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# NTF3055-160

# 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°C unless otherwise noted)

| Rating | Symbol | Value | Unit |
|---|---|---|---|
| Drain–to–Source Voltage | $V_{DSS}$ | 60 | Vdc |
| Drain–to–Gate Voltage ($R_{GS}$ = 1.0 MΩ) | $V_{DGR}$ | 60 | Vdc |
| Gate–to–Source Voltage <br> – Continuous <br> – Non–repetitive ($t_p \leq$ 10 ms) | $V_{GS}$ | ± 20 <br> ± 30 | Vdc <br> Vpk |
| Drain Current <br> – Continuous @ $T_A$ = 25°C <br> – Continuous @ $T_A$ = 100°C <br> – Single Pulse ($t_p \leq$ 10 μs) | $I_D$ <br> $I_D$ <br> $I_{DM}$ | 2.0 <br> 1.2 <br> 6.0 | Adc <br><br> Apk |
| Total Power Dissipation @ $T_A$ = 25°C (Note 1.) <br> Total Power Dissipation @ $T_A$ = 25°C (Note 2.) <br> Derate above 25°C | $P_D$ | 2.1 <br> 1.3 <br> 0.014 | W <br> W <br> W/°C |
| Operating and Storage Temperature Range | $T_J$, $T_{stg}$ | −55 to 175 | °C |
| Single Pulse Drain–to–Source Avalanche Energy – Starting $T_J$ = 25°C <br> ($V_{DD}$ = 25 Vdc, $V_{GS}$ = 10 Vdc, <br> $I_L$(pk) = 6.0 Apk, L = 10 mH, $V_{DS}$ = 60 Vdc) | $E_{AS}$ | 65 | mJ |
| Thermal Resistance <br> – Junction to Ambient (Note 1.) <br> – Junction to Ambient (Note 2.) | <br> $R_{\theta JA}$ <br> $R_{\theta JA}$ | <br> 72.3 <br> 114 | °C/W |
| Maximum Lead Temperature for Soldering Purposes, 1/8″ from case for 10 seconds | $T_L$ | 260 | °C |

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

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### 2.0 AMPERES
### 60 VOLTS
### $R_{DS(on)}$ = 160 mΩ

**N–Channel**
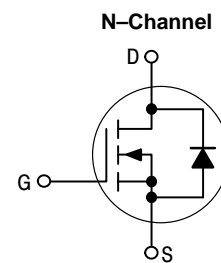


### MARKING DIAGRAM
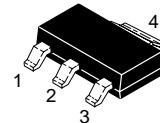


SOT–223 <br> CASE 318E <br> STYLE 3

```
5160
LWW
```
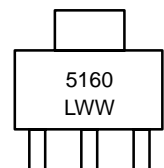
5160 = Device Code <br>
L = Location Code <br>
WW = Work Week

### PIN ASSIGNMENT



| 4 Drain |
| --- |

| 1 | 2 | 3 |
|---|---|---|
| Gate | Drain | Source |
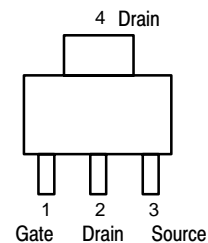
### ORDERING INFORMATION

| 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°C unless otherwise noted)

