High-Current Complementary Silicon Power Transistors

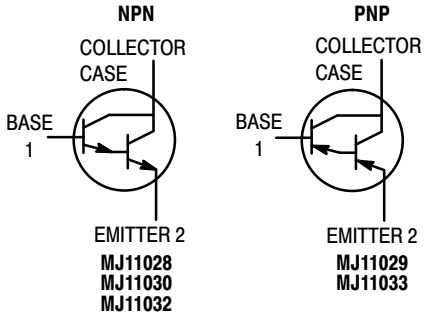
MJ11028, MJ11030, MJ11032 (NPN) MJ11029, MJ11033 (PNP)

50 AMPERE COMPLEMENTARY DARLINGTON POWER TRANSISTORS 60-120 VOLTS 300 WATTS

High-Current Complementary Silicon Power Transistors are for use as output devices in complementary general purpose amplifier applications.

Features

- High DC Current Gain-h_{FE} = 1000 (Min) @ I_C = 25 Adc
  h_{FE} = 400 (Min) @ I_C = 50 Adc
- Curves to 100 A (Pulsed)
- Diode Protection to Rated I_C
- Monolithic Construction with Built-In Base-Emitter Shunt Resistor
- Junction Temperature to +200 °C
- Pb-Free Packages are Available*



MAXIMUM RATINGS (T_J = 25 °C unless otherwise noted)

Rating	Symbol	Value	Unit
Collector–Emitter Voltage MJ11028/29 MJ11030 MJ11032/33	V_{CEO}	60 90 120	Vdc
Collector–Base Voltage MJ11028/29 MJ11030 MJ11032/33	V_{CBO}	60 90 120	Vdc
Emitter–Base Voltage	V_{EBO}	5.0	Vdc
Collector Current -Continuous -Peak (Note 1)	I_C	50 100	Adc
Base Current – Continuous	I_B	2.0	Adc
Total Power Dissipation @ T_C = 25 °C Derate Above 25 °C @ T_C = 100 °C	P_D	300 1.71	W W/°C
Operating and Storage Junction Temperature Range	T_J, T_{stg}	−55 to +200	°C

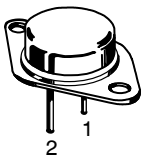
THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Maximum Lead Temperature for Soldering Purposes for ≤ 10 seconds	T_L	275	°C
Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	0.58	°C/W

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

1. Pulse Test: Pulse Width = 5 μs, Duty Cycle ≤ 10%.

* For additional information on our Pb-Free strategy and soldering details, please download the **onsemi** Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.



TO-204 (TO-3)
CASE 197A
STYLE 1

MARKING DIAGRAM

MJ110xx = Device Code
xx = 28, 29, 30, 32, 33
G = Pb-Free Package
A = Location Code
YY = Year
WW = Work Week
MEX = Country of Orgin

ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 3 of this data sheet.

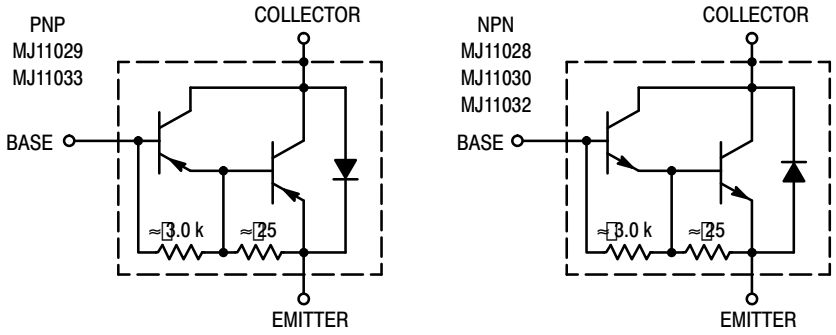


Figure 1. Darlington Circuit Schematic

ELECTRICAL CHARACTERISTICS (T_C = 25 °C unless otherwise noted)

