

MOTOROLA

SEMICONDUCTOR TECHNICAL DATA

Plastic Medium-Power Complementary Silicon Transistors

... designed for general-purpose amplifier and low-speed switching applications.

- High DC Current Gain —
 $h_{FE} = 2500$ (Typ) @ $I_C = 4.0$ Adc
- Collector-Emitter Sustaining Voltage — @ 100 mAdc —
 $V_{CE(sus)} = 60$ Vdc (Min) — 2N6040, 2N6043
 $= 80$ Vdc (Min) — 2N6041, 2N6044
 $= 100$ Vdc (Min) — 2N6042, 2N6045
- Low Collector-Emitter Saturation Voltage —
 $V_{CE(sat)} = 2.0$ Vdc (Max) @ $I_C = 4.0$ Adc — 2N6040, 41, 2N6043, 44
 $= 2.0$ Vdc (Max) @ $I_C = 3.0$ Adc — 2N6042, 2N6045
- Monolithic Construction with Built-In Base-Emitter Shunt Resistors

MAXIMUM RATINGS (1)

Rating	Symbol	2N6040 2N6043	2N6041 2N6044	2N6042 2N6045	Unit
Collector-Emitter Voltage	V_{CEO}	60	80	100	Vdc
Collector-Base Voltage	V_{CB}	60	80	100	Vdc
Emitter-Base Voltage	V_{EB}	5.0			Vdc
Collector Current — Continuous Peak	I_C	8.0 16			Adc
Base Current	I_B	120			mAdc
Total Power Dissipation @ $T_C = 25^\circ\text{C}$ Derate above 25°C	P_D	75 0.60			Watts W/ $^\circ\text{C}$
Operating and Storage Junction, Temperature Range	T_J, T_{stg}	-65 to +150			$^\circ\text{C}$

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Case	θ_{JC}	1.67	$^\circ\text{C/W}$
Thermal Resistance, Junction to Ambient	θ_{JA}	57	$^\circ\text{C/W}$

(1) Indicates JEDEC Registered Data.

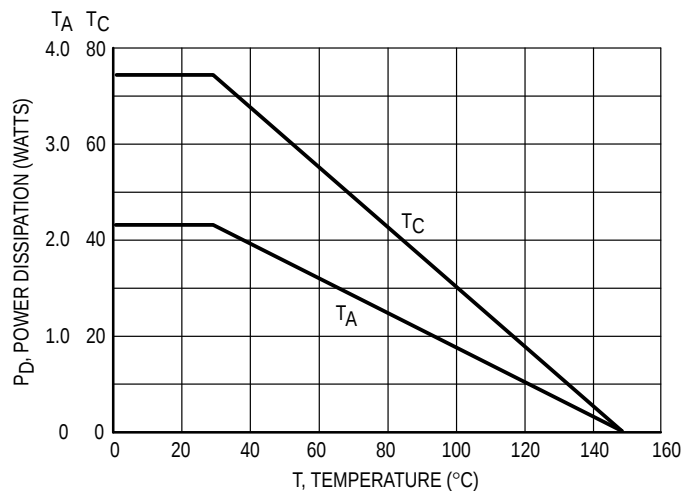


Figure 1. Power Derating

Preferred devices are Motorola recommended choices for future use and best overall value.

REV 1

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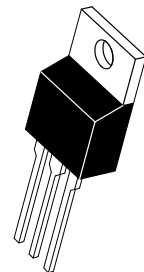
PNP
2N6040

thru
2N6042*
NPN
2N6043

thru
2N6045*

*Motorola Preferred Device

DARLINGTON
8 AMPERE
COMPLEMENTARY
SILICON
POWER TRANSISTORS
60-80-100 VOLTS
75 WATTS



CASE 221A-06
TO-220AB



MOTOROLA

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2N6040 thru 2N6042 2N6043 thru 2N6045

