

# MJD31C (NPN) MJD32C (PNP)

Preferred Device

## Complementary Power Transistors

### DPAK For Surface Mount Applications

Designed for general purpose amplifier and low speed switching applications.

- Lead Formed for Surface Mount Applications in Plastic Sleeves (No Suffix)
- Straight Lead Version in Plastic Sleeves ("–1" Suffix)
- Lead Formed Version in 16 mm Tape and Reel ("T4" Suffix)
- Electrically Similar to Popular TIP31 and TIP32 Series
- Pb-Free Package May be Available. The G-Suffix Denotes a Pb-Free Lead Finish

#### MAXIMUM RATINGS

Rating	Symbol	Max	Unit
Collector–Emitter Voltage	$V_{CEO}$	100	Vdc
Collector–Base Voltage	$V_{CB}$	100	Vdc
Emitter–Base Voltage	$V_{EB}$	5	Vdc
Collector Current – Continuous Peak	$I_C$	3 5	Adc
Base Current	$I_B$	1	Adc
Total Power Dissipation @ $T_C = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	15 0.12	W W/ $^\circ\text{C}$
Total Power Dissipation* @ $T_A = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	1.56 0.012	W W/ $^\circ\text{C}$
Operating and Storage Junction Temperature Range	$T_J, T_{stg}$	–65 to +150	$^\circ\text{C}$

#### THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction–to–Case	$R_{\theta JC}$	8.3	$^\circ\text{C/W}$
Thermal Resistance, Junction–to–Ambient*	$R_{\theta JA}$	80	$^\circ\text{C/W}$
Lead Temperature for Soldering Purposes	$T_L$	260	$^\circ\text{C}$

\*These ratings are applicable when surface mounted on the minimum pad size recommended.



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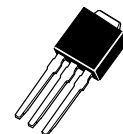
<http://onsemi.com>

### SILICON POWER TRANSISTORS 3 AMPERES 100 VOLTS 15 WATTS

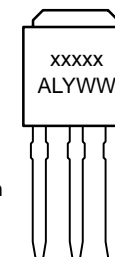
#### MARKING DIAGRAMS



DPAK–3  
CASE 369A



DPAK–3  
CASE 369



xxxxxx = Device Code  
A = Assembly Location  
IL = Wafer Lot  
Y = Year  
WW = Work Week

#### ORDERING INFORMATION

Device	Package	Shipping†
MJD31C	DPAK–3	75 Units / Rail
MJD31CG	DPAK–3	75 Units / Rail
MJD31C1	DPAK–3	75 Units / Rail
MJD31CRL	DPAK–3	1800 /Tape & Reel
MJD31CT4	DPAK–3	2500 /Tape & Reel
MJD31T4	DPAK–3	2500 /Tape & Reel
MJD32C	DPAK–3	75 Units / Rail
MJD32C1	DPAK–3	75 Units / Rail
MJD32CRL	DPAK–3	1800 /Tape & Reel
MJD32CT4	DPAK–3	2500 /Tape & Reel
MJD32RL	DPAK–3	1800 /Tape & Reel
MJD32T4	DPAK–3	2500 /Tape & Reel

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

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

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## ELECTRICAL CHARACTERISTICS (T<sub>C</sub> = 25°C unless otherwise noted)

Characteristic	Symbol	Min	Max	Unit
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### OFF CHARACTERISTICS

Collector–Emitter Sustaining Voltage (Note 1) (I <sub>C</sub> = 30 mA <sub>dc</sub> , I <sub>B</sub> = 0)	V <sub>CEO(sus)</sub>	100	–	V <sub>dc</sub>
Collector Cutoff Current (V <sub>CE</sub> = 60 V <sub>dc</sub> , I <sub>B</sub> = 0)	I <sub>CEO</sub>	–	50	μA <sub>dc</sub>
Collector Cutoff Current (V <sub>CE</sub> = Rated V <sub>CEO</sub> , V <sub>EB</sub> = 0)	I <sub>CES</sub>	–	20	μA <sub>dc</sub>
Emitter Cutoff Current (V <sub>BE</sub> = 5 V <sub>dc</sub> , I <sub>C</sub> = 0)	I <sub>EBO</sub>	–	1	mA <sub>dc</sub>

