NPN
MJL3281A*
PNP
MJL1302A*

***Motorola Preferred Device**

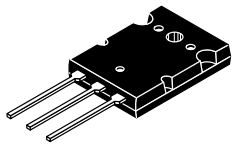
Designer's™ Data Sheet

Complementary NPN-PNP Silicon Power Bipolar Transistor

15 AMPERE COMPLEMENTARY SILICON POWER TRANSISTORS 200 VOLTS 200 WATTS

The MJL3281A and MJL1302A are PowerBase power transistors for high power audio, disk head positioners and other linear applications.

- Designed for 100 W Audio Frequency
- Gain Complementary:
  — Gain Linearity from 100 mA to 7 A
  — High Gain — 60 to 175
  — h_{FE} = 45 (Min) @ I_C = 8 A
- Low Harmonic Distortion
- High Safe Operation Area — 1 A/100 V @ 1 Second
- High f_T — 30 MHz Typical



CASE 340G–02, STYLE 2
TO–264

MAXIMUM RATINGS (T_J = 25°C unless otherwise noted)

Rating	Symbol	Value	Unit
Collector–Emitter Voltage	V_{CEO}	200	Vdc
Collector–Base Voltage	V_{CBO}	200	Vdc
Emitter–Base Voltage	V_{EBO}	7	Vdc
Collector–Emitter Voltage – 1.5 V	V_{CEX}	200	Vdc
Collector Current — Continuous — Peak (1)	I_C	15 25	Adc
Base Current — Continuous	I_B	1.5	Adc
Total Power Dissipation @ T_C = 25°C Derate Above 25°C	P_D	200 1.43	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	$R_{\theta JC}$	0.7	°C/W

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

Characteristic	Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS					
Collector–Emitter Sustaining Voltage (I_C = 100 mAdc, I_B = 0)	$V_{CEO(sus)}$	200	—	—	Vdc
Emitter–Base Voltage (I_E = 100 μAdc, I_C = 0)	V_{EBO}	7	—	—	Vdc

(1) Pulse Test: Pulse Width = 5 ms, Duty Cycle < 10%.

(continued)

Designer's Data for "Worst Case" Conditions — The Designer's Data Sheet permits the design of most circuits entirely from the information presented. SOA Limit curves — representing boundaries on device characteristics — are given to facilitate "worst case" design.

Designer's is a trademark of Motorola, Inc.

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

REV 1

MOTOROLA

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

Characteristic	Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS					
Collector Cutoff Current (V_{CB} = 200 Vdc, I_E = 0)	I_{CBO}	—	—	50	μAdc
Emitter Cutoff Current (V_{EB} = 5 Vdc, I_C = 0)	I_{EBO}	—	—	5	μAdc
Emitter Cutoff Current (V_{EB} = 7 Vdc, I_C = 0)	I_{EBO}	—	—	25	μAdc
SECOND BREAKDOWN					
Second Breakdown Collector with Base Forward Biased (V_{CE} = 50 Vdc, t = 1 s (non–repetitive) (V_{CE} = 100 Vdc, t = 1 s (non–repetitive)	$I_{S/b}$	4 1	— —	— —	Adc
ON CHARACTERISTICS					
DC Current Gain (I_C = 100 mAdc, V_{CE} = 5 Vdc) (I_C = 1 Adc, V_{CE} = 5 Vdc) (I_C = 3 Adc, V_{CE} = 5 Vdc) (I_C = 5 Adc, V_{CE} = 5 Vdc) (I_C = 7 Adc, V_{CE} = 5 Vdc) (I_C = 8 Adc, V_{CE} = 5 Vdc) (I_C = 15 Adc, V_{CE} = 5 Vdc)	h_{FE}	 60 60 60 60 60 45 12	 125 — — — 115 — 35	 175 175 175 175 175 — —	
Collector–Emitter Saturation Voltage (I_C = 10 Adc, I_B = 1 Adc)	$V_{CE(sat)}$	—	—	3	Vdc
DYNAMIC CHARACTERISTICS					
Current–Gain — Bandwidth Product (I_C = 1 Adc, V_{CE} = 5 Vdc, f_{test} = 1 MHz)	f_T	—	30	—	MHz
Output Capacitance (V_{CB} = 10 Vdc, I_E = 0, f_{test} = 1 MHz)	C_{ob}	—	—	600	pF

