### MJ15003 (NPN), MJ15004 (PNP)

## **Complementary Silicon Power Transistors**

The MJ15003 and MJ15004 are power transistors designed for high power audio, disk head positioners and other linear applications.

#### **Features**

- High Safe Operating Area
- For Low Distortion Complementary Designs
- High DC Current Gain
- These Devices are Pb-Free and are RoHS Compliant\*

#### **MAXIMUM RATINGS**

Rating	Symbol	Value	Unit
Collector-Emitter Voltage	V <sub>CEO</sub>	140	Vdc
Collector-Base Voltage	V <sub>CBO</sub>	140	Vdc
Emitter-Base Voltage	V <sub>EBO</sub>	5	Vdc
Collector Current - Continuous	Ic	20	Adc
Base Current - Continuous	I <sub>B</sub>	5	Adc
Emitter Current - Continuous	ΙE	25	Adc
Total Power Dissipation @ T <sub>C</sub> = 25°C Derate above 25°C	P <sub>D</sub>	250 1.43	W W/°C
Operating and Storage Junction Temperature Range	T <sub>J</sub> , T <sub>stg</sub>	-65 to +200	°C

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.

#### THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	0.70	°C/W
Maximum Lead Temperature for Soldering Purposes 1/16" from Case for ≤ 10 secs	TL	265	°C

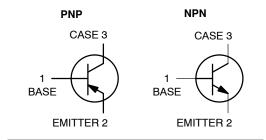


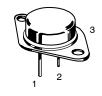
#### ON Semiconductor®

http://onsemi.com

# 20 AMPERE POWER TRANSISTORS COMPLEMENTARY SILICON 140 VOLTS, 250 WATTS

#### **SCHEMATIC**





TO-204AA (TO-3) CASE 1-07 STYLE 1

#### **MARKING DIAGRAM**



MJ1500x = Device Codex = 3 or 4

G = Pb-Free Package A = Location Code YY = Year

WW = Work Week
MEX = Country of Orgin

#### **ORDERING INFORMATION**

Device	Package	Shipping
MJ15003G	TO-204AA (Pb-Free)	100 Units/Tray
MJ15004G	TO-204AA (Pb-Free)	100 Units/Tray

<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.

#### MJ15003 (NPN), MJ15004 (PNP)

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

Characteristic	Symbol	Min	Max	Unit
OFF CHARACTERISTICS	1	I		
Collector Emitter Sustaining Voltage (Note 1) $(I_C = 200 \text{ mAdc}, I_B = 0)$	V <sub>CEO(sus)</sub>	140	-	Vdc
Collector Cutoff Current $(V_{CE} = 140 \text{ Vdc}, V_{BE(off)} = 1.5 \text{ Vdc})$ $(V_{CE} = 140 \text{ Vdc}, V_{BE(off)} = 1.5 \text{ Vdc}, T_{C} = 150^{\circ}\text{C})$	ICEX	_ _	100 2	μAdc mAdc
Collector Cutoff Current (V <sub>CE</sub> = 140 Vdc, I <sub>B</sub> = 0)	I <sub>CEO</sub>	-	250	μAdc
Emitter Cutoff Current $(V_{EB} = 5 \text{ Vdc}, I_C = 0)$	I <sub>EBO</sub>	-	100	μAdc
SECOND BREAKDOWN	<u> </u>	•	•	•
Second Breakdown Collector Current 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 <sub>S/b</sub>	5.0 1.0	_ _	Adc
ON CHARACTERISTICS	<u> </u>	1		
DC Current Gain (I <sub>C</sub> = 5 Adc, V <sub>CE</sub> = 2 Vdc)	h <sub>FE</sub>	25	150	-
Collector Emitter Saturation Voltage ( $I_C = 5 \text{ Adc}$ , $I_B = 0.5 \text{ Adc}$ )	V <sub>CE(sat)</sub>	-	1.0	Vdc
Base Emitter On Voltage ( $I_C = 5 \text{ Adc}$ , $V_{CE} = 2 \text{ Vdc}$ )	V <sub>BE(on)</sub>	-	2.0	Vdc
DYNAMIC CHARACTERISTICS	<u> </u>	•	•	•
Current Gain — Bandwidth Product (I <sub>C</sub> = 0.5 Adc, V <sub>CE</sub> = 10 Vdc, f <sub>test</sub> = 0.5 MHz)	f <sub>T</sub>	2.0	-	MHz
Output Capacitance (V <sub>CB</sub> = 10 Vdc, I <sub>E</sub> = 0, f <sub>test</sub> = 1 MHz)	c <sub>ob</sub>	-	1000	pF

<sup>1.</sup> Pulse Test: Pulse Width = 300  $\mu$ s, Duty Cycle  $\leq$  2%.

