

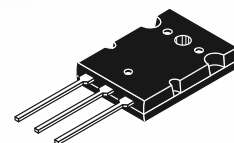
Designer's™ Data Sheet  
**Complementary NPN-PNP  
Silicon Power Bipolar Transistor**

- 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 sec
- High  $f_T$  — 30 MHz Typical

**NPN  
MJL3281A\*  
PNP  
MJL1302A\***

\*Motorola Preferred Device

**15 AMPERE  
COMPLEMENTARY  
SILICON POWER  
TRANSISTORS  
200 VOLTS  
200 WATTS**



**CASE 340G-02, STYLE 2  
TO-264**

**MAXIMUM RATINGS** ( $T_J = 25^\circ\text{C}$  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 @ $T_C = 25^\circ\text{C}$ Derate Above $25^\circ\text{C}$	$P_D$	200 1.43	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	$R_{\theta JC}$	0.7	$^\circ\text{C}/\text{W}$

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

**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.



**MJL3281A****ELECTRICAL CHARACTERISTICS** ( $T_C = 25^\circ\text{C}$  unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
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**OFF CHARACTERISTICS**

Collector–Emitter Sustaining Voltage ( $I_C = 100\text{ mAdc}$ , $I_B = 0$ )	$V_{CEO(sus)}$	200	—	—	Vdc
Emitter–Base Voltage ( $I_E = 100\text{ }\mu\text{Adc}$ , $I_C = 0$ )	$V_{EBO}$	7	—	—	Vdc
Collector Cutoff Current ( $V_{CB} = 200\text{ Vdc}$ , $I_E = 0$ )	$I_{CBO}$	—	—	50	$\mu\text{Adc}$
Emitter Cutoff Current ( $V_{EB} = 5\text{ Vdc}$ , $I_C = 0$ )	$I_{EBO}$	—	—	5	$\mu\text{Adc}$
Emitter Cutoff Current ( $V_{EB} = 7\text{ Vdc}$ , $I_C = 0$ )	$I_{EBO}$	—	—	25	$\mu\text{Adc}$

**SECOND BREAKDOWN**

Second Breakdown Collector with Base Forward Biased ( $V_{CE} = 50\text{ Vdc}$ , $t = 1\text{ s}$ (non–repetitive)) ( $V_{CE} = 100\text{ Vdc}$ , $t = 1\text{ s}$ (non–repetitive))	$I_{S/b}$	4 1	— —	— —	Adc
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**ON CHARACTERISTICS**

DC Current Gain ( $I_C = 100\text{ mAdc}$ , $V_{CE} = 5\text{ Vdc}$ ) ( $I_C = 1\text{ Adc}$ , $V_{CE} = 5\text{ Vdc}$ ) ( $I_C = 3\text{ Adc}$ , $V_{CE} = 5\text{ Vdc}$ ) ( $I_C = 5\text{ Adc}$ , $V_{CE} = 5\text{ Vdc}$ ) ( $I_C = 7\text{ Adc}$ , $V_{CE} = 5\text{ Vdc}$ ) ( $I_C = 8\text{ Adc}$ , $V_{CE} = 5\text{ Vdc}$ ) ( $I_C = 15\text{ Adc}$ , $V_{CE} = 5\text{ Vdc}$ )	$h_{FE}$	60 60 60 60 60 45 12	125 — — — 115 — 35	175 175 175 175 175 — —	
Collector–Emitter Saturation Voltage ( $I_C = 10\text{ Adc}$ , $I_B = 1\text{ Adc}$ )	$V_{CE(sat)}$	—	—	3	Vdc

**DYNAMIC CHARACTERISTICS**

Current–Gain — Bandwidth Product ( $I_C = 1\text{ Adc}$ , $V_{CE} = 5\text{ Vdc}$ , $f_{test} = 1\text{ MHz}$ )	$f_T$	—	30	—	MHz
Output Capacitance ( $V_{CB} = 10\text{ Vdc}$ , $I_E = 0$ , $f_{test} = 1\text{ MHz}$ )	$C_{ob}$	—	—	600	pF

(1) Pulse Test: Pulse Width = 300  $\mu\text{s}$ , Duty Cycle  $\leq 2\%$ .

