

## PNP SWITCHING SILICON TRANSISTOR

Qualified per MIL-PRF-19500/290

### Devices

2N2904	2N2905
2N2904A	2N2905A
2N2904AL	2N2905AL

### Qualified Level

JAN  
JANTX  
JANTXV  
JANS

### MAXIMUM RATINGS

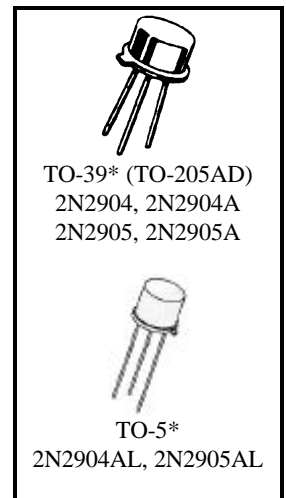
Ratings	Symbol	2N2904 2N2905	2N2904A, L 2N2905A, L	Unit
Collector-Emitter Voltage	$V_{CEO}$	40	60	Vdc
Collector-Base Voltage	$V_{CBO}$		60	Vdc
Emitter-Base Voltage	$V_{EBO}$		5.0	Vdc
Collector Current	$I_C$		600	mAdc
Total Power Dissipation @ $T_A = +25^{\circ}C$ <sup>(1)</sup> @ $T_C = +25^{\circ}C$ <sup>(2)</sup>	$P_T$		0.6 3.0	W
Operating & Storage Junction Temp. Range	$T_J, T_{stg}$		-65 to +200	$^{\circ}C$

### THERMAL CHARACTERISTICS

Characteristics	Symbol	Max.	Unit
Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	0.29	$^{\circ}C/mW$

1) Derate linearly 3.43 W/ $^{\circ}C$  for  $T_A > +25^{\circ}C$

2) Derate linearly 17.2 W/ $^{\circ}C$  for  $T_C > +25^{\circ}C$



\*See appendix A for package outline

### ELECTRICAL CHARACTERISTICS ( $T_A = +25^{\circ}C$ unless otherwise noted)

Characteristics	Symbol	Min.	Max.	Unit
<b>OFF CHARACTERISTICS</b>				
Collector-Emitter Breakdown Voltage $I_C = 10$ mAdc	$V_{(BR)CEO}$	40 60		Vdc
Collector-Emitter Cutoff Voltage $V_{CE} = 40$ Vdc $V_{CE} = 60$ Vdc	$I_{CES}$		1.0 1.0	$\mu$ Adc
Collector-Base Cutoff Current $V_{CB} = 50$ Vdc $V_{CB} = 60$ Vdc	$I_{CBO}$		20 10 10	$\eta$ Adc $\mu$ Adc
Emitter-Base Cutoff Current $V_{EB} = 3.5$ Vdc $V_{EB} = 5.0$ Vdc	$I_{EBO}$		50 10	$\eta$ Adc $\mu$ Adc

**2N2904, 2N2904A, 2N2904AL, 2N2905, 2N2905A, 2N2905AL JAN SERIES**

**ELECTRICAL CHARACTERISTICS (con't)**

Characteristics		Symbol	Min.	Max.	Unit		
<b>ON CHARACTERISTICS <sup>(3)</sup></b>							
Forward-Current Transfer Ratio $I_C = 0.1 \text{ mAdc}, V_{CE} = 10 \text{ Vdc}$ $I_C = 1.0 \text{ mAdc}, V_{CE} = 10 \text{ Vdc}$ $I_C = 10 \text{ mAdc}, V_{CE} = 10 \text{ Vdc}$ $I_C = 150 \text{ mAdc}, V_{CE} = 10 \text{ Vdc}$ $I_C = 500 \text{ mAdc}, V_{CE} = 10 \text{ Vdc}$	2N2904	$h_{FE}$	20				
	2N2905		35				
	2N2904A, 2N2904AL		40				
	2N2905A, 2N2905AL		75				
	2N2904		25	175			
	2N2905		50	450			
	2N2904A, 2N2904AL		40	175			
	2N2905A, 2N2905AL		100	450			
	2N2904		35				
	2N2905		75				
	2N2904A, 2N2904AL		40				
	2N2905A, 2N2905AL		100				
	2N2904, 2N2904A, L		40	120			
	2N2905, 2N2905A, L		100	300			
	2N2904		20				
	2N2905		30				
	2N2904A, 2N2904AL		40				
	2N2905A, 2N2905AL		50				
	Collector-Emitter Saturation Voltage $I_C = 150 \text{ mAdc}, I_B = 15 \text{ mAdc}$ $I_C = 500 \text{ mAdc}, I_B = 50 \text{ mAdc}$			$V_{CE(sat)}$		0.4 1.6	Vdc
	Base-Emitter Voltage $I_C = 150 \text{ mAdc}, I_B = 15 \text{ mAdc}$ $I_C = 500 \text{ mAdc}, I_B = 50 \text{ mAdc}$			$V_{BE(sat)}$		1.3 2.6	Vdc

**DYNAMIC CHARACTERISTICS**

Small-Signal Cutoff Frequency $I_C = 1.0 \text{ mAdc}, V_{CE} = 10 \text{ Vdc}, f = 1.0 \text{ kHz}$ 2N2904 2N2905 2N2904A, 2N2905A 2N2904AL, 2N2905AL	$h_{fe}$	25 50 40 100			
Small-Signal Cutoff Frequency, Magnitude $I_C = 50 \text{ mAdc}, V_{CE} = 20 \text{ Vdc}, f = 100 \text{ MHz}$	$ h_{fe} $	2.0			
Output Capacitance $V_{CB} = 10 \text{ Vdc}, I_E = 0, 100 \text{ kHz} \leq f \leq 1.0 \text{ MHz}$	$C_{obo}$		8.0		pF
Input Capacitance $V_{EB} = 2.0 \text{ Vdc}, I_C = 0, 100 \text{ kHz} \leq f \leq 1.0 \text{ MHz}$	$C_{ibo}$		30		pF

**SWITCHING CHARACTERISTICS**

Turn-On Time $V_{CC} = 30 \text{ Vdc}; I_C = 150 \text{ mAdc}; I_{B1} = 15 \text{ mAdc}$	$t_{on}$		45		$\eta s$
Turn-Off Time $V_{CC} = 30 \text{ Vdc}; I_C = 150 \text{ mAdc}; I_{B1} = I_{B2} = 15 \text{ mAdc}$	$t_{off}$		300		$\eta s$

(3) Pulse Test: Pulse Width = 300 $\mu s$ , Duty Cycle  $\leq$  2.0%.