| Characteristic | Symbol | Min | Typ | Max | Unit |
|---|---|---|---|---|---|
| **OFF CHARACTERISTICS** | | | | | |
| Drain–to–Source Breakdown Voltage (Note 3.) | $V_{(BR)DSS}$ | | | | Vdc |
| ($V_{GS}$ = 0 Vdc, $I_D$ = 250 μAdc) | | 60 | 72 | – | |
| Temperature Coefficient (Positive) | | – | 72 | – | mV/°C |
| Zero Gate Voltage Drain Current | $I_{DSS}$ | | | | μAdc |
| ($V_{DS}$ = 60 Vdc, $V_{GS}$ = 0 Vdc) | | – | – | 1.0 | |
| ($V_{DS}$ = 60 Vdc, $V_{GS}$ = 0 Vdc, $T_J$ = 150°C) | | – | – | 10 | |
| Gate–Body Leakage Current    ($V_{GS}$ = ± 20 Vdc, $V_{DS}$ = 0 Vdc) | $I_{GSS}$ | – | – | ± 100 | nAdc |
| **ON CHARACTERISTICS** (Note 3.) | | | | | |
| Gate Threshold Voltage (Note 3.) | $V_{GS(th)}$ | | | | Vdc |
| ($V_{DS}$ = $V_{GS}$, $I_D$ = 250 μAdc) | | 2.0 | 3.1 | 4.0 | |
| Threshold Temperature Coefficient (Negative) | | – | 6.6 | – | mV/°C |
| Static Drain–to–Source On–Resistance (Note 3.) | $R_{DS(on)}$ | | | | mΩ |
| ($V_{GS}$ = 10 Vdc, $I_D$ = 1.0 Adc) | | – | 142 | 160 | |
| Static Drain–to–Source On–Resistance (Note 3.) | $V_{DS(on)}$ | | | | Vdc |
| ($V_{GS}$ = 10 Vdc, $I_D$ = 2.0 Adc) | | – | 0.142 | 0.384 | |
| ($V_{GS}$ = 10 Vdc, $I_D$ = 1.0 Adc, $T_J$ = 150°C) | | | 0.270 | – | |
| Forward Transconductance (Note 3.)        ($V_{DS}$ = 8.0 Vdc, $I_D$ = 1.5 Adc) | $g_{fs}$ | – | 1.8 | – | Mhos |
| **DYNAMIC CHARACTERISTICS** | | | | | |
| Input Capacitance | ($V_{DS}$ = 25 Vdc, $V_{GS}$ = 0 V, f = 1.0 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 Vdc, $I_D$ = 2.0 Adc, $V_{GS}$ = 10 Vdc, $R_G$ = 9.1 Ω) (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 Vdc, $I_D$ = 2.0 Adc, $V_{GS}$ = 10 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 Adc, $V_{GS}$ = 0 Vdc) ($I_S$ = 2.0 Adc, $V_{GS}$ = 0 Vdc, $T_J$ = 150°C) (Note 3.) | $V_{SD}$ | – | 0.86 | 1.0 | Vdc |
| | | | – | 0.70 | – | |
| Reverse Recovery Time | ($I_S$ = 2.0 Adc, $V_{GS}$ = 0 Vdc, $dI_S$/dt = 100 A/μs) (Note 3.) | $t_{rr}$ | – | 28.9 | – | ns |
| | | $t_a$ | – | 19.1 | – | |
| | | $t_b$ | – | 9.8 | – | |
| Reverse Recovery Stored Charge | | $Q_{RR}$ | – | 0.030 | – | μC |

3. Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2.0%.
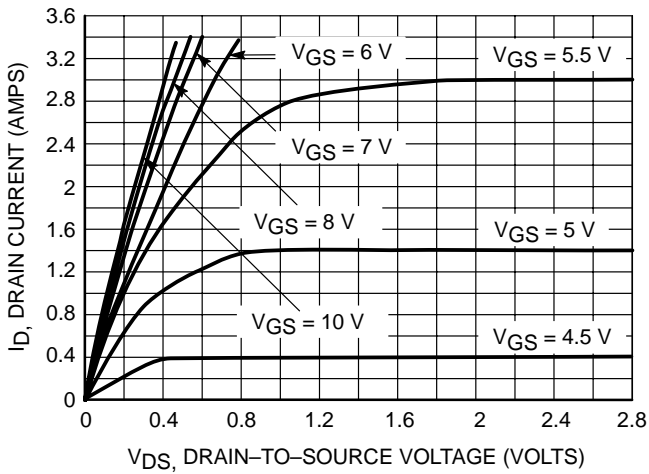4. Switching characteristics are independent of operating junction temperatures.
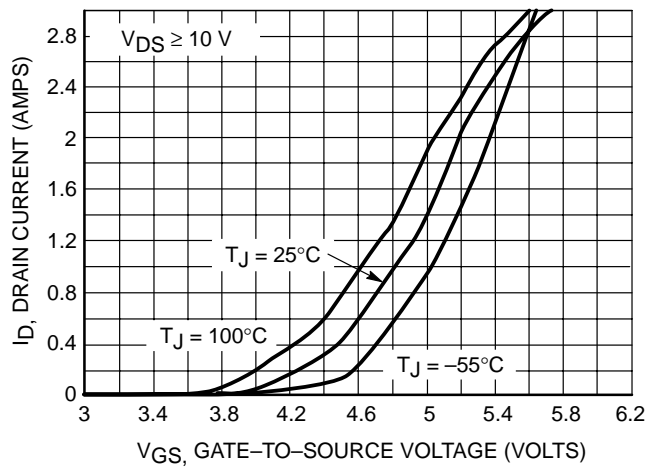
**Figure 1. On–Region Characteristics**

