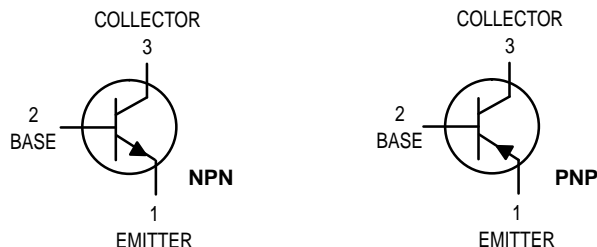


Amplifier Transistors



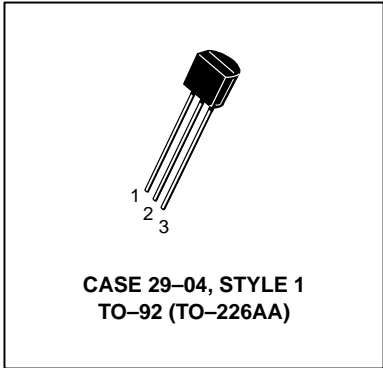
NPN
MPS6601
MPS6602*
PNP
MPS6651
MPS6652*

Voltage and current are negative
for PNP transistors

*Motorola Preferred Device

MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector–Emitter Voltage MPS6601/6651 MPS6602/6652	V_{CEO}	25 40	Vdc
Collector–Base Voltage MPS6601/6651 MPS6602/6652	V_{CBO}	25 30	Vdc
Emitter–Base Voltage	V_{EBO}	4.0	Vdc
Collector Current — Continuous	I_C	1000	mAdc
Total Device Dissipation @ $T_A = 25^\circ\text{C}$ Derate above 25°C	P_D	625 5.0	mW mW/°C
Total Device Dissipation @ $T_C = 25^\circ\text{C}$ Derate above 25°C	P_D	1.5 12	Watts mW/°C
Operating and Storage Junction Temperature Range	T_J, T_{stg}	–55 to +150	°C



THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Ambient	$R_{\theta JA}^{(1)}$	200	°C/W
Thermal Resistance, Junction to Case	$R_{\theta JC}$	83.3	°C/W

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

Characteristic	Symbol	Min	Max	Unit
----------------	--------	-----	-----	------

OFF CHARACTERISTICS

Collector–Emitter Breakdown Voltage ($I_C = 1.0 \text{ mAdc}, I_B = 0$)	$V_{(BR)CEO}$	25 40	— —	Vdc
Collector–Base Breakdown Voltage ($I_C = 100 \mu\text{Adc}, I_E = 0$)	$V_{(BR)CBO}$	25 40	— —	Vdc
Emitter–Base Breakdown Voltage ($I_E = 10 \mu\text{Adc}, I_C = 0$)	$V_{(BR)EBO}$	4.0	—	Vdc
Collector Cutoff Current ($V_{CE} = 25 \text{ Vdc}, I_B = 0$) ($V_{CE} = 30 \text{ Vdc}, I_B = 0$)	I_{CES}	— —	0.1 0.1	μAdc
Collector Cutoff Current ($V_{CB} = 25 \text{ Vdc}, I_E = 0$) ($V_{CB} = 30 \text{ Vdc}, I_E = 0$)	I_{CBO}	— —	0.1 0.1	μAdc

1. $R_{\theta JA}$ is measured with the device soldered into a typical printed circuit board.

