

# MJF31C\* (NPN), MJF32C\* (PNP)

\*Preferred Devices

## Complementary Silicon Plastic Power Transistors for Isolated Package Applications

Designed for use in general purpose amplifier and switching applications.

- Collector–Emitter Saturation Voltage –  
 $V_{CE(sat)} = 1.2 \text{ Vdc (Max) @ } I_C = 3.0 \text{ Adc}$
- Collector–Emitter Sustaining Voltage –  
 $V_{CEO(sus)} = 100 \text{ Vdc (Min)}$
- High Current Gain – Bandwidth Product  
 $f_T = 3.0 \text{ MHz (Min) @ } I_C = 500 \text{ mAdc}$
- UL Recognized, File #E69369, to 3500  $V_{RMS}$  Isolation

### MAXIMUM RATINGS

Rating	Symbol	MJF31C MJF32C	Unit
Collector–Emitter Voltage	$V_{CEO}$	100	Vdc
Collector–Base Voltage	$V_{CB}$	100	Vdc
Emitter–Base Voltage	$V_{EB}$	5.0	Vdc
Collector Current Continuous Peak	$I_C$	3.0 5.0	A dc
Base Current	$I_B$	1.0	A dc
Total Power Dissipation @ $T_C = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	28 0.22	Watts W/ $^\circ\text{C}$
Total Power Dissipation @ $T_A = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	2.0 0.016	Watts W/ $^\circ\text{C}$
Unclamped Inductive Load Energy (Note 1)	E	32	mJ
Operating and Storage Junction Temperature Range	$T_J, T_{stg}$	-65 to +150	$^\circ\text{C}$

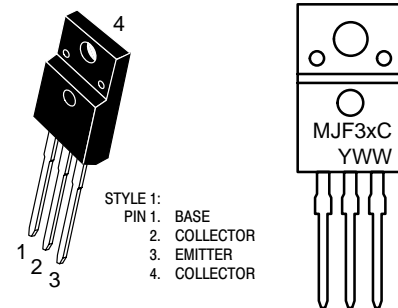
1.  $I_C = 1.8 \text{ A}$ ,  $L = 20 \text{ mH}$ , P.R.F. = 10 Hz,  $V_{CC} = 10 \text{ V}$ ,  $R_{BE} = 100 \Omega$ .



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**3.0 AMPERE  
POWER TRANSISTORS  
COMPLEMENTARY  
SILICON  
100 VOLTS  
28 WATTS**



**TO-220 FULLPAK  
CASE 221D-02**

MJF3xC = Specific Device Code  
x = 1 or 2  
Y = Year  
WW = Work Week

### ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 6 of this data sheet.

**Preferred** devices are recommended choices for future use and best overall value.

## MJF31C\* (NPN), MJF32C\* (PNP)

### THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Ambient	$R_{\theta JA}$	62.5	$^{\circ}C/W$
Thermal Resistance, Junction to Case	$R_{\theta JC}$	4.46	$^{\circ}C/W$

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

Characteristic	Symbol	Min	Max	Unit
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#### OFF CHARACTERISTICS

Collector–Emitter Sustaining Voltage (Note 2) ( $I_C = 30 \text{ mAdc}$ , $I_B = 0$ )	$V_{CEO(sus)}$	100	–	Vdc
Collector Cutoff Current ( $I_C = 3.0 \text{ Adc}$ , $V_{CE} = 4.0 \text{ Vdc}$ )	$I_{CEO}$	–	0.3	mAdc
Collector Cutoff Current	$I_{CES}$	–	200	$\mu\text{Adc}$
Emitter Cutoff Current ( $V_{BE} = 5.0 \text{ Vdc}$ , $I_C = 0$ )	$I_{EBO}$	–	1.0	mAdc

