

# MJ11015 (PNP); MJ11012, MJ11016 (NPN)

MJ11016 is a Preferred Device

## High-Current Complementary Silicon Transistors

... for use as output devices in complementary general purpose amplifier applications.

- High DC Current Gain –  
 $h_{FE} = 1000$  (Min) @  $I_C = 20$  Adc
- Monolithic Construction with Built-in Base Emitter Shunt Resistor
- Junction Temperature to  $+200^\circ\text{C}$

### MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector-Emitter Voltage MJ11012 MJ11015/6	$V_{CEO}$	60 120	Vdc
Collector-Base Voltage MJ11012 MJ11015/6	$V_{CB}$	60 120	Vdc
Emitter-Base Voltage	$V_{EB}$	5	Vdc
Collector Current	$I_C$	30	Adc
Base Current	$I_B$	1	Adc
Total Device Dissipation @ $T_C = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$ @ $T_C = 100^\circ\text{C}$	$P_D$	200 1.15	W W/ $^\circ\text{C}$
Operating Storage Junction Temperature Range	$T_J, T_{stg}$	-55 to +200	$^\circ\text{C}$

### THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	0.87	$^\circ\text{C}/\text{W}$
Maximum Lead Temperature for Soldering Purposes for $\leq 10$ Seconds	$T_L$	275	$^\circ\text{C}$

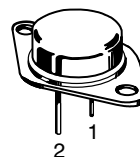
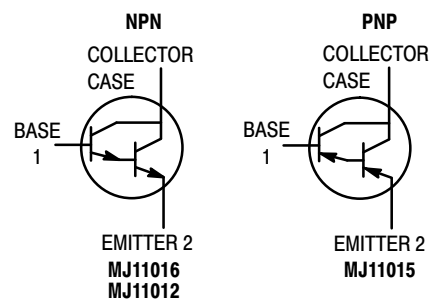
Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.



ON Semiconductor®

<http://onsemi.com>

## 30 AMPERE DARLINGTON POWER TRANSISTORS COMPLEMENTARY SILICON 60 – 120 VOLTS, 200 WATTS



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

### MARKING DIAGRAM



MJ1101x = Device Code  
x = 2, 5 or 6  
G = Pb-Free Package  
A = Location Code  
YY = Year  
WW = Work Week  
MEX = Country of Origin

### ORDERING INFORMATION

Device	Package	Shipping
MJ11012	TO-3	100 Units/Tray
MJ11012G	TO-3 (Pb-Free)	100 Units/Tray
MJ11015	TO-3	100 Units/Tray
MJ11015G	TO-3 (Pb-Free)	100 Units/Tray
MJ11016	TO-3	100 Units/Tray
MJ11016G	TO-3 (Pb-Free)	100 Units/Tray

Preferred devices are recommended choices for future use and best overall value.

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**Figure 1. Darlington Circuit Schematic**

