

# NTF3055-160

Preferred Device

## Power MOSFET 2.0 Amps, 60 Volts N-Channel SOT-223

Designed for low voltage, high speed switching applications in power supplies, converters and power motor controls and bridge circuits.

### Applications

- Power Supplies
- Converters
- Power Motor Controls
- Bridge Circuits

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

Rating	Symbol	Value	Unit
Drain-to-Source Voltage	$V_{DSS}$	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>	$V_{GS}$	$\pm 20$ $\pm 30$	Vdc Vpk
Drain Current <ul style="list-style-type: none"><li>– Continuous @ <math>T_A = 25^\circ\text{C}</math></li><li>– Continuous @ <math>T_A = 100^\circ\text{C}</math></li><li>– Single Pulse (<math>t_p \leq 10\text{ }\mu\text{s}</math>)</li></ul>	$I_D$ $I_D$ $I_{DM}$	2.0 1.2 6.0	Adc Adc Apk
Total Power Dissipation @ $T_A = 25^\circ\text{C}$ (Note 1.) Total Power Dissipation @ $T_A = 25^\circ\text{C}$ (Note 2.) Derate above $25^\circ\text{C}$	$P_D$	2.1 1.3 0.014	W W W/ $^\circ\text{C}$
Operating and Storage Temperature Range	$T_J, T_{stg}$	$-55$ to $175$	$^\circ\text{C}$
Single Pulse Drain-to-Source Avalanche Energy – Starting $T_J = 25^\circ\text{C}$ ( $V_{DD} = 25\text{ Vdc}$ , $V_{GS} = 10\text{ Vdc}$ , $I_L(\text{pk}) = 6.0\text{ Apk}$ , $L = 10\text{ mH}$ , $V_{DS} = 60\text{ Vdc}$ )	$E_{AS}$	65	mJ
Thermal Resistance <ul style="list-style-type: none"><li>– Junction to Ambient (Note 1.)</li><li>– Junction to Ambient (Note 2.)</li></ul>	$R_{\theta JA}$ $R_{\theta JA}$	72.3 114	$^\circ\text{C/W}$
Maximum Lead Temperature for Soldering Purposes, $1/8''$ from case for 10 seconds	$T_L$	260	$^\circ\text{C}$

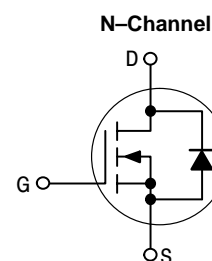
1. When surface mounted to an FR4 board using  $1''$  pad size, (Cu. Area  $1.127\text{ in}^2$ ).
2. When surface mounted to an FR4 board using minimum recommended pad size, 2–2.4 oz. (Cu. Area  $0.272\text{ in}^2$ ).



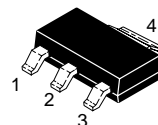
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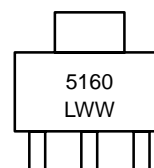
**2.0 AMPERES  
60 VOLTS  
 $R_{DS(on)} = 160\text{ m}\Omega$**



### MARKING DIAGRAM

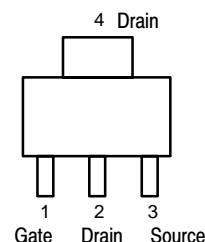


**SOT-223  
CASE 318E  
STYLE 3**



5160 = Device Code  
L = Location Code  
WW = Work Week

### PIN ASSIGNMENT



### ORDERING INFORMATION

Device	Package	Shipping
NTF3055-160T1	SOT-223	1000 Tape & Reel
NTF3055-160T3	SOT-223	4000 Tape & Reel
NTF3055-160T3LF	SOT-223	4000 Tape & Reel

**ELECTRICAL CHARACTERISTICS** ( $T_A = 25^\circ\text{C}$  unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
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**OFF CHARACTERISTICS**

Drain-to-Source Breakdown Voltage (Note 3.) ( $V_{GS} = 0\text{ Vdc}$ , $I_D = 250\text{ }\mu\text{Adc}$ ) Temperature Coefficient (Positive)	$V_{(BR)DSS}$	60 –	72 72	– –	Vdc mV/ $^\circ\text{C}$
Zero Gate Voltage Drain Current ( $V_{DS} = 60\text{ Vdc}$ , $V_{GS} = 0\text{ Vdc}$ ) ( $V_{DS} = 60\text{ Vdc}$ , $V_{GS} = 0\text{ Vdc}$ , $T_J = 150^\circ\text{C}$ )	$I_{DSS}$	– –	– –	1.0 10	$\mu\text{Adc}$
Gate-Body Leakage Current ( $V_{GS} = \pm 20\text{ Vdc}$ , $V_{DS} = 0\text{ Vdc}$ )	$I_{GSS}$	–	–	$\pm 100$	nAdc