Characteristic		Symbol	Min	Max	Unit
OFF CHARACTERISTICS					
Collector−Emitter Breakdown Voltage (Note 1) (I_C = 1 00 mAdc, I_B = 0) MJ11032, MJ11033	MJ11028, MJ11029 MJ11030	$V_{(BR)CEO}$	60 90 120	− − −	Vdc
Collector−Emitter Leakage Current (V_{CE} = 60 Vdc, R_{BE} = 1 kΩ) (V_{CE} = 90 Vdc, R_{BE} = 1 kΩ) (V_{CE} = 120 Vdc, R_{BE} = 1 kΩ) (V_{CE} = 60 Vdc, R_{BE} = 1 kΩ, T_C = 150°C) (V_{CE} = 120 Vdc, R_{BE} = 1 kΩ, T_C = 150°C)	 MJ11028, MJ11029 MJ11030 MJ11032, MJ11033 MJ11028, MJ11029 MJ11032, MJ11033	I_{CER}	 − − − − −	 2 2 2 10 10	mAdc
Emitter Cutoff Current (V_{BE} = 5 Vdc, I_C = 0)		I_{EBO}	 −	 5	mAdc
Collector−Emitter Leakage Current (V_{CE} = 50 Vdc, I_B = 0)		I_{CEO}	 −	 2	mAdc
ON CHARACTERISTICS (Note 1)					
DC Current Gain (I_C = 25 Adc, V_{CE} = 5 Vdc) (I_C = 50 Adc, V_{CE} = 5 Vdc)		h_{FE}	 1 k 400	 18 k −	−
Collector−Emitter Saturation Voltage (I_C = 25 Adc, I_B = 250 mAdc) (I_C = 50 Adc, I_B = 500 mAdc)		$V_{CE(sat)}$	 − −	 2.5 3.5	Vdc
Base−Emitter Saturation Voltage (I_C = 25 Adc, I_B = 200 mAdc) (I_C = 50 Adc, I_B = 300 mAdc)		$V_{BE(sat)}$	 − −	 3.0 4.5	Vdc

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

ORDERING INFORMATION

Device	Package	Shipping†
MJ11028G	TO-204 (Pb-Free)	100 Units / Tray
MJ11032G	TO-204 (Pb-Free)	100 Units / Tray
MJ11033G	TO-204 (Pb-Free)	100 Units / Tray

DISCONTINUED (Note 2)

Device	Package	Shipping†
MJ11028	TO-204	100 Units / Tray
MJ11029	TO-204	100 Units / Tray
MJ11029G	TO-204 (Pb-Free)	100 Units / Tray
MJ11030	TO-204	100 Units / Tray
MJ11030G	TO-204 (Pb-Free)	100 Units / Tray
MJ11032	TO-204 (Pb-Free)	100 Units / Tray
MJ11033	TO-204	100 Units / Tray

† For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D

* NLV Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q100 Qualified and PPAP Capable.

2. **DISCONTINUED:** This device is not available. Please contact your **onsemi** representative for information. The most current information on this device may be available on www.onsemi.com.

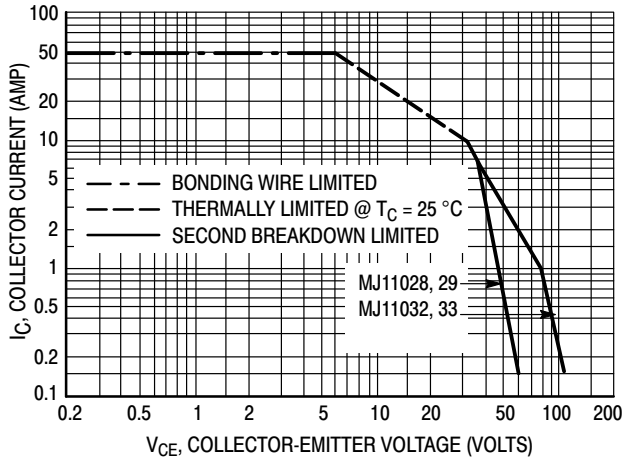


Figure 2. DC Safe Operating Area

There are two limitations on the power-handling ability of a transistor: average junction temperature and second 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 2 is based on $T_{J(pk)}$ = 200 °C; T_C is variable depending on conditions. At high case temperatures, thermal limitations will reduce the power that can be handled to values less than the limitations imposed by second breakdown.