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

Characteristics	Symbol	Min	Max	Unit
<b>OFF CHARACTERISTICS</b>				
Collector–Emitter Breakdown Voltage(1) ( $I_C = 100\text{ mAdc}$ , $I_B = 0$ )	$V_{(BR)CEO}$	60 120	– –	Vdc
Collector–Emitter Leakage Current ( $V_{CE} = 60\text{ Vdc}$ , $R_{BE} = 1\text{ k ohm}$ ) ( $V_{CE} = 120\text{ Vdc}$ , $R_{BE} = 1\text{ k ohm}$ ) ( $V_{CE} = 60\text{ Vdc}$ , $R_{BE} = 1\text{ k ohm}$ , $T_C = 150^\circ\text{C}$ ) ( $V_{CE} = 120\text{ Vdc}$ , $R_{BE} = 1\text{ k ohm}$ , $T_C = 150^\circ\text{C}$ )	$I_{CER}$	– – – –	1 1 5 5	mAdc
Emitter Cutoff Current ( $V_{BE} = 5\text{ Vdc}$ , $I_C = 0$ )	$I_{EBO}$	–	5	mAdc
Collector–Emitter Leakage Current ( $V_{CE} = 50\text{ Vdc}$ , $I_B = 0$ )	$I_{CEO}$	–	1	mAdc
<b>ON CHARACTERISTICS(1)</b>				
DC Current Gain ( $I_C = 20\text{ Adc}$ , $V_{CE} = 5\text{ Vdc}$ ) ( $I_C = 30\text{ Adc}$ , $V_{CE} = 5\text{ Vdc}$ )	$h_{FE}$	1000 200	– –	–
Collector–Emitter Saturation Voltage ( $I_C = 20\text{ Adc}$ , $I_B = 200\text{ mAdc}$ ) ( $I_C = 30\text{ Adc}$ , $I_B = 300\text{ mAdc}$ )	$V_{CE(sat)}$	– –	3 4	Vdc
Base–Emitter Saturation Voltage ( $I_C = 20\text{ A}$ , $I_B = 200\text{ mAdc}$ ) ( $I_C = 30\text{ A}$ , $I_B = 300\text{ mAdc}$ )	$V_{BE(sat)}$	– –	3.5 5	Vdc
<b>DYNAMIC CHARACTERISTICS</b>				
Current–Gain Bandwidth Product ( $I_C = 10\text{ A}$ , $V_{CE} = 3\text{ Vdc}$ , $f = 1\text{ MHz}$ )	$h_{fe}$	4	–	MHz

(1) Pulse Test: Pulse Width = 300  $\mu\text{s}$ , Duty Cycle  $\leq 2.0\%$ .

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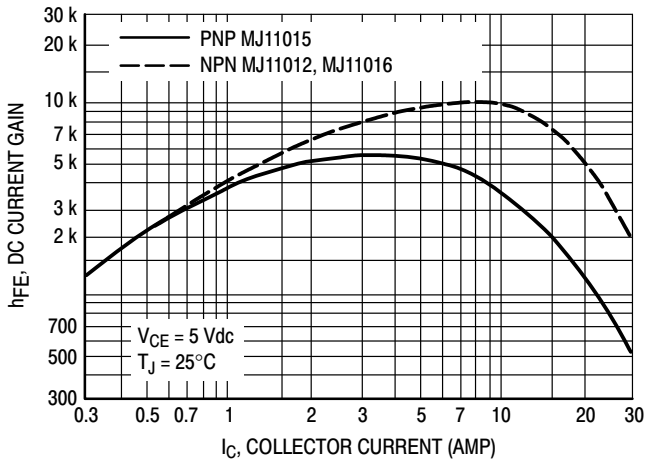


Figure 2. DC Current Gain (1)

