

**COMPLEMENTARY SILICON  
 MEDIUM-POWER TRANSISTORS**

..designed for general-purpose power amplifier and switching applications.

**FEATURES:**

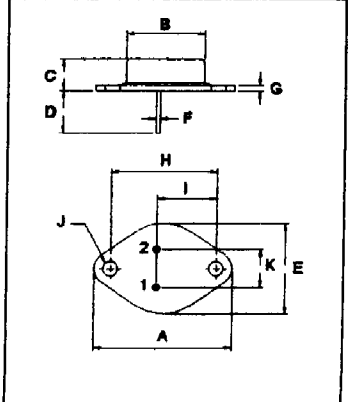
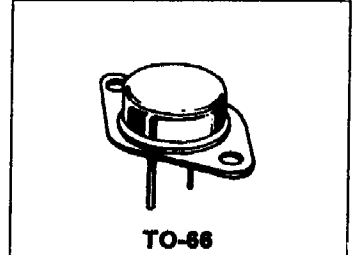
- \* Low Collector-Emitter Saturation Voltage  
 $V_{CE(sat)} = 0.7 \text{ V (Max.) @ } I_C = 1.5 \text{ A}$
- \* Excellent DC Current Gain  
 $hFE = 25-100 @ I_C = 1.5 \text{ A}$
- \* Low Leakage Current-  $I_{CEX} = 0.1 \text{ mA(Max)}$

**MAXIMUM RATINGS**

Characteristic	Symbol	2N4231A 2N6312	2N4232A 2N6313	2N4233A 2N6314	Unit
Collector-Emitter Voltage	$V_{CEO}$	40	60	80	V
Collector-Base Voltage	$V_{CBO}$	40	60	80	V
Emitter-Base Voltage	$V_{EBO}$	5.0			V
Collector Current-Continuous -Peak	$I_C$ $I_{CM}$	5.0 10			A
Base Current	$I_B$	2.0			A
Total Power Dissipation @ $T_C = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	75 0.43			W W/ $^\circ\text{C}$
Operating and Storage Junction Temperature Range	$T_J, T_{STG}$	- 65 to +200			$^\circ\text{C}$

NPN	PNP
2N4231A	2N6312
2N4232A	2N6313
2N4233A	2N6314

**5 AMPERE  
 COMPLEMENTARY SILICON  
 POWER TRANSISTOR  
 40-80 VOLTS  
 75 WATTS**

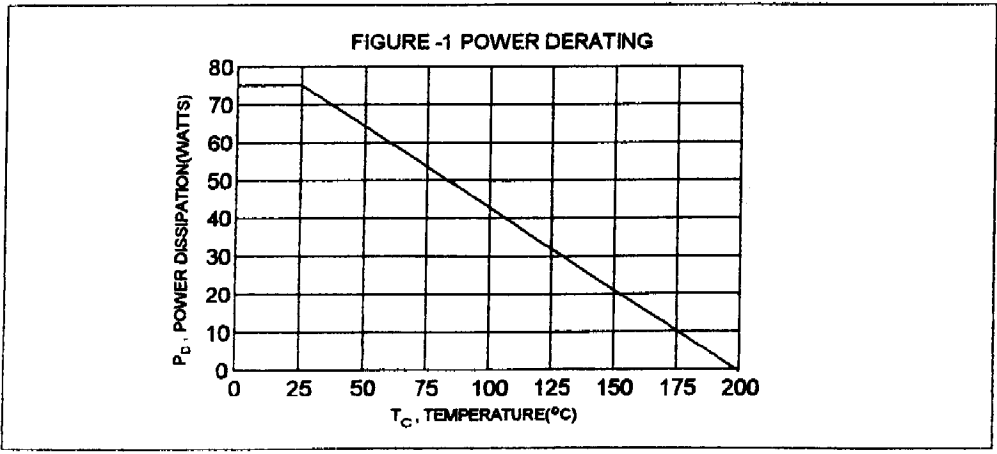


PIN 1. BASE  
 2. EMITTER  
 COLLECTOR (CASE)

DIM	MILLIMETERS	
	MIN	MAX
A	30.60	32.52
B	13.85	14.16
C	8.54	7.22
D	9.50	10.50
E	17.28	18.48
F	0.76	0.92
G	1.38	1.65
H	24.16	24.78
I	13.84	15.60
J	3.32	3.92
K	4.86	5.34

**THERMAL CHARACTERISTICS**

Characteristic	Symbol	Max	Unit
Thermal Resistance Junction to Case	$R_{\theta jc}$	2.32	$^\circ\text{C/W}$



