

# MJH11017, MJH11019, MJH11021 (PNP) MJH11018, MJH11020, MJH11022 (NPN)

Preferred Device

## Complementary Darlington Silicon Power Transistors

These devices are designed for use as general purpose amplifiers, low frequency switching and motor control applications.

### Features

- High DC Current Gain @ 10 Adc —  $h_{FE} = 400$  Min (All Types)
- Collector–Emitter Sustaining Voltage
  - $V_{CE(sus)} = 150$  Vdc (Min) — MJH11018, 17
  - $= 200$  Vdc (Min) — MJH11020, 19
  - $= 250$  Vdc (Min) — MJH11022, 21
- Low Collector–Emitter Saturation Voltage
  - $V_{CE(sat)} = 1.2$  V (Typ) @  $I_C = 5.0$  A
  - $= 1.8$  V (Typ) @  $I_C = 10$  A
- Monolithic Construction
- Pb–Free Packages are Available\*

### MAXIMUM RATINGS

Rating	Symbol	Max	Unit
Collector–Emitter Voltage MJH11018, MJH11017 MJH11020, MJH11019 MJH11022, MJH11021	$V_{CEO}$	150 200 250	Vdc
Collector–Base Voltage MJH11018, MJH11017 MJH11020, MJH11019 MJH11022, MJH11021	$V_{CB}$	150 200 250	Vdc
Emitter–Base Voltage	$V_{EB}$	5.0	Vdc
Collector Current – Continuous – Peak (Note 1)	$I_C$	15 30	Adc
Base Current	$I_B$	0.5	Adc
Total Device Dissipation @ $T_C = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	150 1.2	W W/ $^\circ\text{C}$
Operating and Storage Junction Temperature Range	$T_J, T_{stg}$	–65 to +150	$^\circ\text{C}$

### THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction–to–Case	$R_{\theta JC}$	0.83	$^\circ\text{C}/\text{W}$

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.

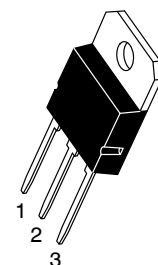
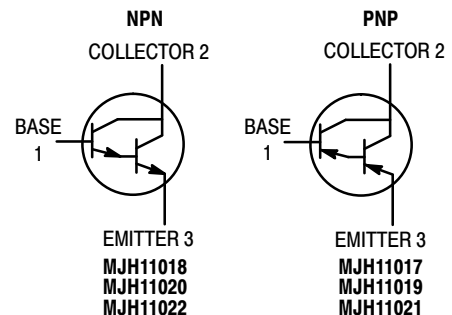
1. Pulse Test: Pulse Width = 5.0 ms, Duty Cycle  $\leq 10\%$ .

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



ON Semiconductor®

## 15 AMPERE DARLINGTON COMPLEMENTARY SILICON POWER TRANSISTORS 150–250 VOLTS, 150 WATTS



SOT-93  
(TO-218)  
CASE 340D  
STYLE 1

### MARKING DIAGRAM



A = Assembly Location  
Y = Year  
WW = Work Week  
G = Pb–Free Package  
MJH110xx = Device Code  
xx = 17, 19, 21, 18, 20, 22

### ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 6 of this data sheet.

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

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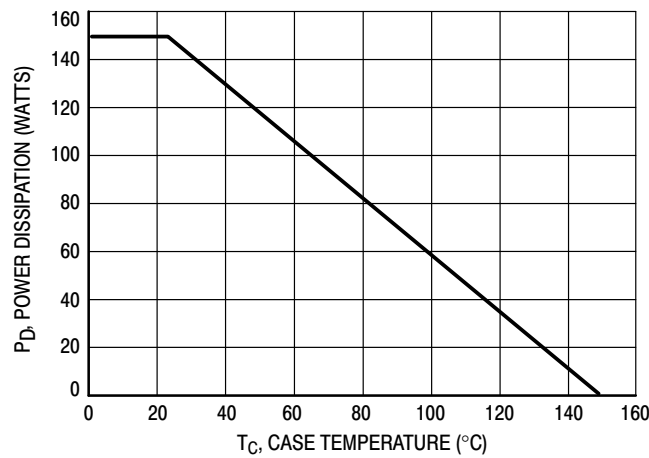


Figure 1. Power Derating

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

Characteristic	Symbol	Min	Max	Unit
<b>OFF CHARACTERISTICS</b>				
Collector-Emitter Sustaining Voltage (Note 2) (I <sub>C</sub> = 0.1 Adc, I <sub>B</sub> = 0)	V <sub>CEO(sus)</sub>	150 200 250	- - -	Vdc
Collector Cutoff Current (V <sub>CE</sub> = 75 Vdc, I <sub>B</sub> = 0) (V <sub>CE</sub> = 100 Vdc, I <sub>B</sub> = 0) (V <sub>CE</sub> = 125 Vdc, I <sub>B</sub> = 0)	I <sub>CEO</sub>	- - -	1.0 1.0 1.0	mAdc
Collector Cutoff Current (V <sub>CE</sub> = Rated V <sub>CB</sub> , V <sub>BE(off)</sub> = 1.5 Vdc) (V <sub>CE</sub> = Rated V <sub>CB</sub> , V <sub>BE(off)</sub> = 1.5 Vdc, T <sub>J</sub> = 150°C)	I <sub>CEV</sub>	- -	0.5 5.0	mAdc
Emitter Cutoff Current (V <sub>BE</sub> = 5.0 Vdc I <sub>C</sub> = 0)	I <sub>EBO</sub>	-	2.0	mAdc

