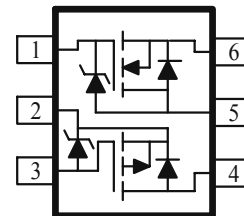
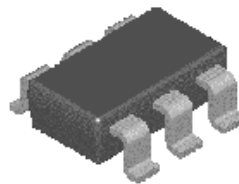


## N & P-Channel 25-V (D-S) MOSFET

These miniature surface mount MOSFETs utilize High Cell Density process. Low  $r_{DS(on)}$  assures minimal power loss and conserves energy, making this device ideal for use in power management circuitry. Typical applications are DC-DC converters, power management in portable and battery-powered products such as computers, printers, PCMCIA cards, cellular and cordless telephones.

- Low  $r_{DS(on)}$  Provides Higher Efficiency and Extends Battery Life
- Miniature TSOP-6 Surface Mount Package Saves Board Space



| $V_{DS}$ (V) | $r_{DS(on)}$ ( $\Omega$ ) | $I_D$ (A) |
|--------------|---------------------------|-----------|
| 25           | 0.45 @ $V_{GS} = 4.5V$    | 1.2       |
|              | 0.72 @ $V_{GS} = 2.5V$    | 1.0       |
| -25          | 1.0 @ $V_{GS} = -4.5V$    | -0.85     |
|              | 1.5 @ $V_{GS} = -2.5V$    | -0.75     |

| ABSOLUTE MAXIMUM RATINGS (T <sub>A</sub> = 25 °C UNLESS OTHERWISE NOTED) |                      |                                   |           |            |       |
|--|----------------------|-----------------------------------|-----------|------------|-------|
| Parameter  |                      | Symbol                            | N-Channel | P-Channel  | Units |
| Drain-Source Voltage   |                      | V <sub>DS</sub>                   | 25        | -25        | V     |
| Gate-Source Voltage  |                      | V <sub>GS</sub>                   | 8         | -8         |       |
| Continuous Drain Current <sup>a</sup>                                    | T <sub>A</sub> =25°C | I <sub>D</sub>                    | 1.2       | -0.9       | A     |
|  | T <sub>A</sub> =70°C |                                   | 0.95      | -0.65      |       |
| Pulsed Drain Current <sup>b</sup>  |                      | I <sub>DM</sub>                   | ±3.5      | ±2.5       |       |
| Continuous Source Current (Diode Conduction) <sup>a</sup>                |                      | I <sub>S</sub>                    | 1         | -1         | A     |
| Power Dissipation <sup>a</sup>   | T <sub>A</sub> =25°C | P <sub>D</sub>                    | 1.25      |            | W     |
|  | T <sub>A</sub> =70°C |                                   | 0.8       |            |       |
| Operating Junction and Storage Temperature Range                         |                      | T <sub>J</sub> , T <sub>stg</sub> |           | -55 to 150 | °C    |

| THERMAL RESISTANCE RATINGS               |                        |            |         |              |
|--|------------------------|------------|---------|--------------|
| Parameter                                |                        | Symbol     | Maximum | Units        |
| Maximum Junction-to-Ambient <sup>a</sup> | $t \leq 5 \text{ sec}$ | $R_{THJA}$ | 100     | $^\circ C/W$ |

### Notes

- Surface Mounted on 1" x 1" FR4 Board.
- Pulse width limited by maximum junction temperature