**ON CHARACTERISTICS** (Note 3.)

Gate Threshold Voltage (Note 3.) ( $V_{DS} = V_{GS}$ , $I_D = 250\text{ }\mu\text{Adc}$ ) Threshold Temperature Coefficient (Negative)	$V_{GS(th)}$	2.0 –	3.1 6.6	4.0 –	Vdc mV/ $^\circ\text{C}$
Static Drain-to-Source On-Resistance (Note 3.) ( $V_{GS} = 10\text{ Vdc}$ , $I_D = 1.0\text{ Adc}$ )	$R_{DS(on)}$	–	142	160	m $\Omega$
Static Drain-to-Source On-Resistance (Note 3.) ( $V_{GS} = 10\text{ Vdc}$ , $I_D = 2.0\text{ Adc}$ ) ( $V_{GS} = 10\text{ Vdc}$ , $I_D = 1.0\text{ Adc}$ , $T_J = 150^\circ\text{C}$ )	$V_{DS(on)}$	–	0.142 0.270	0.384 –	Vdc
Forward Transconductance (Note 3.) ( $V_{DS} = 8.0\text{ Vdc}$ , $I_D = 1.5\text{ Adc}$ )	$g_{fs}$	–	1.8	–	Mhos

**DYNAMIC CHARACTERISTICS**

Input Capacitance	$(V_{DS} = 25\text{ Vdc}$ , $V_{GS} = 0\text{ V}$ , $f = 1.0\text{ MHz}$ )	$C_{iss}$	–	200	280	pF
Output Capacitance		$C_{oss}$	–	68	100	
Transfer Capacitance		$C_{rss}$	–	26	40	

**SWITCHING CHARACTERISTICS** (Note 4.)

Turn-On Delay Time	$(V_{DD} = 30\text{ Vdc}$ , $I_D = 2.0\text{ Adc}$ , $V_{GS} = 10\text{ Vdc}$ , $R_G = 9.1\text{ }\Omega$ ) (Note 3.)	$t_{d(on)}$	–	9.2	20	ns
Rise Time		$t_r$	–	9.2	20	
Turn-Off Delay Time		$t_{d(off)}$	–	16	40	
Fall Time		$t_f$	–	9.2	20	
Gate Charge	$(V_{DS} = 48\text{ Vdc}$ , $I_D = 2.0\text{ Adc}$ , $V_{GS} = 10\text{ Vdc}$ ) (Note 3.)	$Q_T$	–	6.9	14	nC
		$Q_1$	–	1.4	–	
		$Q_2$	–	3.0	–	

**SOURCE-DRAIN DIODE CHARACTERISTICS**

Forward On-Voltage	$(I_S = 2.0\text{ Adc}$ , $V_{GS} = 0\text{ Vdc}$ ) $(I_S = 2.0\text{ Adc}$ , $V_{GS} = 0\text{ Vdc}$ , $T_J = 150^\circ\text{C}$ ) (Note 3.)	$V_{SD}$	– –	0.86 0.70	1.0 –	Vdc
Reverse Recovery Time	$(I_S = 2.0\text{ Adc}$ , $V_{GS} = 0\text{ Vdc}$ , $dI_S/dt = 100\text{ A}/\mu\text{s}$ ) (Note 3.)	$t_{rr}$	–	28.9	–	ns
		$t_a$	–	19.1	–	
		$t_b$	–	9.8	–	
Reverse Recovery Stored Charge		$Q_{RR}$	–	0.030	–	$\mu\text{C}$

