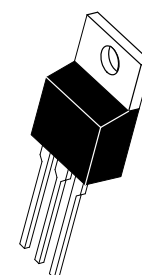
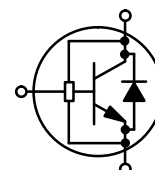


**MJE18002D2**

**POWER TRANSISTORS**  
**2 AMPERES**  
**1000 VOLTS**  
**50 WATTS**



**CASE 221A-06**  
**TO-220AB**

*Advance Information*

**High Speed, High Gain Bipolar NPN Power Transistor with Integrated Collector-Emitter Diode and Built-in Efficient Antisaturation Network**

The MJE18002D2 use a newly developed technology, so called H2BIP\*, to design the state of art transistor dedicated to the Electronic Light Ballast and PFC\*\* circuit.

The main advantages brought by these new transistors are:

- Improved Global Efficiency Due to the Low Base Drive Requirements
- DC Current Gain Typically Centered at 45
- Extremely Low Storage Time Variation, Thanks to the Antisaturation Network
- Easy to Use Thanks to the Integrated Collector/Emitter Diode

The MOTOROLA "Sig Sixma" philosophy provides tight and reproducible parameter distribution.

\* High speed High gain BIPolar transistor

\*\* Power Factor Control

**MAXIMUM RATINGS**

Rating	Symbol	Value	Unit
Collector-Emitter Sustaining Voltage	$V_{CEO}$	450	Vdc
Collector-Base Breakdown Voltage	$V_{CB0}$	1000	Vdc
Collector-Emitter Breakdown Voltage	$V_{CES}$	1000	Vdc
Emitter-Base Voltage	$V_{EBO}$	12	Vdc
Collector Current — Continuous	$I_C$	2	Adc
— Peak (1)	$I_{CM}$	5	
Base Current — Continuous	$I_B$	1	Adc
— Peak (1)	$I_{BM}$	2	
*Total Device Dissipation @ $T_C = 25^\circ\text{C}$	$P_D$	50	Watt
*Derate above $25^\circ\text{C}$		0.4	W/ $^\circ\text{C}$
Operating and Storage Temperature	$T_J, T_{stg}$	-65 to 150	$^\circ\text{C}$

**THERMAL CHARACTERISTICS**

Thermal Resistance — Junction to Case	$R_{\theta JC}$	2.5	$^\circ\text{C/W}$
— Junction to Ambient	$R_{\theta JA}$	62.5	
Maximum Lead Temperature for Soldering Purposes: 1/8" from case for 5 seconds	$T_L$	260	$^\circ\text{C}$

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

This document contains information on a new product. Specifications and information herein are subject to change without notice.

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**MJE18002D2**
**ELECTRICAL CHARACTERISTICS** ( $T_C = 25^\circ\text{C}$  unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
<b>OFF CHARACTERISTICS</b>					
Collector–Emitter Sustaining Voltage ( $I_C = 100\text{ mA}$ , $L = 25\text{ mH}$ )	$V_{CEO(sus)}$	450	570		Vdc
Collector Cutoff Current ( $V_{CE} = \text{Rated } V_{CEO}$ , $I_B = 0$ )	$I_{CEO}$			100	$\mu\text{Adc}$
Collector Cutoff Current ( $V_{CE} = \text{Rated } V_{CES}$ , $V_{EB} = 0$ )  ( $V_{CE} = 500\text{ V}$ , $V_{EB} = 0$ )	$I_{CES}$			100 500 100	$\mu\text{Adc}$
Emitter–Cutoff Current ( $V_{EB} = 10\text{ Vdc}$ , $I_C = 0$ )	$I_{EBO}$			100	$\mu\text{Adc}$

**ON CHARACTERISTICS**

Base–Emitter Saturation Voltage ( $I_C = 0.4\text{ Adc}$ , $I_B = 40\text{ mAdc}$ ) ( $I_C = 1\text{ Adc}$ , $I_B = 0.2\text{ Adc}$ )	@ $T_C = 25^\circ\text{C}$ @ $T_C = 125^\circ\text{C}$	$V_{BE(sat)}$		0.78 0.87	1 1.1	Vdc
Collector–Emitter Saturation Voltage ( $I_C = 0.4\text{ Adc}$ , $I_B = 40\text{ mAdc}$ )  ( $I_C = 1\text{ Adc}$ , $I_B = 0.2\text{ Adc}$ )	@ $T_C = 25^\circ\text{C}$ @ $T_C = 125^\circ\text{C}$  @ $T_C = 25^\circ\text{C}$ @ $T_C = 125^\circ\text{C}$	$V_{CE(sat)}$		0.36 0.5 0.4 0.65	0.6 1 0.75 1.2	Vdc
DC Current Gain ( $I_C = 0.4\text{ Adc}$ , $V_{CE} = 1\text{ Vdc}$ )  ( $I_C = 1\text{ Adc}$ , $V_{CE} = 1\text{ Vdc}$ )	@ $T_C = 25^\circ\text{C}$ @ $T_C = 125^\circ\text{C}$  @ $T_C = 25^\circ\text{C}$ @ $T_C = 125^\circ\text{C}$	$h_{FE}$	14 8 6 4	25 15 10 6		—

