

# High-Current Complementary Silicon Transistors

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

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

## MAXIMUM RATINGS

Rating	Symbol	MJ11012	MJ11015 MJ11016	Unit
Collector-Emitter Voltage	$V_{CEO}$	60	120	Vdc
Collector-Base Voltage	$V_{CB}$	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	Watts W/°C
Operating Storage Junction Temperature Range	$T_J, T_{stg}$	-55 to +200		°C

## THERMAL CHARACTERISTICS

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

**PNP  
MJ11015  
NPN  
MJ11012  
MJ11016\***

\*ON Semiconductor Preferred Device

**30 AMPERE  
DARLINGTON  
POWER TRANSISTORS  
COMPLEMENTARY  
SILICON  
60-120 VOLTS  
200 WATTS**

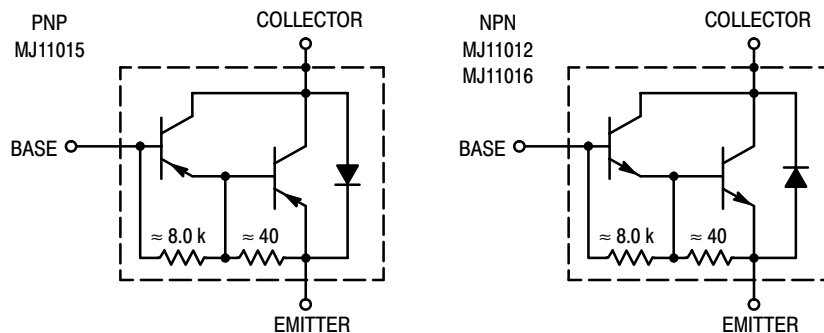
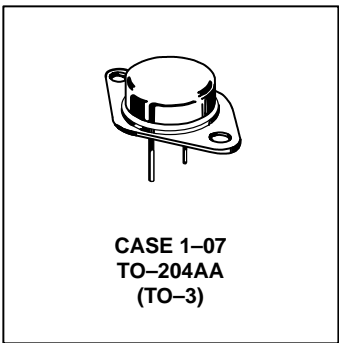


Figure 1. Darlington Circuit Schematic

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

# MJ11015 MJ11012 MJ11016

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

Characteristics	Symbol	Min	Max	Unit
<b>OFF CHARACTERISTICS</b>				
Collector–Emitter Breakdown Voltage(1) (I <sub>C</sub> = 100 mA, I <sub>B</sub> = 0)	V <sub>(BR)CEO</sub>	60 120	— —	Vdc
	MJ11012 MJ11015, MJ11016			
Collector–Emitter Leakage Current (V <sub>CE</sub> = 60 Vdc, R <sub>BE</sub> = 1k ohm)	I <sub>CER</sub>	—	1	mA
(V <sub>CE</sub> = 120 Vdc, R <sub>BE</sub> = 1k ohm)	MJ11015, MJ11016	—	1	
(V <sub>CE</sub> = 60 Vdc, R <sub>BE</sub> = 1k ohm, T <sub>C</sub> = 150°C)	MJ11012	—	5	
(V <sub>CE</sub> = 120 Vdc, R <sub>BE</sub> = 1k ohm, T <sub>C</sub> = 150°C)	MJ11015, MJ11016	—	5	
Emitter Cutoff Current (V <sub>BE</sub> = 5 Vdc, I <sub>C</sub> = 0)	I <sub>EBO</sub>	—	5	mA
Collector–Emitter Leakage Current (V <sub>CE</sub> = 50 Vdc, I <sub>B</sub> = 0)	I <sub>CEO</sub>	—	1	mA
<b>ON CHARACTERISTICS(1)</b>				
DC Current Gain (I <sub>C</sub> = 20 A, V <sub>CE</sub> = 5 Vdc)	h <sub>FE</sub>	1000	—	—
(I <sub>C</sub> = 30 A, V <sub>CE</sub> = 5 Vdc)		200	—	
Collector–Emitter Saturation Voltage (I <sub>C</sub> = 20 A, I <sub>B</sub> = 200 mA)	V <sub>CE(sat)</sub>	—	3	Vdc
(I <sub>C</sub> = 30 A, I <sub>B</sub> = 300 mA)		—	4	
Base–Emitter Saturation Voltage (I <sub>C</sub> = 20 A, I <sub>B</sub> = 200 mA)	V <sub>BE(sat)</sub>	—	3.5	Vdc
(I <sub>C</sub> = 30 A, I <sub>B</sub> = 300 mA)		—	5	
<b>DYNAMIC CHARACTERISTICS</b>				
Current–Gain Bandwidth Product (I <sub>C</sub> = 10 A, V <sub>CE</sub> = 3 Vdc, f = 1 MHz)	h <sub>fe</sub>	4	—	MHz

(1) Pulse Test: Pulse Width = 300 μs, Duty Cycle ≤ 2.0%.