TYPICAL CHARACTERISTICS

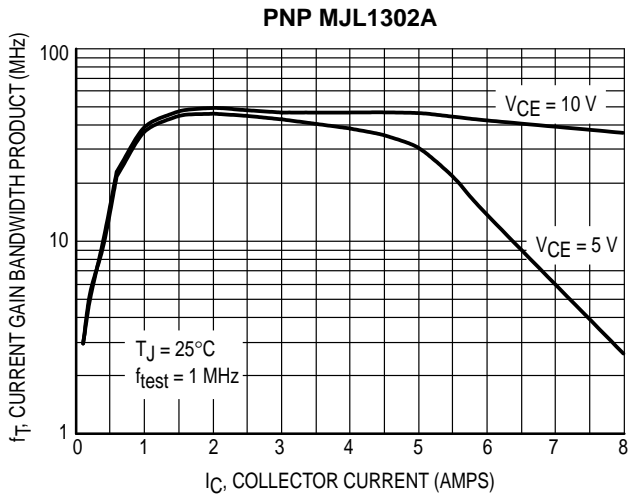


Figure 1. Current-Gain — Bandwidth Product

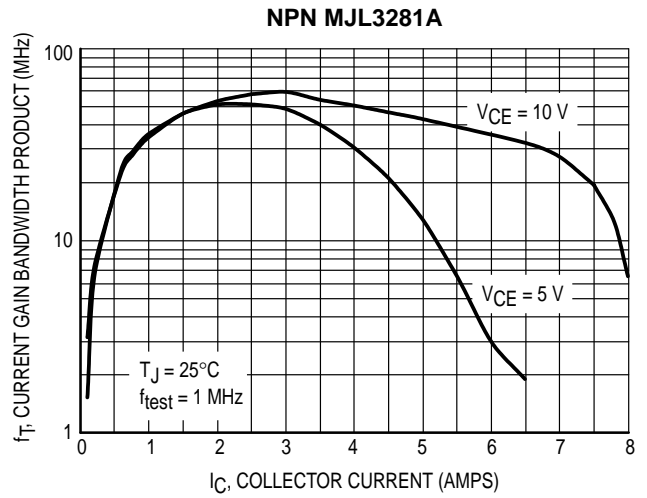


Figure 2. Current-Gain — Bandwidth Product

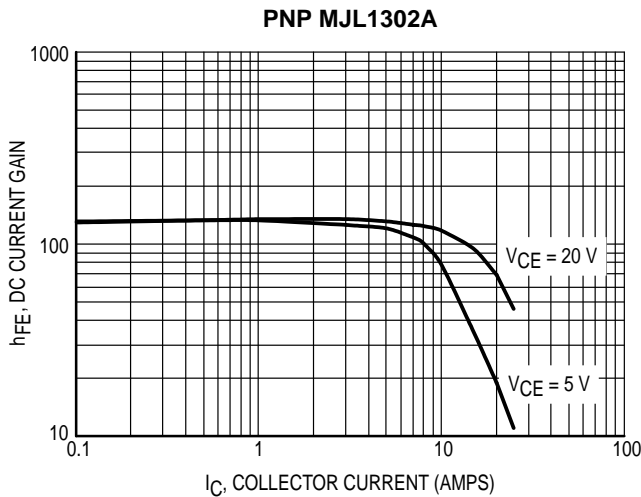


Figure 3. DC Current Gain

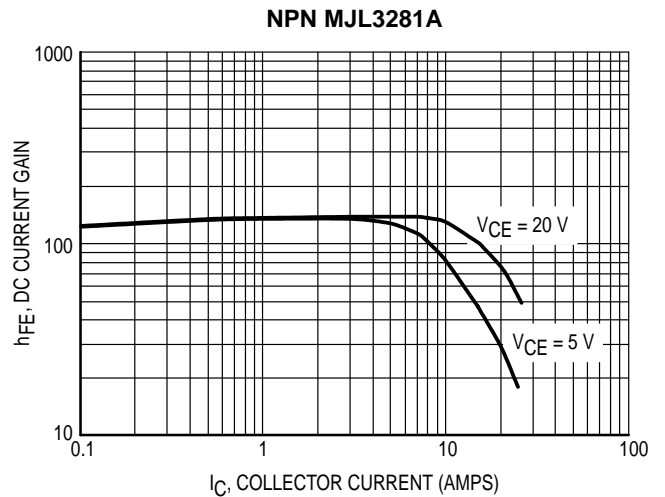


Figure 4. DC Current Gain

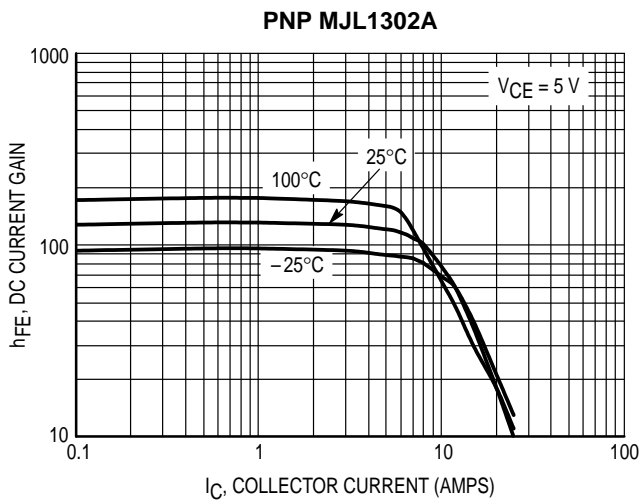