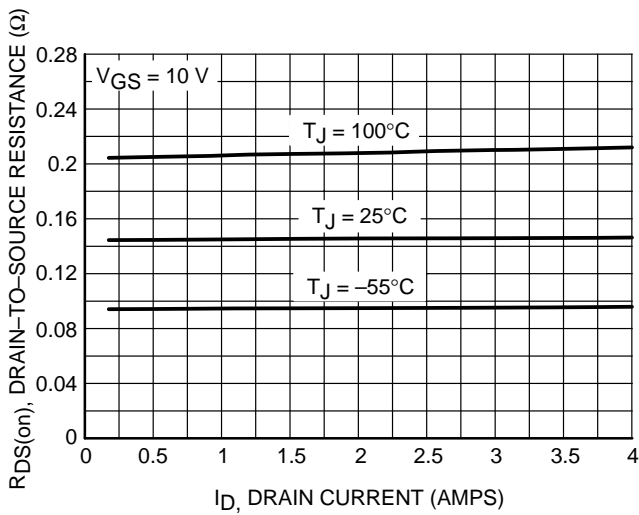

**Figure 2. Transfer Characteristics**



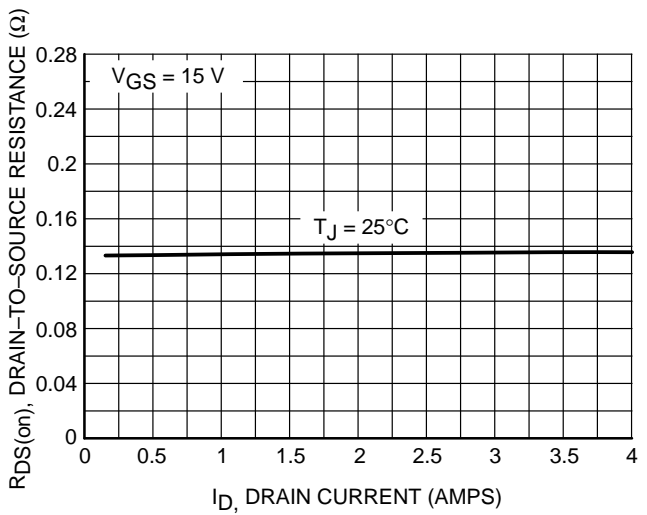**Figure 3. On–Resistance versus
Gate–to–Source Voltage**