PNP MJL1302A

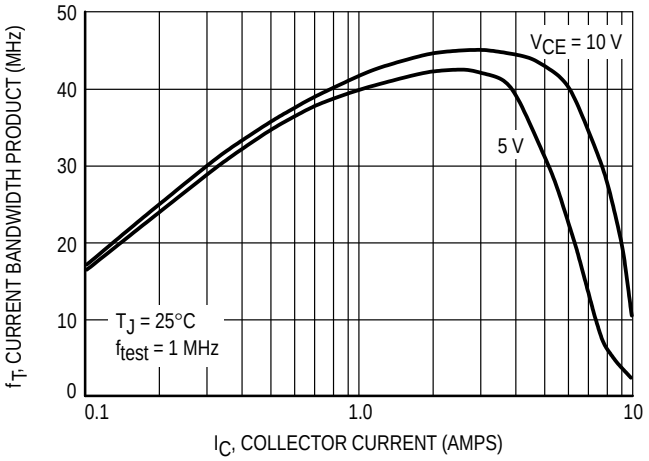


Figure 1. Typical Current Gain Bandwidth Product

NPN MJL3281A

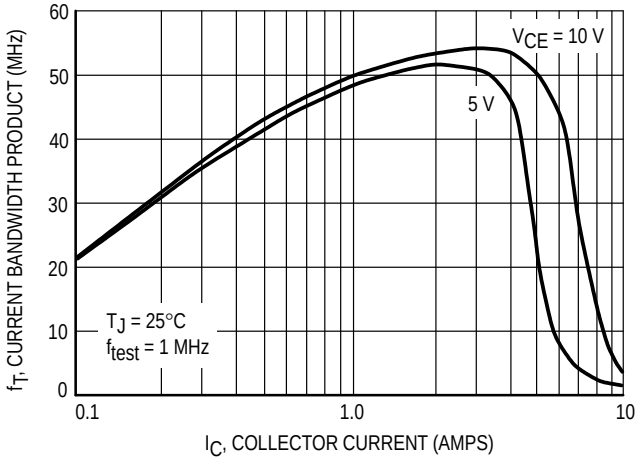


Figure 2. Typical Current Gain Bandwidth Product

TYPICAL CHARACTERISTICS

PNP MJL1302A

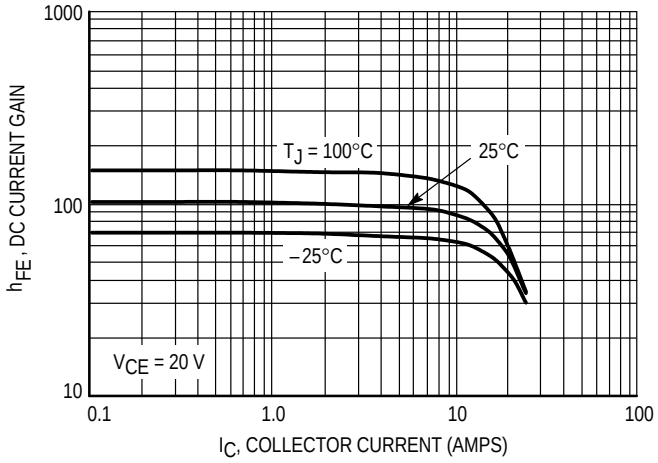


Figure 3. DC Current Gain, V_{CE} = 20 V

NPN MJL3281A

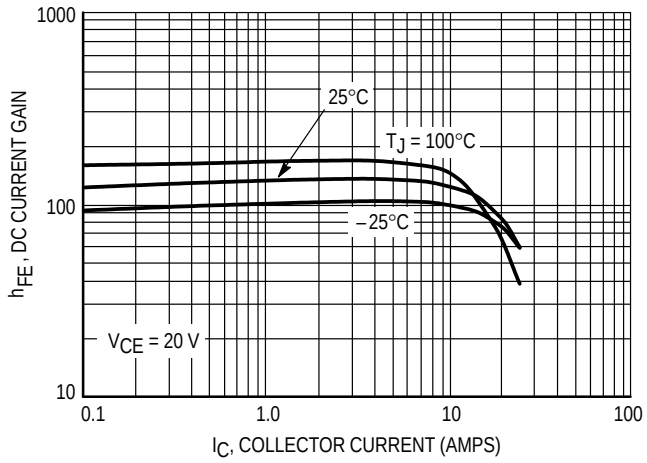


