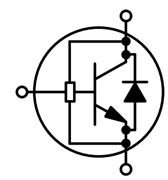
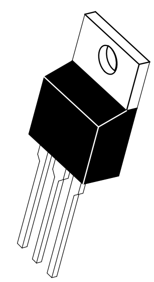
MJE18604D2

Advance Information

High Speed, High Gain Bipolar NPN Power Transistor with Integrated Collector-Emitter Diode and Built-in Efficient Antisaturation Network for 1600 V Applications

POWER TRANSISTORS
3 AMPERES
1600 VOLTS
100 WATTS





CASE 221A–06
TO–220AB

The MJE18604D2 is state–of–art High Speed High gain BIPolar transistor (H2BIP). Tight dynamic characteristics and lot to lot low spread (±150 ns on storage time) make it ideally suitable for light ballast applications. Therefore, there is no more a need to guarantee an h_{fe} window.

Main features:

- Low Base Drive Requirement
- High DC Current Gain (30 Typical) @ I_C = 400 mA
- Extremely Low Storage Time Min/Max Guarantees Due to the Internal Active Antisaturation (H2BIP) Structure which Minimizes the Spread
- Integrated Collector–Emitter Free Wheeling Diode Matched with the Power Transistor
- Fully Characterized and Guaranteed Dynamic $V_{CE(sat)}$
- “6 Sigma” Process Providing Tight and Reproductible Parameter Spreads

MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector–Emitter Breakdown Voltage	V_{CEO}	800	Vdc
Collector–Emitter Sustaining Voltage @ R = 200 Ω	V_{CER}	800	Vdc
Collector–Base Breakdown Voltage	V_{CBO}	1600	Vdc
Collector–Emitter Breakdown Voltage	V_{CES}	1600	Vdc
Emitter–Base Voltage	V_{EBO}	12	Vdc
Collector Current — Continuous — Peak (1)	I_C I_{CM}	3 8	Adc
Base Current — Continuous — Peak (1)	I_B I_{BM}	2 4	Adc
*Total Device Dissipation @ T_C = 25°C *Derate above 25°C	P_D	100 0.8	Watt W/°C
Operating and Storage Temperature	T_J, T_{stg}	–65 to 150	°C

THERMAL CHARACTERISTICS

Thermal Resistance — Junction to Case — Junction to Ambient	$R_{\theta JC}$ $R_{\theta JA}$	1.25 62.5	°C/W
Maximum Lead Temperature for Soldering Purposes: 1/8″ from case for 5 seconds	T_L	260	°C

