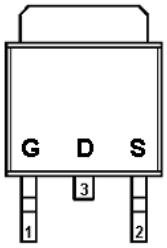
# SPN9971
## N-Channel Enhancement Mode MOSFET

### DESCRIPTION
The SPN9971 is the N-Channel logic enhancement mode power field effect transistors are produced using high cell density , DMOS trench technology. The SPN9971 has been designed specifically to improve the overall efficiency of DC/DC converters using either synchronous or conventional switching PWM controllers. It has been optimized for low gate charge, low $R_{DS(ON)}$ and fast switching speed.

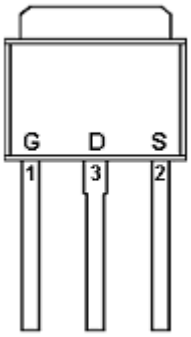
### APPLICATIONS
- Power Management in Note book
- Powered System
- DC/DC Converter
- Load Switch

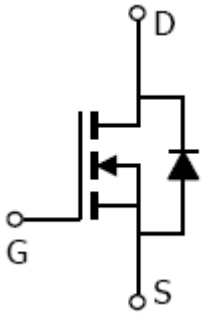
### FEATURES
- 60V/16A,$R_{DS(ON)}$= 40mΩ@$V_{GS}$=10V
- 60V/12A,$R_{DS(ON)}$= 45mΩ@$V_{GS}$=4.5V
- Super high density cell design for extremely low RDS (ON)
- Exceptional on-resistance and maximum DC current capability
- TO-252,TO-251 package design

### PIN CONFIGURATION
**TO-252**



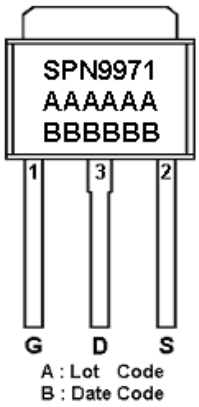

**TO-251**




### PART MARKING





# SPN9971
## N-Channel Enhancement Mode MOSFET

**PIN DESCRIPTION**

| Pin | Symbol | Description |
|---|---|---|
| 1 | G | Gate |
| 2 | S | Source |
| 3 | D | Drain |

**ORDERING INFORMATION**

| Part Number | Package | Part Marking |
|---|---|---|
| SPN9971T252RGB | TO-252 | SPN9971 |
| SPN9971T251TGB | TO-251 | SPN9971 |

※ SPN9971T252RGB : Tape Reel ; Pb – Free ; Halogen - Free
※ SPN9971T251TGB : Tube ; Pb – Free ; Halogen - Free

**ABSOULTE MAXIMUM RATINGS**

($T_A$=25℃ Unless otherwise noted)

| Parameter | | | Symbol | Typical | Unit |
|---|---|---|---|---|---|
| Drain-Source Voltage | | | $V_{DSS}$ | 60 | V |
| Gate –Source Voltage | | | $V_{GSS}$ | ±20 | V |
| Continuous Drain Current | $T_A$=25℃ | | $I_D$ | 25 | A |
| | $T_A$=100℃ | | | 16 | |
| Pulsed Drain Current | | | $I_{DM}$ | 80 | A |
| Avalanche Current | | | $I_{AS}$ | 25 | A |
| Power Dissipation | $T_A$=25℃ | TO-252-2L | $P_D$ | 40 | W |
| | | TO-251 | | 55 | |
| Operating Junction Temperature | | | $T_J$ | 150 | ℃ |
| Storage Temperature Range | | | $T_{STG}$ | -55/150 | ℃ |
| Thermal Resistance-Junction to Ambient | | | $R_{\theta JA}$ | 100 | ℃/W |
| Thermal Resistance-Junction to Case | | | $R_{\theta JC}$ | 1.72 | ℃/W |