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

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

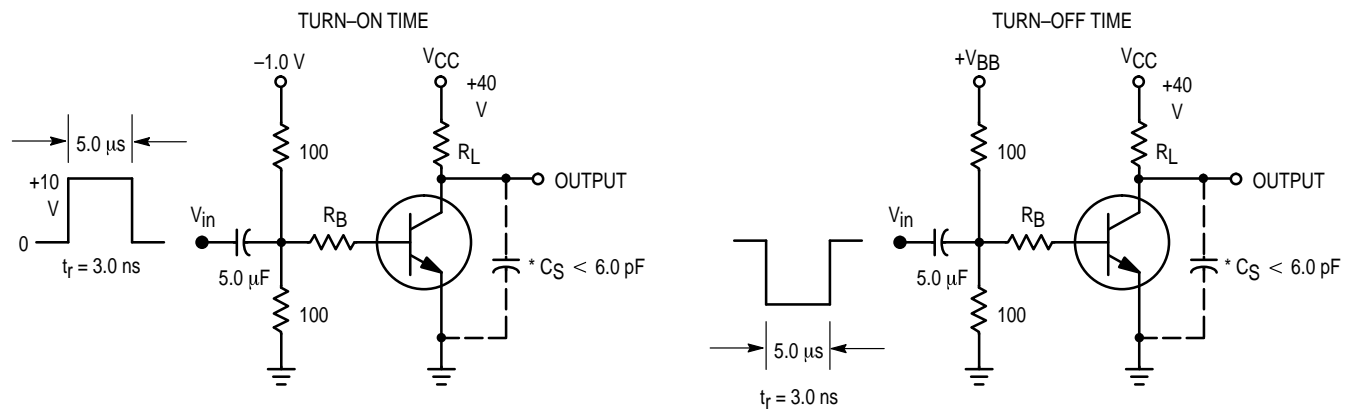
Characteristic	Symbol	Min	Max	Unit
ON CHARACTERISTICS				
DC Current Gain ($I_C = 100\text{ mAdc}$, $V_{CE} = 1.0\text{ Vdc}$) ($I_C = 500\text{ mAdc}$, $V_{CE} = 1.0\text{ Vdc}$) ($I_C = 1000\text{ mAdc}$, $V_{CE} = 1.0\text{ Vdc}$)	h_{FE}	50 50 30	— — —	—
Collector–Emitter Saturation Voltage ($I_C = 1000\text{ mAdc}$, $I_B = 100\text{ mAdc}$)	$V_{CE(sat)}$	—	0.6	Vdc
Base–Emitter On Voltage ($I_C = 500\text{ mAdc}$, $V_{CE} = 1.0\text{ Vdc}$)	$V_{BE(on)}$	—	1.2	Vdc

SMALL–SIGNAL CHARACTERISTICS

Current–Gain — Bandwidth Product ($I_C = 50\text{ mAdc}$, $V_{CE} = 10\text{ Vdc}$, $f = 100\text{ MHz}$)	f_T	100	—	MHz
Output Capacitance ($V_{CB} = 10\text{ Vdc}$, $I_E = 0$, $f = 1.0\text{ MHz}$)	C_{obo}	—	30	pF

SWITCHING CHARACTERISTICS

Delay Time	$(V_{CC} = 40\text{ Vdc}$, $I_C = 500\text{ mAdc}$, $I_{B1} = 50\text{ mAdc}$, $t_p \geq 300\text{ ns}$ Duty Cycle)	t_d	—	25	ns
Rise Time		t_r	—	30	ns
Storage Time		t_s	—	250	ns
Fall Time		t_f	—	50	ns



* Total Shunt Capacitance of Test Jig and Connectors
For PNP Test Circuits, Reverse All Voltage Polarities