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

Characteristic	Symbol	Min	Max	Unit
OFF CHARACTERISTICS				
Collector-Emitter Sustaining Voltage ($I_C = 100\text{ mAdc}$, $I_B = 0$)	$V_{CEO(sus)}$	60 80 100	—	Vdc
Collector Cutoff Current ($V_{CE} = 60\text{ Vdc}$, $I_B = 0$) ($V_{CE} = 80\text{ Vdc}$, $I_B = 0$) ($V_{CE} = 100\text{ Vdc}$, $I_B = 0$)	I_{CEO}	— — —	20 20 20	μA
Collector Cutoff Current ($V_{CE} = 60\text{ Vdc}$, $V_{BE(off)} = 1.5\text{ Vdc}$) ($V_{CE} = 80\text{ Vdc}$, $V_{BE(off)} = 1.5\text{ Vdc}$) ($V_{CE} = 100\text{ Vdc}$, $V_{BE(off)} = 1.5\text{ Vdc}$) ($V_{CE} = 60\text{ Vdc}$, $V_{BE(off)} = 1.5\text{ Vdc}$, $T_C = 150^\circ\text{C}$) ($V_{CE} = 80\text{ Vdc}$, $V_{BE(off)} = 1.5\text{ Vdc}$, $T_C = 150^\circ\text{C}$) ($V_{CE} = 100\text{ Vdc}$, $V_{BE(off)} = 1.5\text{ Vdc}$, $T_C = 150^\circ\text{C}$)	I_{CEX}	— — — — — —	20 20 20 200 200 200	μA
Collector Cutoff Current ($V_{CB} = 60\text{ Vdc}$, $I_E = 0$) ($V_{CB} = 80\text{ Vdc}$, $I_E = 0$) ($V_{CB} = 100\text{ Vdc}$, $I_E = 0$)	I_{CBO}	— — —	20 20 20	μA
Emitter Cutoff Current ($V_{BE} = 5.0\text{ Vdc}$, $I_C = 0$)	I_{EBO}	—	2.0	mAdc

ON CHARACTERISTICS

DC Current Gain ($I_C = 4.0\text{ Adc}$, $V_{CE} = 4.0\text{ Vdc}$) ($I_C = 3.0\text{ Adc}$, $V_{CE} = 4.0\text{ Vdc}$) ($I_C = 8.0\text{ Adc}$, $V_{CE} = 4.0\text{ Vdc}$)	2N6040, 41, 2N6043, 44 2N6042, 2N6045 All Types	h_{FE}	1000 1000 100	20.000 20,000 —	—
Collector-Emitter Saturation Voltage ($I_C = 4.0\text{ Adc}$, $I_B = 16\text{ mAdc}$) ($I_C = 3.0\text{ Adc}$, $I_B = 12\text{ mAdc}$) ($I_C = 8.0\text{ Adc}$, $I_B = 80\text{ Adc}$)	2N6040, 41, 2N6043, 44 2N6042, 2N6045 All Types	$V_{CE(sat)}$	— — —	2.0 2.0 4.0	Vdc
Base-Emitter Saturation Voltage ($I_C = 8.0\text{ Adc}$, $I_B = 80\text{ mAdc}$)		$V_{BE(sat)}$	—	4.5	Vdc
Base-Emitter On Voltage ($I_C = 4.0\text{ Adc}$, $V_{CE} = 4.0\text{ Vdc}$)		$V_{BE(on)}$	—	2.8	Vdc

DYNAMIC CHARACTERISTICS

Small Signal Current Gain ($I_C = 3.0\text{ Adc}$, $V_{CE} = 4.0\text{ Vdc}$, $f = 1.0\text{ MHz}$)		$ h_{fe} $	4.0	—	
Output Capacitance ($V_{CB} = 10\text{ Vdc}$, $I_E = 0$, $f = 0.1\text{ MHz}$)	2N6040/2N6042 2N6043/2N6045	C_{ob}	— —	300 200	pF
Small-Signal Current Gain ($I_C = 3.0\text{ Adc}$, $V_{CE} = 4.0\text{ Vdc}$, $f = 1.0\text{ kHz}$)		h_{fe}	300	—	—

* Indicates JEDEC Registered Data.

