

# MJL3281A (NPN) MJL1302A (PNP)



ON Semiconductor®

<http://onsemi.com>

## Complementary Bipolar Power Transistors

### Features

- Exceptional Safe Operating Area
- NPN/PNP Gain Matching within 10% from 50 mA to 5 A
- Excellent Gain Linearity
- High BVCEO
- High Frequency
- Pb-Free Packages are Available\*

### 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)

### MAXIMUM RATINGS (T<sub>J</sub> = 25°C unless otherwise noted)

Rating	Symbol	Value	Unit
Collector-Emitter Voltage	V <sub>CEO</sub>	260	Vdc
Collector-Base Voltage	V <sub>CBO</sub>	260	Vdc
Emitter-Base Voltage	V <sub>EBO</sub>	5.0	Vdc
Collector-Emitter Voltage - 1.5 V	V <sub>CEX</sub>	260	Vdc
Collector Current - Continuous - Peak (Note 1)	I <sub>C</sub>	15 25	Adc
Base Current - Continuous	I <sub>B</sub>	1.5	Adc
Total Power Dissipation @ T <sub>C</sub> = 25°C Derate Above 25°C	P <sub>D</sub>	200 1.43	Watts W/°C
Operating and Storage Junction Temperature Range	T <sub>J</sub> , T <sub>stg</sub>	- 65 to +150	°C

### THERMAL CHARACTERISTICS

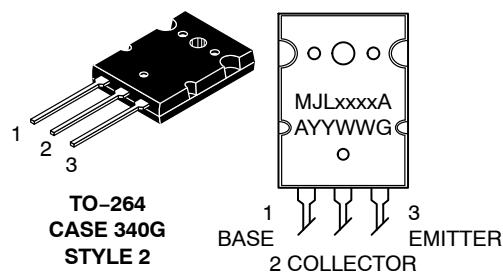
Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction-to-Case	R <sub>θJC</sub>	0.625	°C/W

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

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

**15 AMPERES  
COMPLEMENTARY  
SILICON POWER  
TRANSISTORS  
260 VOLTS  
200 WATTS**

### MARKING DIAGRAM



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

### ORDERING INFORMATION

Device	Package	Shipping
MJL3281A	TO-264	25 Units/Rail
MJL3281AG	TO-264 (Pb-Free)	25 Units/Rail
MJL1302A	TO-264	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 ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

## MJL3281A (NPN) MJL1302A (PNP)

### ELECTRICAL CHARACTERISTICS (T<sub>C</sub> = 25°C unless otherwise noted)

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

#### OFF CHARACTERISTICS

Collector–Emitter Sustaining Voltage (I <sub>C</sub> = 100 mA <sub>dc</sub> , I <sub>B</sub> = 0)	V <sub>CEO(sus)</sub>	260	–	V <sub>dc</sub>
Collector Cutoff Current (V <sub>CB</sub> = 260 V <sub>dc</sub> , I <sub>E</sub> = 0)	I <sub>CBO</sub>	–	50	μA <sub>dc</sub>
Emitter Cutoff Current (V <sub>EB</sub> = 5 V <sub>dc</sub> , I <sub>C</sub> = 0)	I <sub>EBO</sub>	–	5	μA <sub>dc</sub>

#### SECOND BREAKDOWN

Second Breakdown Collector with Base Forward Biased (V <sub>CE</sub> = 50 V <sub>dc</sub> , t = 1 s (non-repetitive)) (V <sub>CE</sub> = 100 V <sub>dc</sub> , t = 1 s (non-repetitive))	I <sub>S/b</sub>	4 1	– –	A <sub>dc</sub>
--	------------------	--------	--------	-----------------

#### ON CHARACTERISTICS

DC Current Gain (I <sub>C</sub> = 500 mA <sub>dc</sub> , V <sub>CE</sub> = 5 V <sub>dc</sub> ) (I <sub>C</sub> = 1 A <sub>dc</sub> , V <sub>CE</sub> = 5 V <sub>dc</sub> ) (I <sub>C</sub> = 3 A <sub>dc</sub> , V <sub>CE</sub> = 5 V <sub>dc</sub> ) (I <sub>C</sub> = 5 A <sub>dc</sub> , V <sub>CE</sub> = 5 V <sub>dc</sub> ) (I <sub>C</sub> = 8 A <sub>dc</sub> , V <sub>CE</sub> = 5 V <sub>dc</sub> )	h <sub>FE</sub>	75 75 75 75 45	150 150 150 150 –	
Collector–Emitter Saturation Voltage (I <sub>C</sub> = 10 A <sub>dc</sub> , I <sub>B</sub> = 1 A <sub>dc</sub> )	V <sub>CE(sat)</sub>	–	3	V <sub>dc</sub>