| SPECIFICATIONS (T <sub>A</sub> = 25°C UNLESS OTHERWISE NOTED) |                      |  |        |       |       |      |      |
|---|----------------------|--|--------|-------|-------|------|------|
| Parameter   | Symbol               | Test Conditions  | Limits |       |       |      | Unit |
|   |                      |  | Ch     | Min   | Typ   | Max  |      |
| Static  |                      |  |        |       |       |      |      |
| Drain-Source Breakdown Voltage                                | V <sub>(BR)DSS</sub> | V <sub>GS</sub> = 0 V, I <sub>D</sub> = 250 uA   | N      | 25    |       |      | V    |
|   |                      | V <sub>GS</sub> = 0 V, I <sub>D</sub> = -250 uA  | P      | -25   |       |      |      |
| Gate-Threshold Voltage  | V <sub>GS(th)</sub>  | V <sub>GS</sub> = V <sub>DS</sub> , I <sub>D</sub> = 250 uA  | N      | 0.65  | 0.81  | 1.5  | V    |
|   |                      | V <sub>GS</sub> = V <sub>DS</sub> , I <sub>D</sub> = -250 uA   | P      | -0.65 | -0.83 | -1.5 |      |
| Gate-Body Leakage Current                                     | I <sub>GSS</sub>     | V <sub>DS</sub> = 0 V, V <sub>GS</sub> = 8 V   | N      |       |       | 100  | uA   |
|   |                      | V <sub>DS</sub> = 0 V, V <sub>GS</sub> = -8 V  | P      |       |       | -100 |      |
| Zero Gate Voltage Drain Current                               | I <sub>DSS</sub>     | V <sub>DS</sub> = 20 V, V <sub>GS</sub> = 0 V  | N      |       |       | 1    | uA   |
|   |                      | V <sub>DS</sub> = 20 V, V <sub>GS</sub> = 0 V, T <sub>J</sub> = 55°C   |        |       |       | 10   |      |
| On-State Drain Current <sup>A</sup>                           | I <sub>D(on)</sub>   | V <sub>DS</sub> = 5 V, V <sub>GS</sub> = 4.5 V   | N      | 1     |       |      | A    |
|   |                      | V <sub>DS</sub> = -5 V, V <sub>GS</sub> = -4.5 V   | P      | -1    |       |      |      |
| Drain-Source On-Resistance <sup>A</sup>                       | r <sub>DS(on)</sub>  | V <sub>GS</sub> = 4.5 V, I <sub>D</sub> = 0.5 A  | N      |       | 0.35  | 0.45 | Ω    |
|   |                      | V <sub>GS</sub> = 2.5 V, I <sub>D</sub> = 0.2 A  |        |       | 0.45  | 0.72 |      |
|   |                      | V <sub>GS</sub> = -4.5 V, I <sub>D</sub> = -0.41 A   | P      |       | 0.860 | 1.09 |      |
|   |                      | V <sub>GS</sub> = -2.5 V, I <sub>D</sub> = -0.2 A  |        |       | 1.15  | 1.50 |      |
| Forward Tranconductance <sup>A</sup>                          | g <sub>fs</sub>      | V <sub>DS</sub> = 5 V, I <sub>D</sub> = 0.5 A  | N      |       | 1.45  |      | S    |
|   |                      | V <sub>DS</sub> = -5 V, I <sub>D</sub> = 0.4 A   | P      |       | 0.9   |      |      |
| Dynamic <sup>b</sup>  |                      |  |        |       |       |      |      |
| Total Gate Charge   | Q <sub>g</sub>       | N-Channel<br><br>V <sub>DS</sub> =5V, V <sub>GS</sub> =4.5V, I <sub>D</sub> =0.5A<br><br>P-Channel<br>V <sub>DS</sub> =-.5V, V <sub>GS</sub> =-4.5V, I <sub>D</sub> =-0.25A  | N      |       | 1.64  | 2.3  | nC   |
|   |                      |  | P      |       | 1.1   | 1.5  |      |
| Gate-Source Charge  | Q <sub>gs</sub>      |  | N      |       | 0.4   |      |      |
|   |                      |  | P      |       | 0.33  |      |      |
| Gate-Drain Charge   | Q <sub>gd</sub>      | N  |        | 0.45  |       |      |      |
|   |                      | P  |        | 0.26  |       |      |      |
| Switching   |                      |  |        |       |       |      |      |
| Turn-On Delay Time  | t <sub>d(on)</sub>   | N-Chaneel<br><br>V <sub>DD</sub> =6V, V <sub>GS</sub> =4.5V, I <sub>D</sub> =0.5A ,<br>R <sub>GEN</sub> =50Ω,<br>P-Channel<br>V <sub>DD</sub> =-6V, V <sub>GS</sub> =-4.5V, I <sub>D</sub> =-0.41 A<br>R <sub>GEN</sub> =50Ω | N      |       | 3     | 6    | nS   |
|   |                      |  | P      |       | 7     | 21   |      |
| Rise Time   | t <sub>r</sub>       |  | N      |       | 8.5   | 18   |      |
|   |                      |  | P      |       | 9     | 19   |      |
| Turn-Off Delay Time   | t <sub>d(off)</sub>  |  | N      |       | 17    | 30   |      |
|   |                      |  | P      |       | 55    | 112  |      |
| Fall-Time   | t <sub>f</sub>       |  | N      |       | 13    | 25   |      |
|   |                      |  | P      |       | 35    | 71   |      |

