

2N3043

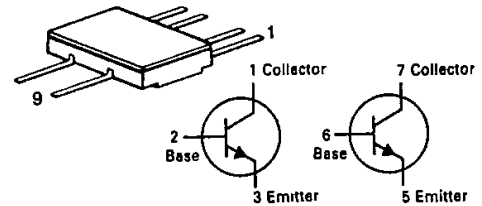
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2N3045

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CASE 610A-04, STYLE 1



**DUAL
AMPLIFIER TRANSISTOR**

NPN SILICON

MAXIMUM RATINGS

Rating	Symbol	Value		Unit
Collector-Emitter Voltage	V _{CEO}	45		Vdc
Collector-Base Voltage	V _{CBO}	45		Vdc
Emitter-Base Voltage	V _{EBO}	5.0		Vdc
Collector Current — Continuous	I _C	30		mAdc
		One Die	Both Die	
Total Device Dissipation @ T _A = 25°C Derate above 25°C	P _D	250 1.67	350 2.33	mW mW/°C
Total Device Dissipation @ T _C = 25°C Derate above 25°C	P _D	0.7 4.67	1.4 9.33	Watts mW/°C
Operating and Storage Junction Temperature Range	T _J , T _{stg}	-65 to +200		°C

ELECTRICAL CHARACTERISTICS (T_A = 25°C unless otherwise noted.)

Characteristic	Symbol	Min	Max	Unit
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OFF CHARACTERISTICS

Collector-Emitter Breakdown Voltage(1) (I _C = 10 mAdc, I _B = 0)	V _{(BR)CEO}	45	—	Vdc
Emitter-Base Breakdown Voltage (I _E = 10 μAdc, I _C = 0)	V _{(BR)EBO}	5.0	—	Vdc
Collector Cutoff Current (V _{CB} = 45 Vdc, I _E = 0) (V _{CB} = 45 Vdc, I _E = 0, T _A = +150°C)	I _{CBO}	—	0.010 10	μAdc
Emitter Cutoff Current (V _{EB} = 4.0 Vdc, I _C = 0)	I _{EBO}	—	0.010	μAdc

ON CHARACTERISTICS

DC Current Gain(1) (I _C = 10 μAdc, V _{CE} = 5.0 Vdc)	2N3043, 2N3044, 2N3045 2N3048	h _{FE}	100	300	—
(I _C = 1.0 mAdc, V _{CE} = 5.0 Vdc)			50	200	
Collector-Emitter Saturation Voltage (I _C = 10 mAdc, I _B = 0.5 mAdc)	2N3043, 2N3044, 2N3045 2N3048	V _{CE(sat)}	—	1.0	Vdc
Base-Emitter On Voltage (I _C = 10 mAdc, V _{CE} = 5.0 Vdc)		V _{BE}	0.6	0.8	Vdc

SMALL-SIGNAL CHARACTERISTICS

Current-Gain — Bandwidth Product (I _C = 1.0 mAdc, V _{CE} = 5.0 Vdc, f = 20 MHz)		f _T	30	—	MHz
Output Capacitance (V _{CB} = 5.0 Vdc, I _E = 0, f = 1.0 MHz)		C _{obo}	—	8.0	pF
Input Impedance (I _C = 1.0 mAdc, V _{CE} = 5.0 Vdc, f = 1.0 kHz)	2N3043, 2N3044, 2N3045 2N3048	h _{ie}	3.2k 1.6k	19k 13k	Ohms
Small-Signal Current Gain (I _C = 1.0 mAdc, V _{CE} = 5.0 Vdc, f = 1.0 kHz)	2N3043, 2N3044, 2N3045 2N3048	h _{fe}	130 65	600 400	—
Output Admittance (I _C = 1.0 mAdc, V _{CE} = 5.0 Vdc, f = 1.0 kHz)		h _{oe}	—	100 70	μmhos
Noise Figure (I _C = 10 μAdc, V _{CE} = 5.0 Vdc, R _S = 10 kohms, Bandwidth = 10 Hz to 15.7 kHz)		NF	—	5.0	dB

MOTOROLA SMALL-SIGNAL SEMICONDUCTORS

ELECTRICAL CHARACTERISTICS (continued) ($T_A = 25^\circ\text{C}$ unless otherwise noted.)