**DYNAMIC CHARACTERISTICS**

Current Gain Bandwidth ( $I_C = 0.5\text{ Adc}$ , $V_{CE} = 10\text{ Vdc}$ , $f = 1\text{ MHz}$ )	$f_T$		13		MHz
Output Capacitance ( $V_{CB} = 10\text{ Vdc}$ , $I_E = 0$ , $f = 1\text{ MHz}$ )	$C_{ob}$		50	100	pF
Input Capacitance ( $V_{EB} = 8\text{ Vdc}$ )	$C_{ib}$		340	500	pF

**DIODE CHARACTERISTICS**

Forward Diode Voltage ( $I_{EC} = 1\text{ Adc}$ )  ( $I_{EC} = 0.2\text{ Adc}$ )  ( $I_{EC} = 0.4\text{ Adc}$ )	@ $T_C = 25^\circ\text{C}$ @ $T_C = 25^\circ\text{C}$ @ $T_C = 125^\circ\text{C}$  @ $T_C = 25^\circ\text{C}$ @ $T_C = 125^\circ\text{C}$	$V_{EC}$		1.2 0.9 0.6 1 0.6	1.5 1.2 1.3	V
Forward Recovery Time ( $I_F = 0.2\text{ Adc}$ , $di/dt = 10\text{ A}/\mu\text{s}$ )  ( $I_F = 0.4\text{ Adc}$ , $di/dt = 10\text{ A}/\mu\text{s}$ )  ( $I_F = 1\text{ Adc}$ , $di/dt = 10\text{ A}/\mu\text{s}$ )	@ $T_C = 25^\circ\text{C}$ @ $T_C = 25^\circ\text{C}$ @ $T_C = 25^\circ\text{C}$	$t_{fr}$		540 517 480		ns

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

Characteristic	Symbol	Min	Typ	Max	Unit
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**SWITCHING CHARACTERISTICS: Resistive Load** (D.C.  $\leq 10\%$ , Pulse Width = 20  $\mu\text{s}$ )

Turn-on Time	$I_C = 1 \text{ Adc}$ , $I_{B1} = 0.2 \text{ Adc}$ $I_{B2} = 0.5 \text{ Adc}$ $V_{CC} = 300 \text{ Vdc}$	@ $T_C = 25^\circ\text{C}$	$t_{on}$		100	150	ns
		@ $T_C = 125^\circ\text{C}$			94		
Turn-off Time		@ $T_C = 25^\circ\text{C}$	$t_{off}$	0.95	1.5	1.25	$\mu\text{s}$
		@ $T_C = 125^\circ\text{C}$					

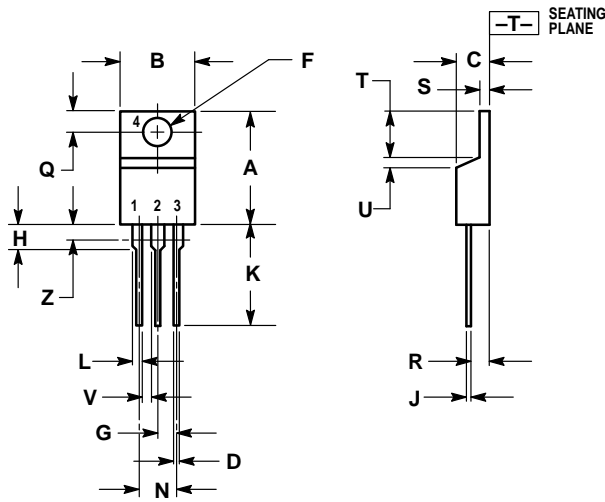
**SWITCHING CHARACTERISTICS: Inductive Load** ( $V_{clamp} = 300 \text{ V}$ ,  $V_{CC} = 15 \text{ V}$ ,  $L = 200 \mu\text{H}$ )