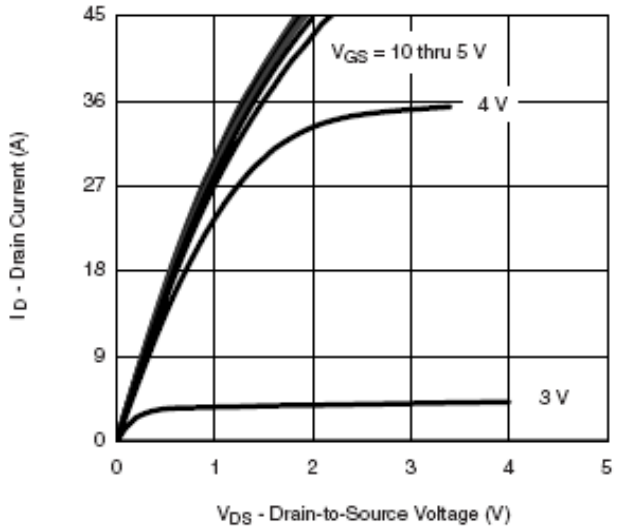
# SPN9971
# N-Channel Enhancement Mode MOSFET

**ELECTRICAL CHARACTERISTICS**

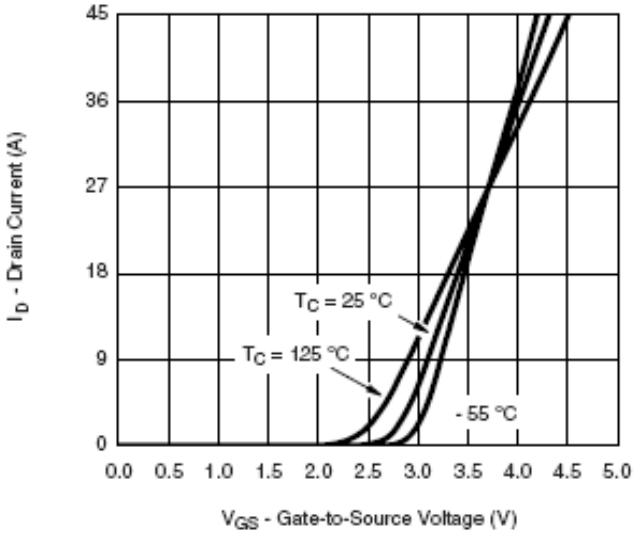
($T_A$=25℃ Unless otherwise noted)

| Parameter | Symbol | Conditions | Min. | Typ | Max. | Unit |
|---|---|---|---|---|---|---|
| **Static** | | | | | | |
| Drain-Source Breakdown Voltage | $V_{(BR)DSS}$ | $V_{GS}$=0V,$I_D$=250uA | 60 | | | V |
| Gate Threshold Voltage | $V_{GS(th)}$ | $V_{DS}$=$V_{GS}$,$I_D$=250uA | 0.8 | | 2.0 | |
| Gate Leakage Current | $I_{GSS}$ | $V_{DS}$=0V,$V_{GS}$=±20V | | | ±100 | nA |
| Zero Gate Voltage Drain Current | $I_{DSS}$ | $V_{DS}$=60V,$V_{GS}$=0V | | | 1 | uA |
| | | $V_{DS}$=60V,$V_{GS}$=0V $T_J$=85℃ | | | 5 | |
| On-State Drain Current | $I_{D(on)}$ | $V_{DS}$≥5V,$V_{GS}$ =10V | 30 | | | A |
| Drain-Source On-Resistance | $R_{DS(on)}$ | $V_{GS}$= 10V,$I_D$=16A | | 0.038 | 0.040 | Ω |
| | | $V_{GS}$=4.5V,$I_D$=12A | | 0.042 | 0.045 | |
| Forward Transconductance | gfs | $V_{DS}$=15V,$I_D$=5.3A | | 24 | | S |
| Diode Forward Voltage | $V_{SD}$ | $I_S$=2.0A,$V_{GS}$ =0V | | 0.8 | 1.2 | V |
| **Dynamic** | | | | | | |
| Total Gate Charge | $Q_g$ | $V_{DS}$=30V,$V_{GS}$=5V $I_D$= 5.3A | | 10 | 15 | nC |
| Gate-Source Charge | $Q_{gs}$ | | | 3.5 | | |
| Gate-Drain Charge | $Q_{gd}$ | | | 3.6 | | |
| Input Capacitance | $C_{iss}$ | $V_{DS}$=30V,$V_{GS}$=0V f=1MHz | | 890 | | pF |
| Output Capacitance | $C_{oss}$ | | | 85 | | |
| Reverse Transfer Capacitance | $C_{rss}$ | | | 48 | | |
| Turn-On Time | $t_{d(on)}$ | $V_{DD}$=30V,$R_L$=6.8Ω $I_D$≡4.4A,$V_{GEN}$=10V $R_G$=1Ω | | 10 | 15 | nS |
| | $t_r$ | | | 12 | 20 | |
| Turn-Off Time | $t_{d(off)}$ | | | 25 | 35 | |
| | $t_f$ | | | 10 | 15 | |