#### DYNAMIC CHARACTERISTICS

Current–Gain – Bandwidth Product (I <sub>C</sub> = 1 A <sub>dc</sub> , V <sub>CE</sub> = 5 V <sub>dc</sub> , f <sub>test</sub> = 1 MHz)	f <sub>T</sub>	30	–	MHz
Output Capacitance (V <sub>CB</sub> = 10 V <sub>dc</sub> , I <sub>E</sub> = 0, f <sub>test</sub> = 1 MHz)	C <sub>ob</sub>	–	600	pF

# MJL3281A (NPN) MJL1302A (PNP)

## TYPICAL CHARACTERISTICS

PNP MJL1302A

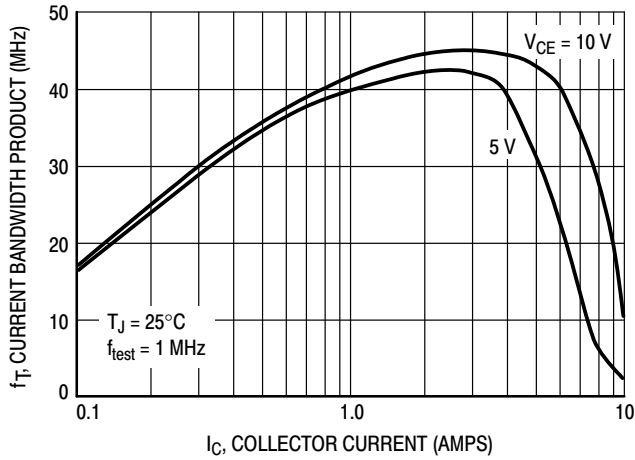


Figure 1. Typical Current Gain Bandwidth Product

NPN MJL3281A

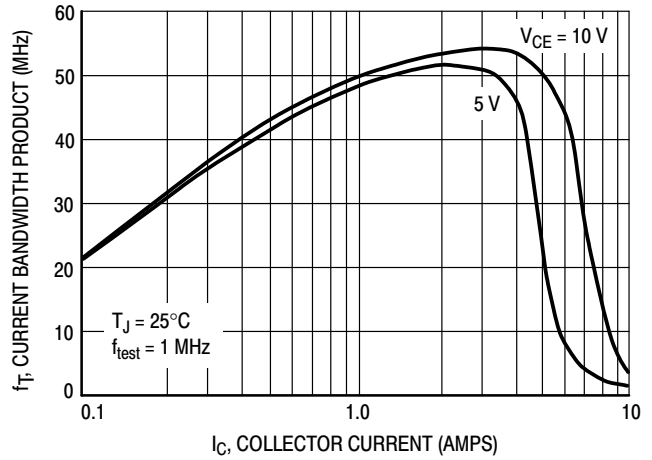


Figure 2. Typical Current Gain Bandwidth Product

PNP MJL1302A

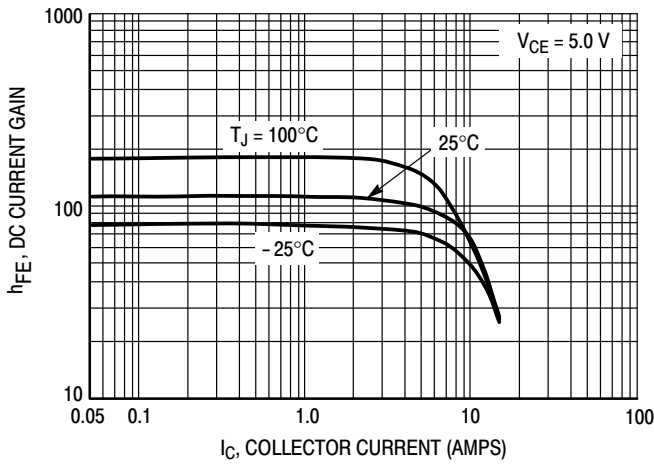


Figure 3. DC Current Gain

NPN MJL3281A

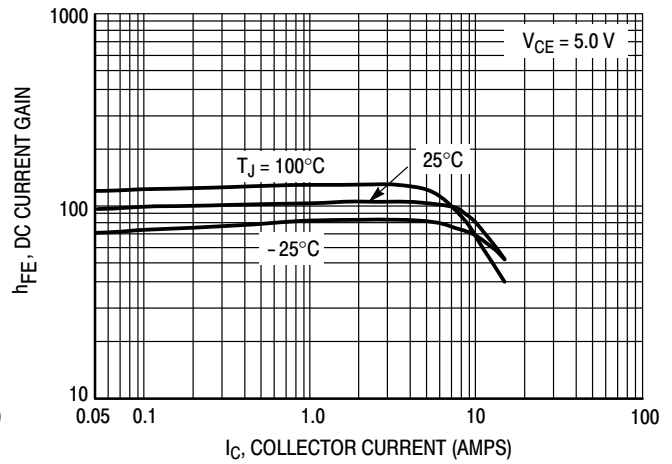


Figure 4. DC Current Gain

PNP MJL1302A

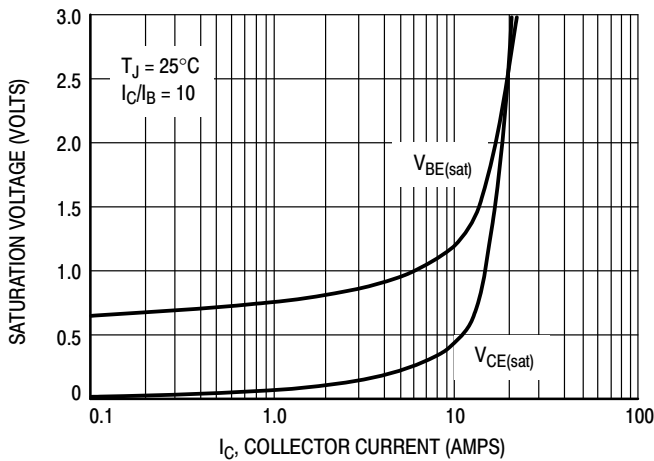


Figure 5. Typical Saturation Voltages

NPN MJL3281A

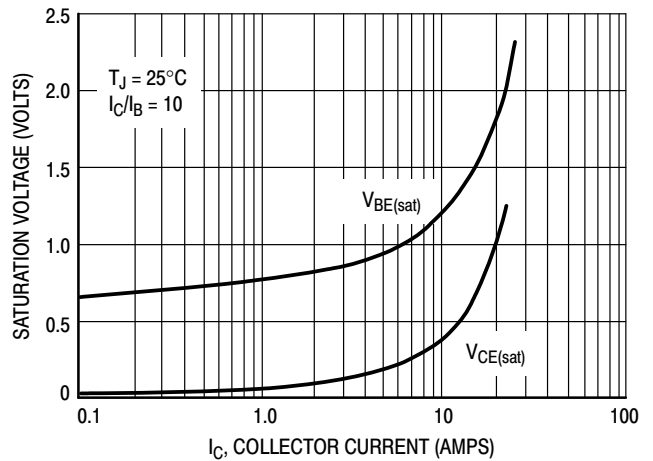


Figure 6. Typical Saturation Voltages

# MJL3281A (NPN) MJL1302A (PNP)

## TYPICAL CHARACTERISTICS

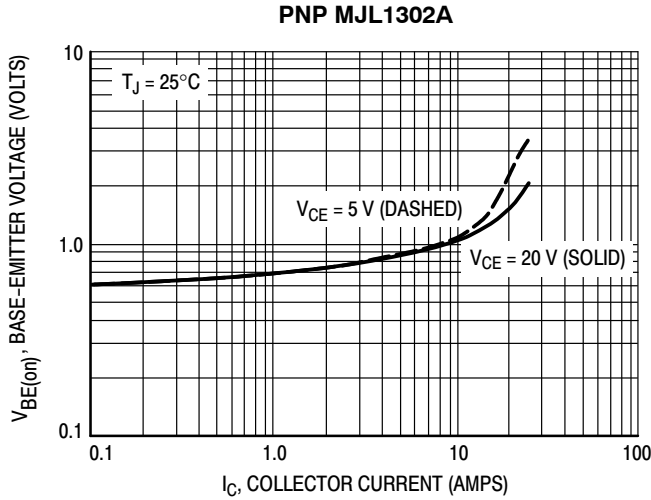


Figure 7. Typical Base-Emitter Voltage

