# Complementary NPN-PNP Silicon Power Bipolar Transistors

The MJL4281A and MJL4302A are power transistors for high power audio.

#### **Features**

- 350 V Collector-Emitter Sustaining Voltage
- Gain Complementary:

Gain Linearity from 100 mA to 5 A High Gain – 80 to 240

 $h_{FE} = 50 \text{ (min)} @ I_C = 8 \text{ A}$ 

- Low Harmonic Distortion
- High Safe Operation Area 1.0 A/100 V @ 1 Second
- High f<sub>T</sub>
- Pb-Free Packages are Available\*

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

Rating	Symbol	Value	Unit
Collector-Emitter Voltage	V <sub>CEO</sub>	350	Vdc
Collector-Base Voltage	V <sub>CBO</sub>	350	Vdc
Emitter-Base Voltage	V <sub>EBO</sub>	5.0	Vdc
Collector-Emitter Voltage - 1.5 V	V <sub>CEX</sub>	350	Vdc
Collector Current - Continuous - Peak (Note 1)	I <sub>C</sub>	15 30	Adc
Base Current - Continuous	Ι <sub>Β</sub>	1.5	Adc
Total Power Dissipation @ T <sub>C</sub> = 25°C Derate Above 25°C	P <sub>D</sub>	230 1.84	°C/W
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	$R_{\theta JC}$	0.54	°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.

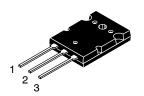
1. Pulse Test: Pulse Width = 5 ms, Duty Cycle < 10%.



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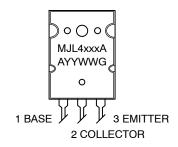
http://onsemi.com

# 15 AMPERES COMPLEMENTARY SILICON POWER TRANSISTORS 350 VOLTS, 230 WATTS



TO-264 CASE 340G STYLE 2

## **MARKING DIAGRAM**



xxx = 281 or 302

A = Assembly Location

YY = Year

WW = Work Week
G = Pb-Free Package

#### ORDERING INFORMATION

Device	Package	Shipping
MJL4281A	TO-264	25 Units/Rail
MJL4281AG	TO-264 (Pb-Free)	25 Units/Rail
MJL4302A	TO-264	25 Units/Rail
MJL4302AG	TO-264 (Pb-Free)	25 Units/Rail

<sup>\*</sup>For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

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

Characteristic	Symbol	Min	Max	Unit
OFF CHARACTERISTICS	<u>.</u>			
Collector Emitter Sustaining Voltage (I <sub>C</sub> = 50 mA, I <sub>B</sub> = 0)	V <sub>CE(sus)</sub>	350		Vdc
Collector Cut-off Current (V <sub>CE</sub> = 200 V, I <sub>B</sub> = 0)	I <sub>CEO</sub>		100	μAdc
Collector Cutoff Current (V <sub>CB</sub> = 350 Vdc, I <sub>E</sub> = 0)	I <sub>CBO</sub>	-	50	μAdc
Emitter Cutoff Current (V <sub>EB</sub> = 5.0 Vdc, I <sub>C</sub> = 0)	I <sub>EBO</sub>	-	5.0	μAdc
SECOND BREAKDOWN	•	•	•	-
Second Breakdown Collector with Base Forward Biased (V <sub>CE</sub> = 50 Vdc, t = 1.0 s (non-repetitive) (V <sub>CE</sub> = 100 Vdc, t = 1.0 s (non-repetitive)	I <sub>S/b</sub>	4.5 1.0	_ _	Adc
ON CHARACTERISTICS	•	1	•	
$\begin{array}{l} \text{DC Current Gain} \\ \text{($I_{C}=100$ mAdc, $V_{CE}=5.0$ Vdc)} \\ \text{($I_{C}=1.0$ Adc, $V_{CE}=5.0$ Vdc)} \\ \text{($I_{C}=3.0$ Adc, $V_{CE}=5.0$ Vdc)} \\ \text{($I_{C}=5.0$ Adc, $V_{CE}=5.0$ Vdc)} \\ \text{($I_{C}=8.0$ Adc, $V_{CE}=5.0$ Vdc)} \\ \text{($I_{C}=15$ Adc, $V_{CE}=5.0$ Vdc)} \\ \text{($I_{C}=15$ Adc, $V_{CE}=5.0$ Vdc)} \end{array}$	h <sub>FE</sub>	80 80 80 80 50	250 250 250 250 250 - -	-
Collector–Emitter Saturation Voltage (I <sub>C</sub> = 8.0 Adc, I <sub>B</sub> = 0.8 Adc)	V <sub>CE(sat)</sub>	-	1.0	Vdc
Emitter-Base Saturation Voltage (I <sub>C</sub> = 8.0 Adc, I <sub>B</sub> = 0.8 A)	V <sub>BE(sat)</sub>	-	1.4	Vdc
Base–Emitter ON Voltage ( $I_C = 8.0 \text{ Adc}$ , $V_{CE} = 5.0 \text{ Vdc}$ )	V <sub>BE(on)</sub>	-	1.5	Vdc
DYNAMIC CHARACTERISTICS	•	•	•	•
Current–Gain – Bandwidth Product ( $I_C = 1.0 \text{ Adc}$ , $V_{CE} = 5.0 \text{ Vdc}$ , $f_{test} = 1.0 \text{ MHz}$ )	f <sub>T</sub>	35	_	MHz
Output Capacitance (V <sub>CB</sub> = 10 Vdc, I <sub>E</sub> = 0, f <sub>test</sub> = 1.0 MHz)	C <sub>ob</sub>	-	600	pF