**Figure 4. On–Resistance versus Drain Current
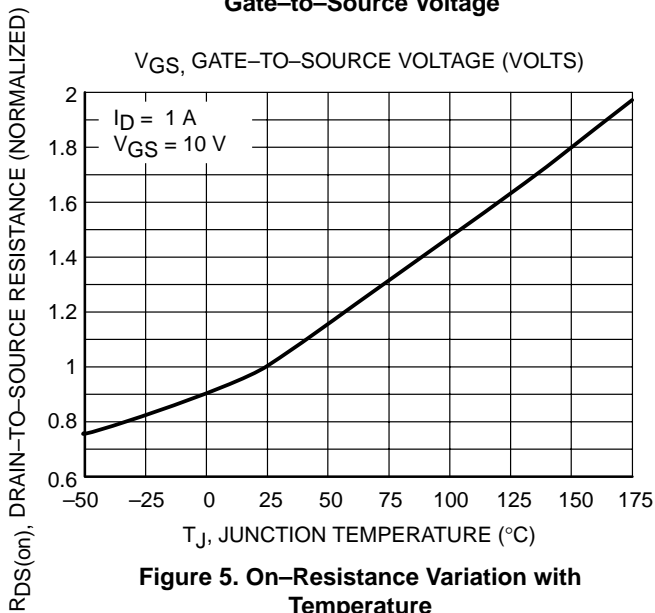and Gate Voltage**



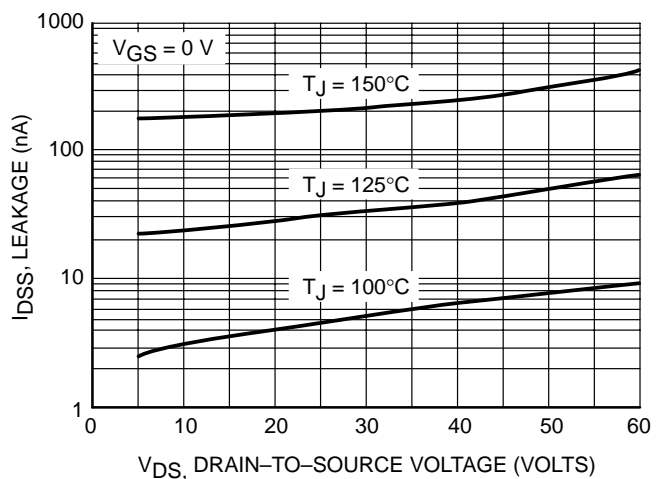**Figure 5. On–Resistance Variation with
Temperature**



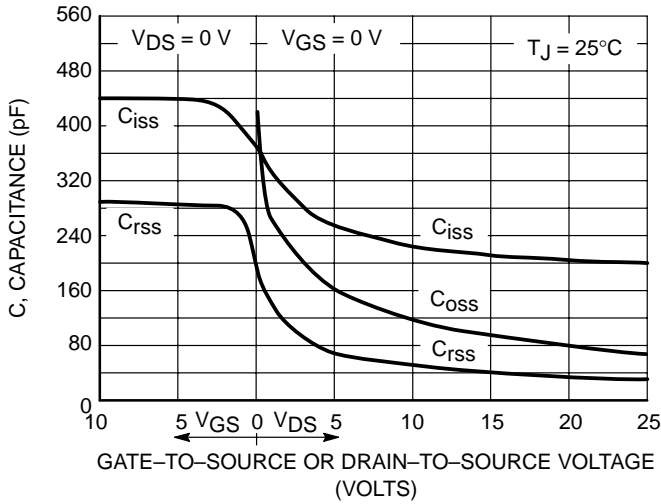**Figure 6. Drain–to–Source Leakage Current
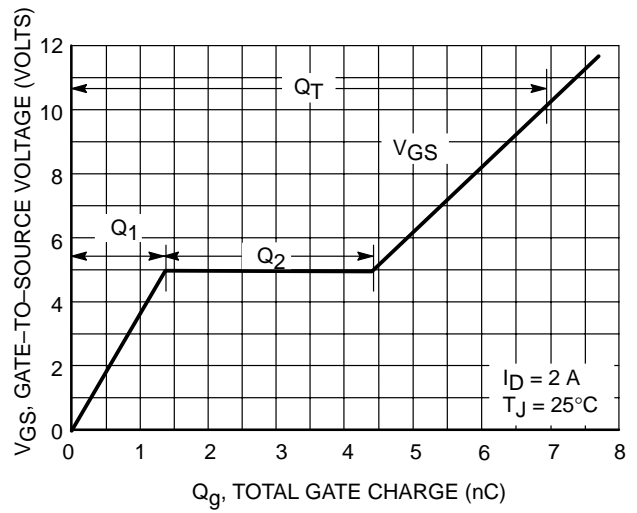versus Voltage**

