

SWITCHMODE™ Series

NPN Silicon Power Transistors

These transistors are designed for high-voltage, high-speed, power switching in inductive circuits where fall time is critical. They are particularly suited for line-operated switchmode applications. The MJ16022 is a selected high-gain version of the MJ16020 for applications where drive current is limited.

Features:

- Fast Switching Times:
 - 30 ns (Typ) Inductive Fall Time
 - 50 ns (Typ) Inductive Crossover Time
 - 800 ns (Typ) Inductive Storage Time
- 100°C Performance Specified for:
 - Reverse-Biased SOA with Inductive Loads
 - Switching Times with Inductive Loads
 - Saturation Voltages

Typical Applications:

- Switching Regulators
- Inverters
- Solenoids and Relay Drivers
- Motor Controls
- Deflection Circuits

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

Rating	Symbol	Max	Unit
Collector-Emitter Sustaining Voltage	V _{CEO}	450	Vdc
Collector-Emitter Breakdown Voltage	V _{CEV}	850	Vdc
Emitter-Base Voltage	V _{EB}	6	Vdc
Collector Current — Continuous — Peak (1)	I _C I _{CM}	30 40	Adc
Base Current — Continuous — Peak (1)	I _B I _{BM}	20 30	Adc
Total Power Dissipation @ T _C = 25°C Derate above 25°C	P _D	250 1.42	Watts W/°C
Operating and Storage Temperature	T _J , T _{stg}	-65 to 200	°C

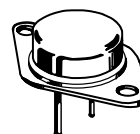
THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance — Junction to Case	R _{θJC}	0.7	°C/W
Maximum Lead Temperature for Soldering Purposes: 1/8" from Case for 5 Seconds	T _L	275	°C

(1) Pulse Test: Pulse Width = 5 ms, Duty Cycle < 10%.

MJ16020
MJ16022

**NPN SILICON POWER
TRANSISTOR
30 AMPERES
450 VOLTS**



**CASE 197A-05
TO-204AE**

MJ16020 MJ16022

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

Characteristic	Symbol	Min	Typ	Max	Unit
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OFF CHARACTERISTICS*

Collector–Emitter Sustaining Voltage ($I_C = 1\text{ mA}$, $I = 0$)	$V_{CEO(sus)}$	450	—	—	Vdc
Collector Cutoff Current ($V_{CE} = 850\text{ Vdc}$, $R_{BE} = 50\text{ Ohms}$, $T_C = 100^\circ\text{C}$)	I_{CER}	—	—	—	mAdc
Collector Cutoff Current ($V_{CE} = 850\text{ Vdc}$, $V_{EB(off)} = 1.5\text{ Vdc}$) ($V_{CE} = 850\text{ Vdc}$, $V_{EB(off)} = 1.5\text{ Vdc}$)	I_{CES}	— —	— —	0.5 5	nAdc
Emitter Cutoff Current ($V_{EB} = 6\text{ Vdc}$, $I_C = 0$)	I_{EBO}	—	—	2	nAdc

ON CHARACTERISTICS*

Base–Emitter Saturation Voltage ($I_C = 20\text{ Adc}$, $I_B = 2\text{ Adc}$) ($I_C = 20\text{ Adc}$, $I_B = 2\text{ Adc}$)	$V_{BE(sat)}$	— —	— —	1.5 1.5	Vdc
Collector–Emitter Saturation Voltage ($I_C = 20\text{ Adc}$, $I_B = 1.4\text{ Adc}$) ($I_C = 20\text{ Adc}$, $I_B = 2.6\text{ Adc}$) ($I_C = 20\text{ Adc}$, $I_B = 2.6\text{ Adc}$)	$V_{CE(sat)}$	— — —	— — —	2.5 3 3	Vdc
DC Current Gain ($I_C = 30\text{ Adc}$, $V_{CE} = 5\text{ Vdc}$)	h_{FE}	5 7	— —	— —	—

DYNAMIC CHARACTERISTICS

Output Capacitance ($V_{CB} = 10\text{ Vdc}$, $I_E = 0$, $f_{test} = 1\text{ MHz}$)	C_{ob}	—	—	800	pF
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*Indicates Pulse Test: Pulse Width = 300 μs Max, Duty Cycle = 2%.