### ON CHARACTERISTICS (Note 1)

DC Current Gain (I <sub>C</sub> = 1 A <sub>dc</sub> , V <sub>CE</sub> = 4 V <sub>dc</sub> ) (I <sub>C</sub> = 3 A <sub>dc</sub> , V <sub>CE</sub> = 4 V <sub>dc</sub> )	h <sub>FE</sub>	25 10	– 50	–
Collector–Emitter Saturation Voltage (I <sub>C</sub> = 3 A <sub>dc</sub> , I <sub>B</sub> = 375 mA <sub>dc</sub> )	V <sub>CE(sat)</sub>	–	1.2	V <sub>dc</sub>
Base–Emitter On Voltage (I <sub>C</sub> = 3 A <sub>dc</sub> , V <sub>CE</sub> = 4 V <sub>dc</sub> )	V <sub>BE(on)</sub>	–	1.8	V <sub>dc</sub>

### DYNAMIC CHARACTERISTICS

Current Gain – Bandwidth Product (Note 2) (I <sub>C</sub> = 500 mA <sub>dc</sub> , V <sub>CE</sub> = 10 V <sub>dc</sub> , f <sub>test</sub> = 1 MHz)	f <sub>T</sub>	3	–	MHz
Small–Signal Current Gain (I <sub>C</sub> = 0.5 A <sub>dc</sub> , V <sub>CE</sub> = 10 V <sub>dc</sub> , f = 1 kHz)	h <sub>fe</sub>	20	–	–

1. Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2%.
2. f<sub>T</sub> = |h<sub>fe</sub>| • f<sub>test</sub>.

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## TYPICAL CHARACTERISTICS

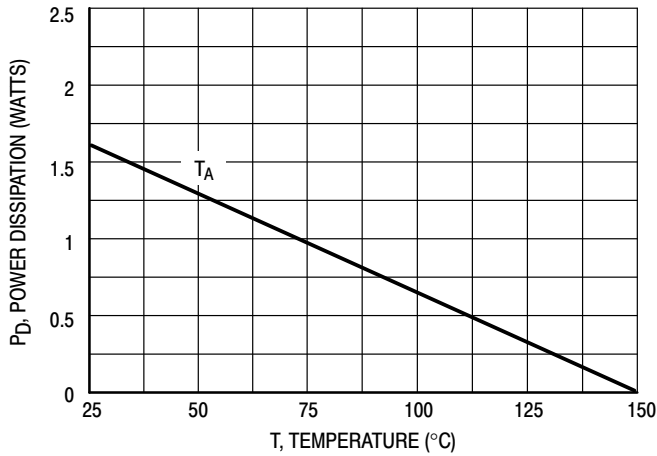
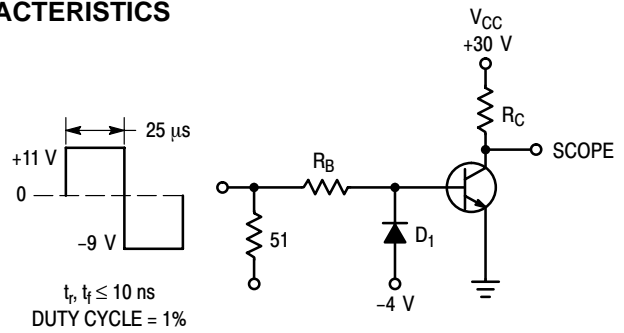


Figure 1. Power Derating



$R_B$  and  $R_C$  VARIED TO OBTAIN DESIRED CURRENT LEVELS  
 $D_1$  MUST BE FAST RECOVERY TYPE, e.g.:  
 1N5825 USED ABOVE  $I_B \approx 100$  mA  
 MSD6100 USED BELOW  $I_B \approx 100$  mA  
 REVERSE ALL POLARITIES FOR PNP.