#### ON CHARACTERISTICS (Note 2)

DC Current Gain ( $I_C = 1.0 \text{ Adc}$ , $V_{CE} = 4.0 \text{ Vdc}$ ) ( $I_C = 3.0 \text{ Adc}$ , $V_{CE} = 4.0 \text{ Vdc}$ )	$h_{FE}$	25 10	– 50	–
Collector–Emitter Saturation Voltage ( $I_C = 3.0 \text{ Adc}$ , $I_B = 375 \text{ mAdc}$ )	$V_{CE(sat)}$	–	1.2	Vdc
Base–Emitter On Voltage ( $I_C = 3.0 \text{ Adc}$ , $V_{CE} = 4.0 \text{ Vdc}$ )	$V_{BE(on)}$	–	1.8	Vdc

#### DYNAMIC CHARACTERISTICS

Current–Gain – Bandwidth Product ( $I_C = 500 \text{ mAdc}$ , $V_{CE} = 10 \text{ Vdc}$ , $f_{test} = 1.0 \text{ MHz}$ )	$f_T$	3.0	–	MHz
Small–Signal Current Gain ( $I_C = 0.5 \text{ Adc}$ , $V_{CE} = 10 \text{ Vdc}$ , $f = 1.0 \text{ kHz}$ )	$h_{fe}$	20	–	–