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

4. Switching characteristics are independent of operating junction temperatures.

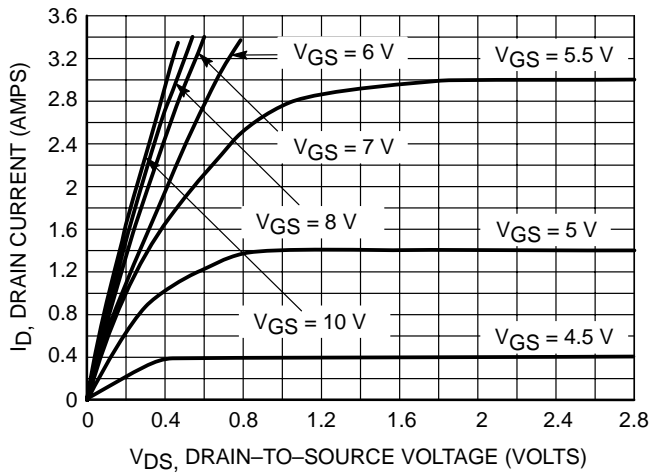


Figure 1. On-Region Characteristics

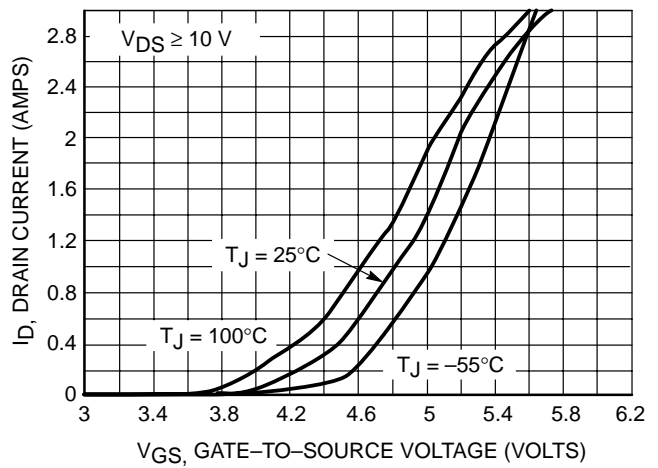


Figure 2. Transfer Characteristics

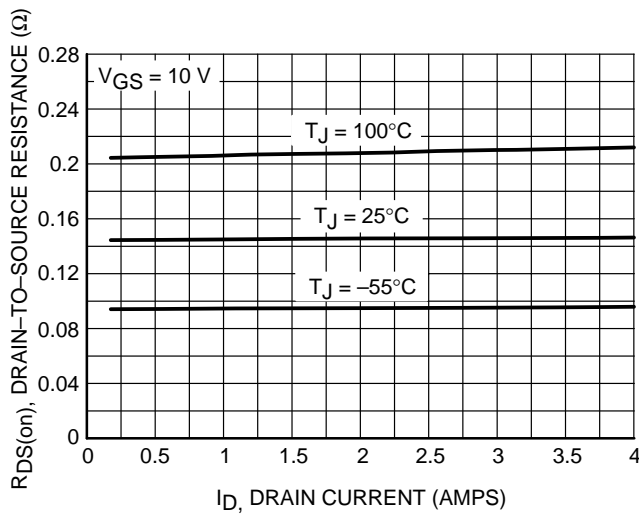


Figure 3. On-Resistance versus Gate-to-Source Voltage

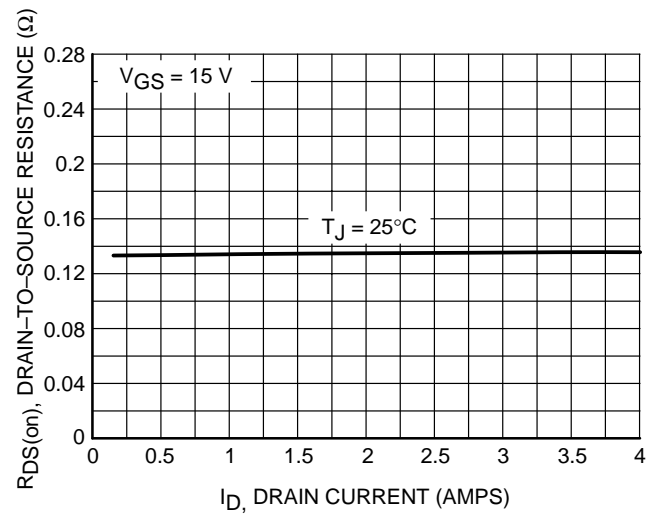


Figure 4. On-Resistance versus Drain Current and Gate Voltage