Figure 2. Switching Time Test Circuit

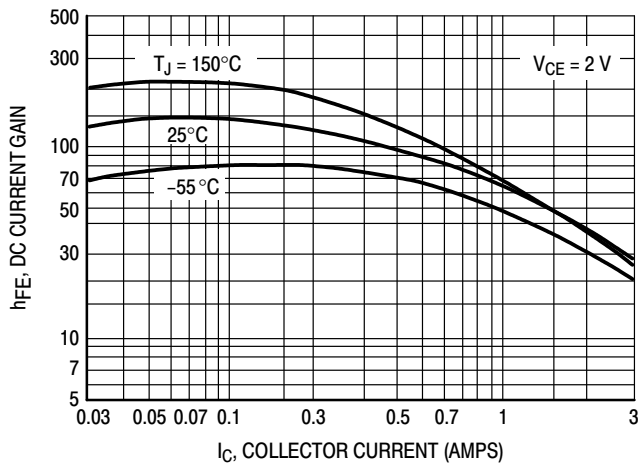


Figure 3. DC Current Gain

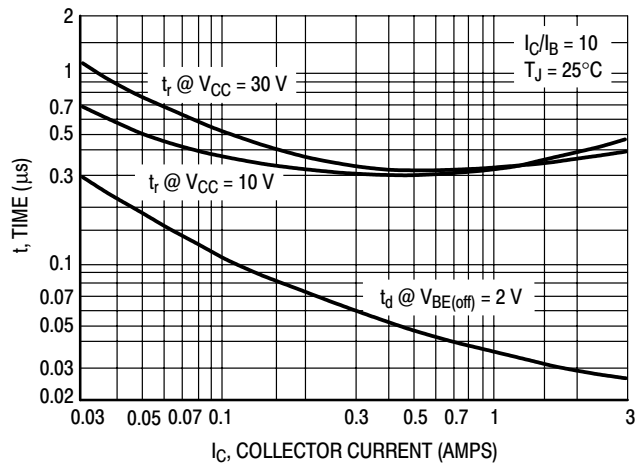


Figure 4. Turn-On Time

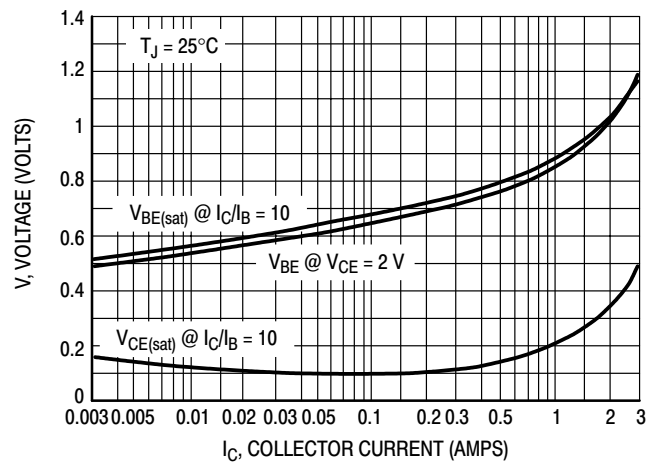


Figure 5. "On" Voltages

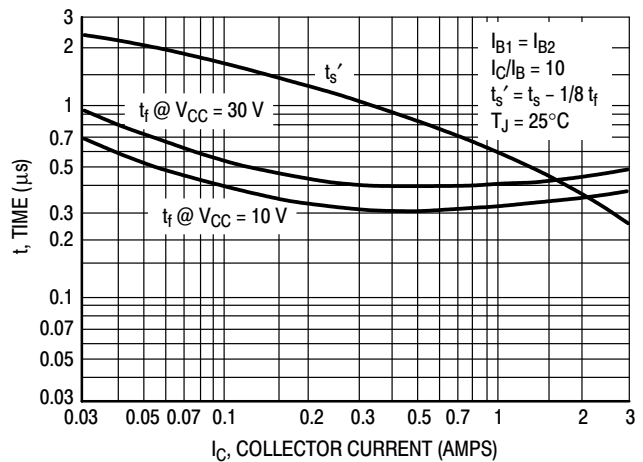


Figure 6. Turn-Off Time

## MJD31C (NPN) MJD32C (PNP)

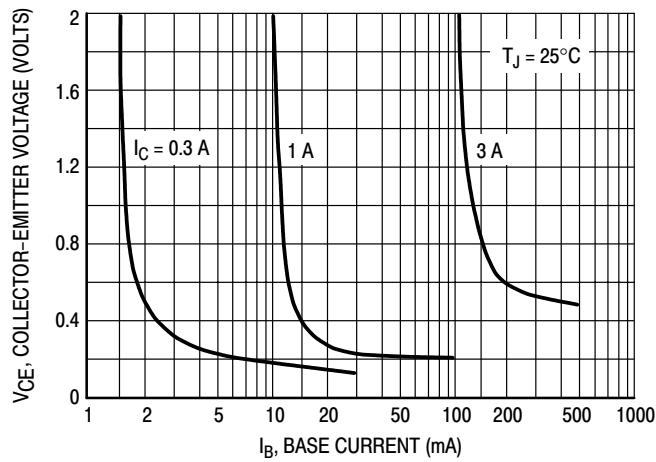


Figure 7. Collector Saturation Region

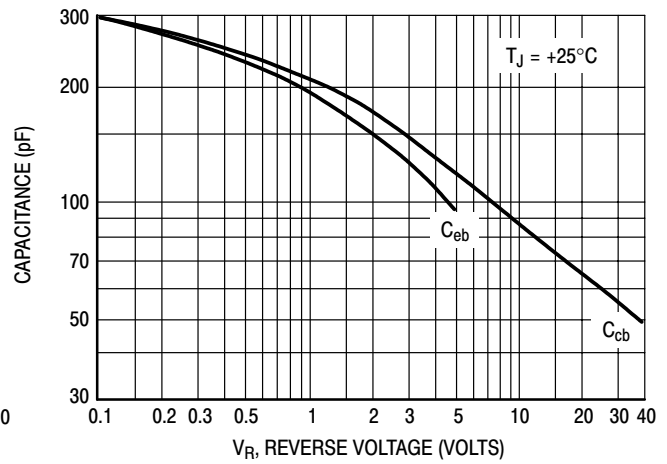


Figure 8. Capacitance

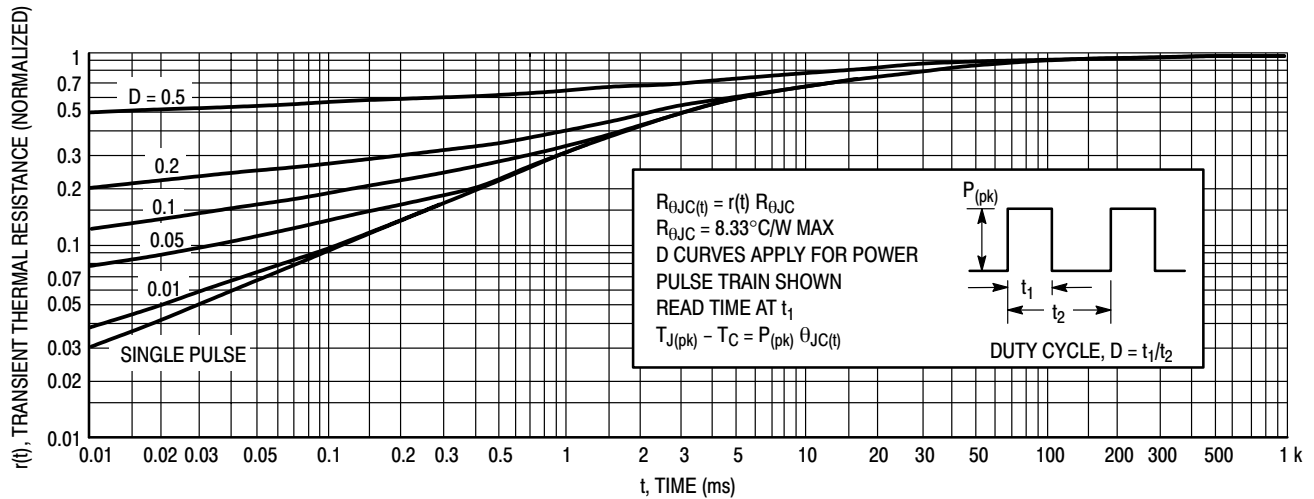


Figure 9. Thermal Response

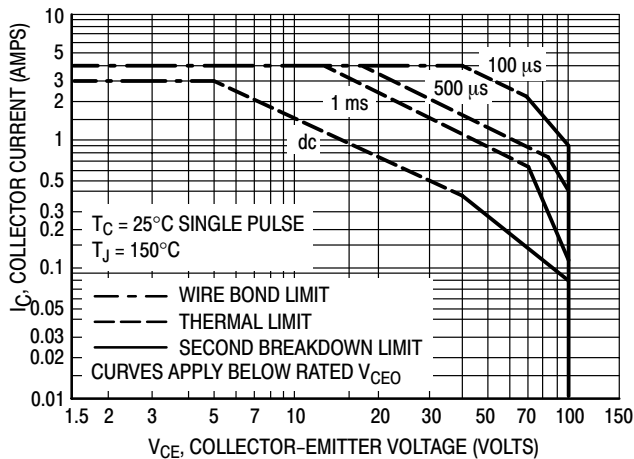


Figure 10. Active Region Safe Operating Area

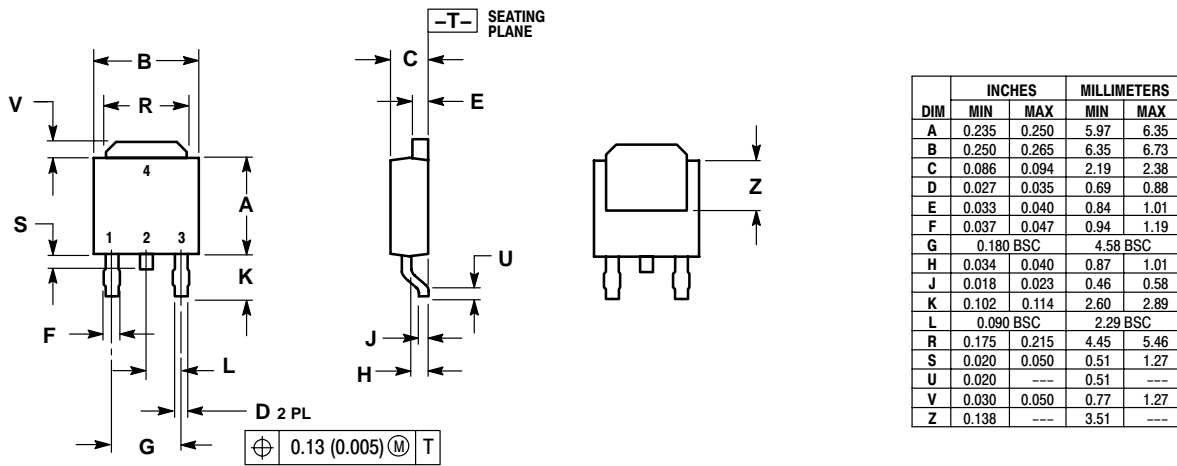