2. Pulse Test: Pulse Width  $\leq 300 \mu\text{s}$ , Duty Cycle  $\leq 2.0\%$ .

# MJF31C\* (NPN), MJF32C\* (PNP)

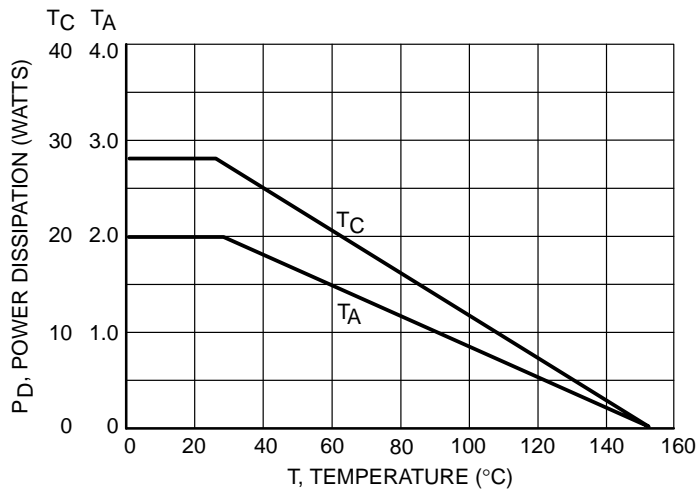


Figure 1. Power Derating

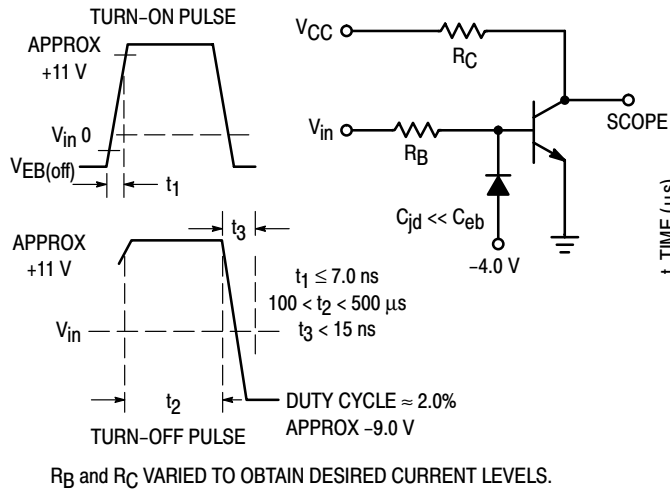


Figure 2. Switching Time Equivalent Circuit

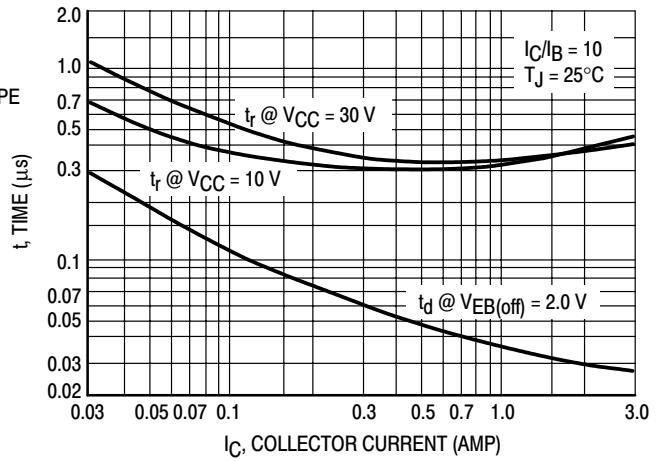


Figure 3. Turn-On Time

# MJF31C\* (NPN), MJF32C\* (PNP)

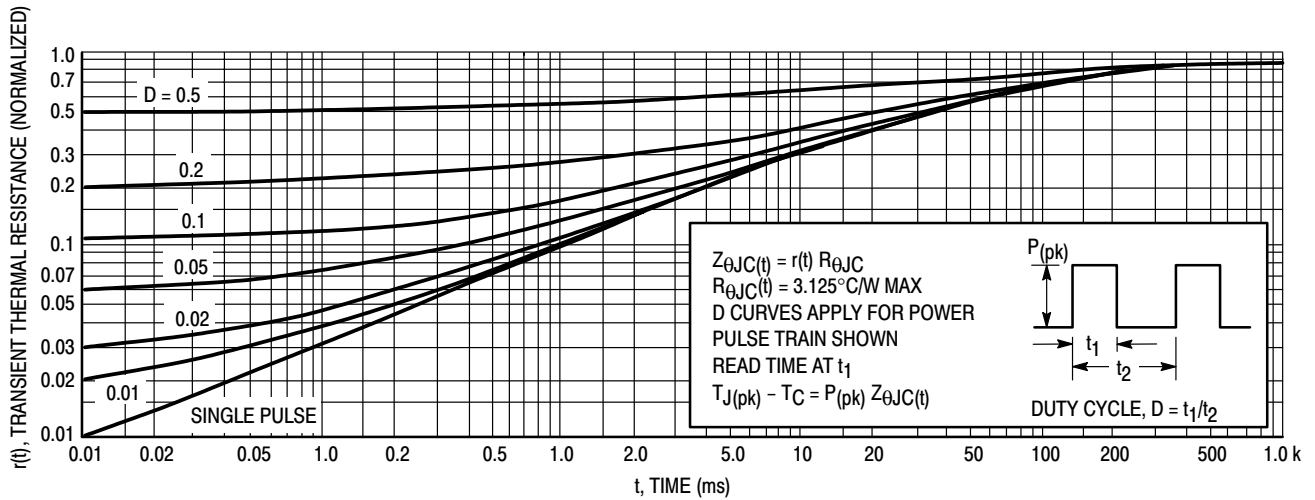


Figure 4. Thermal Response

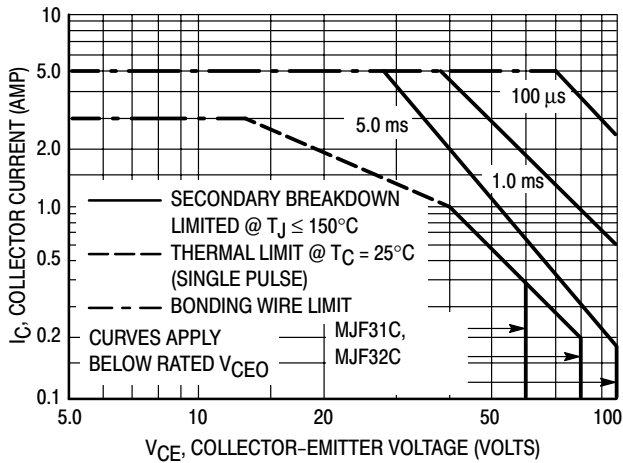


Figure 5. Active Region Safe Operating Area

There are two limitations on the power handling 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 5 is based on  $T_J(\text{pk}) = 150^{\circ}\text{C}$ ;  $T_C$  is variable depending on conditions. Second breakdown pulse limits are valid for duty cycles to 10% provided  $T_J(\text{pk}) \leq 150^{\circ}\text{C}$ .  $T_J(\text{pk})$  may be calculated from the data in Figure 4. At high case temperatures, thermal limitations will reduce the power that can be handled to values less than the limitations imposed by second breakdown.