## Notes

- Pulse test:  $PW \leq 300\mu\text{s}$  duty cycle  $\leq 2\%$ .
- Guaranteed by design, not subject to production testing.

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## Typical Electrical Characteristics (N-Channel)

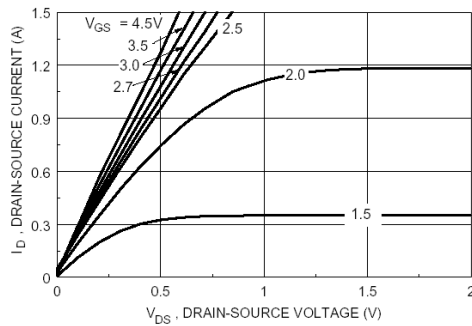


Figure 1. On-Region Characteristics.

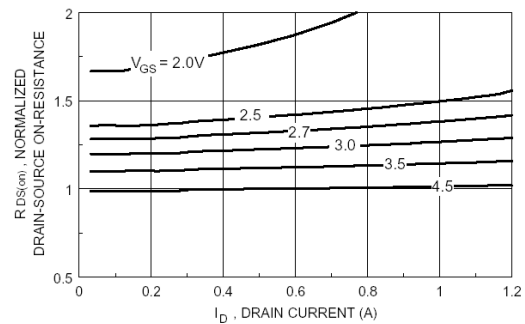


Figure 2. On-Resistance Variation with Drain Current and Gate Voltage.

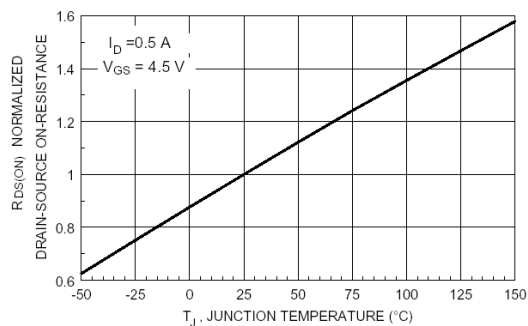


Figure 3. On-Resistance Variation with Temperature.

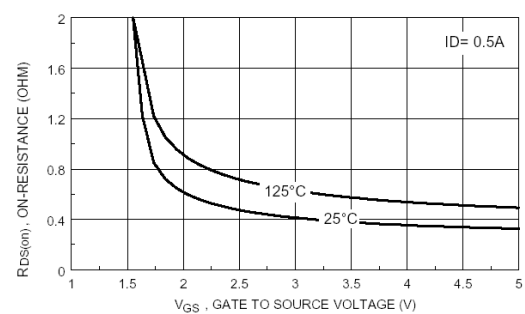


Figure 4. On Resistance Variation with Gate-To-Source Voltage.