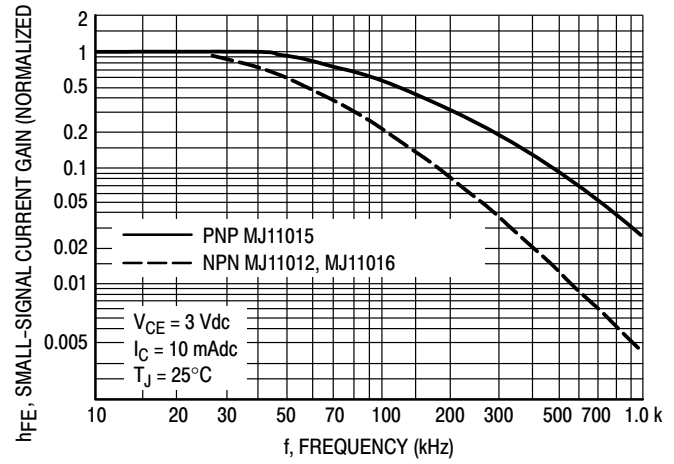


Figure 3. Small-Signal Current Gain

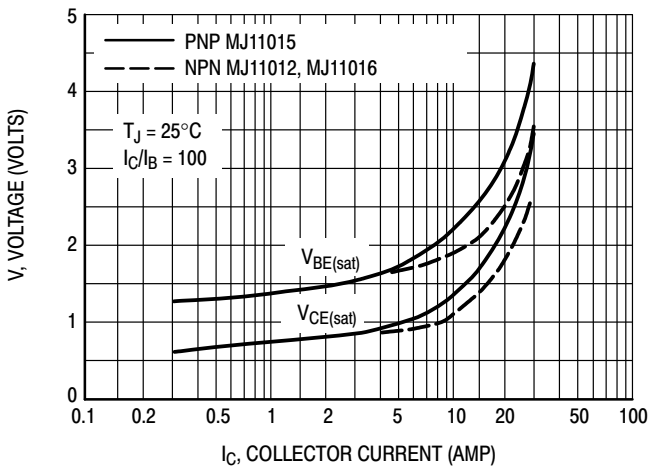


Figure 4. "On" Voltages (1)

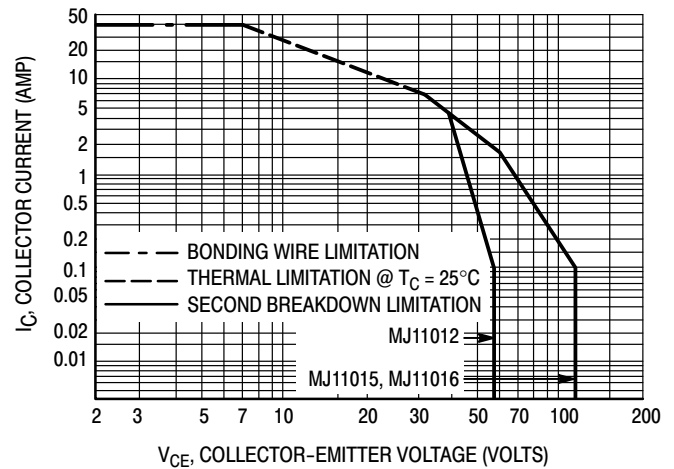


Figure 5. Active Region DC Safe Operating Area

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 operations e.g., the transistor must not be subjected to greater dissipation than the curves indicate.

At high case temperatures, thermal limitations will reduce the power that can be handled to values less than the limitations imposed by secondary breakdown.

# MECHANICAL CASE OUTLINE PACKAGE DIMENSIONS

ON Semiconductor



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

DATE 05/18/1988



SCALE 1:1



NOTES:

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

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	1.550 REF	---	39.37 REF	---
B	---	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	---
H	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	---
V	0.131	0.188	3.33	4.77

- |  |  |   |   |   |
|--|--|---|---|---|
| <p>STYLE 1:<br/>PIN 1. BASE<br/>2. EMITTER<br/>CASE: COLLECTOR</p> | <p>STYLE 2:<br/>PIN 1. BASE<br/>2. COLLECTOR<br/>CASE: EMITTER</p> | <p>STYLE 3:<br/>PIN 1. GATE<br/>2. SOURCE<br/>CASE: DRAIN</p>           | <p>STYLE 4:<br/>PIN 1. GROUND<br/>2. INPUT<br/>CASE: OUTPUT</p>       | <p>STYLE 5:<br/>PIN 1. CATHODE<br/>2. EXTERNAL TRIP/DELAY<br/>CASE: ANODE</p> |
| <p>STYLE 6:<br/>PIN 1. GATE<br/>2. EMITTER<br/>CASE: COLLECTOR</p> | <p>STYLE 7:<br/>PIN 1. ANODE<br/>2. OPEN<br/>CASE: CATHODE</p>     | <p>STYLE 8:<br/>PIN 1. CATHODE #1<br/>2. CATHODE #2<br/>CASE: ANODE</p> | <p>STYLE 9:<br/>PIN 1. ANODE #1<br/>2. ANODE #2<br/>CASE: CATHODE</p> |   |

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