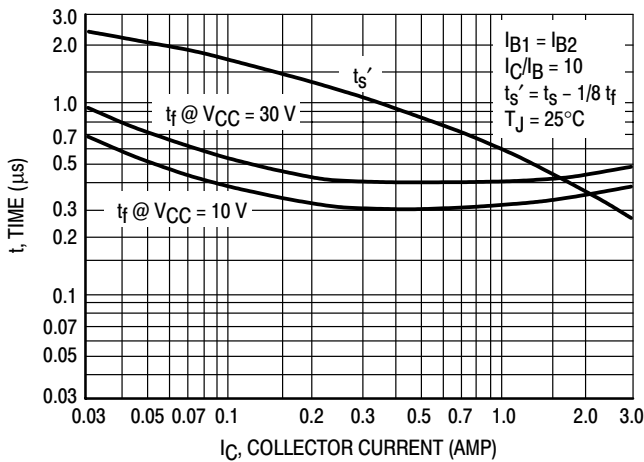


Figure 6. Turn-Off Time

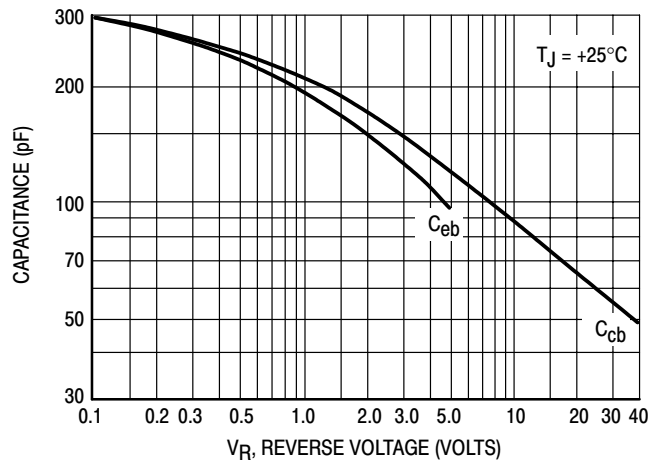


Figure 7. Capacitance

# MJF31C\* (NPN), MJF32C\* (PNP)

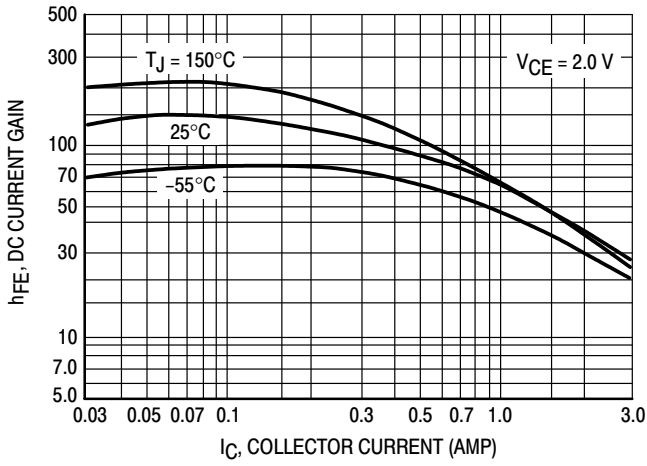


Figure 8. DC Current Gain

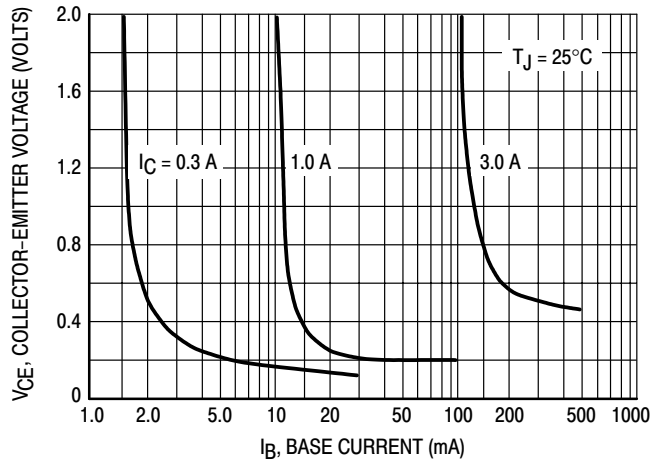


Figure 9. Collector Saturation Region

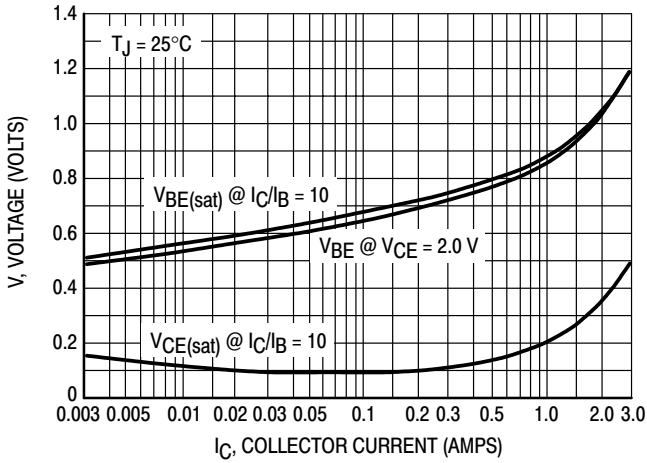


Figure 10. "On" Voltages

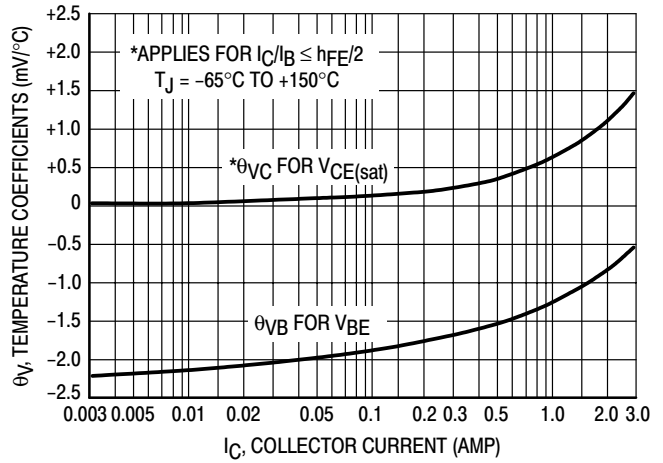


Figure 11. Temperature Coefficients

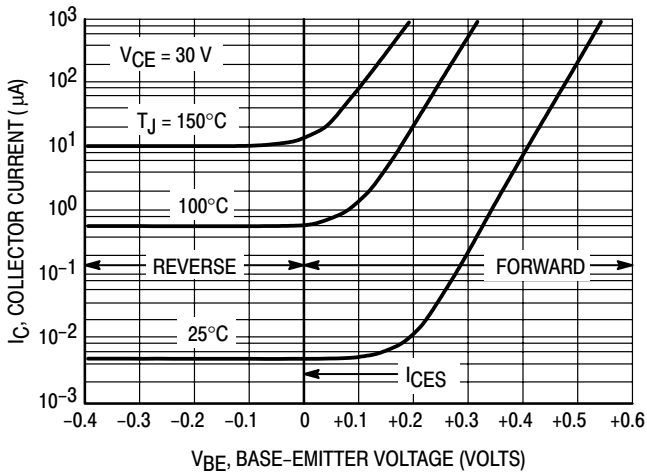


Figure 12. Collector Cut-Off Region

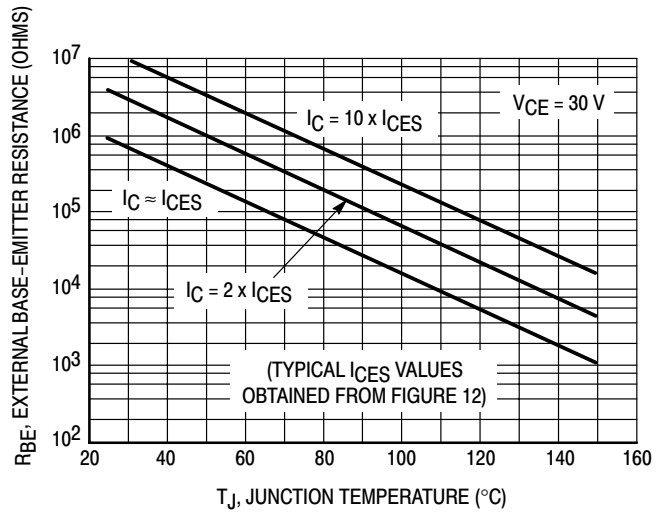


Figure 13. Effects of Base-Emitter Resistance

## MJF31C\* (NPN), MJF32C\* (PNP)

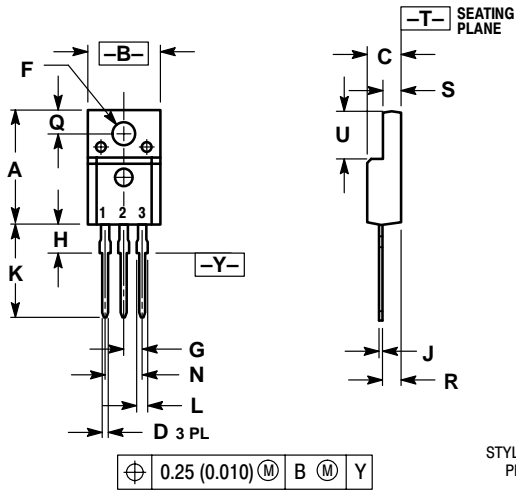
### ORDERING INFORMATION

Device	Package	Shipping
MJF31C	TO-220 FULLPAK	50 Units/Rail
MJF32C	TO-220 FULLPAK	50 Units/Rail

# MJF31C\* (NPN), MJF32C\* (PNP)

## PACKAGE DIMENSIONS

TO-220 FULLPAK  
CASE 221D-02  
ISSUE D




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

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.621	0.629	15.78	15.97
B	0.394	0.402	10.01	10.21
C	0.181	0.189	4.60	4.80
D	0.026	0.034	0.67	0.86
F	0.121	0.129	3.08	3.27
G	0.100 BSC		2.54 BSC	
H	0.123	0.129	3.13	3.27
J	0.018	0.025	0.46	0.64
K	0.500	0.562	12.70	14.27
L	0.045	0.060	1.14	1.52
N	0.200 BSC		5.08 BSC	
Q	0.126	0.134	3.21	3.40
R	0.107	0.111	2.72	2.81
S	0.096	0.104	2.44	2.64
U	0.259	0.267	6.58	6.78

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

## MJF31C\* (NPN), MJF32C\* (PNP)

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