NPN	PNP
TIP 33	TIP 34
TIP 33A	TIP 34A
TIP 33B	TIP 34B
TIP 33C	TIP 34C

MOTOROLA

COMPLEMENTARY SILICON PLASTIC POWER TRANSISTORS

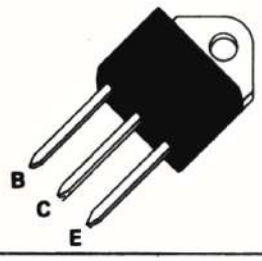
. . . for use as output devices in complementary power amplifier and switching applications.

- High Power Dissipation
  P_D = 80 W (max.) @ Tc = 25°C
- 10 Amp Rated Collector Current
- Transition Frequency
  f_T = 3 MHz (min.) @ 10 V, 0.5 A

10 AMPERES

COMPLEMENTARY SILICON POWER TRANSISTORS

40-60-80-100 VOLTS
80 WATTS

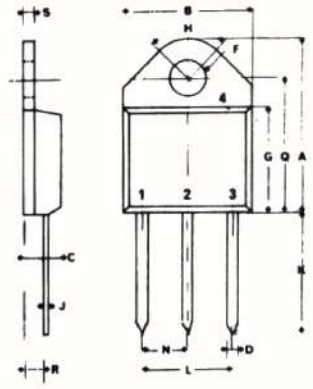


MAXIMUM RATINGS

Rating	Symbol	TIP33 TIP34	TIP33A TIP34A	TIP33B TIP34B	TIP33C TIP34C	Unit
Collector-Emitter Voltage	V_{CEO}	40	60	80	100	Vdc
Collector-Base Voltage	V_{CB}	40	60	80	100	Vdc
Emitter-Base Voltage	V_{EB}	5				Vdc
Collector Current - Continuous - Peak	I_C	10 20				Adc
Base Current	I_B	3				Adc
Total Device Dissipation @ T_C = 25°C Derate above 25°C	P_D	80 0.64				Watts W/°C
Operating and Storage Junction Temperature Range	T_J, T_{stg}	−65 to 150				°C

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max.	Unit
Thermal Resistance, Junction to Case	θ_{JC}	1.56	°C/W

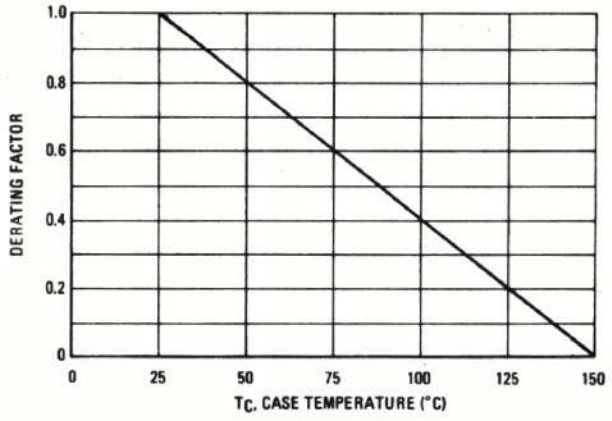


PIN 1: Base
PIN 2: Collector
PIN 3: Emitter
CASE (4): Collector

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	20.30	21.10	0.800	0.830
B	15.50	15.90	0.610	0.626
C	4.20	5.00	0.165	0.197
D	1.00	1.60	0.040	0.063
F	4.00	4.20	0.157	0.165
G	12.30	12.70	0.484	0.500
H	90° typ.		90° typ.	
J	0.45	0.70	0.018	0.028
K	12.7	15.5	0.500	0.610
L	10.65	11.15	0.420	0.440
N	5.20	5.70	0.205	0.225
Q	15.90	16.50	0.626	0.650
R	2.40	3.20	0.094	0.126
S	1.35	1.65	0.053	0.065