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

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

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

Characteristic	Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS					
Collector–Emitter Sustaining Voltage (I_C = 100 mA, L = 25 mH, R_{BE} = 200 Ω)	$V_{CER(sus)}$	800			Vdc
Collector–Base Breakdown Voltage (I_{CBO} = 1 mA)	V_{CBO}	1600			Vdc
Emitter–Base Breakdown Voltage (I_{EBO} = 1 mA)	V_{EBO}	12	14		Vdc
Collector Cutoff Current (V_{CBO} = Rated V_{CBO}, I_B = 0)	I_{CBO}			100	µAdc
Collector Cutoff Current (V_{CE} = Rated V_{CES}, V_{EB} = 0) @ T_C = 25°C	I_{CES}			100	µAdc
@ T_C = 125°C				1000	
(V_{CE} = 1300 V, V_{EB} = 0) @ T_C = 125°C				100	
Emitter–Cutoff Current (V_{EB} = 11 Vdc, I_C = 0)	I_{EBO}			500	µAdc
ON CHARACTERISTICS					
Base–Emitter Saturation Voltage (I_C = 0.5 Adc, I_B = 0.1 Adc) @ T_C = 25°C	$V_{BE(sat)}$		0.8	1.1	Vdc
@ T_C = 125°C			0.6	1	
(I_C = 1 Adc, I_B = 0.1 Adc) @ T_C = 25°C			0.8	1	
@ T_C = 125°C				1	
(I_C = 2 Adc, I_B = 0.4 Adc) @ T_C = 25°C			0.9	1.2	
@ T_C = 125°C			0.8	1.1	
Collector–Emitter Saturation Voltage (I_C = 250 mAdc, I_B = 25 mAdc) @ T_C = 25°C	$V_{CE(sat)}$		1	1.25	Vdc
@ T_C = 125°C			1.7		
(I_C = 0.5 Adc, I_B = 50 mAdc) @ T_C = 25°C			2.1	2.4	
@ T_C = 125°C			4		
(I_C = 0.8 Adc, I_B = 80 mAdc) @ T_C = 25°C			3.7	5	
@ T_C = 125°C					
DC Current Gain (I_C = 0.4 Adc, V_{CE} = 3 Vdc) @ T_C = 25°C	h_{FE}	20		40	—
@ T_C = 125°C		6	10		
(I_C = 5 mAdc, V_{CE} = 10 Vdc) @ T_C = 25°C		20	35		
@ T_C = 125°C		20	55		
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 = 0.3 Adc, I_{B1} = 50 mA, V_{CC} = 300 V; @ 1 µs, @ T_C = 25°C	$V_{CE(dsat)}$		4.7		V
@ 1 µs, @ T_C = 125°C			9.3		
@ 3 µs, @ T_C = 25°C			2.6		
@ 3 µs, @ T_C = 125°C			5.4		
I_C = 0.5 Adc, I_{B1} = 50 mA, V_{CC} = 300 V; @ 1 µs, @ T_C = 25°C			9.7		
@ 1 µs, @ T_C = 125°C			18		
@ 3 µs, @ T_C = 25°C			6.4		
@ 3 µs, @ T_C = 125°C			12.3		
DIODE CHARACTERISTICS					
Forward Diode Voltage (I_{EC} = 0.4 Adc) @ T_C = 25°C	V_{EC}		0.9	1.2	V
@ T_C = 125°C			0.6		
(I_{EC} = 1 Adc) @ T_C = 25°C			1.05	1.5	
@ T_C = 125°C			0.7		
Forward Recovery Time (I_F = 0.4 Adc, di/dt = 10 A/µs) @ T_C = 25°C	t_{fr}		0.9		µs
@ T_C = 125°C			1.5		
(I_F = 1.0 Adc, di/dt = 10 A/µs) @ T_C = 25°C			1.15		
@ T_C = 125°C			1.6		

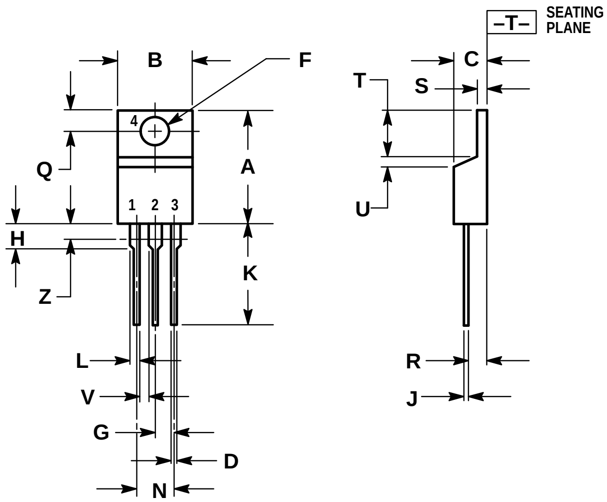
ELECTRICAL CHARACTERISTICS (T_C = 25°C unless otherwise noted)