There are two limitations on the power handling ability of a transistor: average junction temperature and second breakdown. Safe operating area curves indicate  $I_C - V_{CE}$  limits of the transistor that must be observed for reliable operation; i.e., the transistor must not be subjected to greater dissipation than the curves indicate.

The data of Figure 10 is based on  $T_{J(pk)} = 150^\circ\text{C}$ ;  $T_C$  is variable depending on conditions. Second breakdown pulse limits are valid for duty cycles to 10% provided  $T_{J(pk)} \leq 150^\circ\text{C}$ .  $T_{J(pk)}$  may be calculated from the data in Figure 9. At high case temperatures, thermal limitations will reduce the power that can be handled to values less than the limitations imposed by second breakdown.

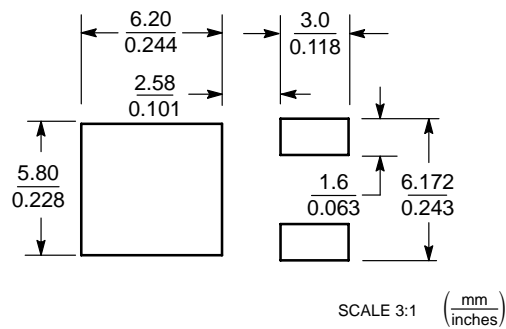