Figure 4. DC Current Gain, V_{CE} = 20 V

PNP MJL1302A

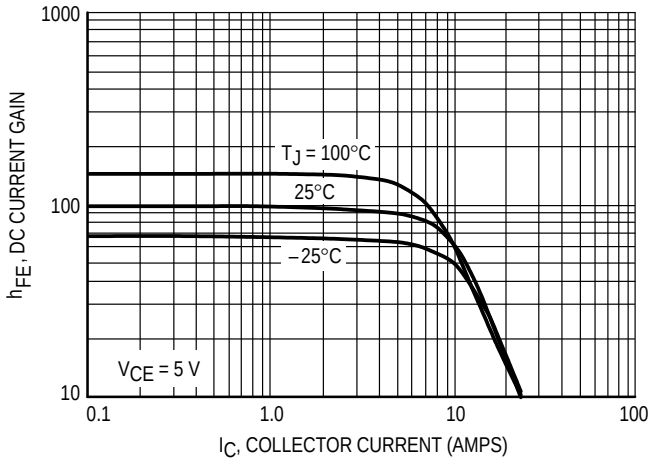


Figure 5. DC Current Gain, V_{CE} = 5 V

NPN MJL3281A

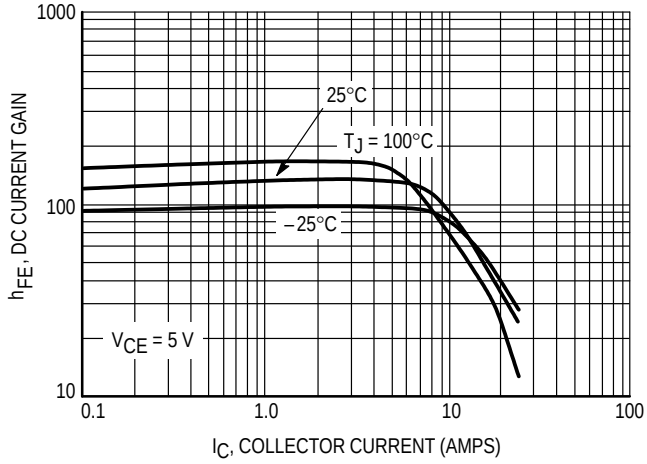


Figure 6. DC Current Gain, V_{CE} = 5 V

PNP MJL1302A

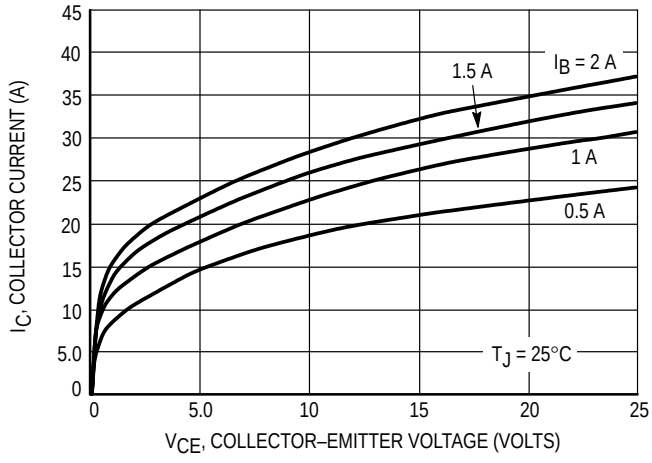


Figure 7. Typical Output Characteristics

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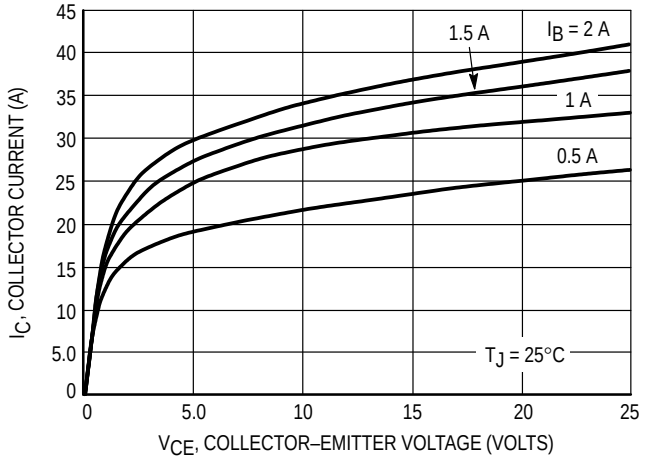