CASE 340

FIGURE 1 – POWER DERATING



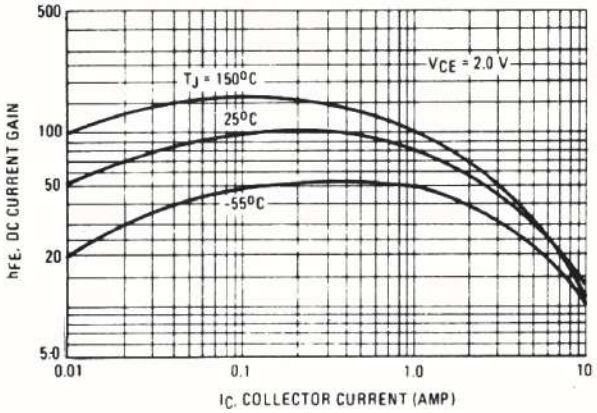
ELECTRICAL CHARACTERISTICS (T_C = 25°C unless othervise noted)

Characteristic		Symbol	Min.	Max.	Unit
OFF CHARACTERISTICS					
Collector-Emitter Sustaining Voltage (1) (I_C = 30 mAdc, I_B = 0)	TIP33, TIP34	$V_{CEO(sus)}$	40	–	Vdc
	TIP33A, TIP34A		60	–	
	TIP33B, TIP34B		80	–	
	TIP33C, TIP34C		100	–	
Collector Cutoff Current		I_{CEO}			mAdc
(V_{CE} = 30 Vdc, I_B = 0)	TIP33, 33A, TIP34, 34A		–	0.7	
(V_{CE} = 60 Vdc, I_B = 0)	TIP33B, 33C, TIP34B, 34C		–	0.7	
Collector Cutoff Current		I_{CES}			mAdc
(V_{CE} = 40 Vdc, V_{EB} = 0)	TIP33, TIP34		–	0.4	
(V_{CE} = 60 Vdc, V_{EB} = 0)	TIP33A, TIP34A		–	0.4	
(V_{CE} = 80 Vdc, V_{EB} = 0)	TIP33B, TIP34B		–	0.4	
(V_{CE} = 100 Vdc, V_{EB} = 0)	TIP33C, TIP34C		–	0.4	
Emitter Cutoff Current (V_{BE} = 5 Vdc, I_C = 0)		I_{EBO}	*	1	mAdc
ON CHARACTERISTICS (1)					
DC Current Gain		h_{FE}			–
(I_C = 1 Adc, V_{CE} = 4 Vdc)			40		
(I_C = 3 Adc, V_{CE} = 4 Vdc)			20	100	
Collector-Emitter Saturation Voltage		$V_{CE(sat)}$			Vdc
(I_C = 3 Adc, I_B = 0.3 Adc)				1	
(I_C = 10 Adc, I_B = 2.5 Adc)				4	
Base-Emitter On Voltage		$V_{BE(on)}$			Vdc
(I_C = 3 Adc, V_{CE} = 4 Vdc)				1.6	
(I_C = 10 Adc, V_{CE} = 4 Vdc)				3	
DYNAMIC CHARACTERISTICS					
Current Gain – Bandwidth Product (2) (I_C = 0.5 Adc, V_{CE} = 10 Vdc, f_{test} = 1 MHz)		f_T	3	–	MHz
Small-Signal Current Gain (I_C = 0.5 Adc, V_{CE} = 10 Vdc, f = 1 kHz)		h_{te}	20	–	–

(1) Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2.0%.