Characteristic			Symbol	Min	Typ	Max	Unit
DYNAMIC CHARACTERISTICS							
Current Gain Bandwidth (I_C = 0.5 Adc, V_{CE} = 10 Vdc, f = 1 MHz)			f_T		13		MHz
Output Capacitance (V_{CB} = 10 Vdc, I_E = 0, f = 1 MHz)			C_{ob}		230	500	pF
Input Capacitance (V_{CE} = 8 Vdc)			C_{ib}		480	1000	pF
SWITCHING CHARACTERISTICS: Resistive Load (D.C. ≤ 10%, Pulse Width = 40 μs)							
Delay Time	I_C = 0.5 Adc, I_{B1} = 66 mAdc, I_{B2} = 390 mAdc, V_{CC} = 125 V	@ T_C = 25°C @ T_C = 125°C	t_d		95 110	150	ns
Rise Time		@ T_C = 25°C @ T_C = 125°C	t_r		475 900	750	ns
Storage Time		@ T_C = 25°C @ T_C = 125°C	t_s	400	 910	700	ns
Fall Time		@ T_C = 25°C @ T_C = 125°C	t_f		675 775	850	ns
Turn–on Time	I_C = 0.3 Adc, I_{B1} = 50 mAdc, I_{B2} = 50 mAdc, V_{CC} = 125 V	@ T_C = 25°C @ T_C = 125°C	t_{on}		440 570		ns
Storage Time		@ T_C = 25°C @ T_C = 125°C	t_s		4 5.9		μs
Fall Time		@ T_C = 25°C @ T_C = 125°C	t_f		375 675		ns
Turn–off Time		@ T_C = 25°C @ T_C = 125°C	t_{off}		4.5 6.6		μs
Turn–on Time	I_C = 0.3 Adc, I_{B1} = 50 mAdc, I_{B2} = 150 mAdc, V_{CC} = 125 V	@ T_C = 25°C @ T_C = 125°C	t_{on}		465 550	600	ns
Storage Time		@ T_C = 25°C @ T_C = 125°C	t_s	500	 1800	800	ns
Fall Time		@ T_C = 25°C @ T_C = 125°C	t_f		800 550	1000	ns
Turn–off Time		@ T_C = 25°C @ T_C = 125°C	t_{off}		1.5 2.4	1.75	μs
Turn–on Time	I_C = 0.5 Adc, I_{B1} = 50 mAdc, I_{B2} = 50 mAdc, V_{CC} = 125 V	@ T_C = 25°C @ T_C = 125°C	t_{on}		550 1300		ns
Storage Time		@ T_C = 25°C @ T_C = 125°C	t_s		4.35 5		μs
Fall Time		@ T_C = 25°C @ T_C = 125°C	t_f		500 2000		ns
Turn–off Time		@ T_C = 25°C @ T_C = 125°C	t_{off}		4.8 7		μs
Delay Time	I_C = 0.5 Adc, I_{B1} = 50 mAdc, I_{B2} = 250 mAdc, V_{CC} = 125 V	@ T_C = 25°C	t_d		100	300	ns
Rise Time		@ T_C = 25°C	t_r		300	800	ns
Storage Time		@ T_C = 25°C	t_s		1	1.2	μs
Fall Time		@ T_C = 25°C	t_f		200	350	ns

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

Characteristic			Symbol	Min	Typ	Max	Unit
SWITCHING CHARACTERISTICS: Inductive Load (V_{CC} = 15 V)							
Fall Time	I_C = 300 mAdc I_{B1} = 50 mAdc I_{B2} = 50 mAdc V_Z = 300 V L_C = 200 µH	@ T_C = 25°C @ T_C = 125°C	t_f		170 210		ns
Storage Time		@ T_C = 25°C @ T_C = 125°C	t_s		1.7 2.7		µs
Crossover Time		@ T_C = 25°C @ T_C = 125°C	t_c		150 400		ns
Fall Time	I_C = 300 mAdc I_{B1} = 50 mAdc I_{B2} = 150 mAdc V_Z = 300 V L_C = 200 µH	@ T_C = 25°C @ T_C = 125°C	t_f		160 150	250	ns
Storage Time		@ T_C = 25°C @ T_C = 125°C	t_s	0.7	 1.1	1	µs
Crossover Time		@ T_C = 25°C @ T_C = 125°C	t_c		160 160	250	ns
Fall Time	I_C = 500 mAdc I_{B1} = 50 mAdc I_{B2} = 50 mAdc V_Z = 300 V L_C = 200 µH	@ T_C = 25°C @ T_C = 125°C	t_f		165 700		ns
Storage Time		@ T_C = 25°C @ T_C = 125°C	t_s		3 4.1		µs
Crossover Time		@ T_C = 25°C @ T_C = 125°C	t_c		200 800		ns
Fall Time	I_C = 500 mAdc I_{B1} = 50 mAdc I_{B2} = 250 mAdc V_Z = 300 V L_C = 200 µH	@ T_C = 25°C @ T_C = 125°C	t_f		110 130	175	ns
Storage Time		@ T_C = 25°C @ T_C = 125°C	t_s	0.7	 1.8	1	µs
Crossover Time		@ T_C = 25°C @ T_C = 125°C	t_c		130 250	200	ns

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.

	INCHES		MILLIMETERS	
DIM	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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