Silicon Power Transistors

MJ15023 (PNP), MJ15025 (PNP)

The MJ15023 and MJ15025 are power transistors designed for high power audio, disk head positioners and other linear applications.

Features

- High Safe Operating Area
- High DC Current Gain
- Complementary to MJ15022 (NPN), MJ15024 (NPN)
- These Devices are Pb−Free and are RoHS Compliant*

MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector−Emitter Voltage MJ15023 MJ15025	V_{CEO}	 200 250	Vdc
Collector−Base Voltage MJ15023 MJ15025	V_{CBO}	 350 400	Vdc
Emitter−Base Voltage	V_{EBO}	5	Vdc
Collector−Emitter Voltage	V_{CEX}	400	Vdc
Collector Current − Continuous (Note 1)	I_C	16	Adc
Collector Current − Peak (Note 1)	I_{CM}	30	Adc
Base Current − Continuous	I_B	5	Adc
Total Device Dissipation @ T_C = 25°C Derate above 25°C	P_D	 250 1.43	 W W/°C
Operating and Storage Junction Temperature Range	T_J, T_{stg}	−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.

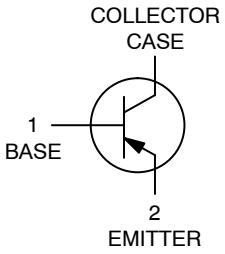
1. Pulse Test: Pulse Width = 5 ms, Duty Cycle ≤ 10%.

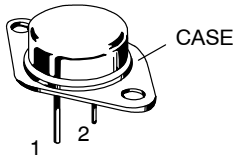
THERMAL CHARACTERISTICS

Characteristics	Symbol	Max	Unit
Thermal Resistance, Junction−to−Case	$R_{\theta JC}$	0.70	°C/W

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

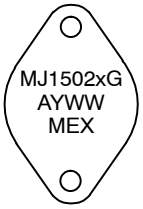
16 AMPERES SILICON POWER TRANSISTORS 200 − 250 VOLTS, 250 WATTS





TO−204 (TO−3)
CASE 1−07
STYLE 1

MARKING DIAGRAM



MJ1502x	=	Device Code x = 3 or 5
G	=	Pb−Free Package
A	=	Assembly Location
Y	=	Year
WW	=	Work Week
MEX	=	Country of Origin

ORDERING INFORMATION

Device	Package	Shipping
MJ15023G	TO−204 (Pb−Free)	100 Units / Tray
MJ15025G	TO−204 (Pb−Free)	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.

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

Characteristic	Symbol	Min	Max	Unit
OFF CHARACTERISTICS				
Collector–Emitter Sustaining Voltage (Note 2) (I_C = 100 mAdc, I_B = 0) MJ15023 MJ15025	$V_{CEO(sus)}$	 200 250	 – –	–
Collector Cutoff Current (V_{CE} = 200 Vdc, $V_{BE(off)}$ = 1.5 Vdc) MJ15023 (V_{CE} = 250 Vdc, $V_{BE(off)}$ = 1.5 Vdc) MJ15025	I_{CEX}	 – –	 250 250	μAdc
Collector Cutoff Current (V_{CE} = 150 Vdc, I_B = 0) MJ15023 (V_{CE} = 200 Vdc, I_B = 0) MJ15025	I_{CEO}	 – –	 500 500	μAdc
Emitter Cutoff Current (V_{CE} = 5 Vdc, I_B = 0) Both	I_{EBO}	 –	 500	μAdc
SECOND BREAKDOWN				
Second Breakdown Collector Current with Base Forward Biased (V_{CE} = 50 Vdc, t = 0.5 s (non–repetitive)) (V_{CE} = 80 Vdc, t = 0.5 s (non–repetitive))	$I_{S/b}$	 5 2	 – –	Adc
ON CHARACTERISTICS				
DC Current Gain (I_C = 8 Adc, V_{CE} = 4 Vdc) (I_C = 16 Adc, V_{CE} = 4 Vdc)	h_{FE}	 15 5	 60 –	–
Collector–Emitter Saturation Voltage (I_C = 8 Adc, I_B = 0.8 Adc) (I_C = 16 Adc, I_B = 3.2 Adc)	$V_{CE(sat)}$	 – –	 1.4 4.0	Vdc
Base–Emitter On Voltage (I_C = 8 Adc, V_{CE} = 4 Vdc)	$V_{BE(on)}$	 –	 2.2	Vdc
DYNAMIC CHARACTERISTICS				
Current–Gain – Bandwidth Product (I_C = 1 Adc, V_{CE} = 10 Vdc, f_{test} = 1 MHz)	f_T	 4	 –	MHz
Output Capacitance (V_{CB} = 10 Vdc, I_E = 0, f_{test} = 1 MHz)	C_{ob}	 –	 600	pF

