Complementary Bipolar Power Transistors

MJL3281A (NPN)
MJL1302A (PNP)

15 AMPERES
COMPLEMENTARY
SILICON POWER
TRANSISTORS
260 VOLTS
200 WATTS

Features

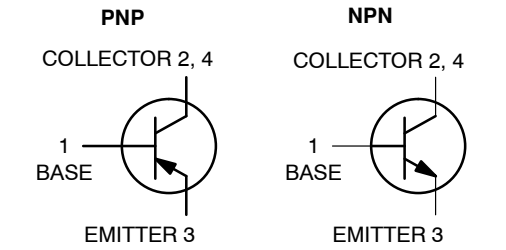
- Exceptional Safe Operating Area
- NPN/PNP Gain Matching within 10% from 50 mA to 5 A
- Excellent Gain Linearity
- High BVCEO
- High Frequency
- These Devices are Pb−Free and are RoHS Compliant*

Benefits

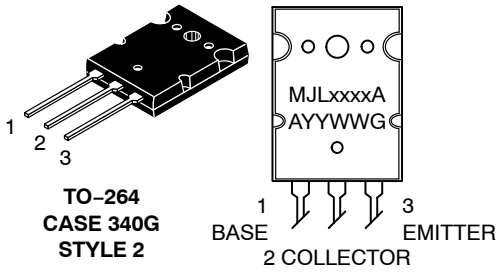
- Reliable Performance at Higher Powers
- Symmetrical Characteristics in Complementary Configurations
- Accurate Reproduction of Input Signal
- Greater Dynamic Range
- High Amplifier Bandwidth

Applications

- High−End Consumer Audio Products
  - Home Amplifiers
  - Home Receivers
- Professional Audio Amplifiers
  - Theater and Stadium Sound Systems
  - Public Address Systems (PAs)



MARKING DIAGRAM



TO−264
CASE 340G
STYLE 2

xxxx	= 3281 or 1302
A	= Location Code
YY	= Year
WW	= Work Week
G	= Pb−Free Package

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

Rating	Symbol	Value	Unit
Collector−Emitter Voltage	V_{CEO}	260	Vdc
Collector−Base Voltage	V_{CBO}	260	Vdc
Emitter−Base Voltage	V_{EBO}	5.0	Vdc
Collector−Emitter Voltage − 1.5 V	V_{CEX}	260	Vdc
Collector Current − Continuous	I_C	15	Adc
Collector Current − Peak (Note 1)	I_{CM}	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	$R_{\theta JC}$	0.625	°C/W

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

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

ORDERING INFORMATION

Device	Package	Shipping
MJL3281AG	TO−264 (Pb−Free)	25 Units/Rail
MJL1302AG	TO−264 (Pb−Free)	25 Units/Rail

*For additional information on our Pb−Free strategy and soldering details, please download the **onsemi** Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

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

Characteristic	Symbol	Min	Max	Unit
OFF CHARACTERISTICS				
Collector−Emitter Sustaining Voltage (I_C = 100 mAdc, I_B = 0)	$V_{CEO(sus)}$	260	–	Vdc
Collector Cutoff Current (V_{CB} = 260 Vdc, I_E = 0)	I_{CBO}	–	50	μAdc
Emitter Cutoff Current (V_{EB} = 5 Vdc, I_C = 0)	I_{EBO}	–	5	μAdc
SECOND BREAKDOWN				
Second Breakdown Collector with Base Forward Biased (V_{CE} = 50 Vdc, t = 1 s (non−repetitive))	$I_{S/b}$	4	–	Adc
(V_{CE} = 100 Vdc, t = 1 s (non−repetitive))		1	–	
ON CHARACTERISTICS				
DC Current Gain (I_C = 500 mAdc, V_{CE} = 5 Vdc)	h_{FE}	75	150	
(I_C = 1 Adc, V_{CE} = 5 Vdc)		75	150	
(I_C = 3 Adc, V_{CE} = 5 Vdc)		75	150	
(I_C = 5 Adc, V_{CE} = 5 Vdc)		75	150	
(I_C = 8 Adc, V_{CE} = 5 Vdc)		45	–	
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