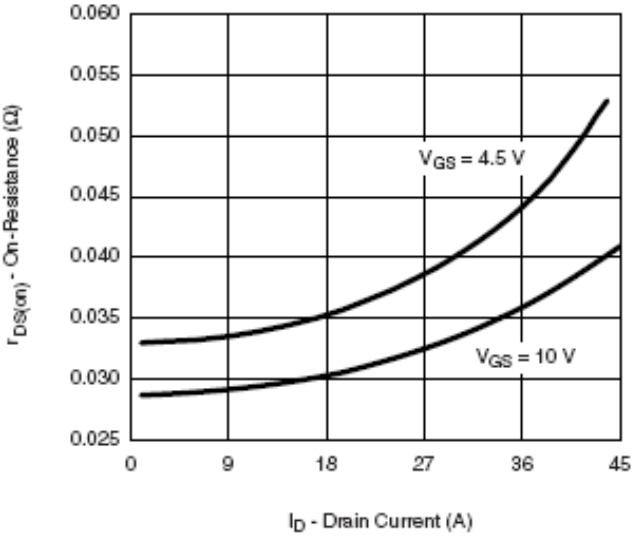
**TYPICAL CHARACTERISTICS**



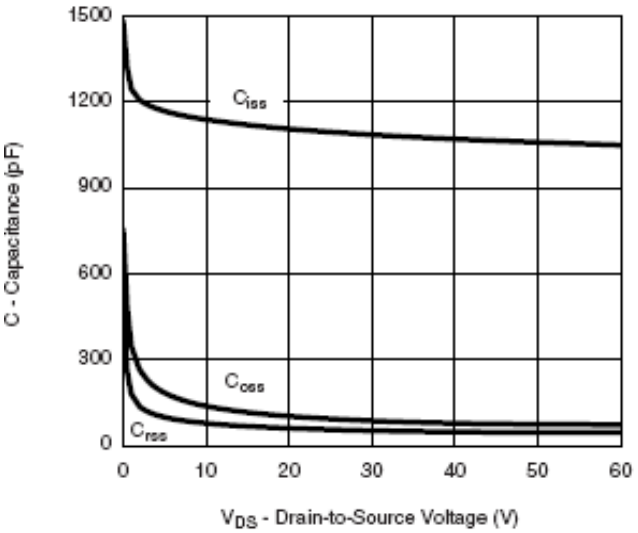

**Output Characteristics**




**Transfer Characteristics**

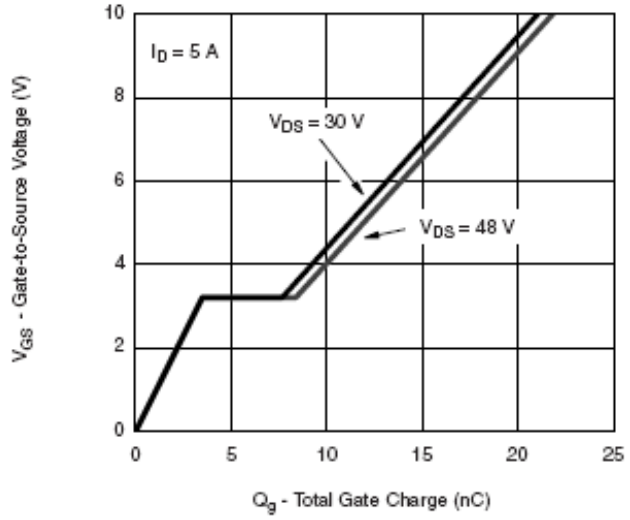



**On-Resistance vs. Drain Current**

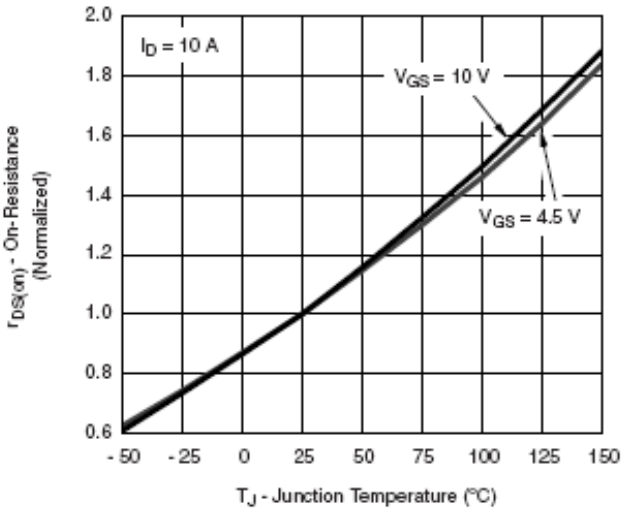



**Capacitance**

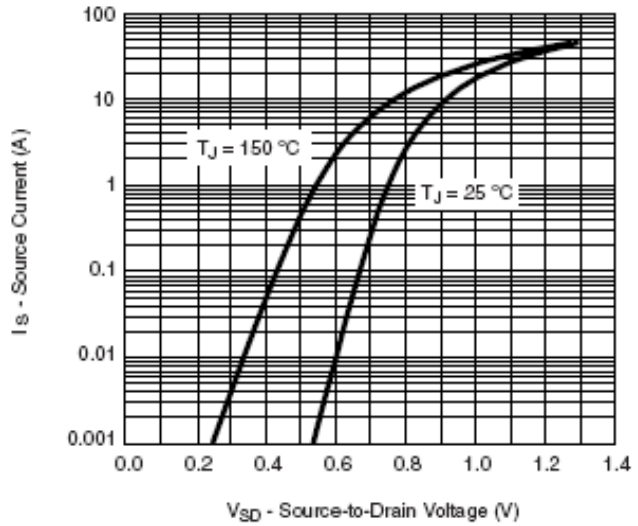
**TYPICAL CHARACTERISTICS**



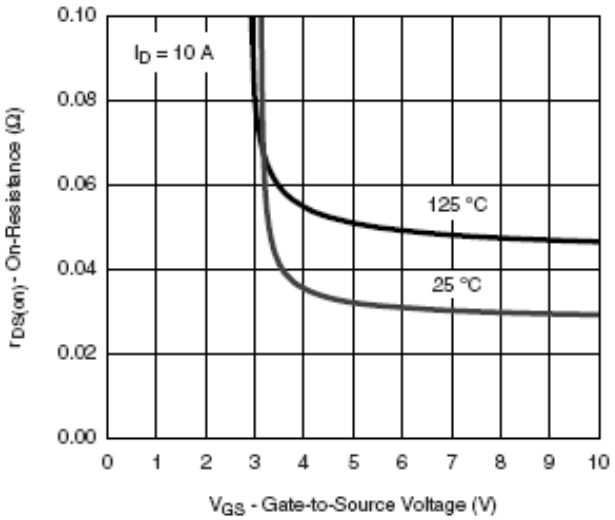