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

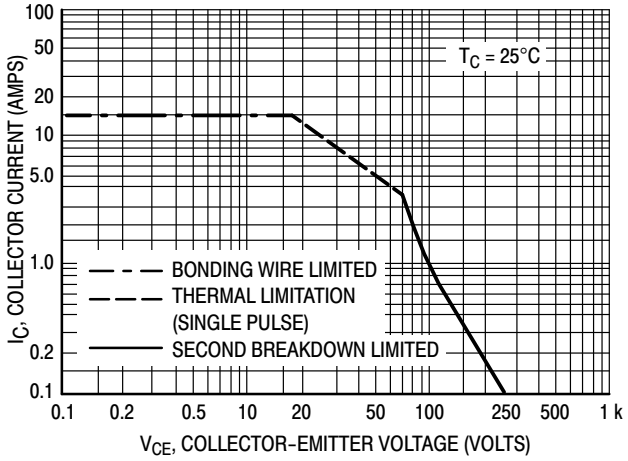


Figure 1. Active–Region Safe Operating Area

There are two limitations on the powerhandling 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 1 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.

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TYPICAL CHARACTERISTICS

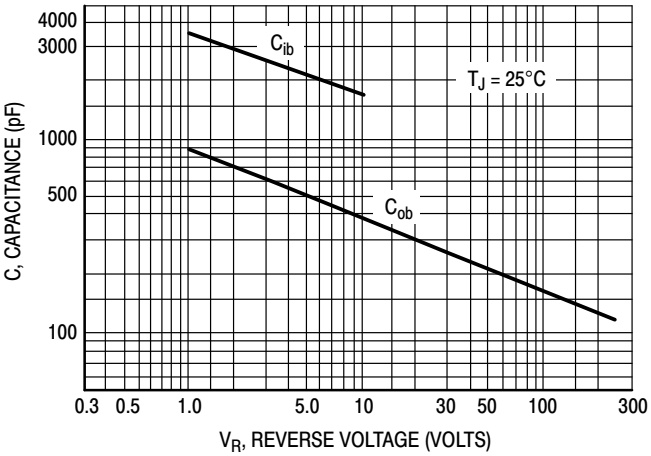


Figure 2. Capacitances

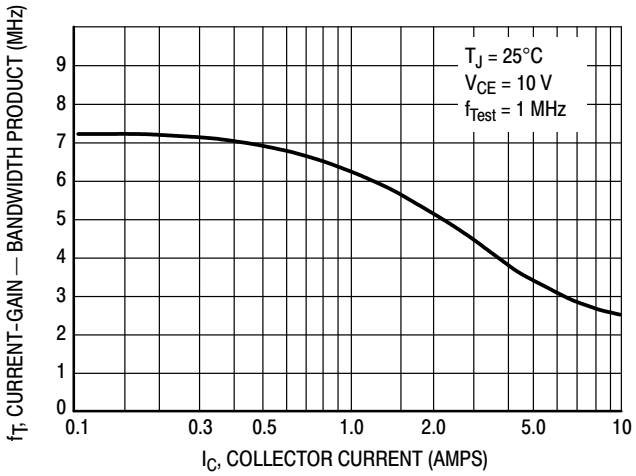


Figure 3. Current−Gain − Bandwidth Product

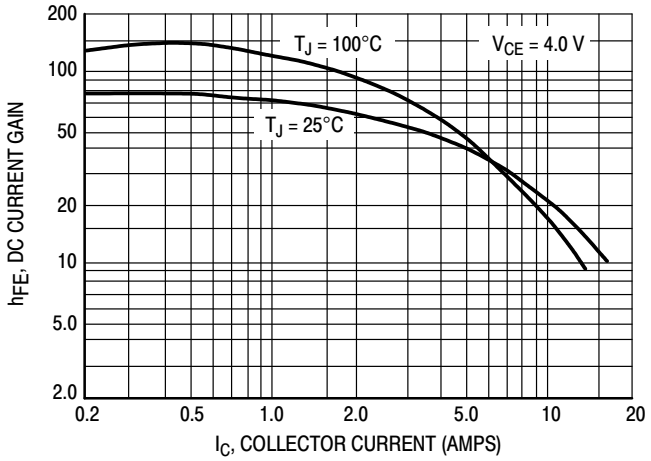


Figure 4. DC Current Gain

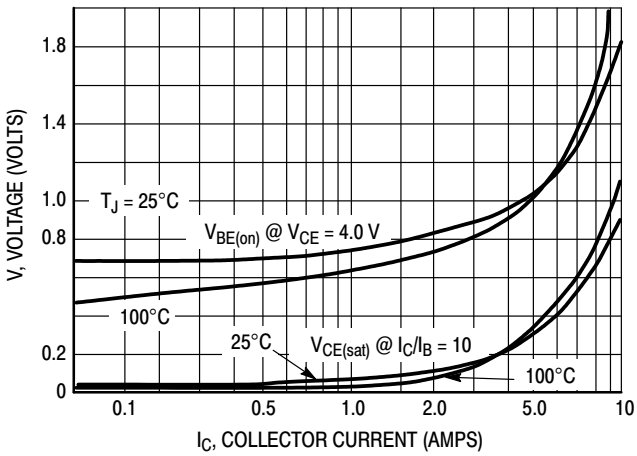
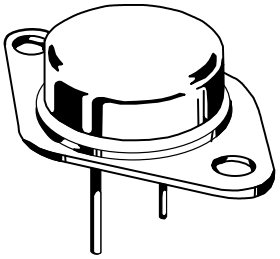


Figure 5. “On” Voltages

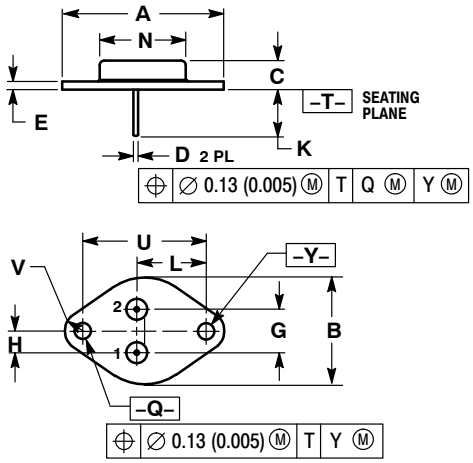
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SCALE 1:1

TO−204 (TO−3)
CASE 1−07
ISSUE Z

DATE 10 MAR 2000



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.

	INCHES		MILLIMETERS	
DIM	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

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

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

STYLE 4:
PIN 1. GROUND
2. INPUT
CASE: OUTPUT

STYLE 5:
PIN 1. CATHODE
2. EXTERNAL TRIP/DELAY
CASE: ANODE

STYLE 6:
PIN 1. GATE
2. EMITTER
CASE: COLLECTOR

STYLE 7:
PIN 1. ANODE
2. OPEN
CASE: CATHODE

STYLE 8:
PIN 1. CATHODE #1
2. CATHODE #2
CASE: ANODE

STYLE 9:
PIN 1. ANODE #1
2. ANODE #2
CASE: CATHODE

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