

# MTB55N06Z

Preferred Device

## Power MOSFET 55 Amps, 60 Volts N-Channel D<sup>2</sup>PAK

This Power MOSFET is designed to withstand high energy in the avalanche mode and switch efficiently. This high energy device also offers a drain-to-source diode with fast recovery time. Designed for high voltage, high speed switching applications in power supplies, PWM motor controls and other inductive loads, the avalanche energy capability is specified to eliminate the guesswork in designs where inductive loads are switched and offer additional safety margin against unexpected voltage transients.

- Avalanche Energy Capability Specified at Elevated Temperature
- Source-to-Drain Diode Recovery Time Comparable to a Discrete Fast Recovery Diode
- Low Stored Gate Charge for Efficient Switching
- Internal Source-to-Drain Diode Designed to Replace External Zener Transient Suppressor—Absorbs High Energy in the Avalanche Mode
- ESD Protected. Designed to Typically Withstand 400 V Machine Model and 4000 V Human Body Model.

### MAXIMUM RATINGS ( $T_J = 25^\circ\text{C}$ unless otherwise noted)

Rating	Symbol	Value	Unit
Drain-to-Source Voltage	$V_{DS}$	60	Vdc
Drain-to-Gate Voltage ( $R_{GS} = 1.0\text{ M}\Omega$ )	$V_{DGR}$	60	Vdc
Gate-to-Source Voltage <ul style="list-style-type: none"><li>– Continuous</li><li>– Non-Repetitive (<math>t_p \leq 10\text{ ms}</math>)</li></ul>	$V_{GS}$ $V_{GSM}$	$\pm 20$ $\pm 40$	Vdc Vpk
Drain Current <ul style="list-style-type: none"><li>– Continuous @ <math>T_C = 25^\circ\text{C}</math></li><li>– Continuous @ <math>T_C = 100^\circ\text{C}</math></li><li>– Single Pulse (<math>t_p \leq 10\text{ }\mu\text{s}</math>)</li></ul>	$I_D$ $I_D$ $I_{DM}$	55 35.5 165	Adc Adc Apk
Total Power Dissipation @ $T_C = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$ Total Power Dissipation @ $T_A = 25^\circ\text{C}$ (Note NO TAG)	$P_D$	113 0.91 2.5	Watts W/ $^\circ\text{C}$
Operating and Storage Temperature Range	$T_J, T_{stg}$	$-55$ to $150$	$^\circ\text{C}$
Single Pulse Drain-to-Source Avalanche Energy – Starting $T_J = 25^\circ\text{C}$ ( $V_{DD} = 25\text{ Vdc}$ , $V_{DS} = 60\text{ Vdc}$ , $V_{GS} = 10\text{ Vdc}$ , Peak $I_L = 55\text{ Apk}$ , $L = 0.3\text{ mH}$ , $R_G = 25\text{ }\Omega$ )	$E_{AS}$	454	mJ
Thermal Resistance <ul style="list-style-type: none"><li>– Junction to Case</li><li>– Junction to Ambient</li><li>– Junction to Ambient (Note NO TAG)</li></ul>	$R_{\theta JC}$ $R_{\theta JC}$ $R_{\theta JA}$	1.1 62.5 50	$^\circ\text{C/W}$
Maximum Lead Temperature for Soldering Purposes, 1/8" from case for 10 seconds	$T_L$	260	$^\circ\text{C}$

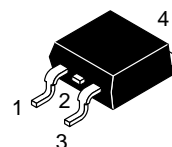
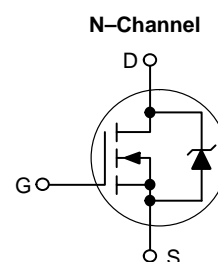
1. When surface mounted to an FR4 board using the minimum recommended pad size.



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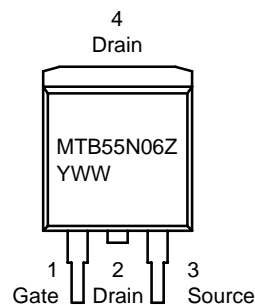
<http://onsemi.com>

**55 AMPERES  
60 VOLTS  
 $R_{DS(on)} = 18\text{ m}\Omega$**



**D2PAK  
CASE 418B  
STYLE 2**

### MARKING DIAGRAM & PIN ASSIGNMENT



MTB55N06Z = Device Code  
Y = Year  
WW = Work Week

### ORDERING INFORMATION

Device	Package	Shipping
MTB55N06Z	D2PAK	50 Units/Rail
MTB55N06ZT4	D2PAK	800/Tape & Reel