## TYPICAL CHARACTERISTICS

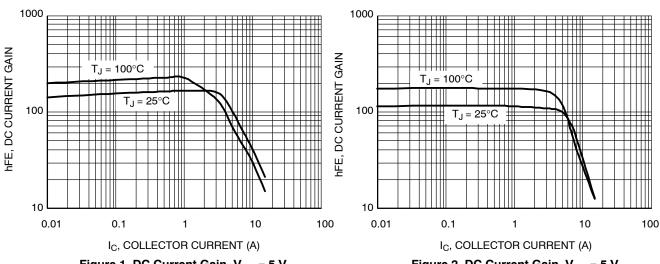


Figure 1. DC Current Gain, V<sub>CE</sub> = 5 V, NPN MJL4281A

Figure 2. DC Current Gain,  $V_{CE} = 5 \text{ V}$ , PNP MJL4302A

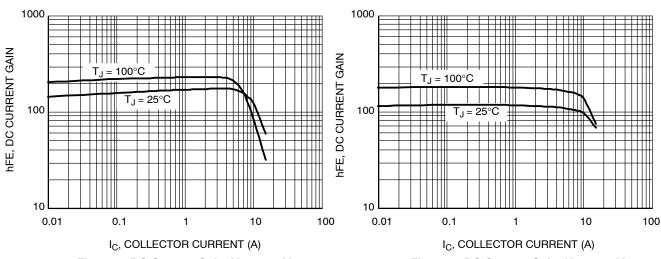


Figure 3. DC Current Gain, V<sub>CE</sub> = 20 V, NPN MJL4281A

Figure 4. DC Current Gain, V<sub>CE</sub> = 20 V, PNP MJL4302A

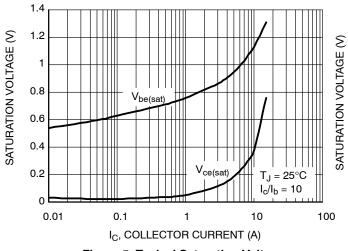


Figure 5. Typical Saturation Voltage, NPN MJL4281A

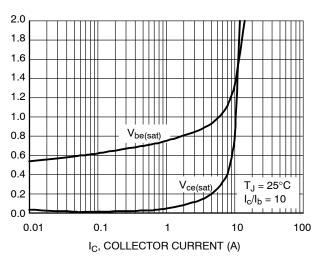


Figure 6. Typical Saturation Voltage, PNP MJL4302A

## TYPICAL CHARACTERISTICS

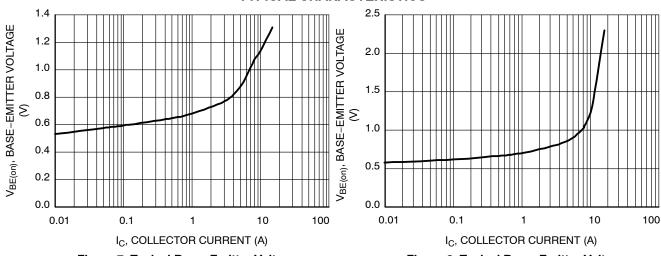


Figure 7. Typical Base-Emitter Voltages, NPN MJL4281A

Figure 8. Typical Base-Emitter Voltages, PNP MJL4302A

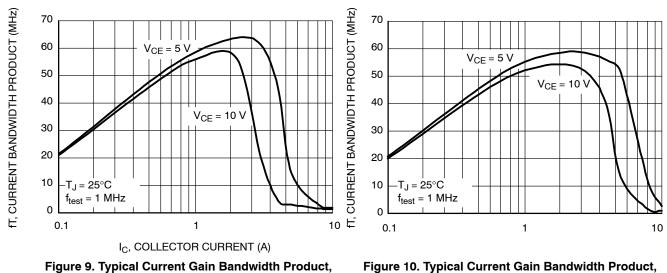


Figure 9. Typical Current Gain Bandwidth Product, NPN MJL4281A

Ic, COLLECTOR CURRENT (A)

100 100 10 mS COLLECTOR CURRENT (A) 10 10 1 Sec 1 Sec 100 mS 100 mS 0.1 0.1 Ö  $T_J = 25^{\circ}C$ T<sub>J</sub> = 25°C 0.01 0.01 10 100 1000 10 100 1000

Figure 11. Active Region Safe Operating Area, NPN MJL4281A

V<sub>ce</sub>, COLLECTOR-EMITTER VOLTAGE (V)

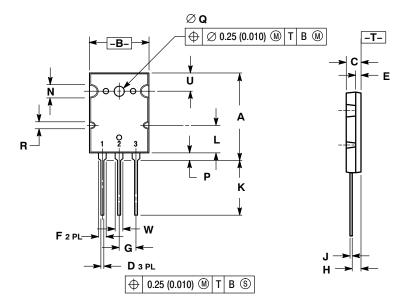
Figure 12. Active Region Safe Operating Area, PNP MJL4302A

V<sub>ce</sub>, COLLECTOR-EMITTER VOLTAGE (V)

PNP MJL4302A

#### PACKAGE DIMENSIONS

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



#### NOTES

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

	MILLIN	IETERS	TERS INCHES	
DIM	MIN	MAX	MIN	MAX
Α	28.0	29.0	1.102	1.142
В	19.3	20.3	0.760	0.800
С	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	
Н	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 2. COLL COLLECTOR 3. EMITTER

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