NPN

FIGURE 2 – DC CURRENT GAIN



PNP

FIGURE 3 – DC CURRENT GAIN

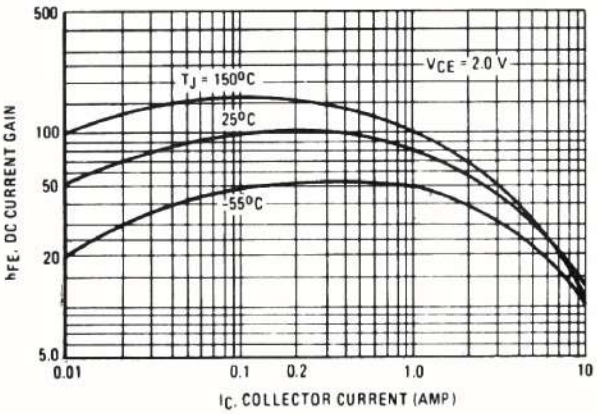


FIGURE 4 – "ON" VOLTAGES

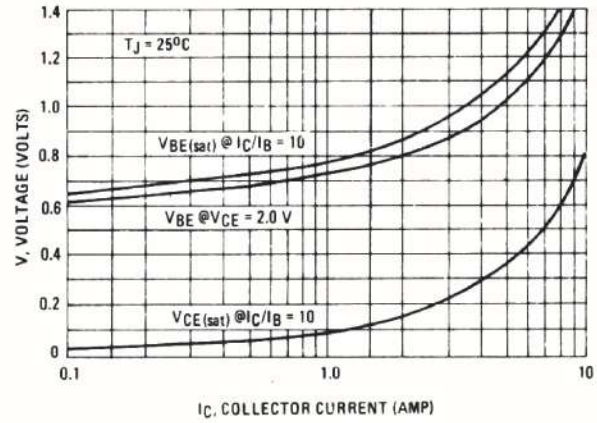


FIGURE 5 – "ON" VOLTAGES

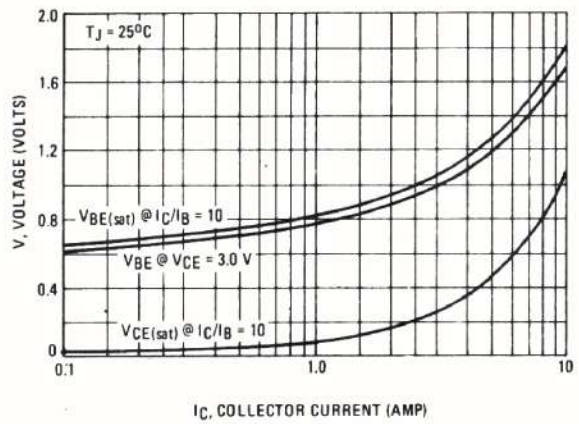
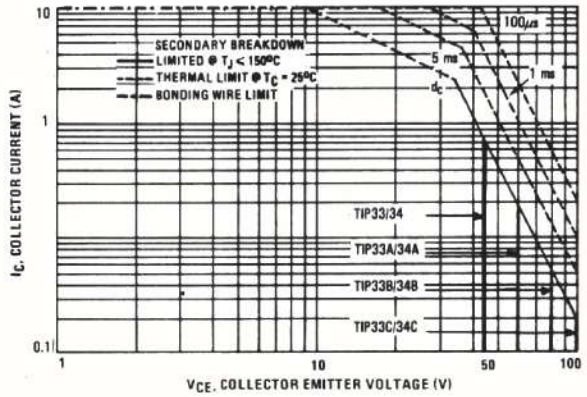


FIGURE 6 – ACTIVE REGION SAFE OPERATING AREA



There are two limitations on the power handling ability of a transistor: average junction temperature and second breakdown. Safe operating area curves indicate I_C-V_{CE} limits of the transistor that must be observed for reliable operation i.e., the transistor must not be subjected to greater dissipation than the curves indicate.

The data of figure 6 is based on $T_{J(pk)}$ = 150°C, T_C is variable depending on conditions. Second breakdown pulse limits are valid for duty cycles to 10% provided $T_{J(pk)} \leq 150°C$. $T_{J(pk)}$ may be calculated from the data in figure 7. At high case temperatures, thermal limitations will reduce the power that can be handled to values less than the limitations imposed by second breakdown. (See AN-415A)

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FIGURE 7 – THERMAL RESPONSE