

NCE N-Channel Enhancement Mode Power MOSFET

Description

The NCE1520KA uses advanced trench technology and design to provide excellent $R_{DS(ON)}$ with low gate charge. It can be used in a wide variety of applications.

General Features

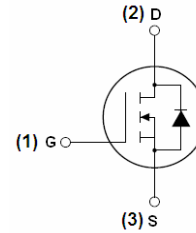
- $V_{DS} = 150V, I_D = 20A$
 $R_{DS(ON)} < 75m\Omega @ V_{GS} = 10V$ (Typ: 62m Ω)
 $R_{DS(ON)} < 80m\Omega @ V_{GS} = 4.5V$ (Typ: 68m Ω)
- High density cell design for ultra low R_{dson}
- Fully characterized avalanche voltage and current
- Good stability and uniformity with high E_{AS}
- Excellent package for good heat dissipation

Application

- Boost converters
- LED backlighting
- Uninterruptible power supply

100% UIS TESTED!

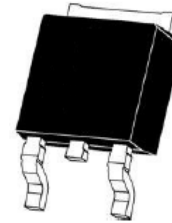
100% ΔV_{ds} TESTED!



Schematic diagram



Marking and pin assignment



TO-252 -2L top view

Package Marking and Ordering Information

| Device Marking | Device | Device Package | Reel Size | Tape width | Quantity |
|----------------|-----------|----------------|-----------|------------|----------|
| NCE1520KA | NCE1520KA | TO-252-2L | - | - | - |

Absolute Maximum Ratings ($T_C = 25^\circ C$ unless otherwise noted)

| Symbol | Parameter | Limit | Unit |
|--------------------|---|------------|---------------|
| V_{DS} | Drain-Source Voltage | 150 | V |
| V_{GS} | Gate-Source Voltage | ± 20 | V |
| I_D | Drain Current-Continuous | 20 | A |
| $I_D(100^\circ C)$ | Drain Current-Continuous($T_C = 100^\circ C$) | 14 | A |
| I_{DM} | Pulsed Drain Current | 40 | A |
| P_D | Maximum Power Dissipation | 90 | W |
| | Derating factor | 0.6 | W/ $^\circ C$ |
| E_{AS} | Single pulse avalanche energy ^(Note 5) | 80 | mJ |
| T_J, T_{STG} | Operating Junction and Storage Temperature Range | -55 To 175 | $^\circ C$ |

Thermal Characteristic

| | | | |
|-----------------|--|-----|---------------|
| $R_{\theta JC}$ | Thermal Resistance, Junction-to-Case ^(Note 2) | 1.7 | $^{\circ}C/W$ |
|-----------------|--|-----|---------------|

Electrical Characteristics ($T_C=25^{\circ}C$ unless otherwise noted)

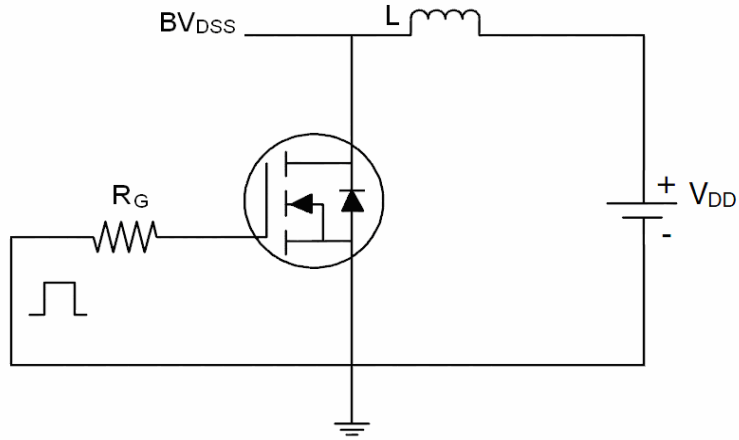
| Symbol | Parameter | Condition | Min | Typ | Max | Unit |
|--|---|--|-----|------|-----------|------------|
| Off Characteristics | | | | | | |
| BV_{DSS} | Drain-Source Breakdown Voltage | $V_{GS}=0V, I_D=250\mu A$ | 150 | 165 | - | V |
| I_{DSS} | Zero Gate Voltage Drain Current | $V_{DS}=150V, V_{GS}=0V$ | - | - | 1 | μA |
| I_{GSS} | Gate-Body Leakage Current | $V_{GS}=\pm 20V, V_{DS}=0V$ | - | - | ± 100 | nA |
| On Characteristics ^(Note 3) | | | | | | |
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{DS}=V_{GS}, I_D=250\mu A$ | 1.2 | 1.6 | 2.5 | V |
| $R_{DS(on)}$ | Drain-Source On-State Resistance | $V_{GS}=10V, I_D=10A$ | - | 62 | 75 | m Ω |
| | | $V_{GS}=4.5V, I_D=10A$ | - | 68 | 80 | m Ω |
| g_{FS} | Forward Transconductance | $V_{DS}=5V, I_D=10A$ | - | 20 | - | S |
| Dynamic Characteristics ^(Note 4) | | | | | | |
| C_{iss} | Input Capacitance | $V_{DS}=75V, V_{GS}=0V,$ $F=1.0MHz$ | - | 2500 | - | PF |
| C_{oss} | Output Capacitance | | - | 68 | - | PF |
| C_{rss} | Reverse Transfer Capacitance | | - | 54 | - | PF |
| Switching Characteristics ^(Note 4) | | | | | | |
| $t_{d(on)}$ | Turn-on Delay Time | $V_{DD}=75V, R_L=5\Omega$ $V_{GS}=10V, R_{GEN}=3\Omega$ | - | 18.5 | - | nS |
| t_r | Turn-on Rise Time | | - | 10 | - | nS |
| $t_{d(off)}$ | Turn-Off Delay Time | | - | 22 | - | nS |
| t_f | Turn-Off Fall Time | | - | 8 | - | nS |
| Q_g | Total Gate Charge | $V_{DS}=75V, I_D=10A,$ $V_{GS}=10V$ | - | 60 | - | nC |
| Q_{gs} | Gate-Source Charge | | - | 7.1 | - | nC |
| Q_{gd} | Gate-Drain Charge | | - | 17 | - | nC |
| Drain-Source Diode Characteristics | | | | | | |
| V_{SD} | Diode Forward Voltage ^(Note 3) | $V_{GS}=0V, I_S=20A$ | - | - | 1.2 | V |
| I_S | Diode Forward Current ^(Note 2) | - | - | - | 20 | A |
| t_{rr} | Reverse Recovery Time | $T_J = 25^{\circ}C, I_F = 10A$ $di/dt = 100A/\mu s$ ^(Note 3) | - | 34 | - | nS |
| Q_{rr} | Reverse Recovery Charge | | - | 55 | - | nC |
| t_{on} | Forward Turn-On Time | Intrinsic turn-on time is negligible (turn-on is dominated by LS+LD) | | | | |