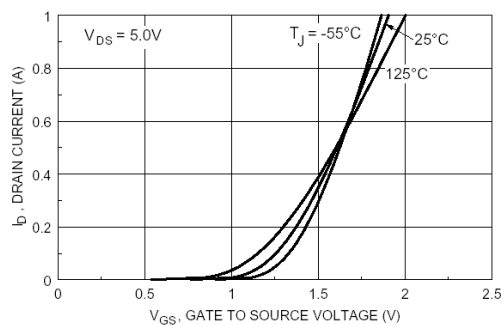


Figure 5. Transfer Characteristics.

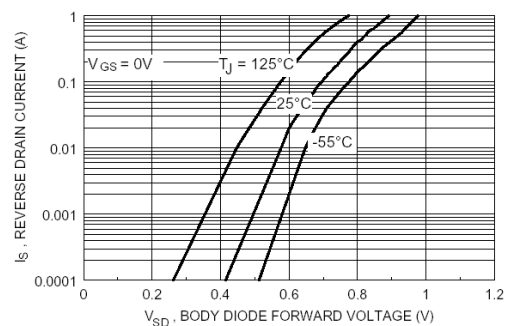


Figure 6. Body Diode Forward Voltage Variation with Source Current and Temperature.

## Typical Electrical Characteristics (N-Channel)

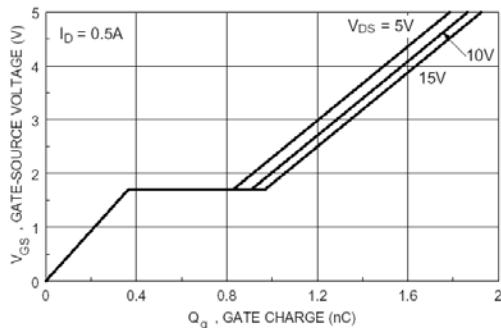


Figure 7. Gate Charge Characteristics.

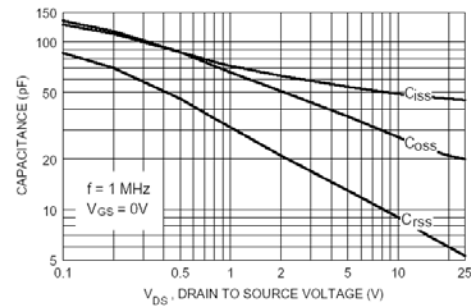


Figure 8. Capacitance Characteristics.

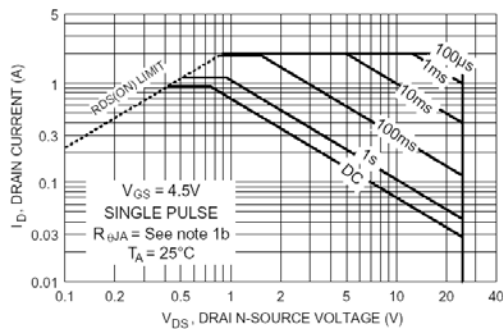


Figure 9. Maximum Safe Operating Area.

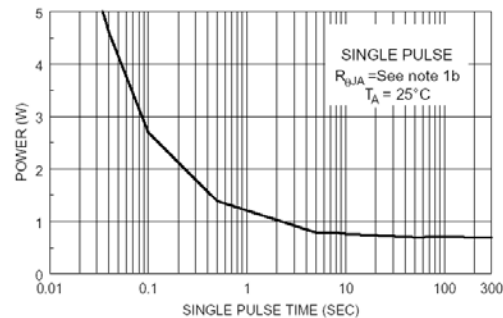


Figure 10. Single Pulse Maximum Power Dissipation.