MJ16020 MJ16022

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

Characteristic	Symbol	Min	Typ	Max	Unit
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SWITCHING CHARACTERISTICS: MJ16020

Resistive Load							
Delay Time	$(V_{CC} = 250\text{ Vdc},$ $I_C = 20\text{ Adc},$ $I_{B1} = 2.6\text{ Adc},$ $t_p = 30\text{ }\mu\text{s},$ Duty Cycle < 2%)	$I_{B2} = 5.2\text{ Adc}$ $R_B = 1.6\text{ Ohm}$	t_d	—	20	—	ns
Rise Time			t_r	—	200	—	
Storage Time			t_s	—	1200	—	
Fall Time			t_f	—	200	—	
Storage Time		$(V_{BE(off)} = 5\text{ Vdc})$	t_s	—	650	—	
Fall Time			t_f	—	80	—	
Inductive Load							
Storage Time	$(I_C = 20\text{ A}, I_{B1} = 2.6\text{ Adc},$ $V_{CE(pk)} = 400\text{ V},$ $V_{BE(off)} = 5\text{ Vdc})$	$(T_C = 100^{\circ}\text{C})$	t_{sv}	—	800	2000	ns
Crossover Time			t_{fi}	—	50	200	
Fall Time			t_c	—	90	250	
Storage Time	$(I_C = 20\text{ A}, I_{B1} = 2.6\text{ Adc},$ $V_{CE(pk)} = 400\text{ V},$ $V_{BE(off)} = 5\text{ Vdc})$	$(T_C = 150^{\circ}\text{C})$	t_{sv}	—	1050	—	
Crossover Time			t_{fi}	—	70	—	
Fall Time			t_c	—	120	—	

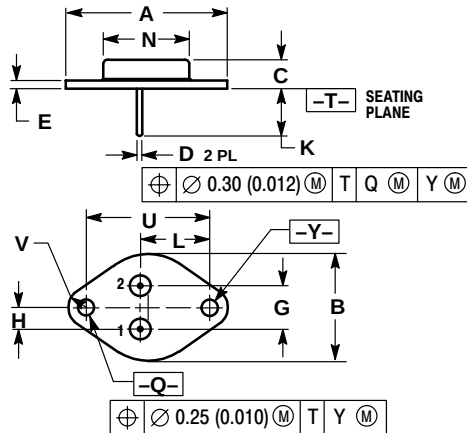
SWITCHING CHARACTERISTICS: MJ16022

Resistive Load							
Delay Time	(V _{CC} = 250 Vdc, I _C = 20 Adc, I _{B1} = 2.6 Adc, t _p = 30 μs, Duty Cycle < 2%)	I _{B2} = 5.2 Adc R _B = 1.6 Ohm	t _d	—	20	—	ns
Rise Time			t _r	—	200	—	
Storage Time			t _s	—	900	—	
Fall Time			t _f	—	150	—	
Storage Time		(V _{BE(off)} = 5 Vdc)	t _s	—	500	—	
Fall Time			t _f	—	40	—	
Inductive Load							
Storage Time	(I _C = 20 A, I _{B1} = 2.6 Adc, V _{CE(pk)} = 400 V, V _{BE(off)} = 5 Vdc)	(T _C = 100°C)	t _{sv}	—	650	1700	ns
Crossover Time			t _{fi}	—	30	150	
Fall Time			t _c	—	50	200	
Storage Time	(I _C = 20 A, I _{B1} = 2.6 Adc, V _{CE(pk)} = 400 V, V _{BE(off)} = 5 Vdc)	(T _C = 150°C)	t _{sv}	—	850	—	
Crossover Time			t _{fi}	—	30	—	
Fall Time			t _c	—	70	—	

MJ16020 MJ16022

PACKAGE DIMENSIONS

CASE 197A-05 TO-204AE ISSUE J



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

DIM	INCHES		MILLIMETERS	
	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

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