## ON CHARACTERISTICS (Note 2)

DC Current Gain (I <sub>C</sub> = 10 Adc, V <sub>CE</sub> = 5.0 Vdc) (I <sub>C</sub> = 15 Adc, V <sub>CE</sub> = 5.0 Vdc)	h <sub>FE</sub>	400 100	15,000 -	-
Collector-Emitter Saturation Voltage (I <sub>C</sub> = 10 Adc, I <sub>B</sub> = 100 mA) (I <sub>C</sub> = 15 Adc, I <sub>B</sub> = 150 mA)	V <sub>CE(sat)</sub>	- -	2.5 4.0	Vdc
Base-Emitter On Voltage (I <sub>C</sub> = 10 A, V <sub>CE</sub> = 5.0 Vdc)	V <sub>BE(on)</sub>	-	2.8	Vdc
Base-Emitter Saturation Voltage (I <sub>C</sub> = 15 Adc, I <sub>B</sub> = 150 mA)	V <sub>BE(sat)</sub>	-	3.8	Vdc

## DYNAMIC CHARACTERISTICS

Current-Gain Bandwidth Product (I <sub>C</sub> = 10 Adc, V <sub>CE</sub> = 3.0 Vdc, f = 1.0 MHz)	f <sub>T</sub>	3.0	-	-
Output Capacitance (V <sub>CB</sub> = 10 Vdc, I <sub>E</sub> = 0, f = 0.1 MHz)	C <sub>ob</sub>	- -	400 600	pF
Small-Signal Current Gain (I <sub>C</sub> = 10 Adc, V <sub>CE</sub> = 3.0 Vdc, f = 1.0 kHz)	h <sub>fe</sub>	75	-	-

## SWITCHING CHARACTERISTICS

Characteristic	Symbol	Typical		Unit
		NPN	PNP	
Delay Time	t <sub>d</sub>	150	75	ns
Rise Time	t <sub>r</sub>	1.2	0.5	μs
Storage Time	t <sub>s</sub>	4.4	2.7	μs
Fall Time	t <sub>f</sub>	2.5	2.5	μs

(V<sub>CC</sub> = 100 V, I<sub>C</sub> = 10 A, I<sub>B</sub> = 100 mA  
V<sub>BE(off)</sub> = 5.0 V) (See Figure 2)

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

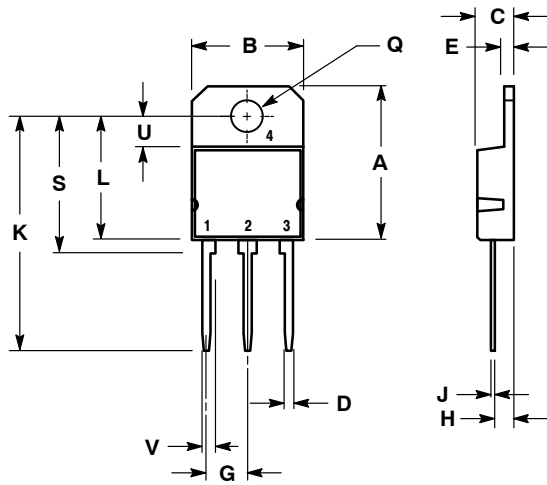
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## ORDERING INFORMATION

Device Order Number	Package Type	Shipping
MJH11017	SOT-93	30 Units / Rail
MJH11017G	SOT-93 (Pb-Free)	30 Units / Rail
MJH11018	SOT-93	30 Units / Rail
MJH11018G	SOT-93 (Pb-Free)	30 Units / Rail
MJH11019	SOT-93	30 Units / Rail
MJH11019G	SOT-93 (Pb-Free)	30 Units / Rail
MJH11020	SOT-93	30 Units / Rail
MJH11020G	SOT-93 (Pb-Free)	30 Units / Rail
MJH11021	SOT-93	30 Units / Rail
MJH11021G	SOT-93 (Pb-Free)	30 Units / Rail
MJH11022	SOT-93	30 Units / Rail
MJH11022G	SOT-93 (Pb-Free)	30 Units / Rail

PACKAGE DIMENSIONS

SOT-93 (TO-218)  
CASE 340D-02  
ISSUE E



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

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	---	20.35	---	0.801
B	14.70	15.20	0.579	0.598
C	4.70	4.90	0.185	0.193
D	1.10	1.30	0.043	0.051
E	1.17	1.37	0.046	0.054
G	5.40	5.55	0.213	0.219
H	2.00	3.00	0.079	0.118
J	0.50	0.78	0.020	0.031
K	31.00 REF		1.220 REF	
L	---	16.20	---	0.638
Q	4.00	4.10	0.158	0.161
S	17.80	18.20	0.701	0.717
U	4.00 REF		0.157 REF	
V	1.75 REF		0.069	

STYLE 1:  
PIN 1. BASE  
2. COLLECTOR  
3. EMITTER  
4. COLLECTOR