Figure 1. Switching Time Test Circuits

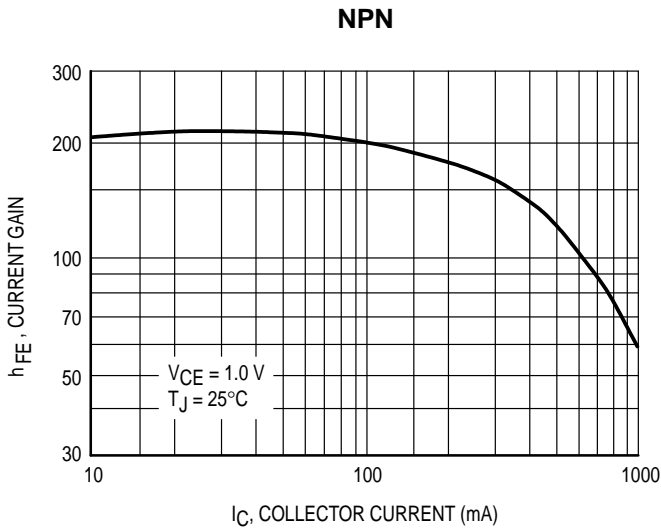


Figure 2. MPS6601/6602 DC Current Gain

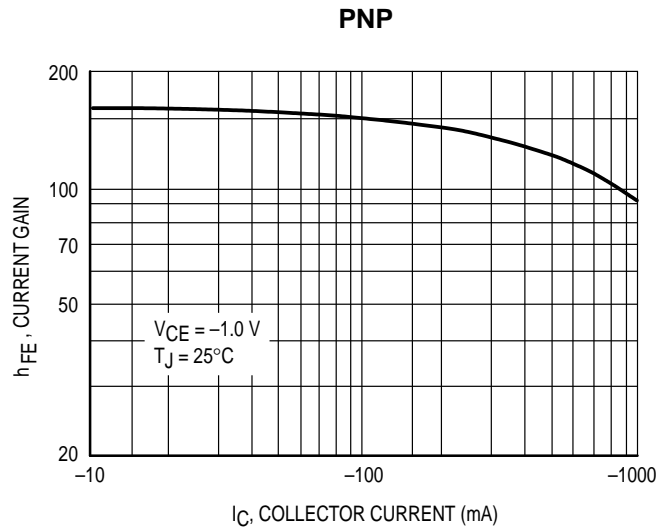


Figure 3. MPS6651/6652 DC Current Gain

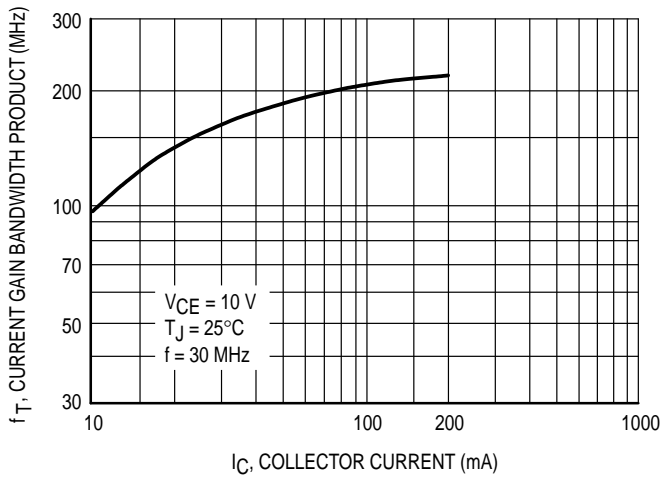