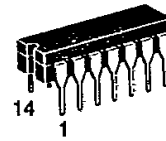
Characteristic		Symbol	Min	Max	Unit
MATCHING CHARACTERISTICS					
DC Current Gain Ratio(2) ($I_C = 10 \mu\text{A}_{dc}$, $V_{CE} = 5.0 \text{V}_{dc}$)	2N3043 2N3044	h_{FE1}/h_{FE2}	0.9 0.8	1.0 1.0	—
Base-Emitter Voltage Differential ($I_C = 10 \mu\text{A}_{dc}$, $V_{CE} = 5.0 \text{V}_{dc}$)	2N3043 2N3044	$ V_{BE1}-V_{BE2} $	— —	5.0 10	mVdc
Base-Emitter Voltage Differential Temperature Gradient ($I_C = 10 \mu\text{A}_{dc}$, $V_{CE} = 5.0 \text{V}_{dc}$, $T_A = -55$ to $+125^\circ\text{C}$)	2N3043 2N3044	$\frac{\Delta(V_{BE1}-V_{BE2})}{\Delta T_A}$	— —	10 20	$\mu\text{V}/^\circ\text{C}$

(1) Pulse Test: Pulse Width $\leq 300 \mu\text{s}$, Duty Cycle $\leq 2.0\%$.(2) The lowest h_{FE} reading is taken as h_{FE1} for this test.

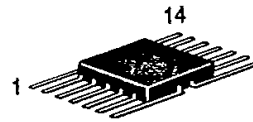
MAXIMUM RATINGS

Rating	Symbol	Value	Unit	
Collector-Emitter Voltage	V_{CE0}	60	Vdc	
Collector-Base Voltage	V_{CB}	60	Vdc	
Emitter-Base Voltage	V_{EB}	5.0	Vdc	
Collector Current — Continuous	I_C	600	mAdc	
		Each Transistor	Total Device	
M558-01 Total Power Dissipation @ $T_A = 25^\circ\text{C}$ Derate above 25°C	P_D	0.525 3.0	1.5 8.57	Watts mW/°C
M558-02 - Total Power Dissipation @ $T_A = 25^\circ\text{C}$ Derate above 25°C	P_D	0.14 0.8	0.4 2.29	Watts mW/°C
Operating and Storage Junction Temperature Range	T_J, T_{stg}	-65 to +200	°C	

M558-01
M558-02



M558-01
CERAMIC
CASE 632-02
STYLE 1



M558-02
CERAMIC
CASE 607-04
STYLE 1

QUAD
TRANSISTORS
PNP SILICON

Table 1. Product Classifications

JAN	— Controlled Lot with Sample Environmental and Life Testing
JTX	— 100% Processing Plus Sample Environmental and Life Testing
JTXV	— Same as JTX Plus 100% Internal Visual Inspection

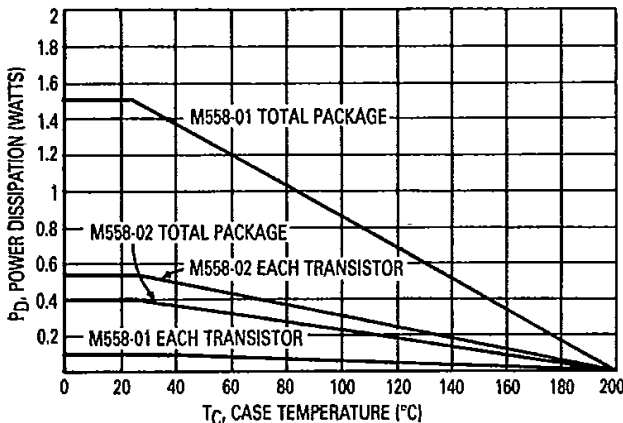


Figure 1. Power Temperature Derating Curve

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

Characteristic	Symbol	Min	Max	Unit
OFF CHARACTERISTICS				
Collector-Emitter Breakdown Voltage(1) ($I_C = 10 \text{ mAdc}, I_B = 0$)	$V_{(BR)CEO}$	60	—	Vdc
Collector-Base Breakdown Voltage ($I_C = 10 \mu\text{Adc}, I_E = 0$)	$V_{(BR)CBO}$	60	—	Vdc
Emitter-Base Breakdown Voltage ($I_E = 10 \mu\text{Adc}, I_C = 0$)	$V_{(BR)EBO}$	5.0	—	Vdc
Collector Cutoff Current ($I_E = 0, V_{CB} = 60 \text{ Vdc}$) ($I_E = 0, V_{CB} = 60 \text{ V}, T_A = 150^\circ\text{C}$)	I_{CBO}	—	10	nAdc μA
Emitter Cutoff Current ($I_C = 0, V_{CB} = 4.0 \text{ Vdc}$)	I_{EBO}	—	10	nAdc
ON CHARACTERISTICS				
DC Current Gain(1) ($I_C = 0.1 \text{ mA}, V_{CE} = 10 \text{ Vdc}$) ($I_C = 1.0 \text{ mA}, V_{CE} = 10 \text{ Vdc}$) ($I_C = 10 \text{ mAdc}, V_{CE} = 10 \text{ Vdc}$) ($I_C = 150 \text{ mAdc}, V_{CE} = 10 \text{ Vdc}$) ($I_C = 500 \text{ mAdc}, V_{CE} = 10 \text{ Vdc}$) ($I_C = 10 \text{ mA}, V_{CE} = 10 \text{ V}, T_A = -55^\circ\text{C}$)	h_{FE}	75 100 100 100 50 50	— 450 — 300 — —	
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 Saturation Voltage ($I_C = 150 \text{ mAdc}, I_B = 15 \text{ mAdc}$) ($I_C = 500 \text{ mAdc}, I_B = 50 \text{ mAdc}$)	$V_{BE(sat)}$	0.6 —	1.3 2.6	Vdc
DYNAMIC CHARACTERISTICS				
Current-Gain — Bandwidth Product(1) ($I_C = 50 \text{ mAdc}, V_{CE} = 20 \text{ Vdc}, f = 100 \text{ MHz}$)	f_T	250	800	MHz
Output Capacitance ($V_{CB} = 10 \text{ Vdc}, I_E = 0, f = 1.0 \text{ MHz}$)	C_{obo}	—	8.0	pF
Input Capacitance ($V_{BE} = 0.5 \text{ Vdc}, I_C = 0, f = 1.0 \text{ MHz}$)	C_{ibo}	—	30	pF