# MJD31C (NPN) MJD32C (PNP)

## PACKAGE DIMENSIONS

**DDAK-3**  
 CASE 369A-13  
 ISSUE AB



## SOLDERING FOOTPRINT\*



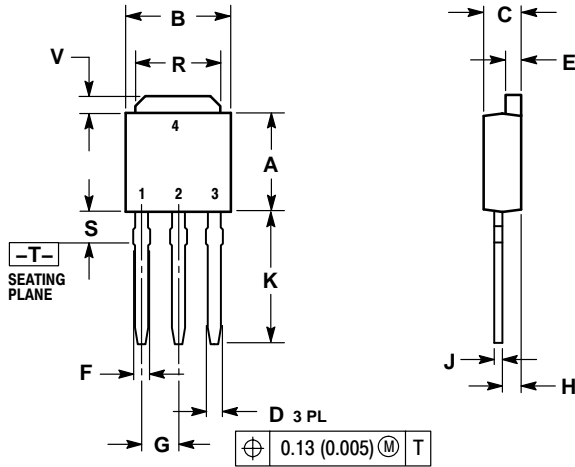
**Figure 11. DPAK**

\*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

# MJD31C (NPN) MJD32C (PNP)


## PACKAGE DIMENSIONS

### DKA-3 CASE 369-07 ISSUE M



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

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.235	0.250	5.97	6.35
B	0.250	0.265	6.35	6.73
C	0.086	0.094	2.19	2.38
D	0.027	0.035	0.69	0.88
E	0.033	0.040	0.84	1.01
F	0.037	0.047	0.94	1.19
G	0.090 BSC		2.29 BSC	
H	0.034	0.040	0.87	1.01
J	0.018	0.023	0.46	0.58
K	0.350	0.380	8.89	9.65
R	0.175	0.215	4.45	5.46
S	0.050	0.090	1.27	2.28
V	0.030	0.050	0.77	1.27

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