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

# MTB55N06Z

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

Characteristic	Symbol	Min	Typ	Max	Unit
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### OFF CHARACTERISTICS

Drain-to-Source Breakdown Voltage (V <sub>GS</sub> = 0 Vdc, I <sub>D</sub> = 250 $\mu$ Adc) Temperature Coefficient (Positive)	V <sub>(BR)DSS</sub>	60 –	– 53	– –	Vdc mV/°C
Zero Gate Voltage Drain Current (V <sub>DS</sub> = 60 Vdc, V <sub>GS</sub> = 0 Vdc) (V <sub>DS</sub> = 60 Vdc, V <sub>GS</sub> = 0 Vdc, T <sub>J</sub> = 125°C)	I <sub>DSS</sub>	– –	– –	1.0 10	$\mu$ Adc
Gate-Body Leakage Current (V <sub>GS</sub> = $\pm$ 20 Vdc, V <sub>DS</sub> = 0 Vdc)	I <sub>GSS</sub>	–	–	100	nAdc

### ON CHARACTERISTICS (Note 2.)

Gate Threshold Voltage (V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250 $\mu$ Adc) Threshold Temperature Coefficient (Negative)	V <sub>GS(th)</sub>	2.0 –	3.0 6.0	4.0 –	Vdc mV/°C
Static Drain-to-Source On-Resistance (V <sub>GS</sub> = 10 Vdc, I <sub>D</sub> = 27.5 Adc)	R <sub>DS(on)</sub>	–	14	18	m $\Omega$
Drain-to-Source On-Voltage (V <sub>GS</sub> = 10 Vdc) (I <sub>D</sub> = 55 Adc) (I <sub>D</sub> = 27.5 Adc, T <sub>J</sub> = 125°C)	V <sub>DS(on)</sub>	– –	0.825 0.74	1.2 1.0	Vdc
Forward Transconductance (V <sub>DS</sub> = 4.0 Vdc, I <sub>D</sub> = 27.5 Adc)	g <sub>FS</sub>	12	15	–	Mhos

### DYNAMIC CHARACTERISTICS

Input Capacitance	(V <sub>DS</sub> = 25 Vdc, V <sub>GS</sub> = 0 Vdc, f = 1.0 MHz)	C <sub>iss</sub>	–	1390	1950	pF
Output Capacitance		C <sub>oss</sub>	–	520	730	
Transfer Capacitance		C <sub>rss</sub>	–	119	238	

### SWITCHING CHARACTERISTICS (Note 3.)

Turn-On Delay Time	(V <sub>DD</sub> = 30 Vdc, I <sub>D</sub> = 55 Adc, V <sub>GS(on)</sub> = 10 Vdc, R <sub>G</sub> = 9.1 $\Omega$ )	t <sub>d(on)</sub>	–	27	54	ns
Rise Time		t <sub>r</sub>	–	157	314	
Turn-Off Delay Time		t <sub>d(off)</sub>	–	116	232	
Fall Time		t <sub>f</sub>	–	126	252	
Gate Charge (See Figure 8)	(V <sub>DS</sub> = 48 Vdc, I <sub>D</sub> = 55 Adc, V <sub>GS</sub> = 10 Vdc)	Q <sub>T</sub>	–	40	56	nC
		Q <sub>1</sub>	–	7.0	–	
		Q <sub>2</sub>	–	18	–	
		Q <sub>3</sub>	–	15	–	

### SOURCE-DRAIN DIODE CHARACTERISTICS

Forward On-Voltage	(I <sub>S</sub> = 55 Adc, V <sub>GS</sub> = 0 Vdc) (I <sub>S</sub> = 55 Adc, V <sub>GS</sub> = 0 Vdc, T <sub>J</sub> = 125°C)	V <sub>SD</sub>	– –	0.93 0.82	1.1 –	Vdc
Reverse Recovery Time	(I <sub>S</sub> = 55 Adc, V <sub>GS</sub> = 0 Vdc, dI <sub>S</sub> /dt = 100 A/ $\mu$ s)	t <sub>rr</sub>	–	57	–	ns
		t <sub>a</sub>	–	32	–	
		t <sub>b</sub>	–	25	–	
Reverse Recovery Stored Charge		Q <sub>RR</sub>	–	0.11	–	$\mu$ C

### INTERNAL PACKAGE INDUCTANCE

Internal Drain Inductance (Measured from contact screw on tab to center of die) (Measured from drain lead 0.25" from package to center of die)	L <sub>D</sub>	– –	3.5 4.5	– –	nH
Internal Source Inductance (Measured from the source lead 0.25" from package to source bond pad)	L <sub>S</sub>	–	7.5	–	

2. Pulse Test: Pulse Width  $\leq$  300  $\mu$ s, Duty Cycle  $\leq$  2%.
3. Switching characteristics are independent of operating junction temperature.