**Gate Charge**




**On-Resistance vs. Junction Temperature**

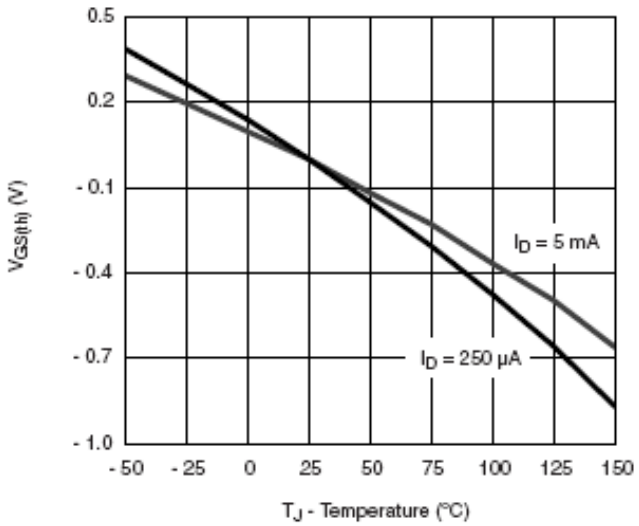



**Source-Drain Diode Forward Voltage**

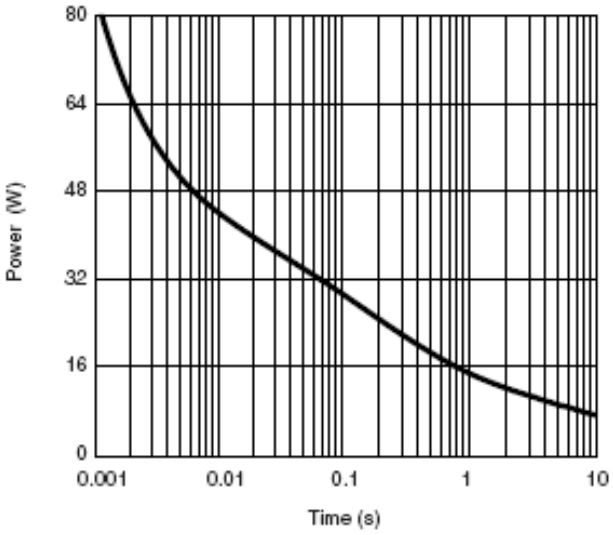



**On-Resistance vs. Gate-to-Source Voltage**

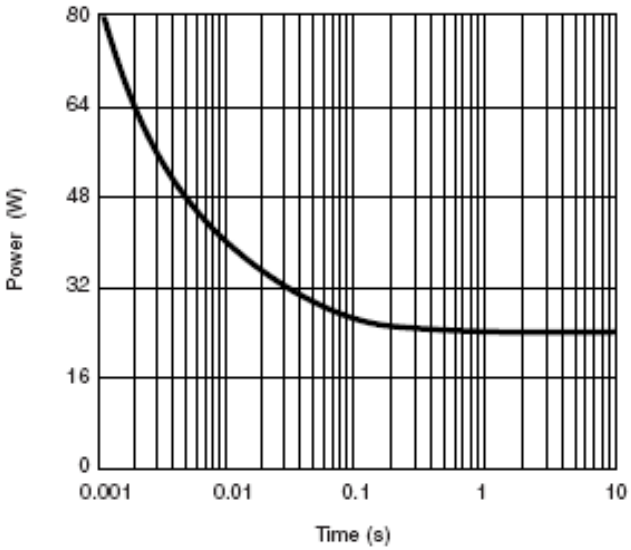
## TYPICAL CHARACTERISTICS



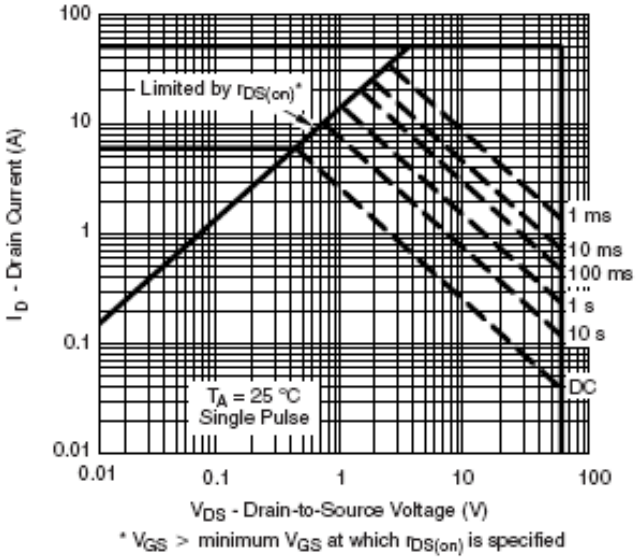

**Threshold Voltage**




**Single Pulse Power, Junction-to-Ambient**



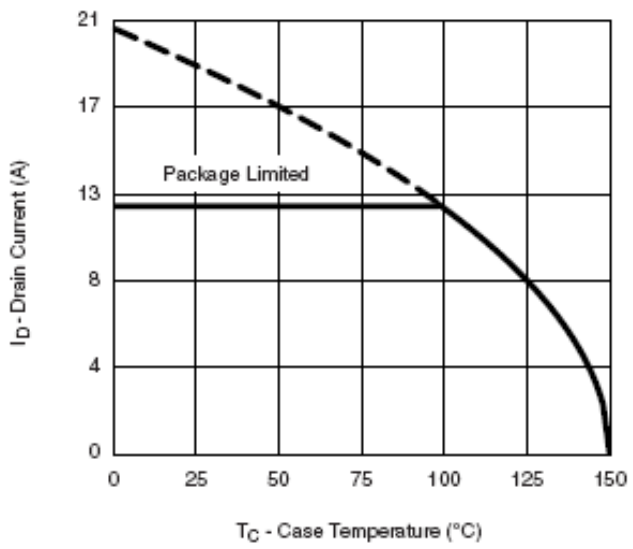

**Single Pulse Power, Junction-to-Case**



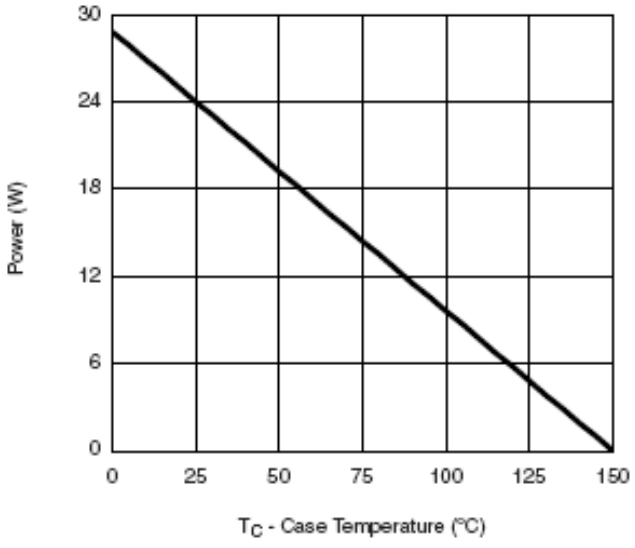