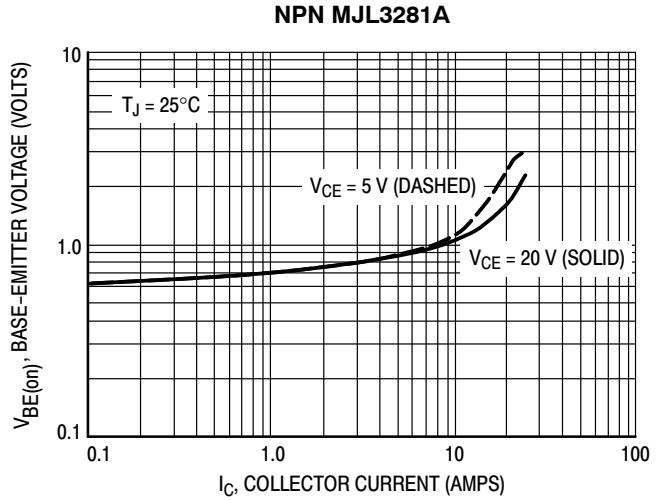


Figure 8. Typical Base-Emitter Voltage

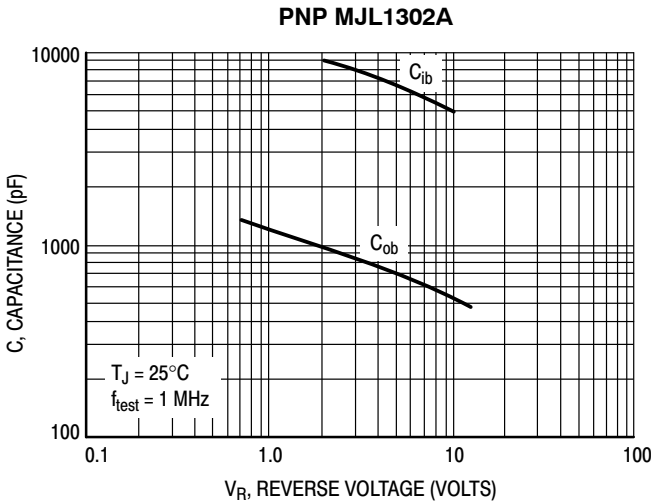


Figure 9. MJL1302A Typical Capacitance

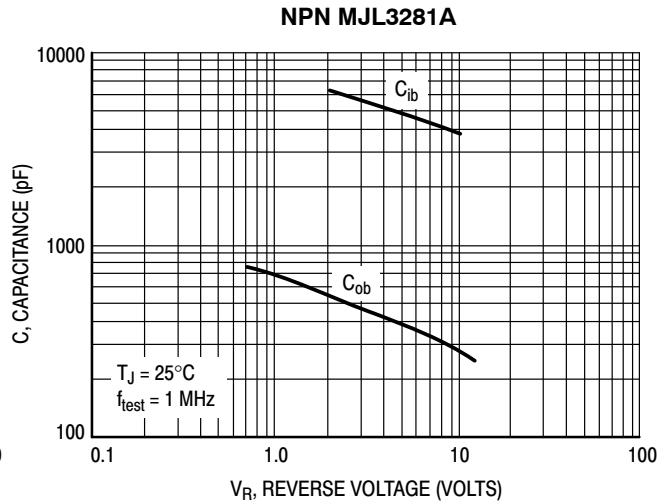


Figure 10. MJL3281A Typical Capacitance

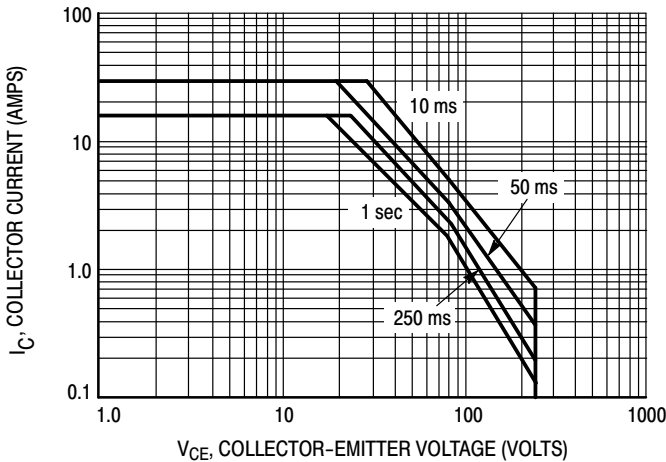


Figure 11. Active Region Safe Operating Area

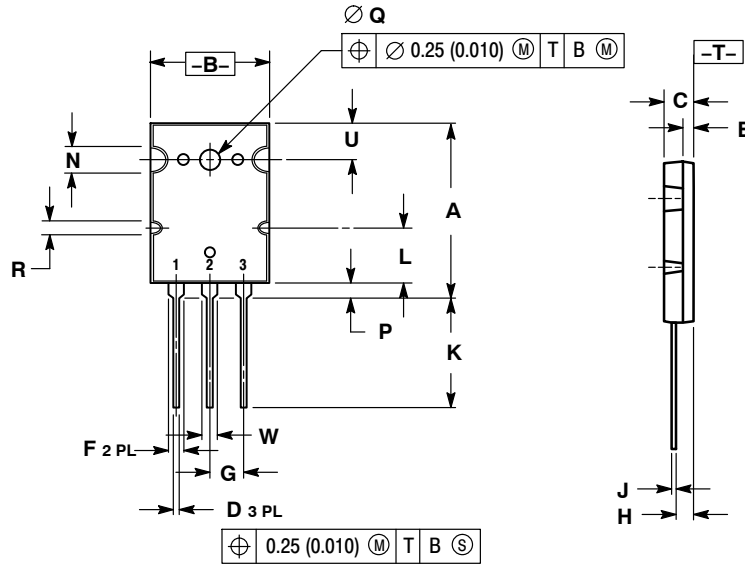
There are two limitations on the power handling ability of a transistor; average junction temperature and secondary breakdown. Safe operating area curves indicate  $I_C - V_{CE}$  limits of the transistor that must be observed for reliable operation; i.e., the transistor must not be subjected to greater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

The data of Figure 11 is based on  $T_{J(pk)} = 150^\circ\text{C}$ ;  $T_C$  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.

# MJL3281A (NPN) MJL1302A (PNP)

## PACKAGE DIMENSIONS

TO-3PBL (TO-264)  
CASE 340G-02  
ISSUE J



### NOTES:

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

DIM	MILLIMETERS		INCHES	
	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 2:

- PIN 1. BASE
- COLLECTOR
- EMITTER

ON Semiconductor and are registered trademarks of Semiconductor Components Industries, LLC (SCILLC). SCILLC owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of SCILLC's product/patent coverage may be accessed at [www.onsemi.com/site/pdf/Patent-Marking.pdf](http://www.onsemi.com/site/pdf/Patent-Marking.pdf). SCILLC reserves the right to make changes without further notice to any products herein. SCILLC makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does SCILLC assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. "Typical" parameters which may be provided in SCILLC data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. SCILLC does not convey any license under its patent rights nor the rights of others. SCILLC products are not designed, intended, or authorized for use as components in systems intended for surgical implant into the body, or other applications intended to support or sustain life, or for any other application in which the failure of the SCILLC product could create a situation where personal injury or death may occur. Should Buyer purchase or use SCILLC products for any such unintended or unauthorized application, Buyer shall indemnify and hold SCILLC and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that SCILLC was negligent regarding the design or manufacture of the part. SCILLC is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.

### PUBLICATION ORDERING INFORMATION

#### LITERATURE FULFILLMENT:

Literature Distribution Center for ON Semiconductor  
P.O. Box 5163, Denver, Colorado 80217 USA  
Phone: 303-675-2175 or 800-344-3860 Toll Free USA/Canada  
Fax: 303-675-2176 or 800-344-3867 Toll Free USA/Canada  
Email: [orderlit@onsemi.com](mailto:orderlit@onsemi.com)

N. American Technical Support: 800-282-9855 Toll Free  
USA/Canada  
Europe, Middle East and Africa Technical Support:  
Phone: 421 33 790 2910  
Japan Customer Focus Center  
Phone: 81-3-5817-1050

ON Semiconductor Website: [www.onsemi.com](http://www.onsemi.com)

Order Literature: <http://www.onsemi.com/orderlit>

For additional information, please contact your local Sales Representative