Figure 4. Current Gain Bandwidth Product

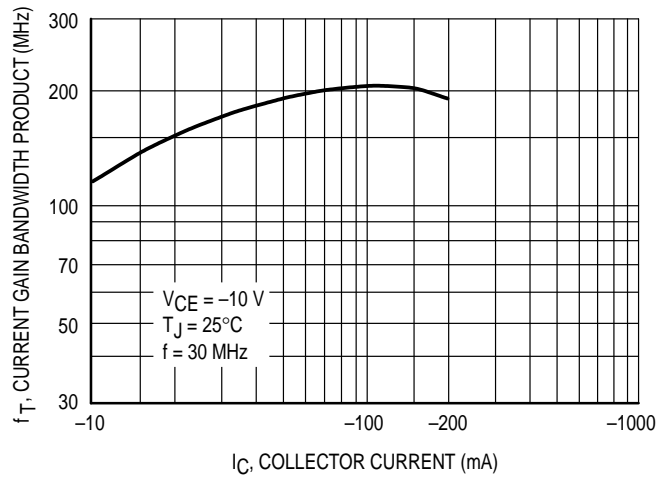


Figure 5. Current Gain Bandwidth Product

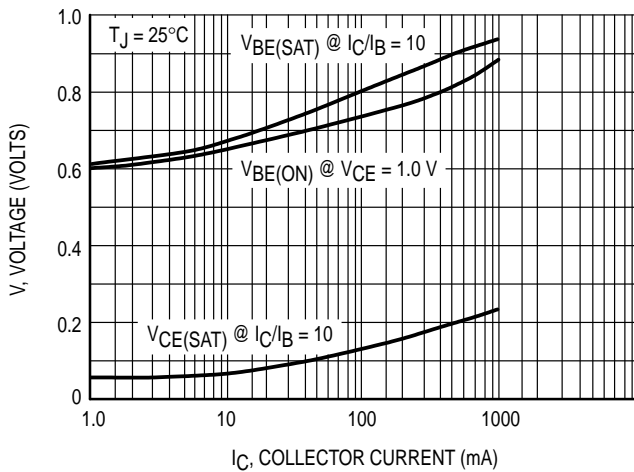


Figure 6. On Voltages

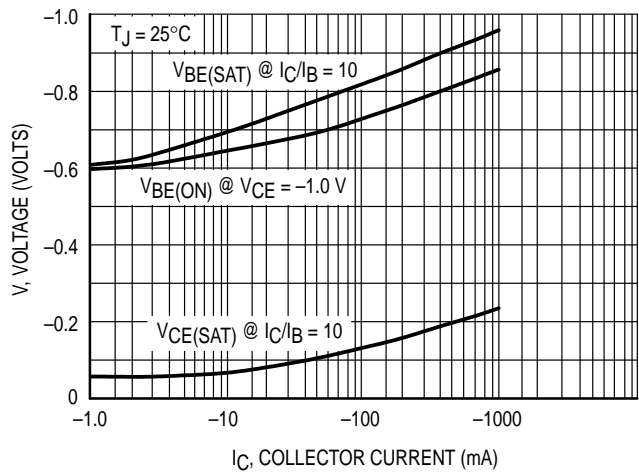