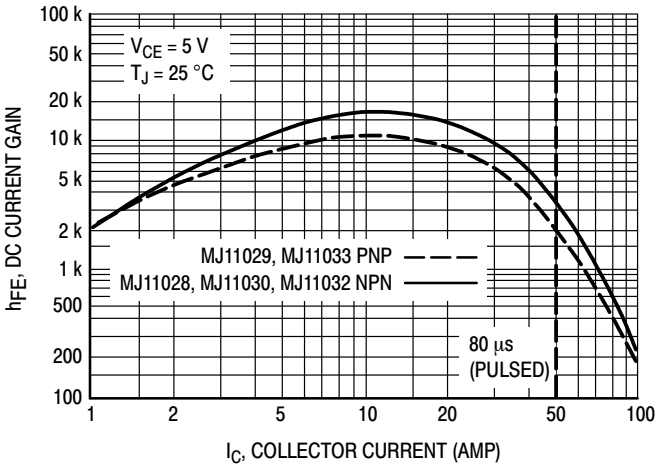


Figure 3. DC Current Gain

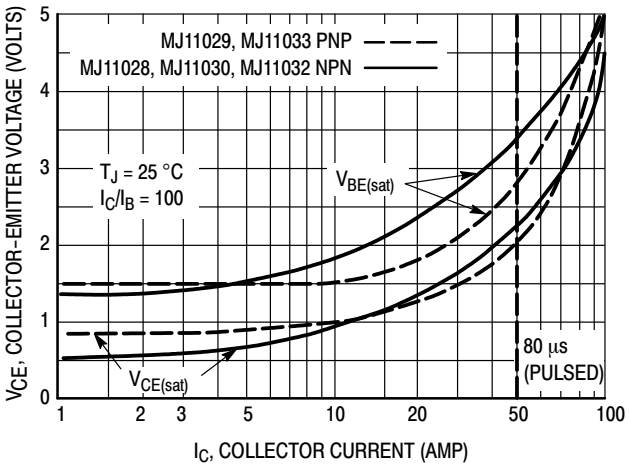
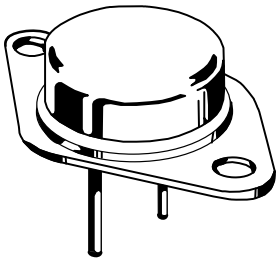


Figure 4. “On” Voltage

REVISION HISTORY

Revision	Description of Changes	Date
7	MJ11028, MJ11029, MJ11029G, MJ11030, MJ11030G, MJ11032, MJ11033, OPN Marked as Discontinued + Rebranded the Data Sheet to **onsemi** format	10/7/2025

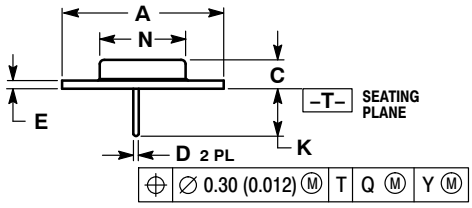
This document has undergone updates prior to the inclusion of this revision history table. The changes tracked here only reflect updates made on the noted approval dates.

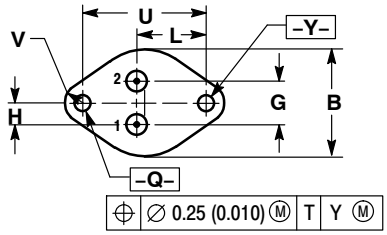


SCALE 1:1

TO−204 (TO−3)
CASE 197A−05
ISSUE K

DATE 21 FEB 2000





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

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	1.530 REF		38.86 REF	
B	0.990	1.050	25.15	26.67
C	0.250	0.335	6.35	8.51
D	0.057	0.063	1.45	1.60
E	0.060	0.070	1.53	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	0.760	0.830	19.31	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

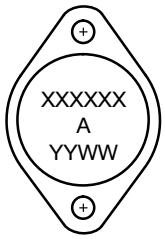
STYLE 1:
PIN 1. BASE
2. EMITTER
CASE: COLLECTOR

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

STYLE 3:
PIN 1. GATE
2. SOURCE
CASE: DRAIN

STYLE 4:
PIN 1. ANODE = 1
2. ANODE = 2
CASE: CATHODES

GENERIC MARKING DIAGRAM*



XXXXX = Specific Device Code
A = Assembly Locationa
YY = Year
WW = Work Week

*This information is generic. Please refer to device data sheet for actual part marking. Pb−Free indicator, “G” or microdot “▪”, may or may not be present. Some products may not follow the Generic Marking.

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DESCRIPTION:	**TO−204 (TO−3)**	**PAGE 1 OF 1**

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