**2N4231A Thru 2N4233A NPN / 2N6312 Thru 2N6314 PNP**

**ELECTRICAL CHARACTERISTICS (  $T_c = 25^\circ\text{C}$  unless otherwise noted )**

Characteristic	Symbol	Min	Max	Unit
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**OFF CHARACTERISTICS**

Collector - Emitter Sustaining Voltage (1) ( $I_c = 100 \text{ mA}, I_B = 0$ )	2N4231A,2N6312 2N4232A,2N6313 2N4233A,2N6314	$V_{CE(sus)}$	40 60 80	V
Collector Cutoff Current ( $V_{CE} = 30 \text{ V}, I_B = 0$ ) ( $V_{CE} = 50 \text{ V}, I_B = 0$ ) ( $V_{CE} = 70 \text{ V}, I_B = 0$ )	2N4231A,2N6312 2N4232A,2N6313 2N4233A,2N6314	$I_{CEO}$	1.0 1.0 1.0	mA
Collector-Emitter Leakage Current ( $V_{CE} = 40 \text{ V}, V_{BE(on)} = 1.5 \text{ V}$ ) ( $V_{CE} = 60 \text{ V}, V_{BE(on)} = 1.5 \text{ V}$ ) ( $V_{CE} = 80 \text{ V}, V_{BE(on)} = 1.5 \text{ V}$ ) ( $V_{CE} = 40 \text{ V}, V_{BE(on)} = 1.5 \text{ V}, T_c = 125^\circ\text{C}$ ) ( $V_{CE} = 60 \text{ V}, V_{BE(on)} = 1.5 \text{ V}, T_c = 125^\circ\text{C}$ ) ( $V_{CE} = 80 \text{ V}, V_{BE(on)} = 1.5 \text{ V}, T_c = 125^\circ\text{C}$ )	2N4231A,2N6312 2N4232A,2N6313 2N4233A,2N6314 2N4231A,2N6312 2N4232A,2N6313 2N4233A,2N6314	$I_{CEX}$	0.1 0.1 0.1 1.0 1.0 1.0	mA
Collector Cutoff Current ( $V_{CE} = 40 \text{ V}, I_B = 0$ ) ( $V_{CE} = 60 \text{ V}, I_B = 0$ ) ( $V_{CE} = 80 \text{ V}, I_B = 0$ )	2N4231A,2N6312 2N4232A,2N6313 2N4233A,2N6314	$I_{CBO}$	50 50 50	$\mu\text{A}$
Emitter Cutoff Current ( $V_{EB} = 5.0 \text{ V}, I_C = 0$ )		$I_{EBO}$	0.5	mA

**ON CHARACTERISTICS (1)**

DC Current Gain ( $I_c = 0.5 \text{ A}, V_{CE} = 2.0 \text{ V}$ ) ( $I_c = 1.5 \text{ A}, V_{CE} = 2.0 \text{ V}$ ) ( $I_c = 3.0 \text{ A}, V_{CE} = 2.0 \text{ V}$ ) ( $I_c = 5.0 \text{ A}, V_{CE} = 4.0 \text{ V}$ )		$h_{FE}$	40 25 10 4.0	100
Collector-Emitter Saturation Voltage ( $I_c = 1.5 \text{ A}, I_B = 0.15 \text{ A}$ ) ( $I_c = 3.0 \text{ A}, I_B = 0.3 \text{ A}$ ) ( $I_c = 5.0 \text{ A}, I_B = 1.25 \text{ A}$ )		$V_{CE(sat)}$	0.7 2.0 4.0	V
Base-Emitter Saturation Voltage ( $I_c = 1.5 \text{ A}, V_{CE} = 2.0 \text{ V}$ )		$V_{BE(on)}$	1.4	V

**DYNAMIC CHARACTERISTICS**

Current Gain - Bandwidth Product (2) ( $I_c = 0.5 \text{ A}, V_{CE} = 10 \text{ V}, f = 1.0 \text{ MHz}$ )	$f_T$	4.0		MHz
Output Capacitance ( $V_{CE} = 10 \text{ V}, I_E = 0, f = 0.1 \text{ MHz}$ )	$C_{ob}$		300	pF
Small-Signal Current Gain ( $I_c = 0.5 \text{ A}, V_{CE} = 10 \text{ V}, f = 1.0 \text{ KHz}$ )	$h_{fe}$	20		

(1) Pulse Test: Pulse width = 300  $\mu\text{s}$ , Duty Cycle  $\leq 2.0\%$

(2)  $f_T = |h_{fe}| \cdot f_{test}$