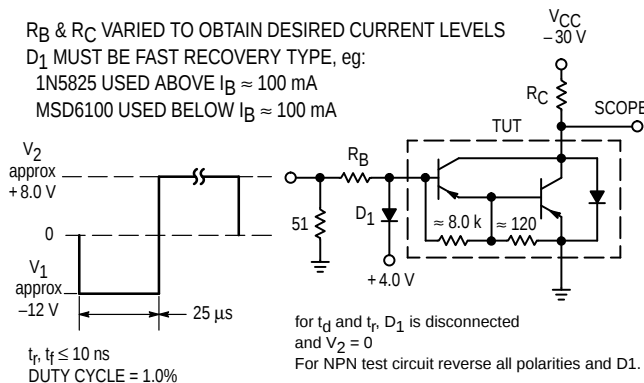


Figure 2. Switching Times Equivalent Circuit

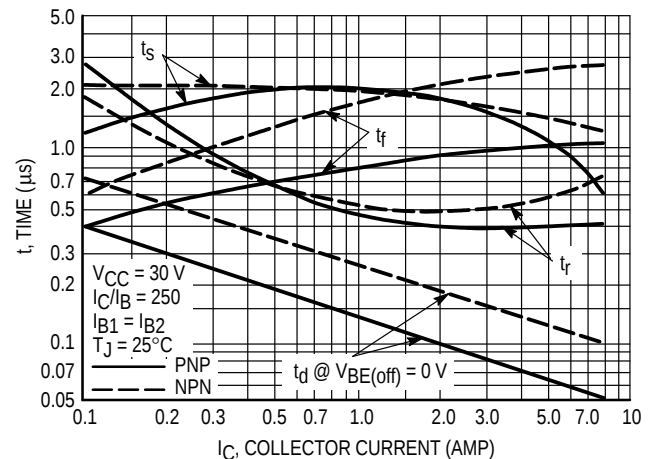


Figure 3. Switching Times

2N6040 thru 2N6042 2N6043 thru 2N6045

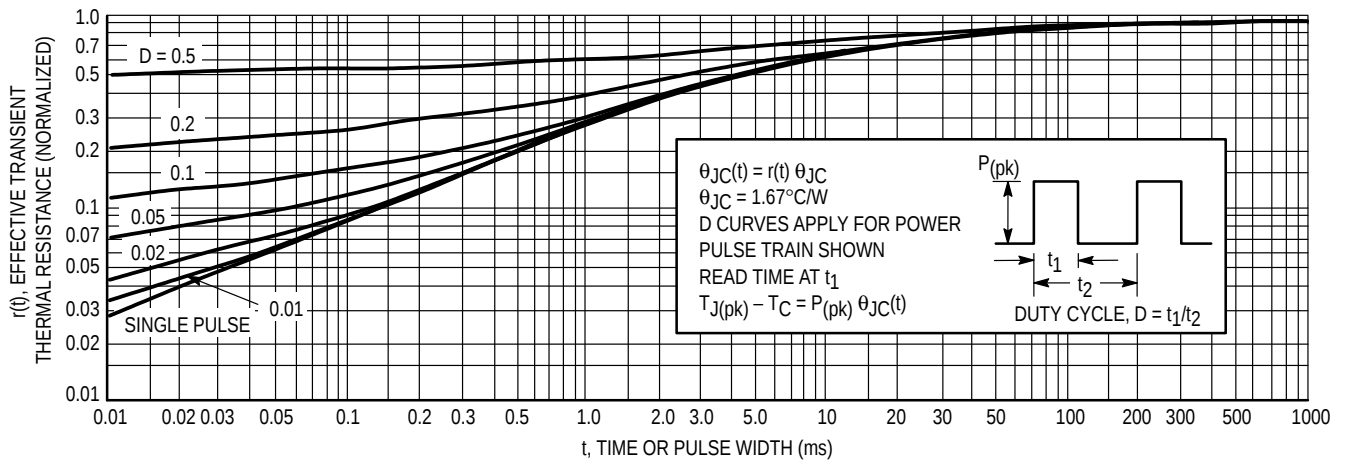