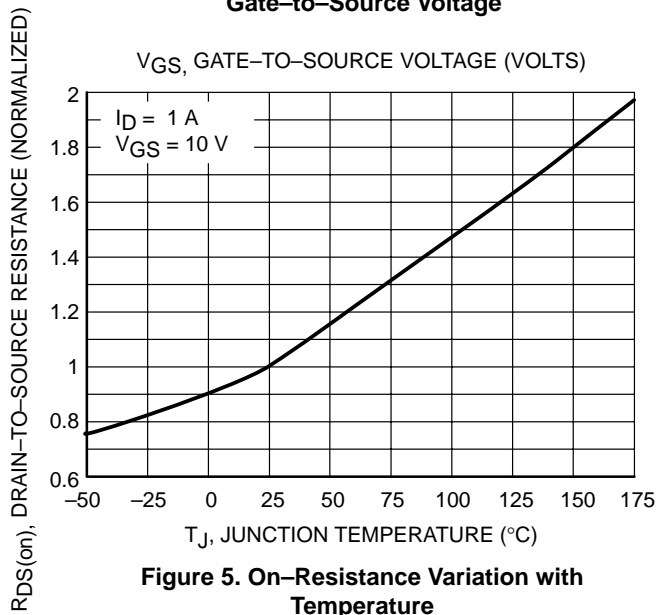


Figure 5. On-Resistance Variation with Temperature

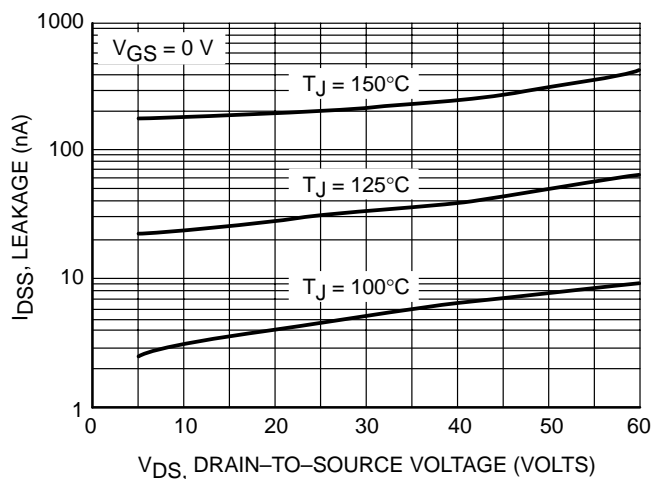


Figure 6. Drain-to-Source Leakage Current versus Voltage

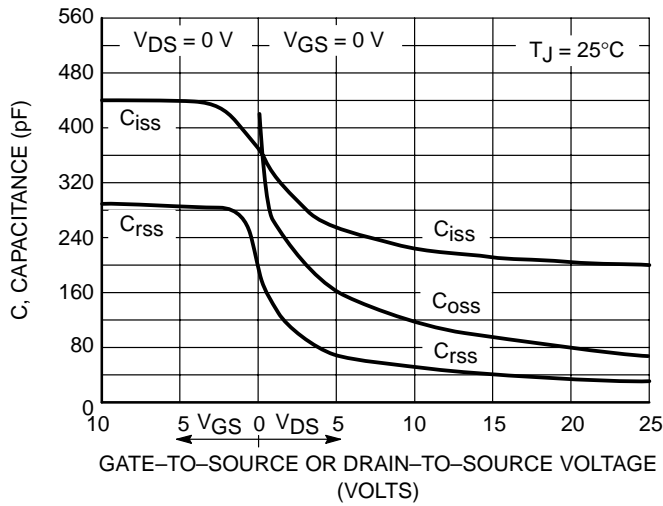


Figure 7. Capacitance Variation

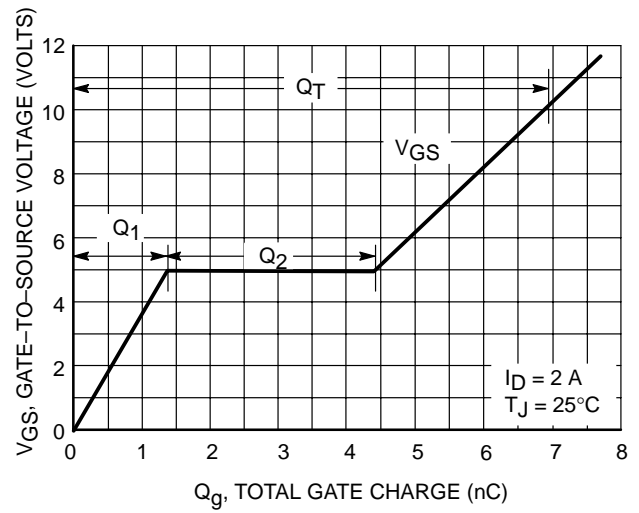


Figure 8. Gate-to-Source and Drain-to-Source Voltage versus Total Charge

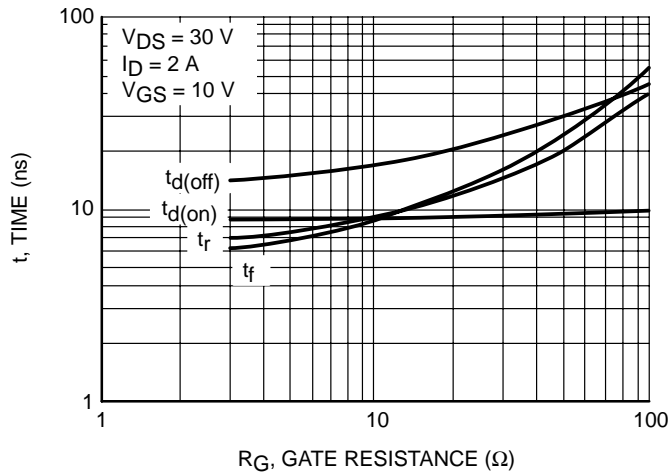


Figure 9. Resistive Switching Time Variation versus Gate Resistance

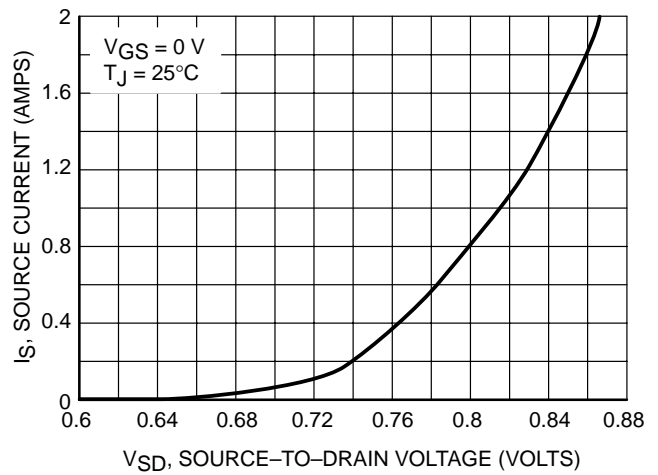