#### TYPICAL CHARACTERISTICS MJ15003G (NPN)

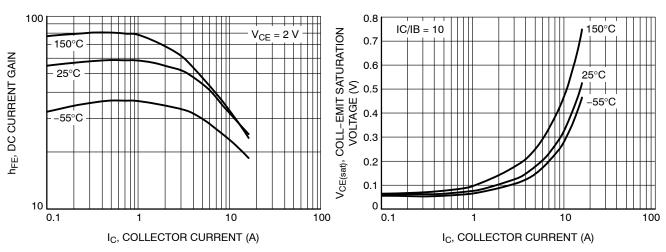


Figure 1. DC Current Gain

Figure 2. Collector-Emitter Saturation Voltage

#### MJ15003 (NPN), MJ15004 (PNP)

#### TYPICAL CHARACTERISTICS MJ15003G (NPN)

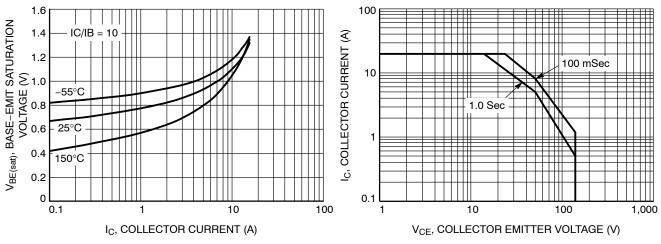


Figure 3. Base-Emitter Saturation Voltage

Figure 4. Safe Operating Area

#### TYPICAL CHARACTERISTICS MJ15004G (PNP)

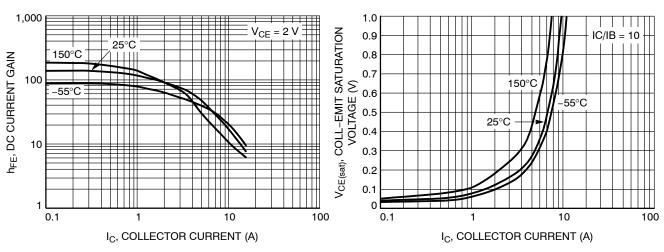


Figure 5. DC Current Gain

Figure 6. Collector-Emitter Saturation Voltage

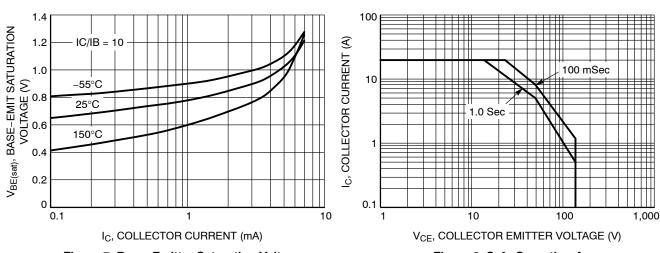


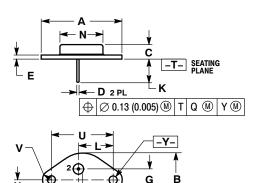
Figure 7. Base-Emitter Saturation Voltage

Figure 8. Safe Operating Area

#### MJ15003 (NPN), MJ15004 (PNP)

#### PACKAGE DIMENSIONS

TO-204 (TO-3) **CASE 1-07 ISSUE Z** 



⊕ Ø 0.13 (0.005) M T Y M

Œ

Q-

#### NOTES

- 1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
- CONTROLLING DIMENSION: INCH.
   ALL RULES AND NOTES ASSOCIATED WITH REFERENCED TO-204AA OUTLINE SHALL APPLY.

	INCHES		MILLIMETERS		
DIM	MIN	MAX	MIN	MAX	
Α	1.550 REF		39.37	REF	
В		1.050		26.67	
C	0.250	0.335	6.35	8.51	
D	0.038	0.043	0.97	1.09	
E	0.055	0.070	1.40	1.77	
G	0.430 BSC		10.92 BSC		
Н	0.215 BSC		5.46 BSC		
K	0.440	0.480	11.18	12.19	
L	0.665 BSC		16.89 BSC		
N		0.830		21.08	
Q	0.151	0.165	3.84	4.19	
U	1.187	BSC	30.15 BSC		
٧	0.131	0.188	3.33	4.77	

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

ON Semiconductor and un are registered trademarks of Semiconductor Components Industries, LLC (SCILLC). SCILLC owns the rights to a number of patents, trademarks, ON semiconductor and war 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. 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 implications the polar or other applications intended to surgical implications which the failure of the SCILLC expects existing where 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

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

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

For additional information, please contact your local Sales Representative