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

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TYPICAL CHARACTERISTICS

PNP MJL1302A

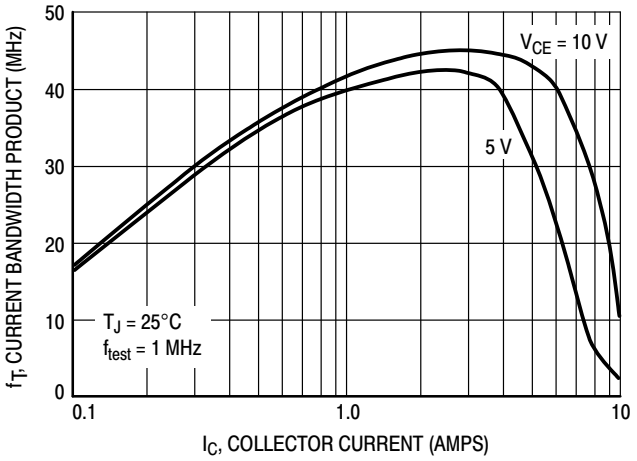

Figure 1. Typical Current Gain Bandwidth Product

NPN MJL3281A

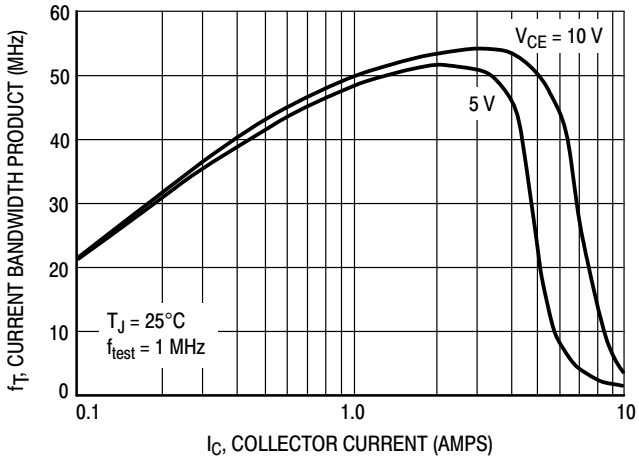

Figure 2. Typical Current Gain Bandwidth Product

PNP MJL1302A

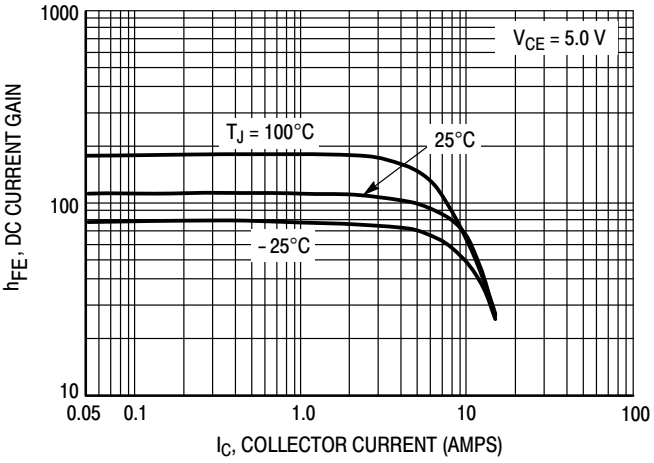

Figure 3. DC Current Gain

NPN MJL3281A

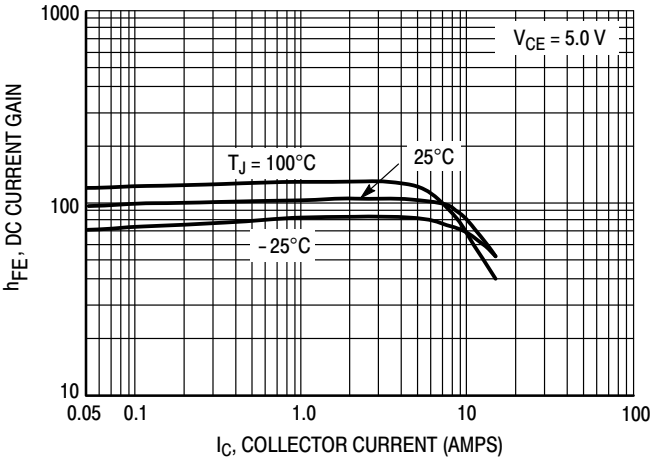

Figure 4. DC Current Gain

PNP MJL1302A

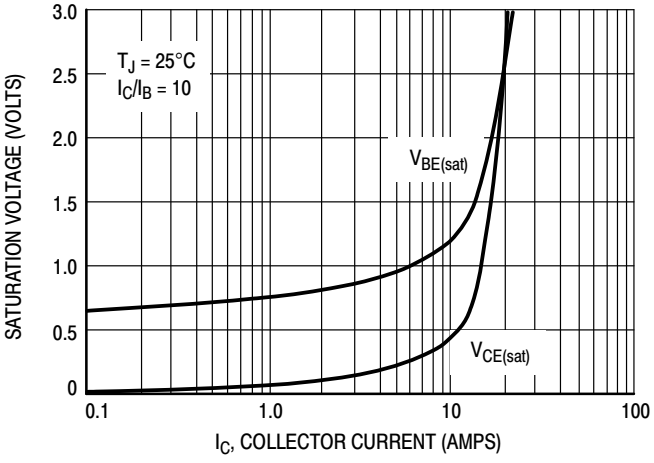

Figure 5. Typical Saturation Voltages

NPN MJL3281A

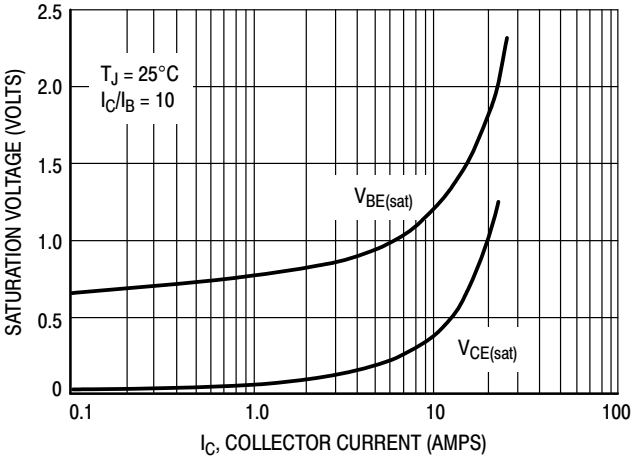

Figure 6. Typical Saturation Voltages

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TYPICAL CHARACTERISTICS

PNP MJL1302A

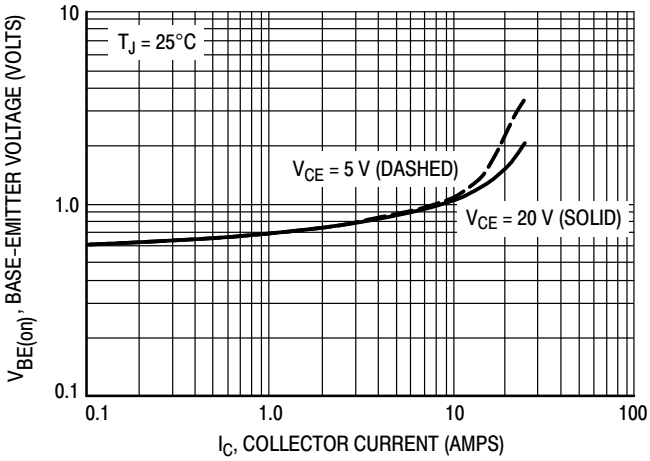