Figure 10. Diode Forward Voltage versus Current

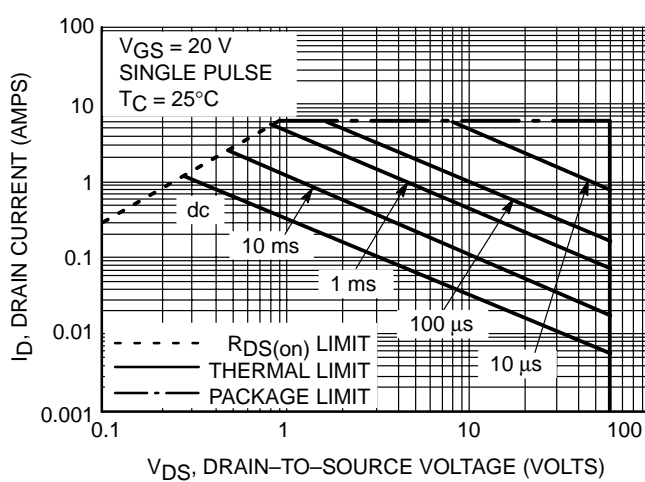


Figure 11. Maximum Rated Forward Biased Safe Operating Area

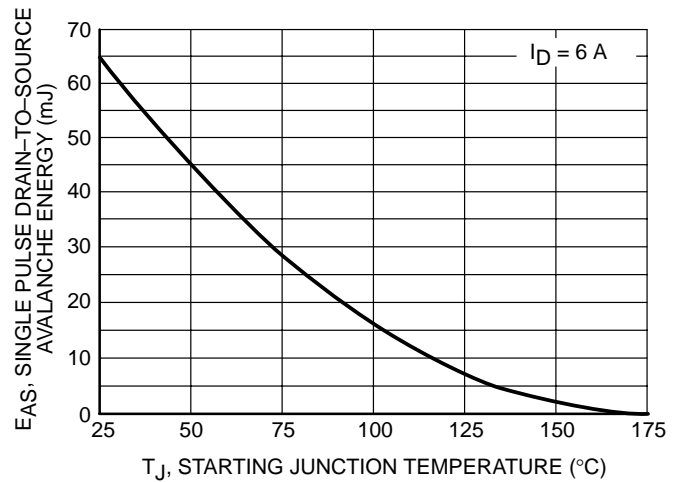


Figure 12. Maximum Avalanche Energy versus Starting Junction Temperature

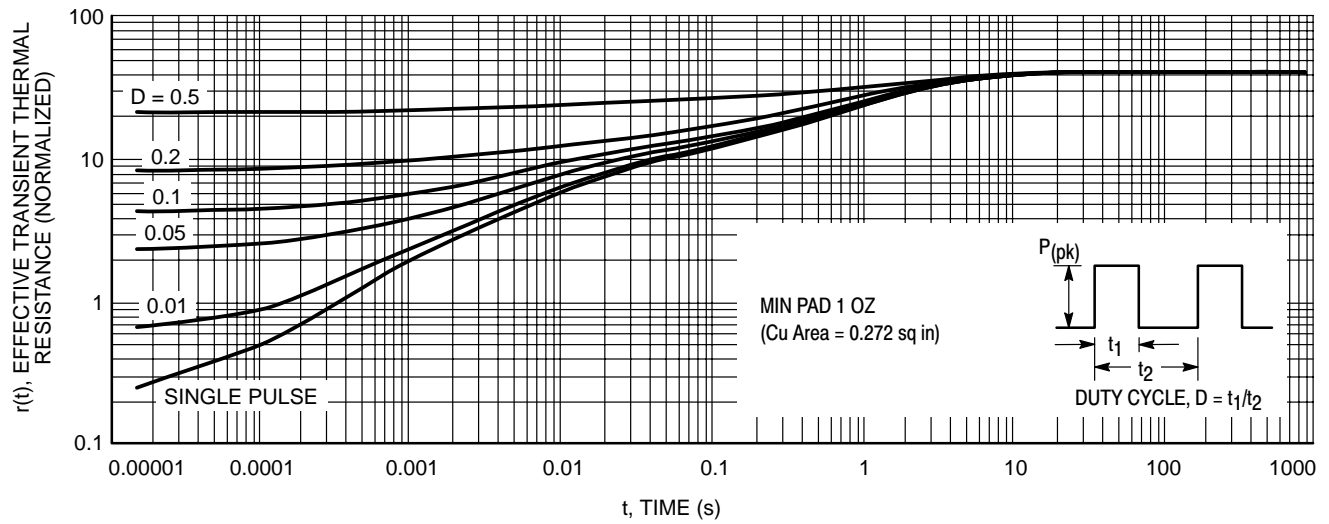
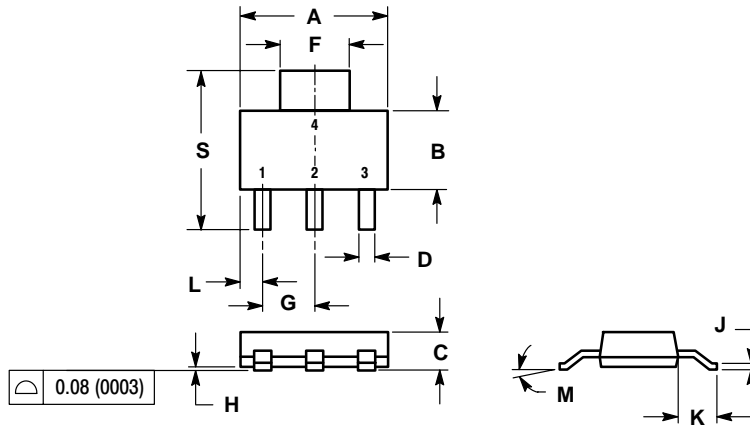


Figure 13. Thermal Response

# NTF3055-160

## PACKAGE DIMENSIONS

SOT-223 (TO-261)  
CASE 318E-04  
ISSUE K



### NOTES:


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

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.249	0.263	6.30	6.70
B	0.130	0.145	3.30	3.70
C	0.060	0.068	1.50	1.75
D	0.024	0.035	0.60	0.89
F	0.115	0.126	2.90	3.20
G	0.087	0.094	2.20	2.40
H	0.0008	0.0040	0.020	0.100
J	0.009	0.014	0.24	0.35
K	0.060	0.078	1.50	2.00
L	0.033	0.041	0.85	1.05
M	0 °	10 °	0 °	10 °
S	0.264	0.287	6.70	7.30

### STYLE 3:

- PIN 1. GATE  
2. DRAIN  
3. SOURCE  
4. DRAIN

## **Notes**

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