Fall Time	$I_C = 0.4 \text{ Adc}$ $I_{B1} = 40 \text{ mAdc}$ $I_{B2} = 0.2 \text{ Adc}$	@ $T_C = 25^\circ\text{C}$	$t_f$		130	175	ns
		@ $T_C = 125^\circ\text{C}$			120		
Storage Time		@ $T_C = 25^\circ\text{C}$	$t_s$		0.55	0.65	$\mu\text{s}$
		@ $T_C = 125^\circ\text{C}$			0.7		
Crossover Time		@ $T_C = 25^\circ\text{C}$	$t_c$		110	175	ns
		@ $T_C = 125^\circ\text{C}$			100		
Fall Time	$I_C = 0.8 \text{ Adc}$ $I_{B1} = 160 \text{ mAdc}$ $I_{B2} = 160 \text{ mAdc}$	@ $T_C = 25^\circ\text{C}$	$t_f$		130	175	ns
		@ $T_C = 125^\circ\text{C}$			140		
Storage Time		@ $T_C = 25^\circ\text{C}$	$t_s$	2.1	3	2.4	$\mu\text{s}$
		@ $T_C = 125^\circ\text{C}$					
Crossover Time		@ $T_C = 25^\circ\text{C}$	$t_c$		275	350	ns
		@ $T_C = 125^\circ\text{C}$			350		
Fall Time	$I_C = 1 \text{ Adc}$ $I_{B1} = 0.2 \text{ Adc}$ $I_{B2} = 0.5 \text{ Adc}$	@ $T_C = 25^\circ\text{C}$	$t_f$		100	150	ns
		@ $T_C = 125^\circ\text{C}$			100		
Storage Time		@ $T_C = 25^\circ\text{C}$	$t_s$		1.05	1.2	$\mu\text{s}$
		@ $T_C = 125^\circ\text{C}$		1.45			
Crossover Time		@ $T_C = 25^\circ\text{C}$	$t_c$		100	150	ns
		@ $T_C = 125^\circ\text{C}$			115		

**DYNAMIC SATURATION VOLTAGE**

Dynamic Saturation Voltage: Determined 1 $\mu\text{s}$ and 3 $\mu\text{s}$ respectively after rising $I_{B1}$ reaches 90% of final $I_{B1}$	$I_C = 0.4 \text{ Adc}$ $I_{B1} = 40 \text{ mA}$ $V_{CC} = 300 \text{ V}$	@ 1 $\mu\text{s}$	@ $T_C = 25^\circ\text{C}$	$V_{CE(dsat)}$		7.4		V
		@ 3 $\mu\text{s}$	@ $T_C = 25^\circ\text{C}$			2.5		
	$I_C = 1 \text{ Adc}$ $I_{B1} = 0.2 \text{ A}$ $V_{CC} = 300 \text{ V}$	@ 1 $\mu\text{s}$	@ $T_C = 25^\circ\text{C}$			11.7		
		@ 3 $\mu\text{s}$	@ $T_C = 25^\circ\text{C}$			1.3		

PACKAGE DIMENSIONS



- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
  2. CONTROLLING DIMENSION: INCH.
  3. DIMENSION Z DEFINES A ZONE WHERE ALL BODY AND LEAD IRREGULARITIES ARE ALLOWED.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.570	0.620	14.48	15.75
B	0.380	0.405	9.66	10.28
C	0.160	0.190	4.07	4.82
D	0.025	0.035	0.64	0.88
F	0.142	0.147	3.61	3.73
G	0.095	0.105	2.42	2.66
H	0.110	0.155	2.80	3.93
J	0.018	0.025	0.46	0.64
K	0.500	0.562	12.70	14.27
L	0.045	0.060	1.15	1.52
N	0.190	0.210	4.83	5.33
Q	0.100	0.120	2.54	3.04
R	0.080	0.110	2.04	2.79
S	0.045	0.055	1.15	1.39
T	0.235	0.255	5.97	6.47
U	0.000	0.050	0.00	1.27
V	0.045	—	1.15	—
Z	—	0.080	—	2.04

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

CASE 221A-06  
 TO-220AB  
 ISSUE Y

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How to reach us:  
 USA / EUROPE: Motorola Literature Distribution;  
 P.O. Box 20912; Phoenix, Arizona 85036. 1-800-441-2447

JAPAN: Nippon Motorola Ltd.; Tatsumi-SPD-JLDC, Toshikatsu Otsuki,  
 6F Seibu-Butsuryu-Center, 3-14-2 Tatsumi Koto-Ku, Tokyo 135, Japan. 03-3521-8315

MFAX: RMFAX0@email.sps.mot.com - TOUCHTONE (602) 244-6609  
 INTERNET: http://Design-NET.com

HONG KONG: Motorola Semiconductors H.K. Ltd.; 8B Tai Ping Industrial Park,  
 51 Ting Kok Road, Tai Po, N.T., Hong Kong. 852-26629298