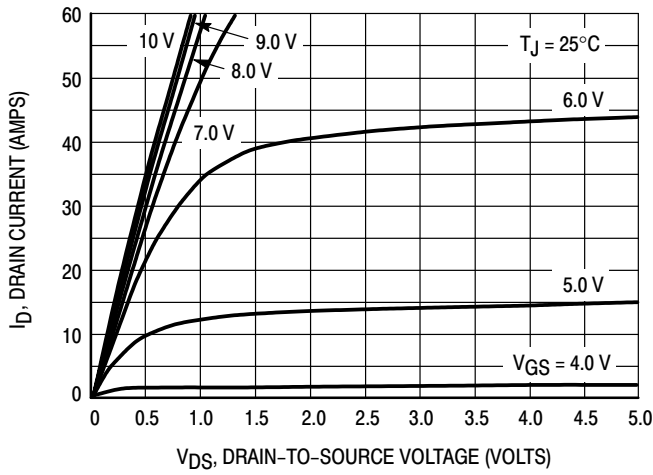


Figure 1. On-Region Characteristics

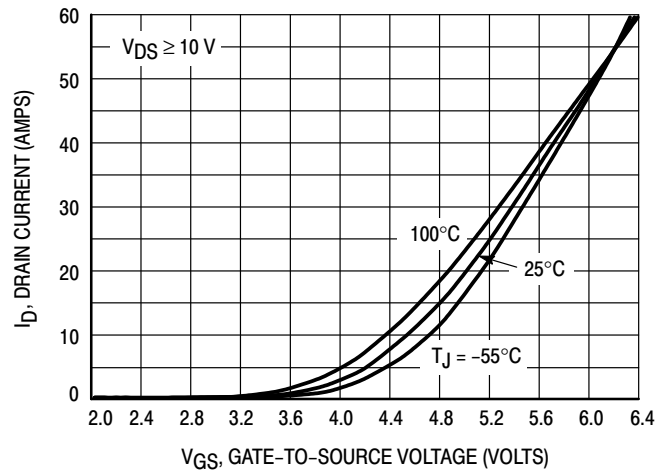


Figure 2. Transfer Characteristics

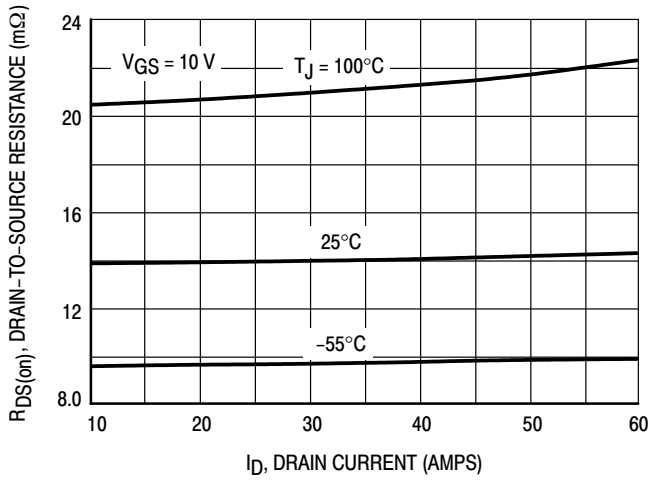


Figure 3. On-Resistance versus Drain Current and Temperature

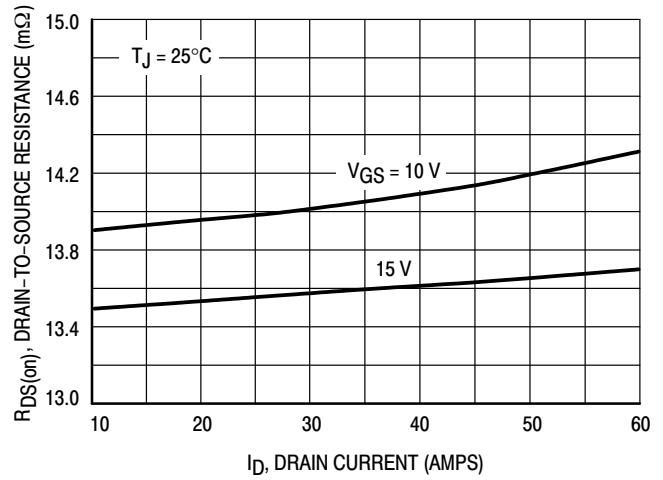


Figure 4. On-Resistance versus Drain Current and Gate Voltage

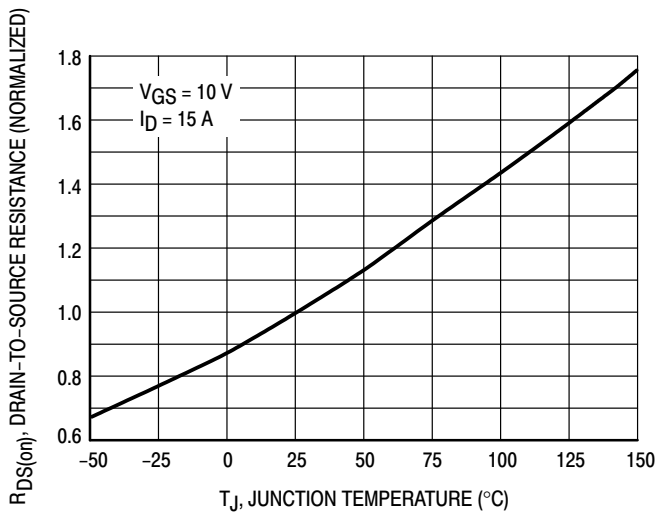


Figure 5. On-Resistance Variation with Temperature