Figure 4. Thermal Response

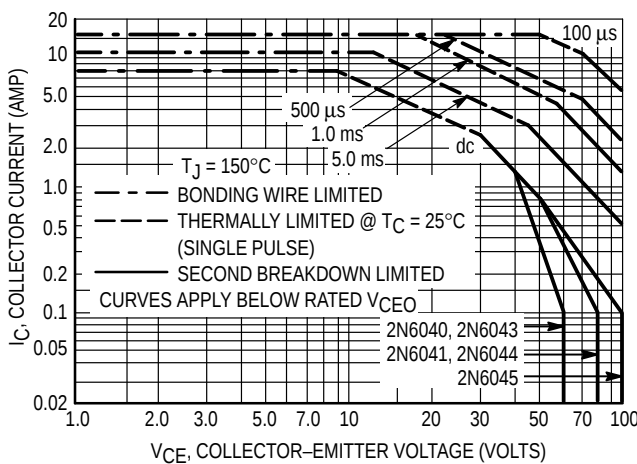


Figure 5. Active-Region Safe Operating Area

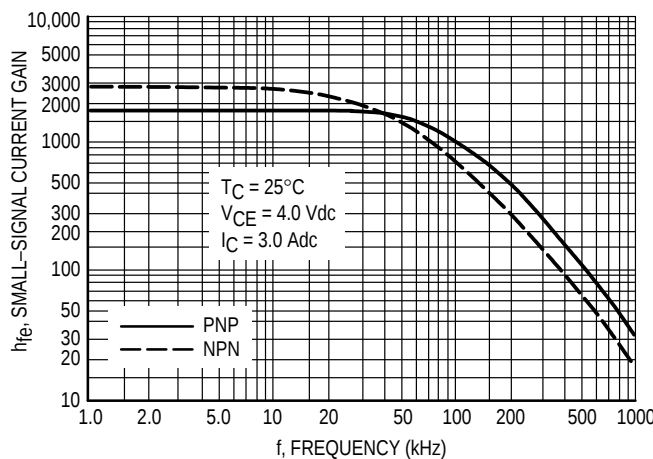


Figure 6. Small-Signal Current Gain

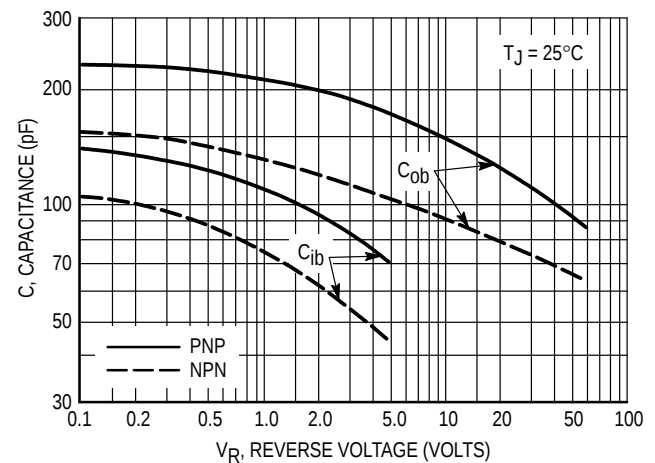