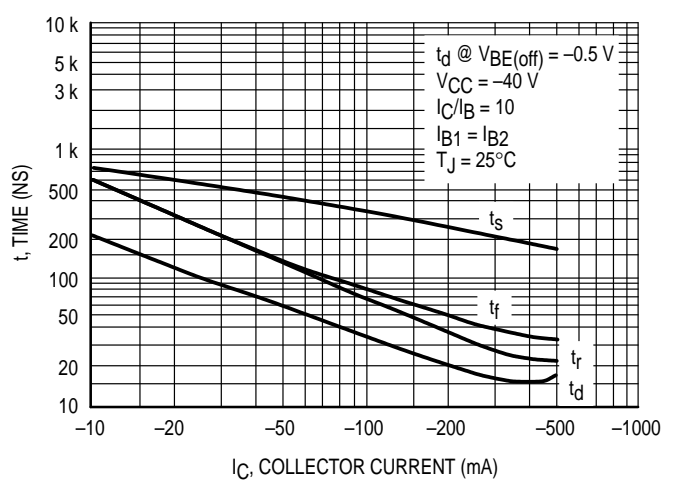
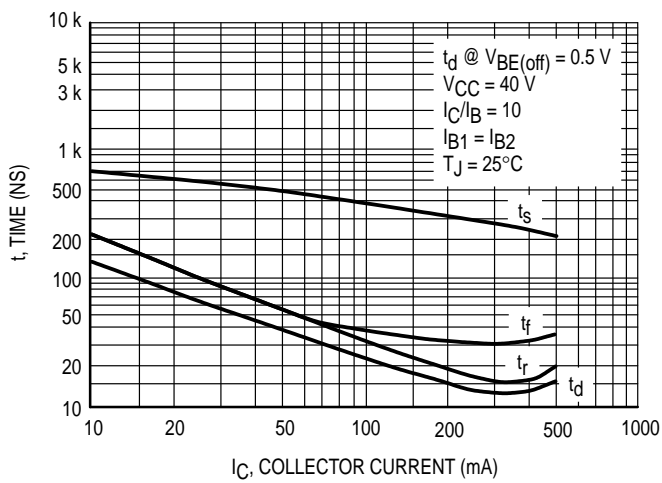
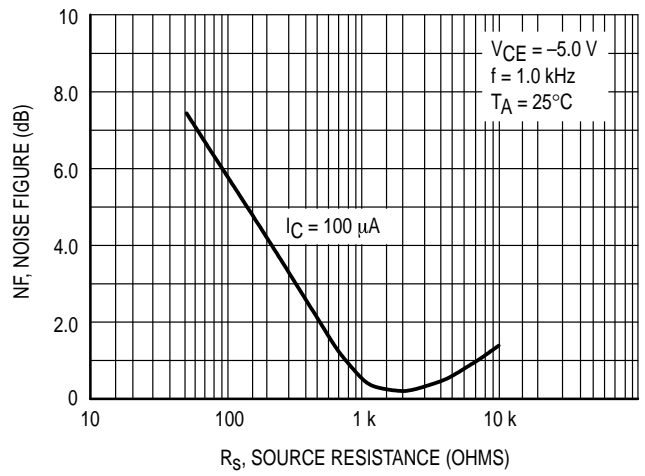
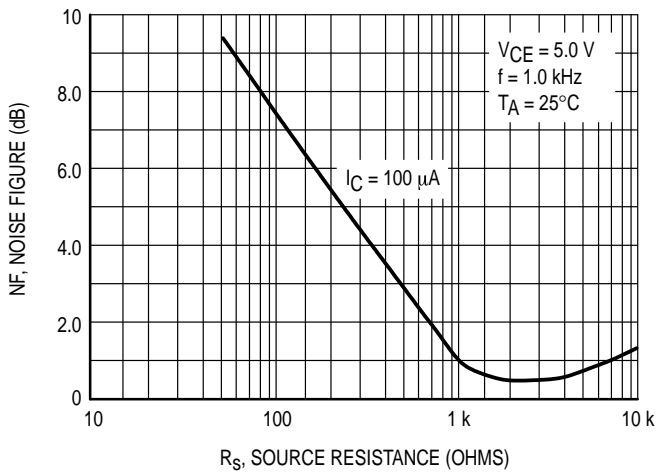
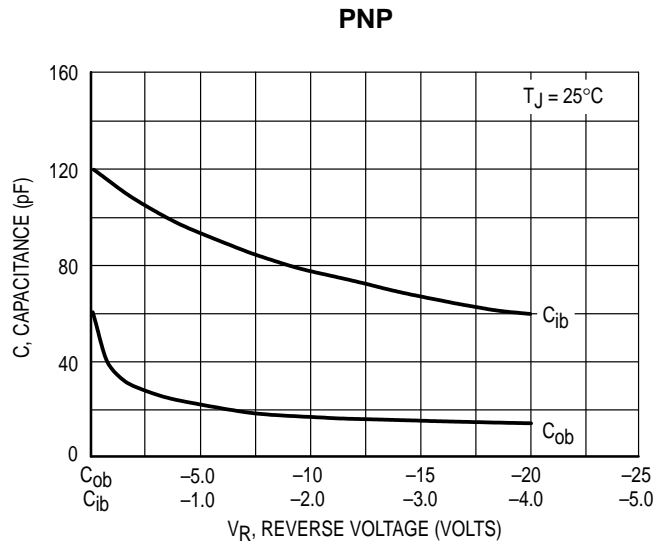
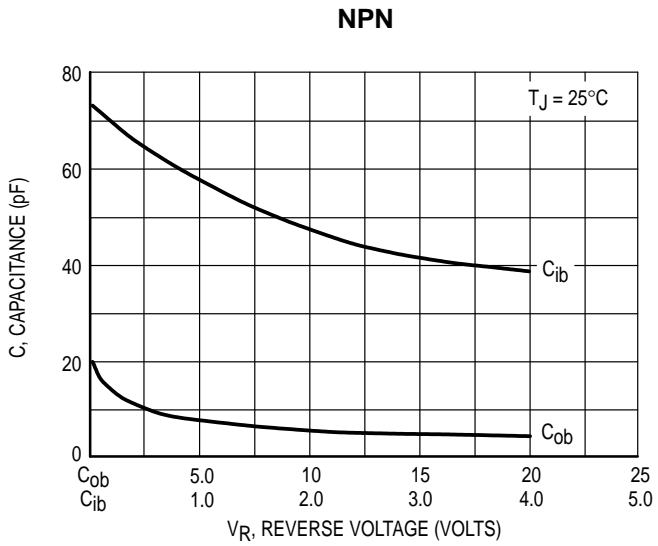