Figure 5. DC Current Gain,  $V_{CE} = 5 V$

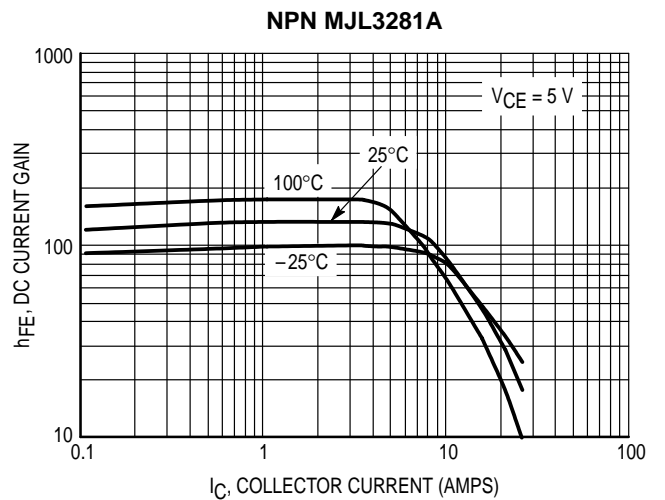
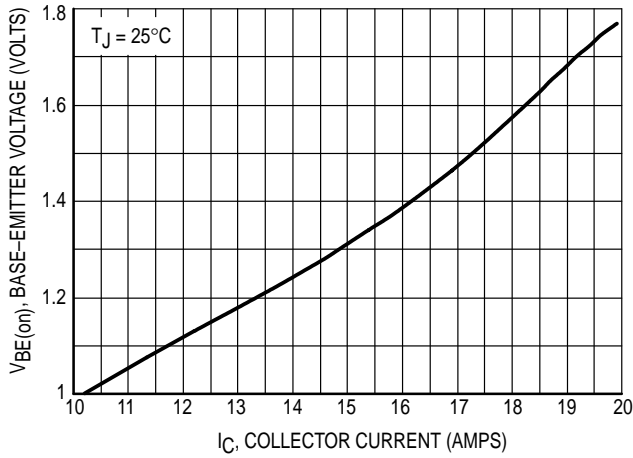


Figure 6. DC Current Gain,  $V_{CE} = 5 V$

**MJL3281A**

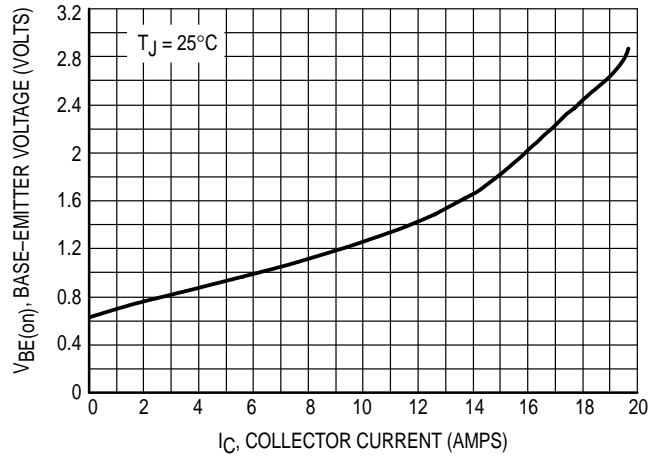
**TYPICAL CHARACTERISTICS**

**PNP MJL1302A**



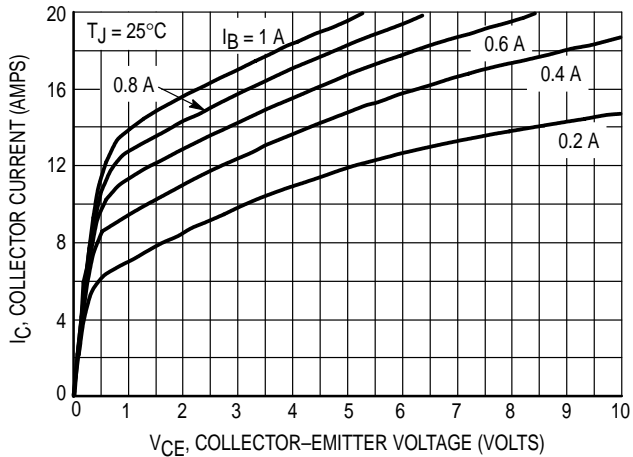
**Figure 7. Typical Base–Emitter Voltage**

