	60		80		V
I <sub>CEO</sub> Collector Cutoff Current	V <sub>CE</sub> = 30 V, I <sub>B</sub> = 0 V <sub>CE</sub> = 40 V, I <sub>B</sub> = 0	0.5		0.5		mA
I <sub>CEV</sub> Collector Cutoff Current	V <sub>CE</sub> = 60 V, V <sub>BE</sub> = -1.5 V	0.1				mA
	V <sub>CE</sub> = 80 V, V <sub>BE</sub> = -1.5 V			0.1		
	V <sub>CE</sub> = 60 V, V <sub>BE</sub> = -1.5 V, T <sub>C</sub> = 150°C	2				
	V <sub>CE</sub> = 80 V, V <sub>BE</sub> = -1.5 V, T <sub>C</sub> = 150°C	2				
I <sub>CBO</sub> Collector Cutoff Current	V <sub>CB</sub> = 60 V, I <sub>E</sub> = 0	0.1				mA
	V <sub>CB</sub> = 80 V, I <sub>E</sub> = 0			0.1		
I <sub>EBO</sub> Emitter Cutoff Current	V <sub>EB</sub> = 5 V, I <sub>C</sub> = 0	1		1		mA
	V <sub>CE</sub> = 4 V, I <sub>C</sub> = 300 mA	35		35		
h <sub>FE</sub> Static Forward Current Transfer Ratio	V <sub>CE</sub> = 4 V, I <sub>C</sub> = 1.5 A	20	100	20	100	
	V <sub>CE</sub> = 4 V, I <sub>C</sub> = 3 A	5		5		
V <sub>BE</sub> Base-Emitter Voltage	I <sub>B</sub> = 200 mA, I <sub>C</sub> = 2 A	1.6		1.6		V
	V <sub>CE</sub> = 4 V, I <sub>C</sub> = 3 A	2		2		
V <sub>CE(sat)</sub> Collector-Emitter Saturation Voltage	I <sub>B</sub> = 200 mA, I <sub>C</sub> = 2 A	1		1		V
	I <sub>B</sub> = 0.6 A, I <sub>C</sub> = 3 A	2		2		
h <sub>fe</sub> Small-Signal Common-Emitter Forward Current Transfer Ratio	V <sub>CE</sub> = 4 V, I <sub>C</sub> = 0.25 A, f = 1 kHz	20		20		
h <sub>fe</sub>   Small-Signal Common-Emitter Forward Current Transfer Ratio	V <sub>CE</sub> = 10 V, I <sub>C</sub> = 0.25 A, f = 1 MHz	4		4		
C <sub>obo</sub> Common-Base Open-Circuit Output Capacitance	V <sub>CB</sub> = 10 V, I <sub>E</sub> = 0, f = 1 MHz	150		150		pF

NOTES: 6. These parameters must be measured using pulse techniques. t<sub>w</sub> = 300 μs, duty cycle ≤ 2%.

7. These parameters are measured with voltage-sensing contacts separate from the current-carrying contacts and located within 0.125 inch from the device body.

\*switching characteristics at 25°C case temperature

PARAMETER	TEST CONDITIONS†	MIN	MAX	UNIT
t <sub>r</sub> Rise Time	I <sub>C</sub> = 1.5 A, I <sub>B(1)</sub> = 0.15 A, I <sub>B(2)</sub> = -0.15 A, V <sub>BE(off)</sub> = -5 V, R <sub>L</sub> = 20 Ω, See Note 8	0.7		μs
t <sub>s</sub> Storage Time		1		
t <sub>f</sub> Fall Time		0.8		

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

\*JEDEC registered data.

NOTE 8: These characteristics are measured in the circuit of clause 3.3.13.2 of the forthcoming JEDEC publication *Suggested Standards on Power Transistors*. ‡ V<sub>BB1</sub> = 25 V, V<sub>BB2</sub> = 5 V, V<sub>CC</sub> = 30 V, V<sub>on</sub> = 23 V, R<sub>BB1</sub> = 73 Ω, R<sub>BB2</sub> = 39 Ω.

‡This circuit appears on page 5-1 of this data book.

### MAXIMUM SAFE OPERATING AREA

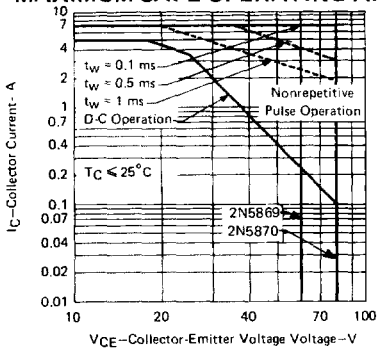


FIGURE 1

### THERMAL CHARACTERISTICS

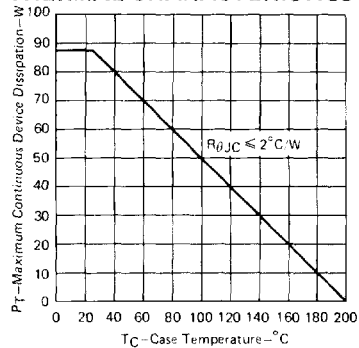


FIGURE 2