Figure 8. Typical Output Characteristics

TYPICAL CHARACTERISTICS

PNP MJL1302A

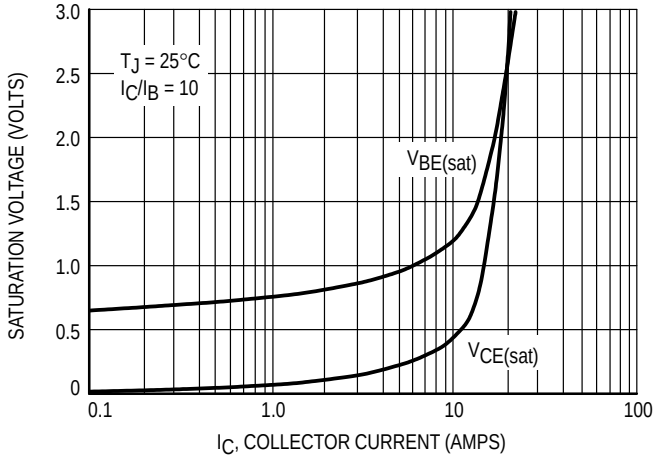

Figure 9. Typical Saturation Voltages

NPN MJL3281A

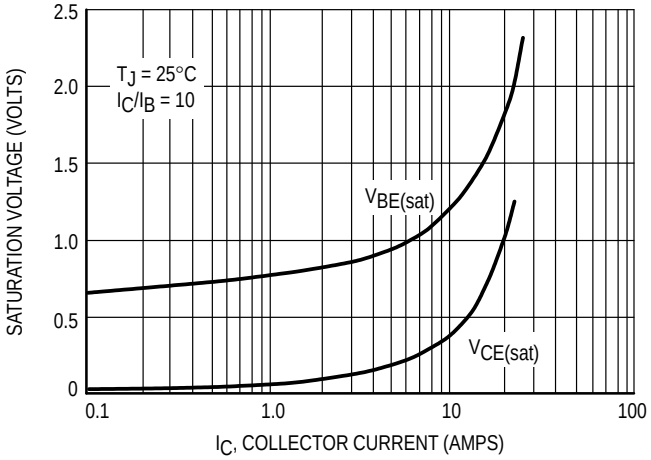

Figure 10. Typical Saturation Voltages

PNP MJL1302A

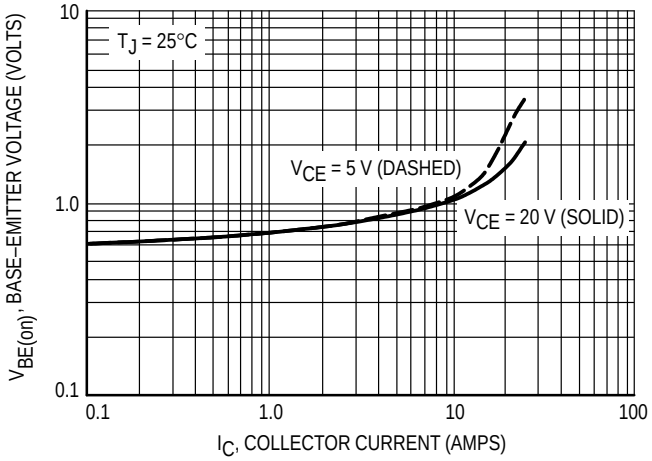

Figure 11. Typical Base–Emitter Voltage

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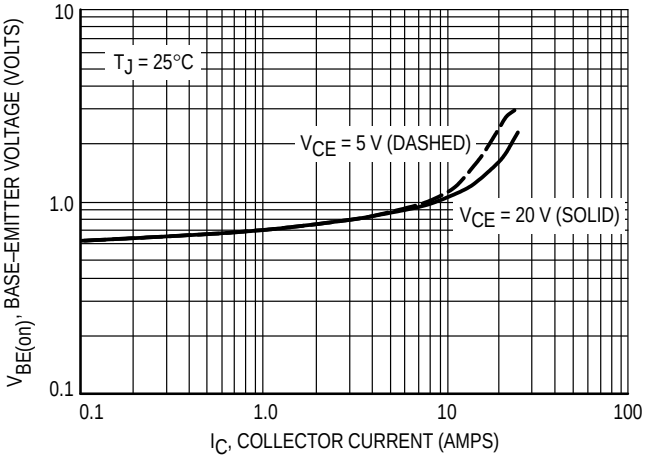


Figure 12. Typical Base–Emitter Voltage