## Normalized Thermal Transient Junction to Ambient

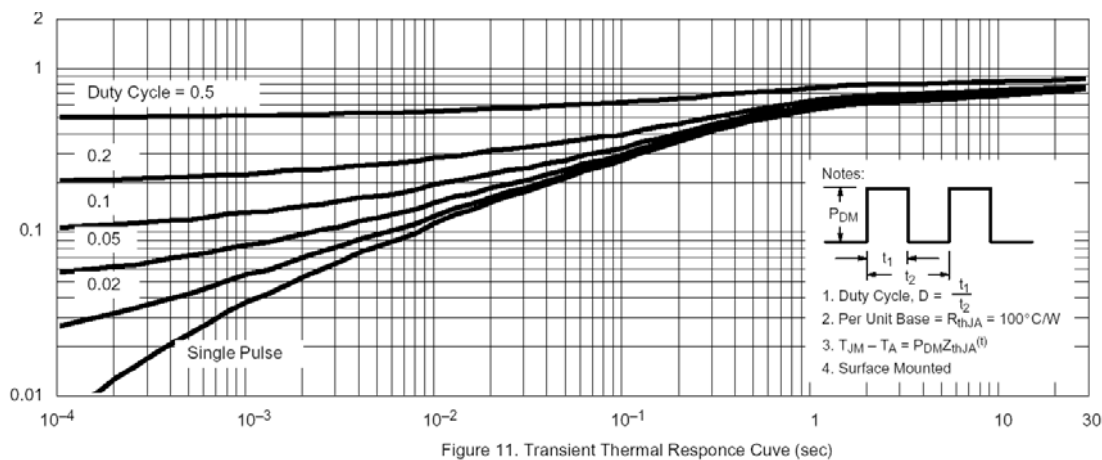


Figure 11. Transient Thermal Response Curve (sec)

## Typical Electrical Characteristics (P-Channel)

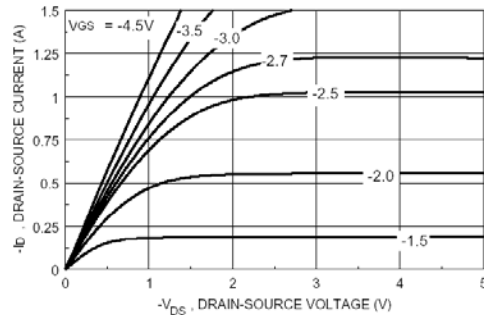


Figure 12. On-Region Characteristics.

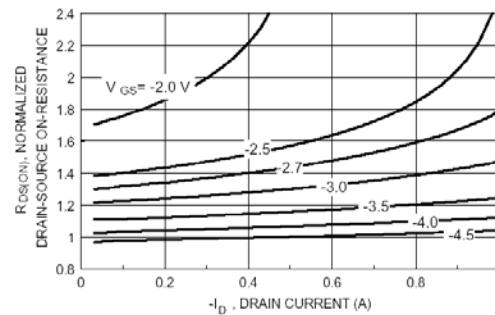


Figure 13. On-Resistance Variation with Drain Current and Gate Voltage.

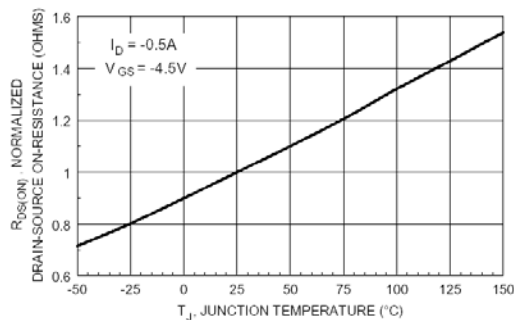


Figure 14. On-Resistance Variation with Temperature.

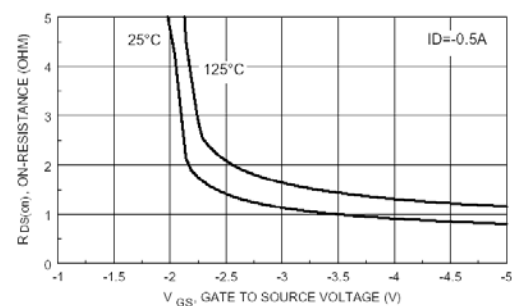


Figure 15. On Resistance Variation with Gate-To- Source Voltage.