**Figure 7. Capacitance Variation**



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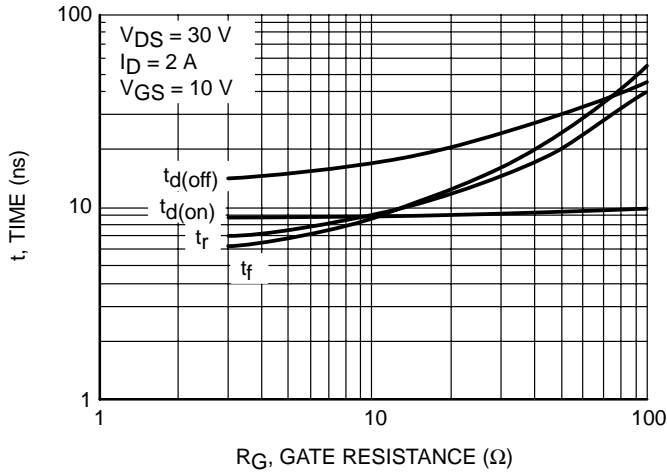Drain–to–Source Voltage versus Total Charge**



**Figure 9. Resistive Switching Time Variation
versus Gate Resistance**
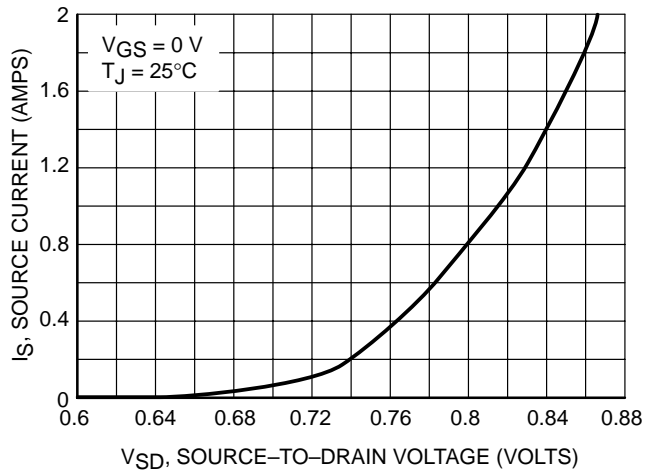


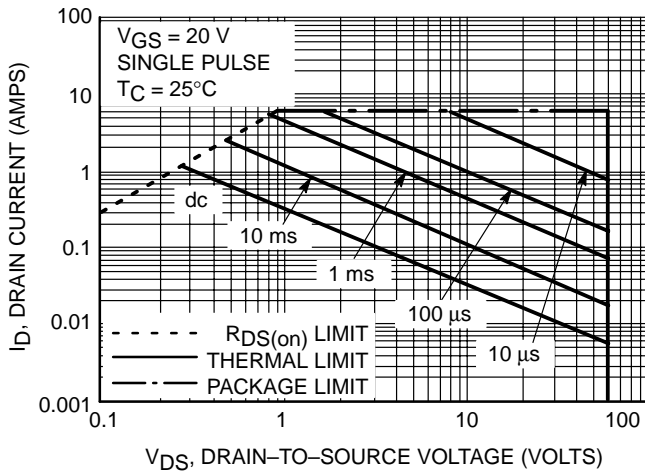**Figure 10. Diode Forward Voltage versus Current**



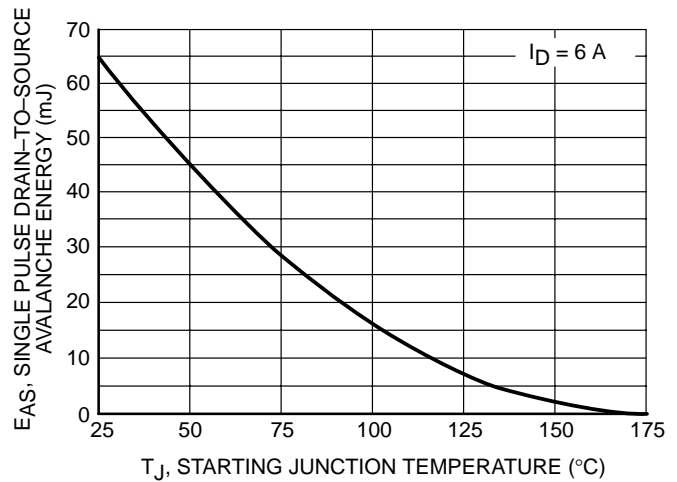**Figure 11. Maximum Rated Forward Biased
Safe Operating Area**