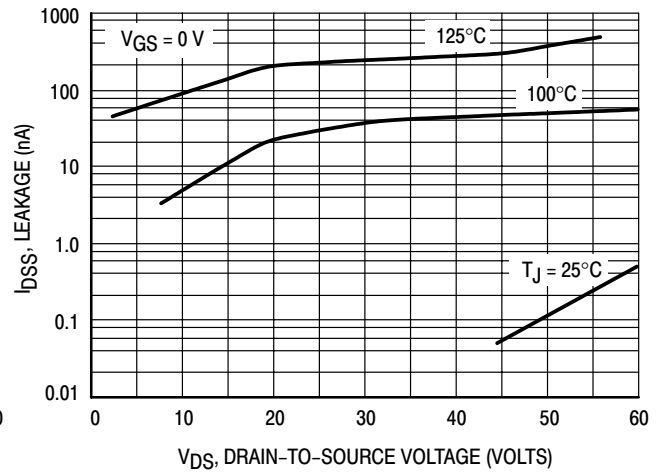


Figure 6. Drain-to-Source Leakage Current versus Voltage

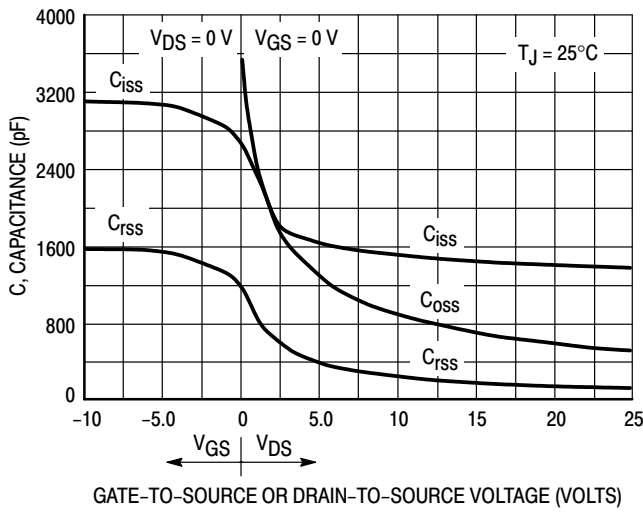


Figure 7. Capacitance Variation

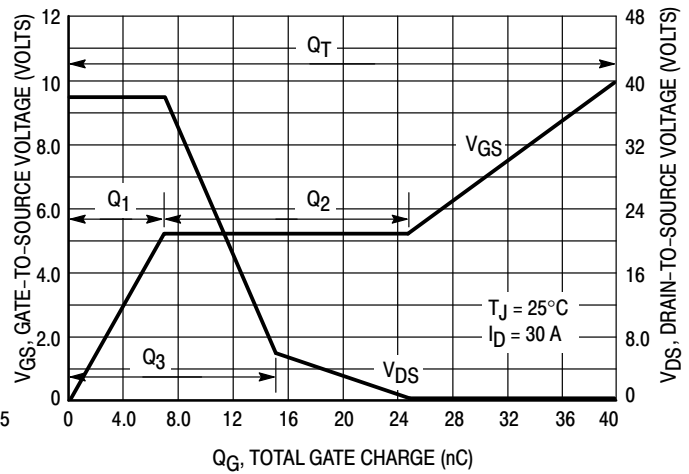


Figure 8. Gate-to-Source and Drain-to-Source Voltage versus Total Charge

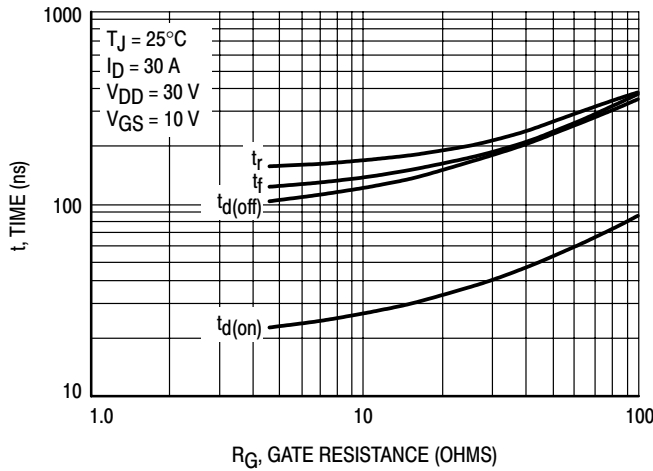


Figure 9. Resistive Switching Time Variation versus Gate Resistance

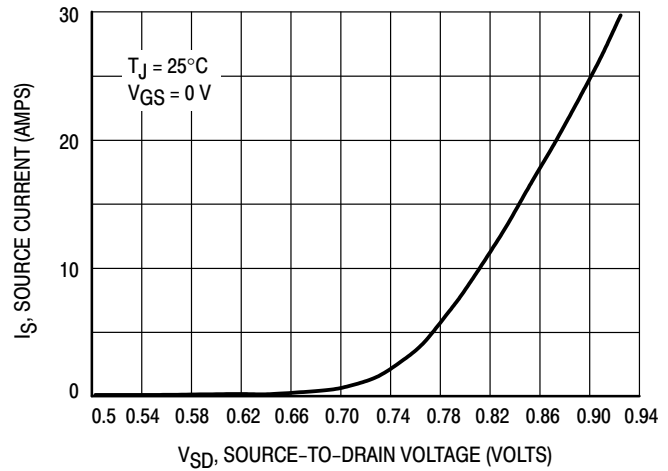


Figure 10. Diode Forward Voltage versus Current