Notes:

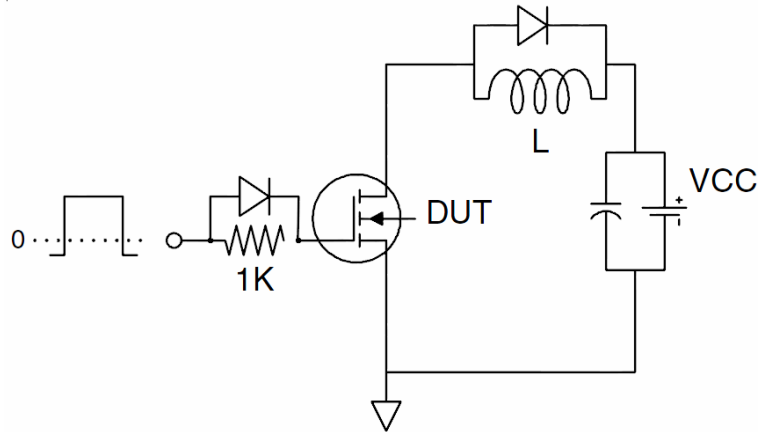
1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Surface Mounted on FR4 Board, $t \leq 10$ sec.
3. Pulse Test: Pulse Width $\leq 300\mu s$, Duty Cycle $\leq 2\%$.
4. Guaranteed by design, not subject to production
5. EAS condition: $T_J=25^{\circ}C, V_{DD}=50V, V_G=10V, L=0.5mH, R_g=25\Omega$

Test Circuit

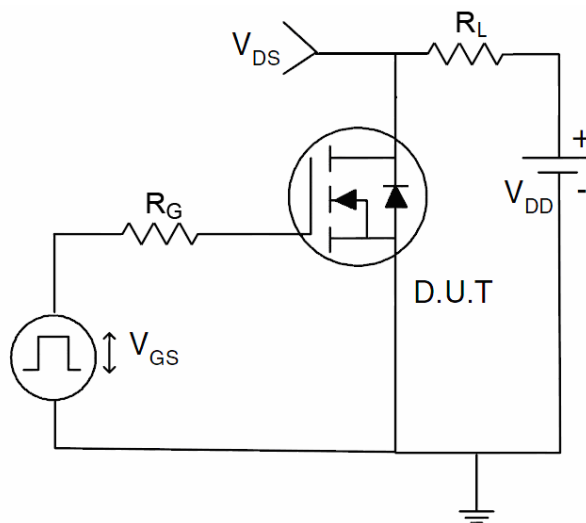
1) E_{AS} Test Circuit



2) Gate Charge Test Circuit



3) Switch Time Test Circuit



Typical Electrical and Thermal Characteristics (Curves)