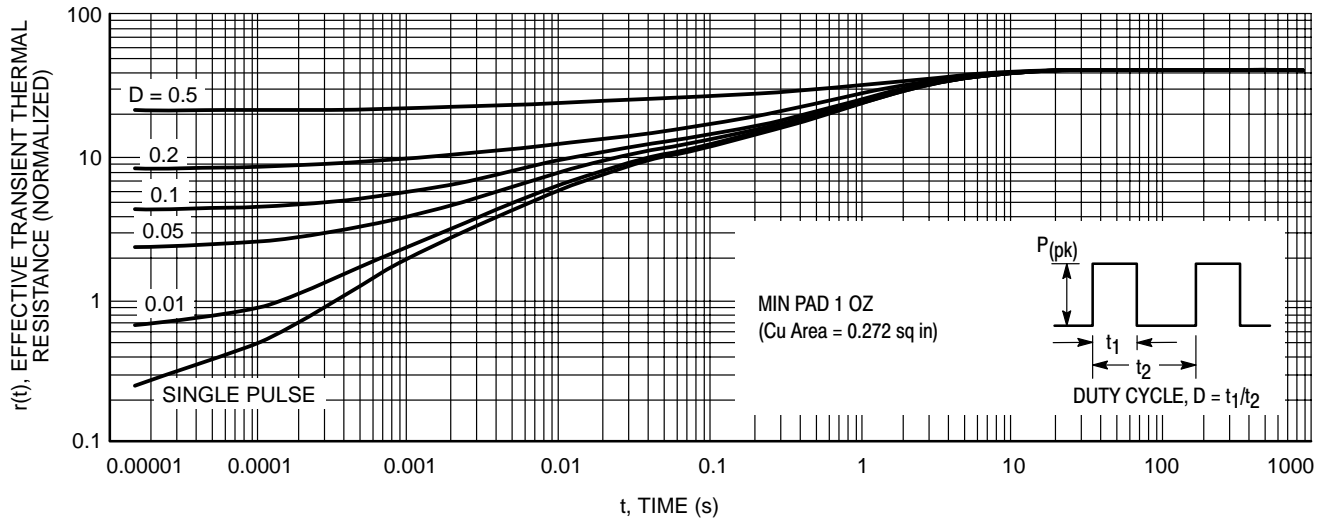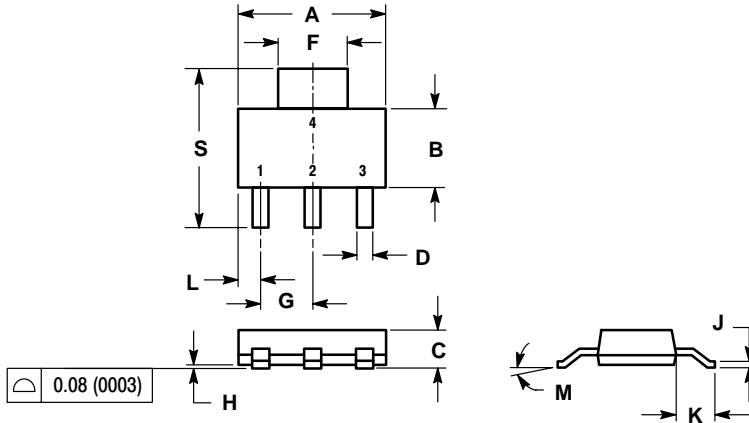**Figure 12. Maximum Avalanche Energy versus
Starting Junction Temperature**

**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

# <u>Notes</u>

# NTF3055–160

## PUBLICATION ORDERING INFORMATION

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