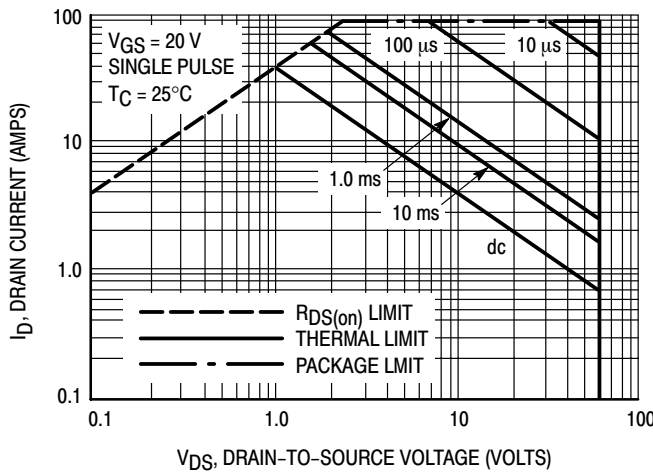


Figure 11. Maximum Rated Forward Biased Safe Operating Area

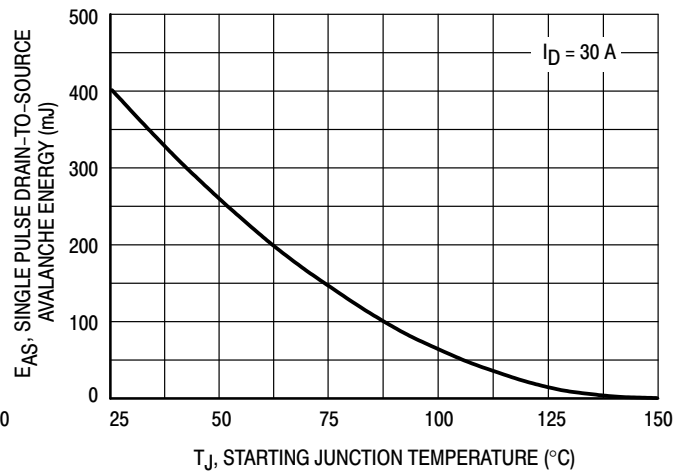


Figure 12. Maximum Avalanche Energy versus Starting Junction Temperature

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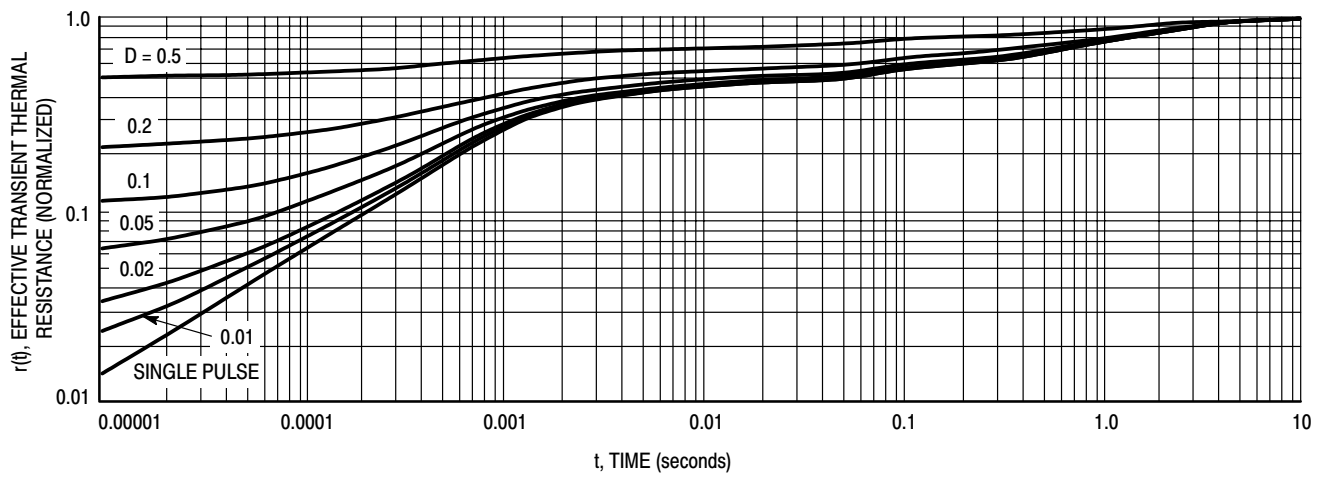
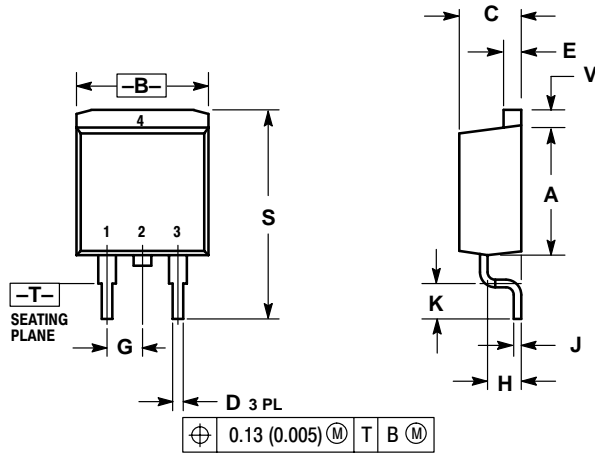


Figure 13. Thermal Response

# MTB55N06Z

## PACKAGE DIMENSIONS

**D2PAK**  
CASE 418B-03  
ISSUE D



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

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.340	0.380	8.64	9.65
B	0.380	0.405	9.65	10.29
C	0.160	0.190	4.06	4.83
D	0.020	0.035	0.51	0.89
E	0.045	0.055	1.14	1.40
G	0.100 BSC		2.54 BSC	
H	0.080	0.110	2.03	2.79
J	0.018	0.025	0.46	0.64
K	0.090	0.110	2.29	2.79
S	0.575	0.625	14.60	15.88
V	0.045	0.055	1.14	1.40

STYLE 2:  
PIN 1. GATE  
2. DRAIN  
3. SOURCE  
4. DRAIN

## **Notes**

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