Figure 7. Capacitance

2N6040 thru 2N6042 2N6043 thru 2N6045

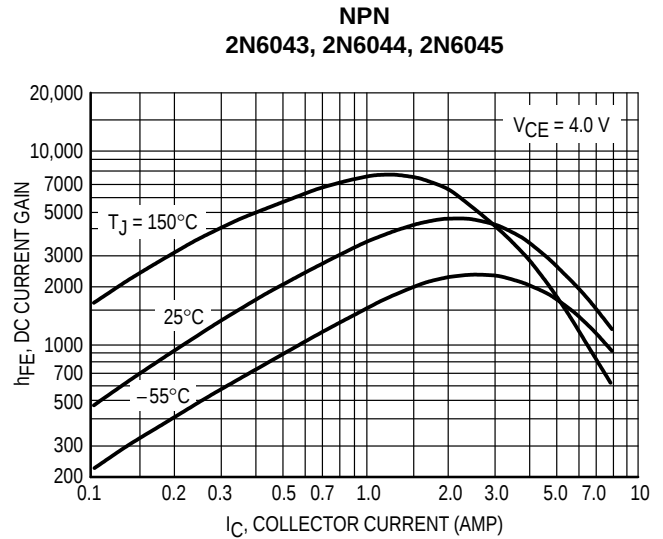
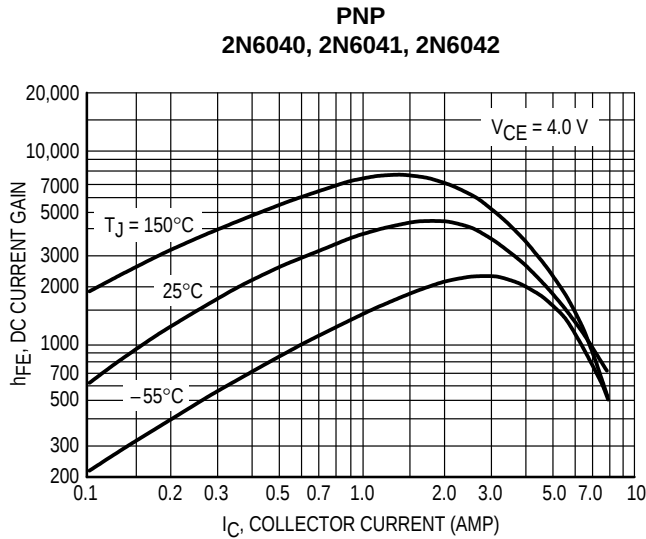


Figure 8. DC Current Gain

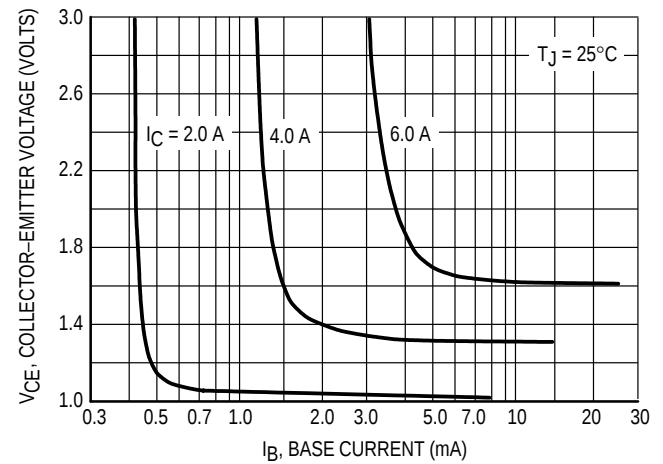
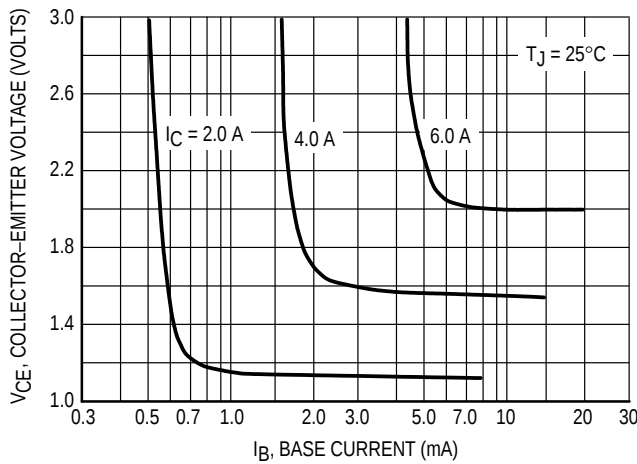