MOTOROLA SMALL-SIGNAL SEMICONDUCTORS

M558-01, M558-02

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

Characteristic	Symbol	Min	Max	Unit
SWITCHING CHARACTERISTICS				
Turn-On Time ($V_{CC} = 30\text{ Vdc}$, $V_{BE(off)} = 0.5\text{ Vdc}$, $I_C = 150\text{ mAdc}$, $I_{B1} = 15\text{ mAdc}$) (Figure 2)	t_{on}	—	45	ns
Turn-Off Time ($V_{CC} = 30\text{ Vdc}$, $I_C = 150\text{ mAdc}$, $I_{B1} = I_{B2} = 15\text{ mAdc}$) (Figure 3)	t_{off}	—	300	ns

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

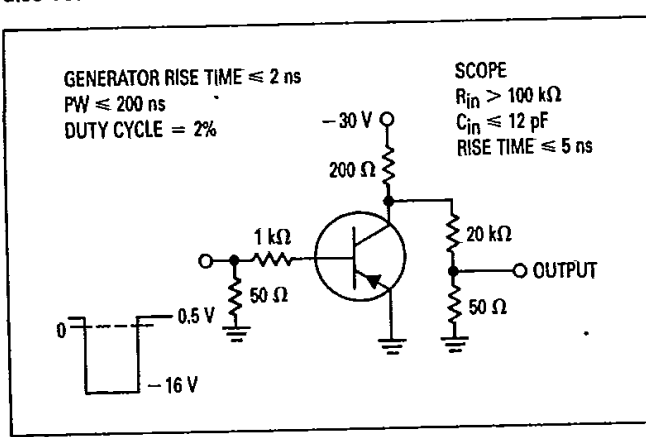


Figure 2. t_{on} Test Circuit

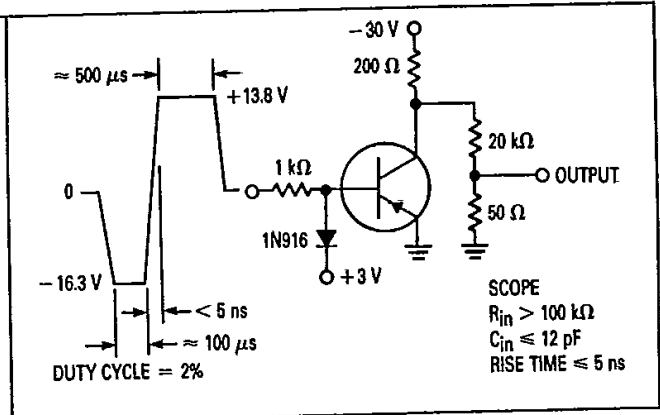


Figure 3. t_{off} Test Circuit

Table 2. JTX, JTXV 100% Processing Steps

	JTX	JTXV
Internal Visual (Mil-Std-750, Method 2072)	—	100%
High Temperature Storage (Mil-Std-750, Method 1032)	100%	100%
Thermal Shock (Mil-Std-750, Method 1051 Cond. F*)	100%	100%
Constant Acceleration (Mil-Std-750, Method 2006, 20 KG ^s , Y ₁)	100%	100%
Hermetic Seal (Fine + Gross Leak) (Mil-Std-750, Method 1071, Cond. G or H)**	100%	100%
READ Electrical Parameters (Group A)	100%	100%
High Temperature Reverse Bias (Mil-Std-750, Method 1039, Cond. A)	100%	100%
READ Electrical Parameters (Group A)	100%	100%
Power Burn-In (Mil-Std-750, Method 1039, Cond. B)	100%	100%
READ Electrical Parameters (Group A)	100%	100%

*T(LOW) = -55°C

**Cond. G, Fine Leak = 1×10^{-7} ATM. CC/sec.

Table 3. Simplified Hi-Rel Product Flow