# MJ11015 MJ11012 MJ11016

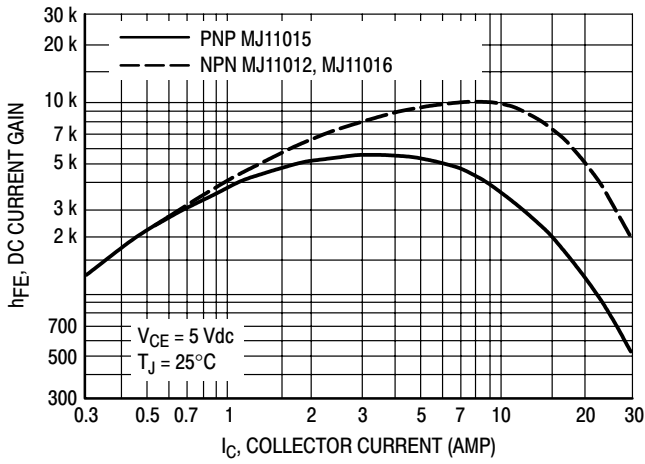


Figure 2. DC Current Gain (1)

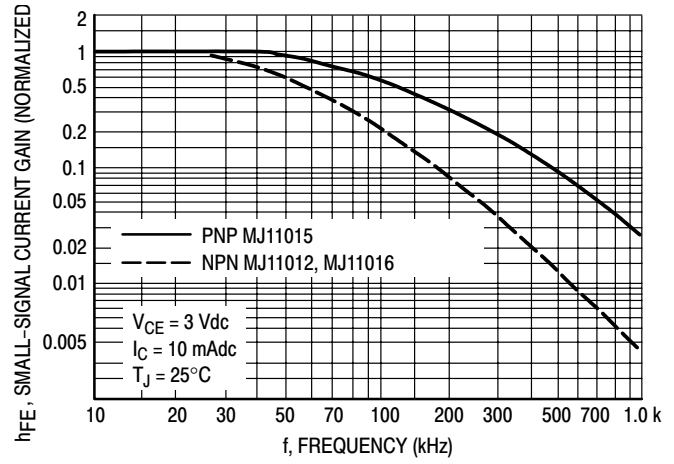


Figure 3. Small-Signal Current Gain

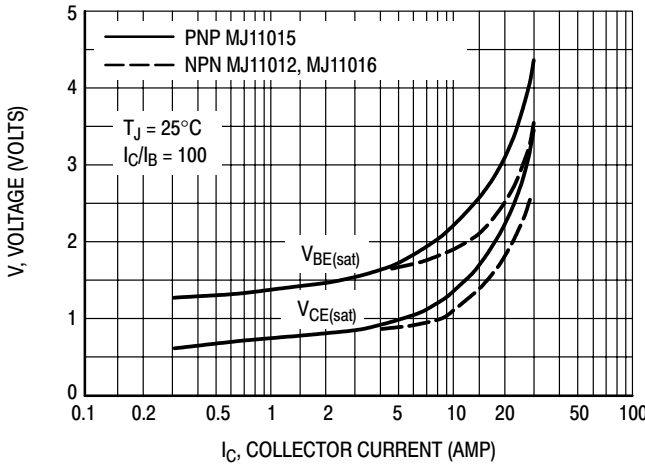


Figure 4. "On" Voltages (1)

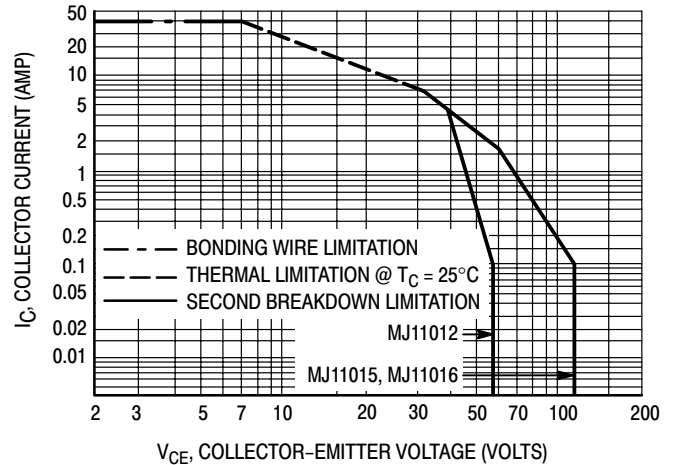


Figure 5. Active Region DC Safe Operating Area

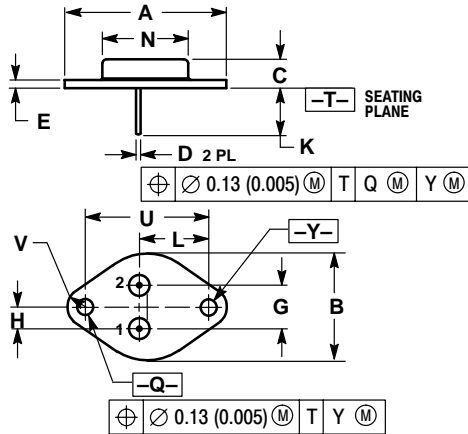
There are two limitations on the power handling ability of a transistor average junction temperature and secondary breakdown. Safe operating area curves indicate  $I_C - V_{CE}$  limits of the transistor that must be observed for reliable operations e.g., the transistor must not be subjected to greater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

# MJ11015 MJ11012 MJ11016

## PACKAGE DIMENSIONS

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



- 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

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

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