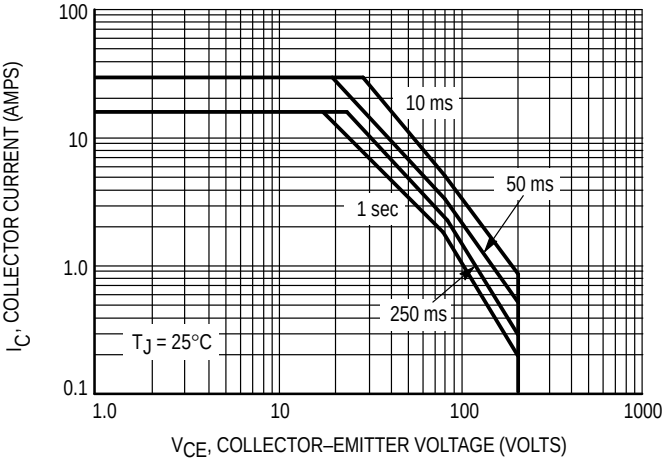


Figure 13. Active Region Safe Operating Area

There are two limitations on the power handling ability of a transistor; average junction temperature and secondary 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 13 is based on $T_{J(pk)}$ = 200°C; T_C is variable depending on conditions. At high case temperatures, thermal limitations will reduce the power than can be handled to values less than the limitations imposed by second breakdown.