* $V_{GS}$ > minimum $V_{GS}$ at which $r_{DS(on)}$ is specified

**Safe Operating Area, Junction-to-Ambient**

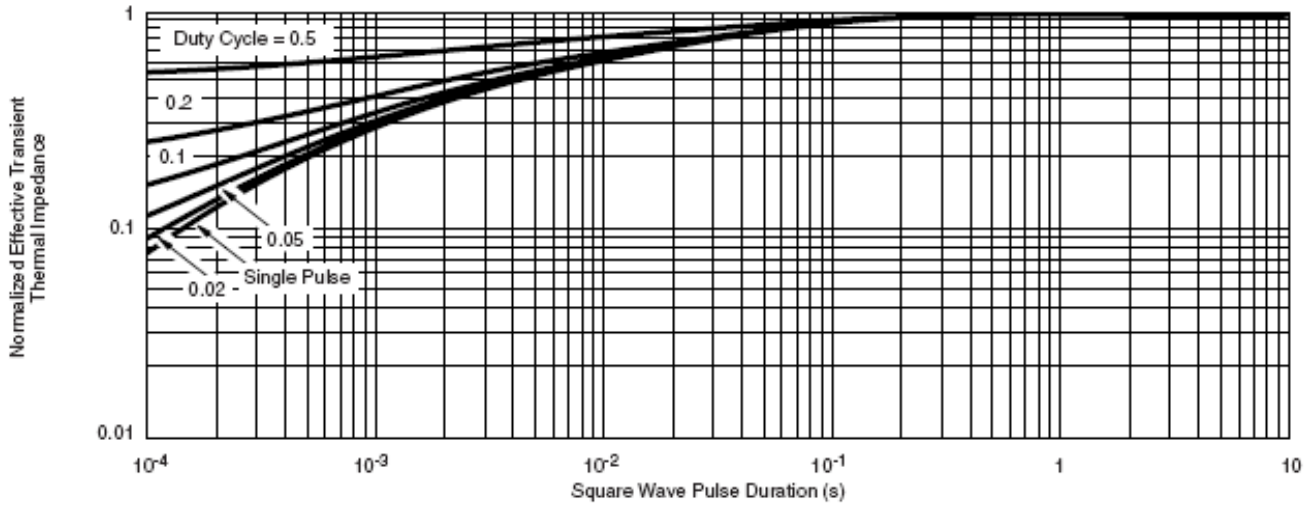
## TYPICAL CHARACTERISTICS




**Current Derating*, Junction-to-Case**

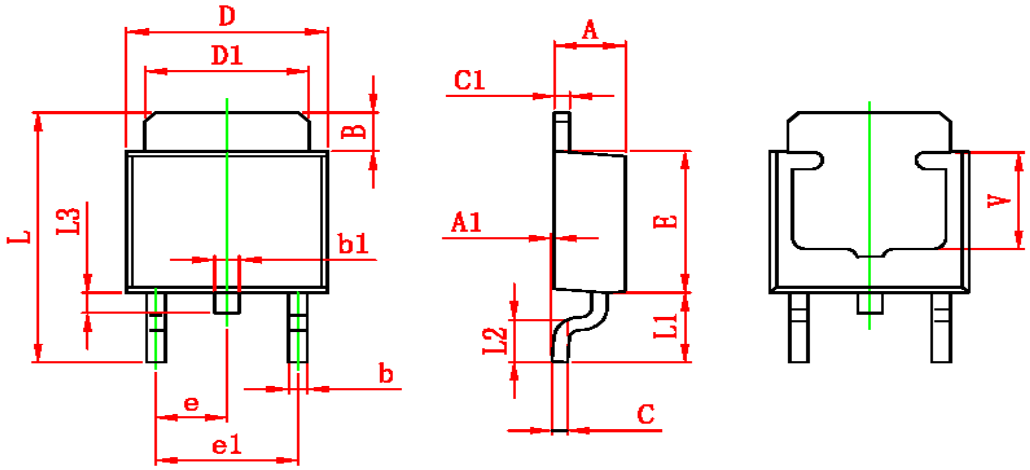



**Power Derating*, Junction-to-Case**



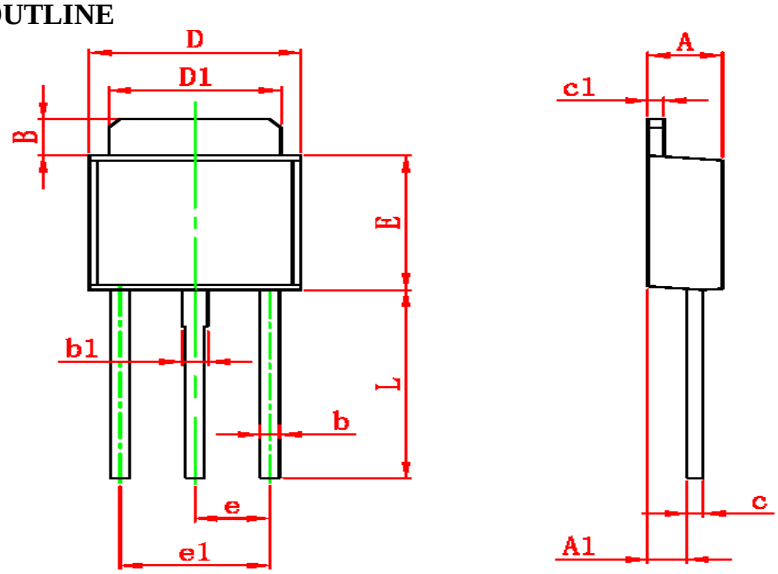

**Normalized Thermal Transient Impedance, Junction-to-Case**

**TO-252 PACKAGE OUTLINE**




| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|---|---|---|---|---|
| | Min | Max | Min | Max |
| A | 2.200 | 2.400 | 0.087 | 0.094 |
| A1 | 0.000 | 0.127 | 0.000 | 0.005 |
| B | 1.350 | 1.650 | 0.053 | 0.065 |
| b | 0.500 | 0.700 | 0.020 | 0.028 |
| b1 | 0.700 | 0.900 | 0.028 | 0.035 |
| c | 0.430 | 0.580 | 0.017 | 0.023 |
| c1 | 0.430 | 0.580 | 0.017 | 0.023 |
| D | 6.350 | 6.650 | 0.250 | 0.262 |
| D1 | 5.200 | 5.400 | 0.205 | 0.213 |
| E | 5.400 | 5.700 | 0.213 | 0.224 |
| e | 2.300 TYP | | 0.091 TYP | |
| e1 | 4.500 | 4.700 | 0.177 | 0.185 |
| L | 9.500 | 9.900 | 0.374 | 0.390 |
| L1 | 2.550 | 2.900 | 0.100 | 0.114 |
| L2 | 1.400 | 1.780 | 0.055 | 0.070 |
| L3 | 0.350 | 0.650 | 0.014 | 0.026 |
| V | 3.80 REF | | 0.150 REF | |

**TO-251 PACKAGE OUTLINE**




| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|---|---|---|---|---|
| | Min | Max | Min | Max |
| A | 2.200 | 2.400 | 0.087 | 0.094 |
| A1 | 1.020 | 1.270 | 0.040 | 0.050 |
| B | 1.350 | 1.650 | 0.053 | 0.065 |
| b | 0.500 | 0.700 | 0.020 | 0.028 |
| b1 | 0.700 | 0.900 | 0.028 | 0.035 |
| c | 0.430 | 0.580 | 0.017 | 0.023 |
| c1 | 0.430 | 0.580 | 0.017 | 0.023 |
| D | 6.350 | 6.650 | 0.250 | 0.262 |
| D1 | 5.200 | 5.400 | 0.205 | 0.213 |
| E | 5.400 | 5.700 | 0.213 | 0.224 |
| e | 2.300 TYP | | 0.091 TYP | |
| e1 | 4.500 | 4.700 | 0.177 | 0.185 |
| L | 7.500 | 7.900 | 0.295 | 0.311 |

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