**NPN MJL3281A**



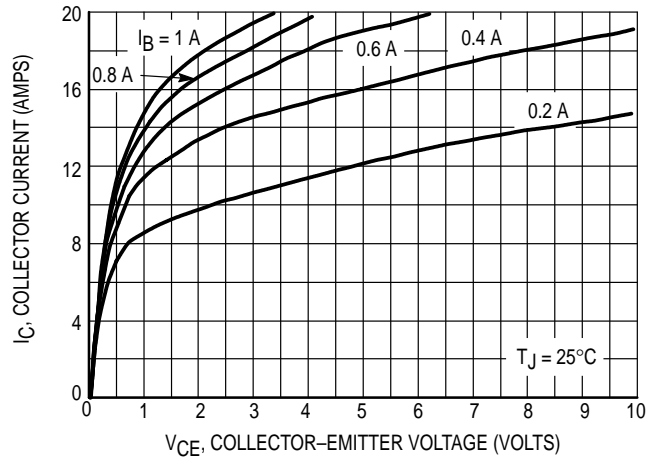
**Figure 8. Typical Base–Emitter Voltage**

**PNP MJL1302A**

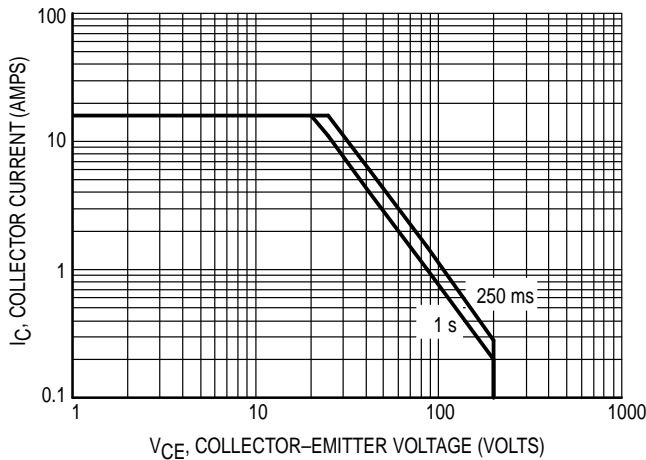


**Figure 9. Typical Output Characteristics**

**NPN MJL3281A**



**Figure 10. Typical Output Characteristics**

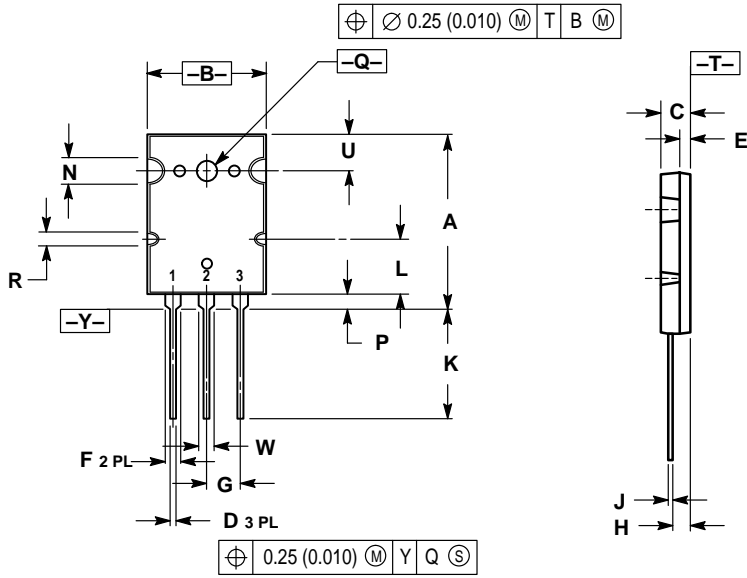


**Figure 11. Forward Bias Safe Operating Area (FBSOA)**

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 11 is based on  $T_{J(pk)} = 200^\circ\text{C}$ ;  $T_C$  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.

PACKAGE DIMENSIONS




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

DIM	MILLIMETERS		INCHES	
	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  
 TO-264  
 ISSUE E

## MJL3281A

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