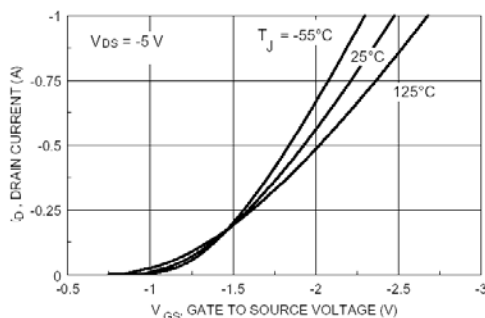


Figure 16. Transfer Characteristics.

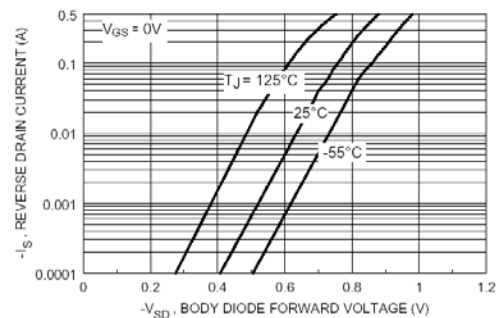


Figure 17. Body Diode Forward Voltage Variation with Source Current and Temperature.

## Typical Electrical Characteristics (P-Channel)

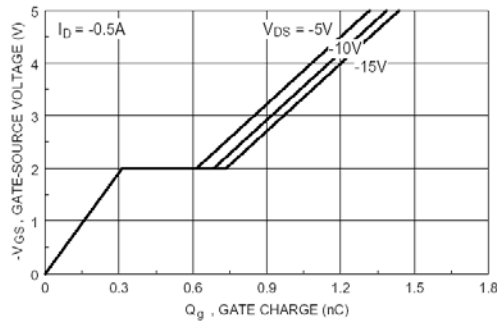


Figure 18. Gate Charge Characteristics.

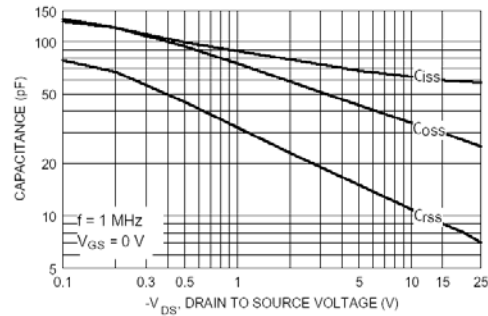


Figure 19. Capacitance Characteristics.

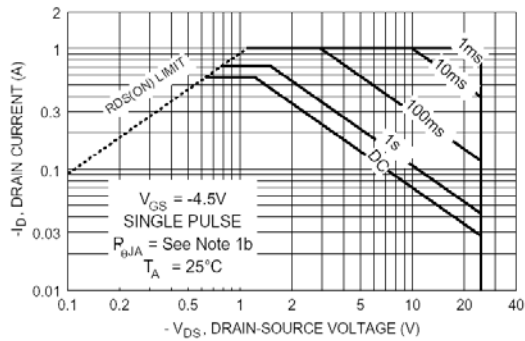


Figure 20. Maximum Safe Operating Area.

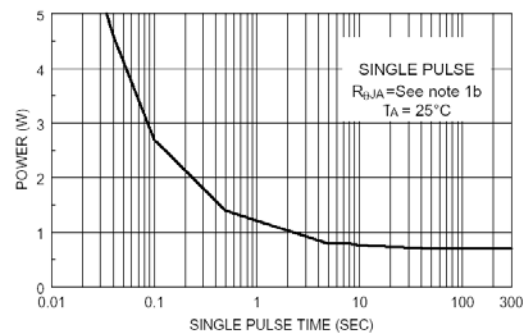


Figure 21. Single Pulse Maximum Power Dissipation.