Figure 7. Typical Base−Emitter Voltage

NPN MJL3281A

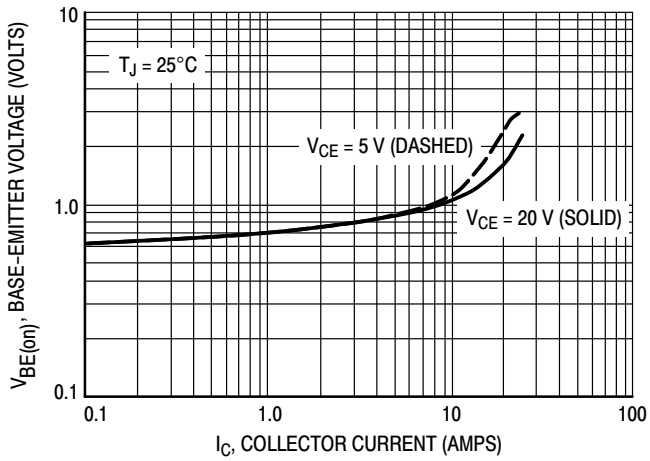

Figure 8. Typical Base−Emitter Voltage

PNP MJL1302A

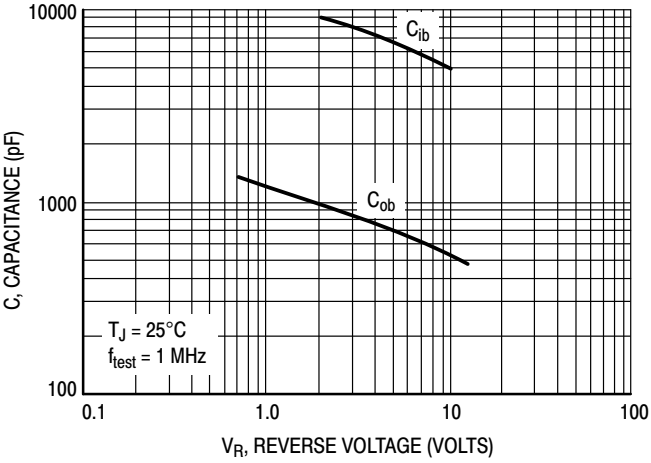

Figure 9. MJL1302A Typical Capacitance

NPN MJL3281A

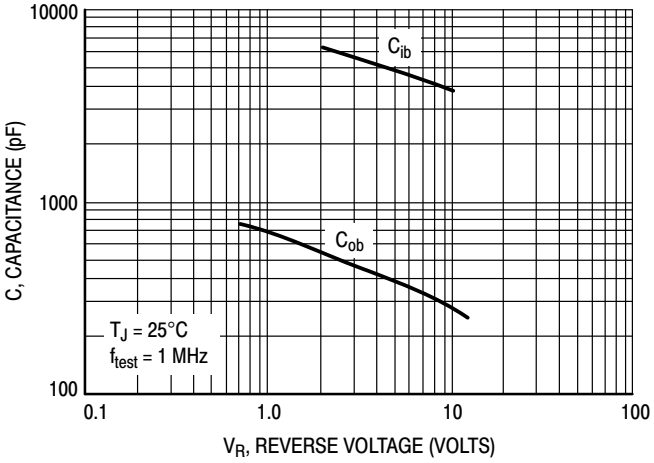

Figure 10. MJL3281A Typical Capacitance

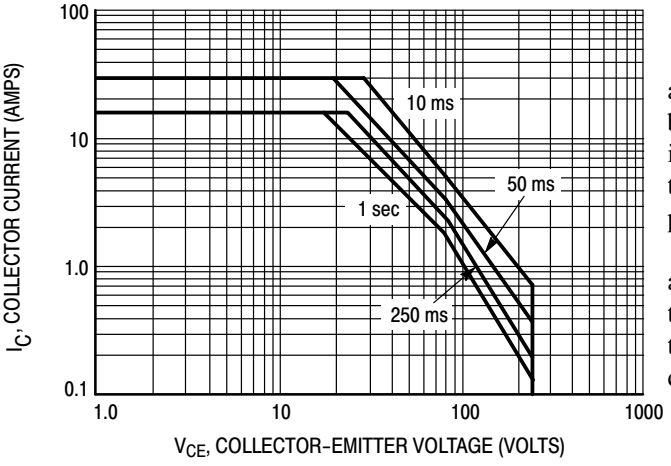

Figure 11. Active Region Safe Operating Area

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 11 is based on $T_{J(pk)}$ = 150°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.

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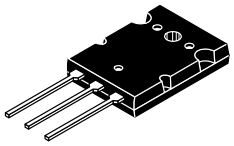
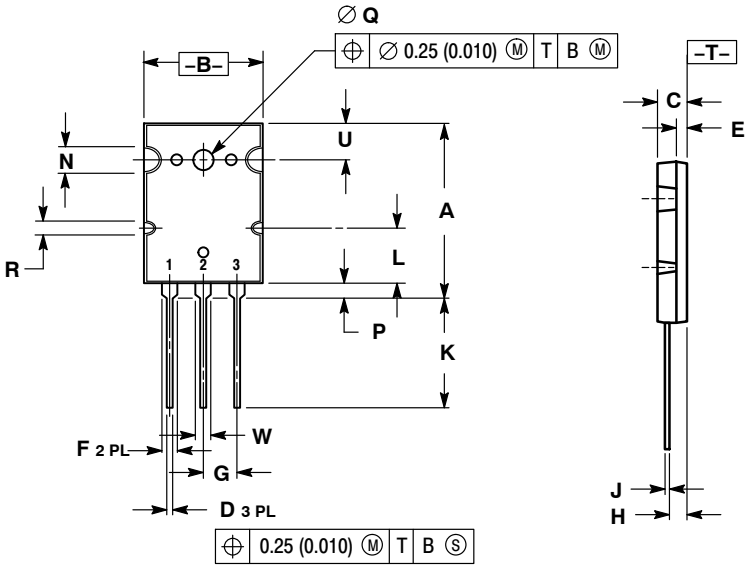


TO−3BPL (TO−264)
CASE 340G−02
ISSUE J

DATE 17 DEC 2004

SCALE 1:2



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

	MILLIMETERS		INCHES	
DIM	MIN	MAX	MIN	MAX
A	28.0	29.0	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	11.2 REF		0.411 REF	
N	4.35 REF		0.172 REF	
P	2.2	2.6	0.087	0.102
Q	3.1	3.5	0.122	0.137
R	2.25 REF		0.089 REF	
U	6.3 REF		0.248 REF	
W	2.8	3.2	0.110	0.125

STYLE 1:
PIN 1. GATE
2. DRAIN
3. SOURCE

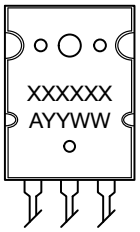
STYLE 2:
PIN 1. BASE
2. COLLECTOR
3. EMITTER

STYLE 3:
PIN 1. GATE
2. SOURCE
3. DRAIN

STYLE 4:
PIN 1. DRAIN
2. SOURCE
3. GATE

STYLE 5:
PIN 1. GATE
2. COLLECTOR
3. EMITTER

GENERIC MARKING DIAGRAM*



XXXXXX = Specific Device Code
A = Location Code
YY = Year
WW = Work Week

*This information is generic. Please refer to device data sheet for actual part marking. Pb−Free indicator, “G” or microdot “ ▪”, may or may not be present.

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