Figure 9. Collector Saturation Region

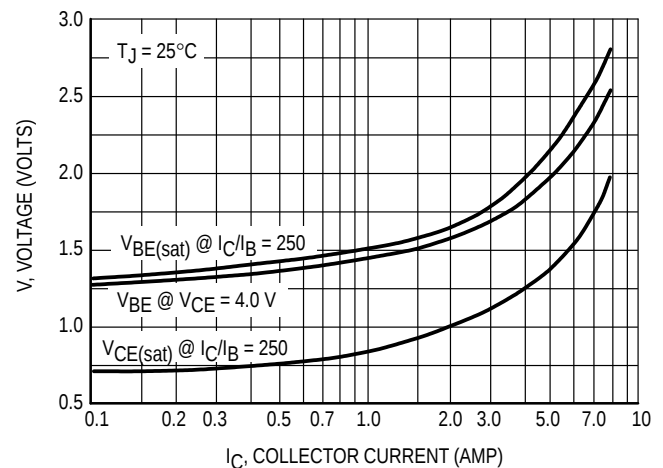
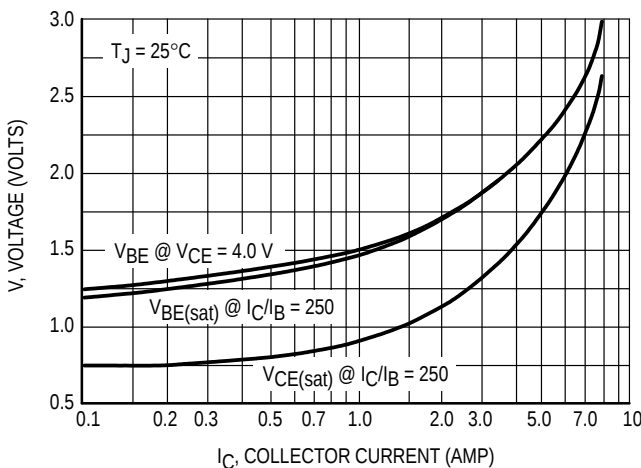
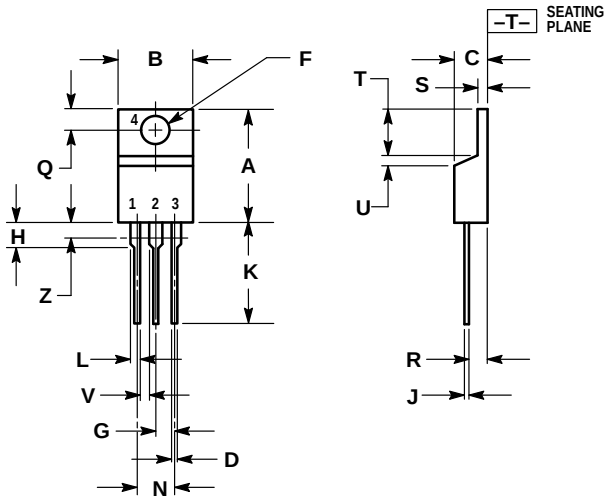


Figure 10. "On" Voltages

2N6040 thru 2N6042 2N6043 thru 2N6045

PACKAGE DIMENSIONS



- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
 2. CONTROLLING DIMENSION: INCH.
 3. DIMENSION Z DEFINES A ZONE WHERE ALL BODY AND LEAD IRREGULARITIES ARE ALLOWED.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.570	0.620	14.48	15.75
B	0.380	0.405	9.66	10.28
C	0.160	0.190	4.07	4.82
D	0.025	0.035	0.64	0.88
E	0.142	0.147	3.61	3.73
F	0.095	0.105	2.42	2.66
G	0.110	0.155	2.80	3.93
H	0.018	0.025	0.46	0.64
I	0.500	0.562	12.70	14.27
J	0.045	0.060	1.15	1.52
K	0.190	0.210	4.83	5.33
L	0.100	0.120	2.54	3.04
M	0.080	0.110	2.04	2.79
N	0.045	0.055	1.15	1.39
O	0.235	0.255	5.97	6.47
P	0.000	0.050	0.00	1.27
Q	0.045	—	1.15	—
R	—	0.080	—	2.04

- STYLE 1:
1. BASE
 2. COLLECTOR
 3. EMITTER
 4. COLLECTOR

CASE 221A-06
TO-220AB
ISSUE Y

2N6040 thru 2N6042 2N6043 thru 2N6045

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