TYPICAL CHARACTERISTICS

PNP MJL1302A

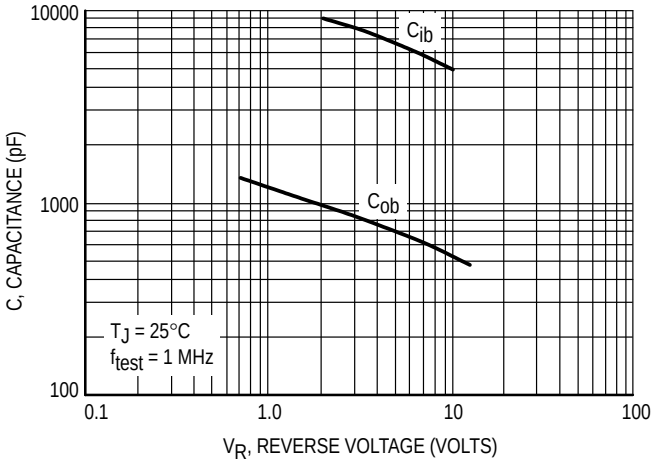


Figure 14. MJL1302A Typical Capacitance

NPN MJL3281A

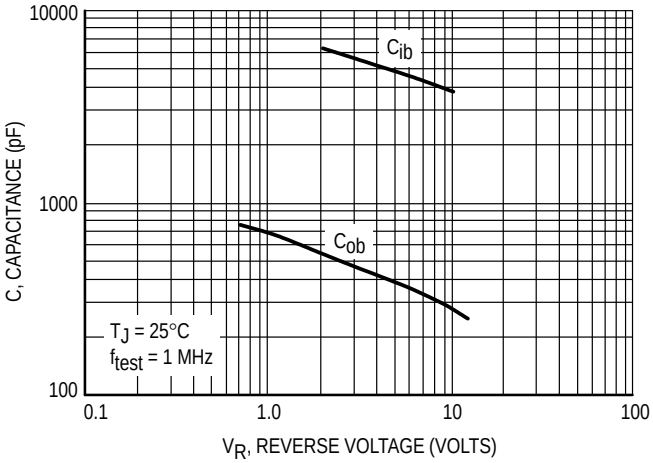
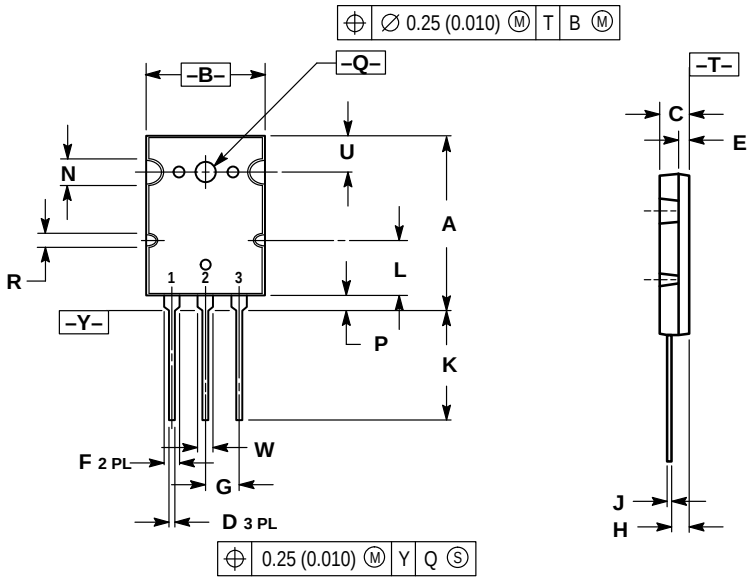


Figure 15. MJL3281A Typical Capacitance

PACKAGE DIMENSIONS



NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.

	MILLIMETERS		INCHES	
DIM	MIN	MAX	MIN	MAX
A	2.8	2.9	1.102	1.142
B	19.3	20.3	0.760	0.800
C	4.7	5.3	0.185	0.209
D	0.93	1.48	0.037	0.058
E	1.9	2.1	0.075	0.083
F	2.2	2.4	0.087	0.102
G	5.45 BSC		0.215 BSC	
H	2.6	3.0	0.102	0.118
J	0.43	0.78	0.017	0.031
K	17.6	18.8	0.693	0.740
L	11.0	11.4	0.433	0.449
N	3.95	4.75	0.156	0.187
P	2.2	2.6	0.087	0.102
Q	3.1	3.5	0.122	0.137
R	2.15	2.35	0.085	0.093
U	6.1	6.5	0.240	0.256
W	2.8	3.2	0.110	0.125

STYLE 2:
PIN 1. BASE
2. COLLECTOR
3. EMITTER

CASE 340G–02
ISSUE F

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