Figure 7. On Voltages



NPN

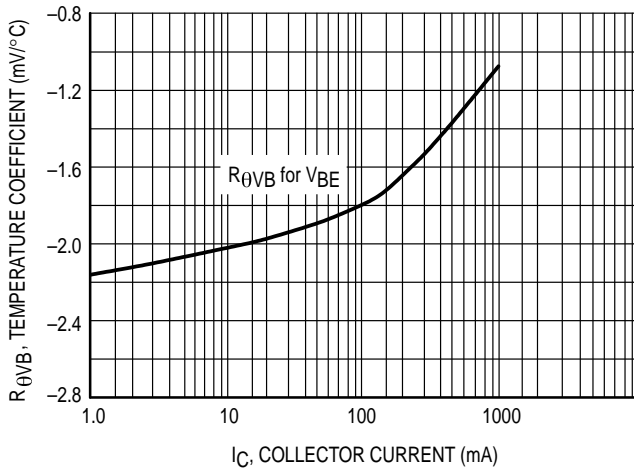


Figure 14. Base-Emitter Temperature Coefficient

PNP

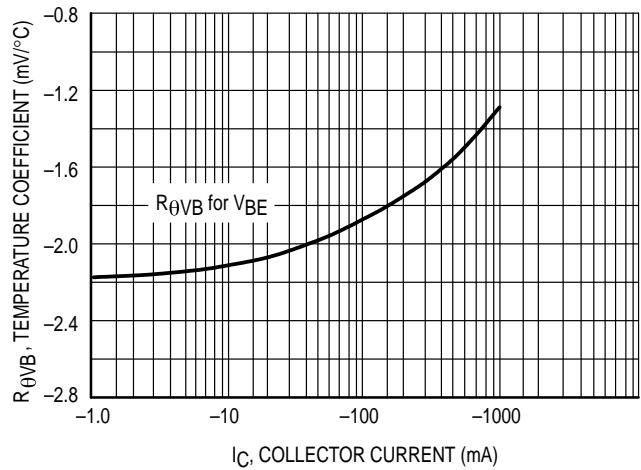


Figure 15. Base-Emitter Temperature Coefficient

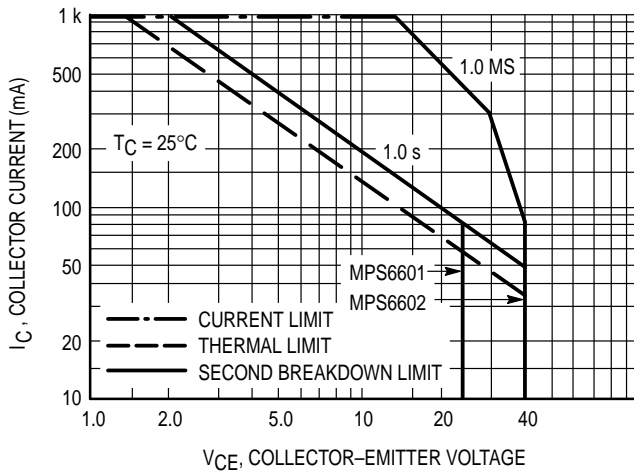


Figure 16. Safe Operating Area

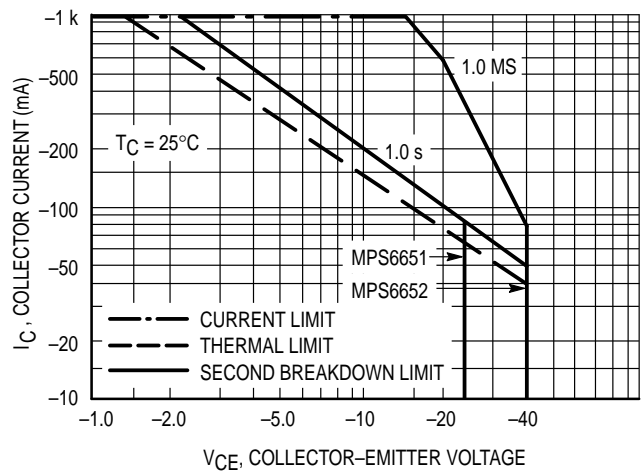


Figure 17. Safe Operating Area

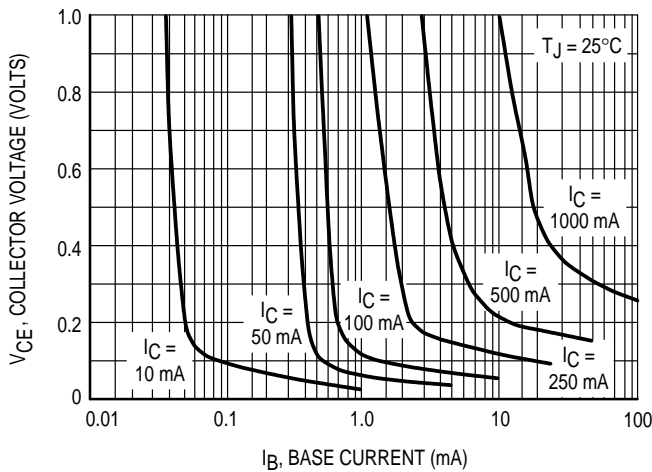


Figure 18. MPS6601/6602 Saturation Region

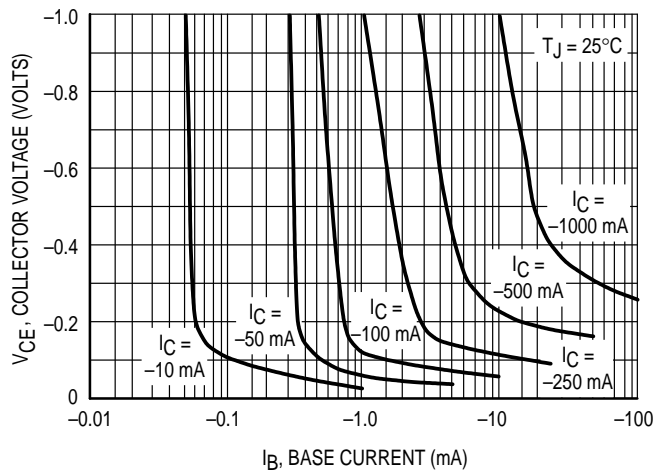


