

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

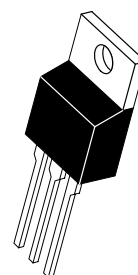
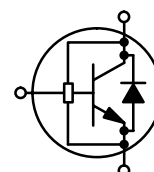
The ON Semiconductor Six Sigma philosophy provides tight and reproducible parameter distribution.

* High speed High gain Bipolar transistor

** Power Factor Control

MJE18002D2

POWER TRANSISTORS
2 AMPERES
1000 VOLTS
50 WATTS



CASE 221A-00
TO-220AB

MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector-Emitter Sustaining Voltage	V_{CEO}	450	Vdc
Collector-Base Breakdown Voltage	V_{CBO}	1000	Vdc
Collector-Emitter Breakdown Voltage	V_{CES}	1000	Vdc
Emitter-Base Voltage	V_{EBO}	12	Vdc
Collector Current — Continuous — Peak (1)	I_C I_{CM}	2 5	Adc
Base Current — Continuous — Peak (1)	I_B I_{BM}	1 2	Adc
*Total Device Dissipation @ $T_C = 25^\circ\text{C}$ *Derate above 25°C	P_D	50 0.4	Watt 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 — Junction to Ambient	$R_{\theta JC}$ $R_{\theta JA}$	2.5 62.5	$^\circ\text{C/W}$
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 $\leq 10\%$.

MJE18002D2

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 ($I_C = 100\text{ mA}$, $L = 25\text{ mH}$)	$V_{CEO(sus)}$	450	570		Vdc
Collector Cutoff Current ($V_{CE} = \text{Rated } V_{CEO}$, $I_B = 0$)	I_{CEO}			100	μAdc
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	μAdc
Emitter–Cutoff Current ($V_{EB} = 10\text{ Vdc}$, $I_C = 0$)	I_{EBO}			100	μAdc

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

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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 μs)

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

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

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

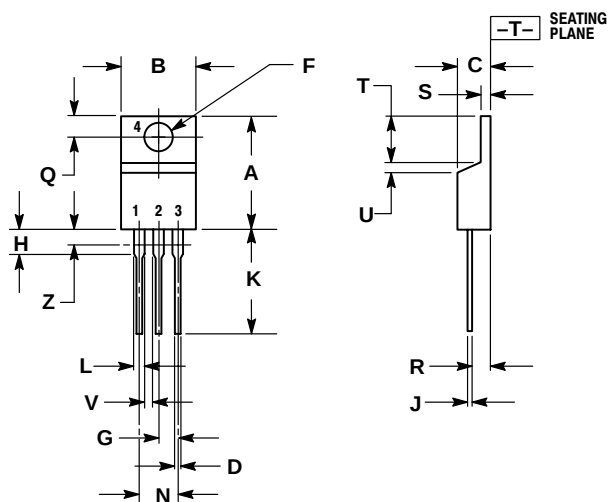
DYNAMIC SATURATION VOLTAGE

Dynamic Saturation Voltage: Determined 1 μs and 3 μs 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 μs	@ $T_C = 25^\circ\text{C}$	$V_{CE(dsat)}$		7.4		V
		@ 3 μs	@ $T_C = 25^\circ\text{C}$			2.5		
	$I_C = 1 \text{ Adc}$ $I_{B1} = 0.2 \text{ A}$ $V_{CC} = 300 \text{ V}$	@ 1 μs	@ $T_C = 25^\circ\text{C}$			11.7		
		@ 3 μs	@ $T_C = 25^\circ\text{C}$			1.3		

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PACKAGE DIMENSIONS

TO-220AB CASE 221A-09 ISSUE AA



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

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