## Normalized Thermal Transient Junction to Ambient

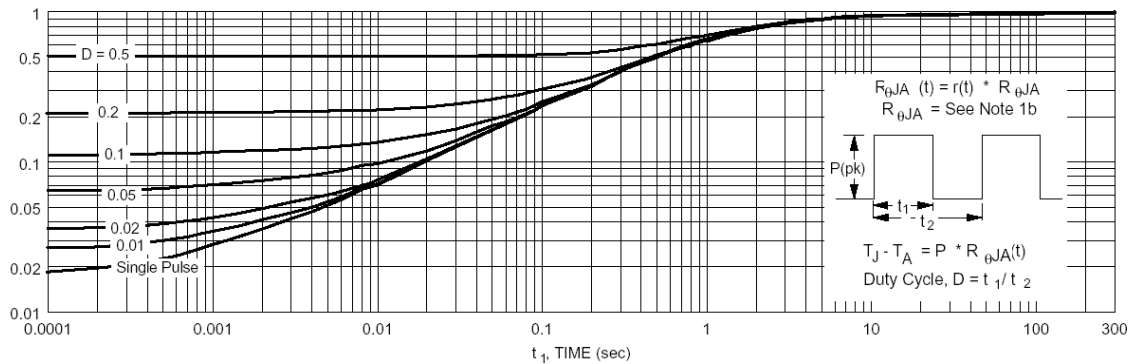
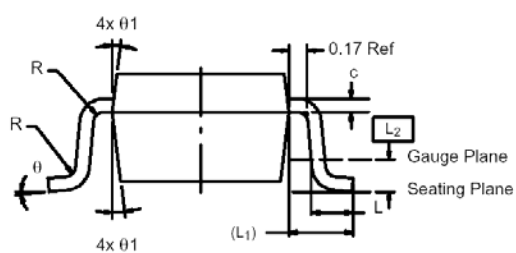
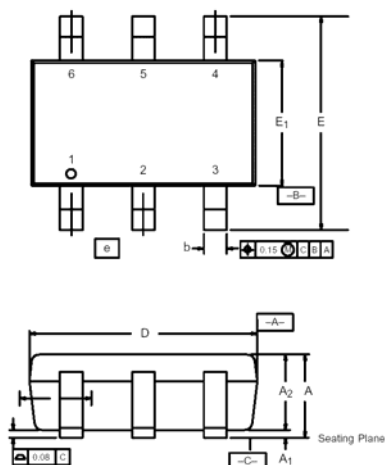


Figure 22. Transient Thermal Response Curve.

## Package Information

## TSOP-6: 6LEAD



| Dim            | MILLIMETERS |      |      | INCHES     |       |       |
|----------------|-------------|------|------|------------|-------|-------|
|                | Min         | Nom  | Max  | Min        | Nom   | Max   |
| A              | 0.91        | —    | 1.10 | 0.036      | —     | 0.043 |
| A <sub>1</sub> | 0.01        | —    | 0.10 | 0.0004     | —     | 0.004 |
| A <sub>2</sub> | 0.84        | —    | 1.00 | 0.033      | 0.038 | 0.039 |
| b              | 0.30        | 0.32 | 0.45 | 0.012      | 0.013 | 0.018 |
| c              | 0.10        | 0.15 | 0.20 | 0.004      | 0.006 | 0.008 |
| D              | 2.95        | 3.05 | 3.10 | 0.116      | 0.120 | 0.122 |
| E              | 2.70        | 2.85 | 2.98 | 0.106      | 0.112 | 0.117 |
| E <sub>1</sub> | 1.55        | 1.65 | 1.70 | 0.061      | 0.065 | 0.067 |
| e              | 1.00 BSC    |      |      | 0.0394 BSC |       |       |
| L              | 0.35        | —    | 0.50 | 0.014      | —     | 0.020 |
| L <sub>1</sub> | 0.60 Ref    |      |      | 0.024 Ref  |       |       |
| L <sub>2</sub> | 0.25 BSC    |      |      | 0.010 BSC  |       |       |
| R              | 0.10        | —    | —    | 0.004      | —     | —     |
| θ              | 0°          | 4°   | 8°   | 0°         | 4°    | 8°    |
| θ <sub>1</sub> | 7° Nom      |      |      | 7° Nom     |       |       |