Figure 19. MPS6651/6652 Saturation Region

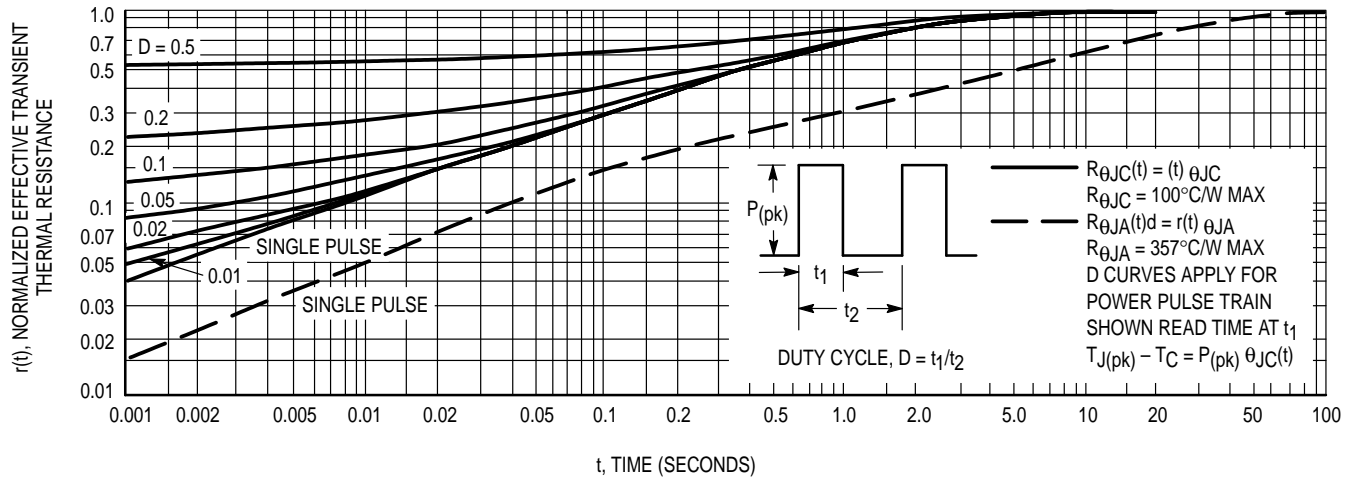
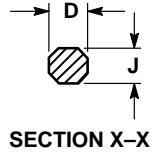
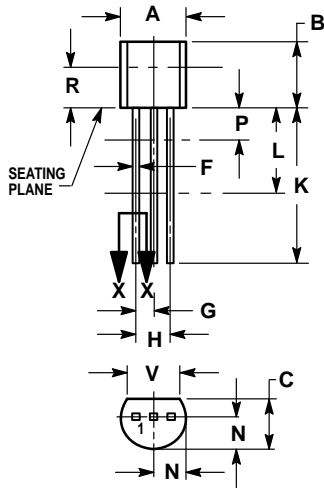


Figure 20. Thermal Response

PACKAGE DIMENSIONS



CASE 029-04
(TO-226AA)
ISSUE AD


NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. CONTOUR OF PACKAGE BEYOND DIMENSION R IS UNCONTROLLED.
4. DIMENSION F APPLIES BETWEEN P AND L. DIMENSION D AND J APPLY BETWEEN L AND K. MINIMUM LEAD DIMENSION IS UNCONTROLLED IN P AND BEYOND DIMENSION K MINIMUM.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.175	0.205	4.45	5.20
B	0.170	0.210	4.32	5.33
C	0.125	0.165	3.18	4.19
D	0.016	0.022	0.41	0.55
F	0.016	0.019	0.41	0.48
G	0.045	0.055	1.15	1.39
H	0.095	0.105	2.42	2.66
J	0.015	0.020	0.39	0.50
K	0.500	—	12.70	—
L	0.250	—	6.35	—
N	0.080	0.105	2.04	2.66
P	—	0.100	—	2.54
R	0.115	—	2.93	—
V	0.135	—	3.43	—

STYLE 1:

- PIN 1. EMITTER
2. BASE
3. COLLECTOR

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MOTOROLA



MPS6601/D