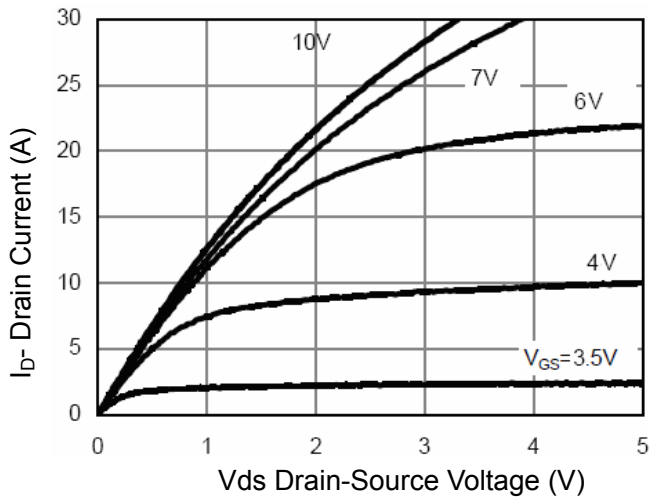


Figure 1 Output Characteristics

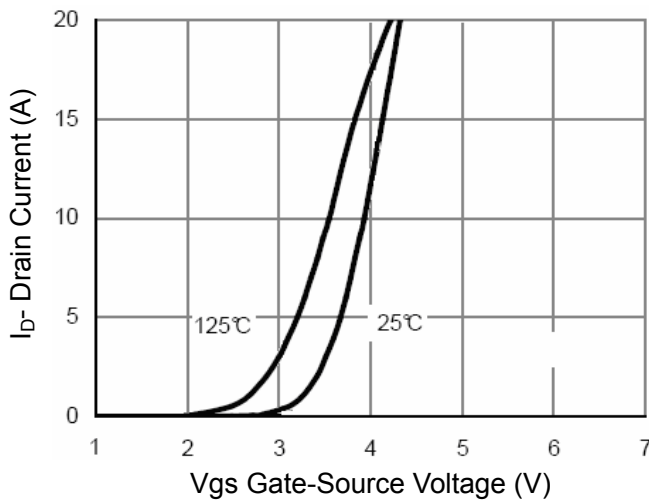


Figure 2 Transfer Characteristics

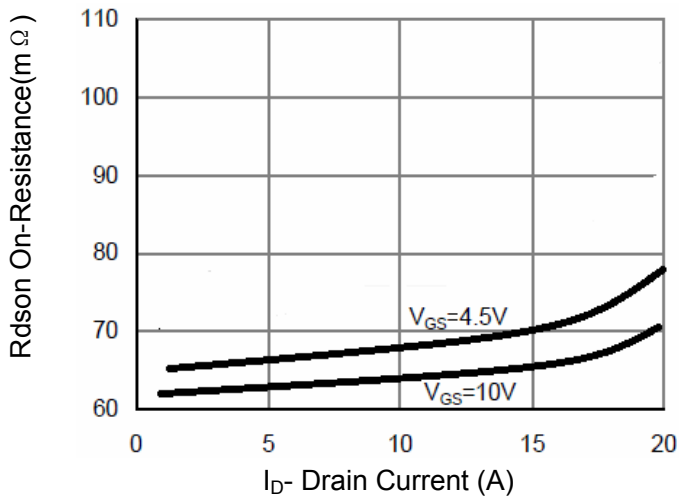


Figure 3 Rdson- Drain Current

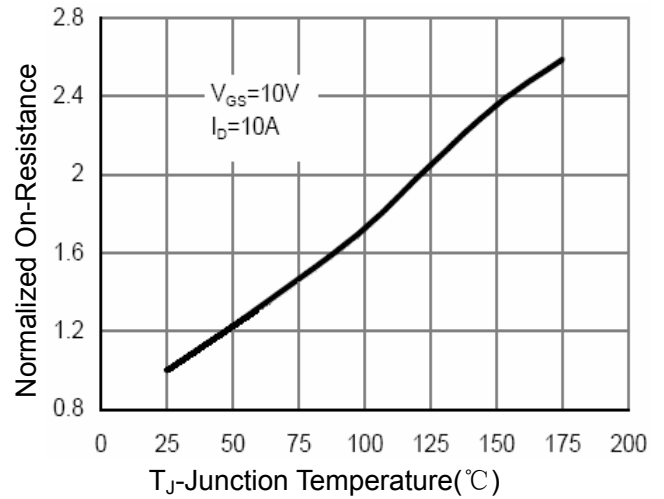


Figure 4 Rdson-Junction Temperature

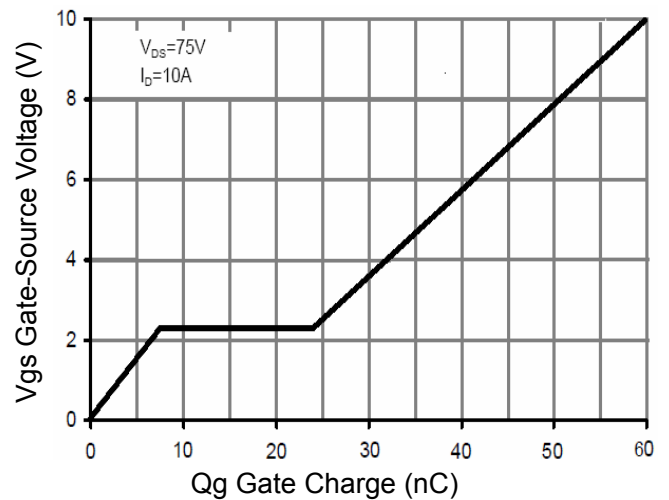


Figure 5 Gate Charge

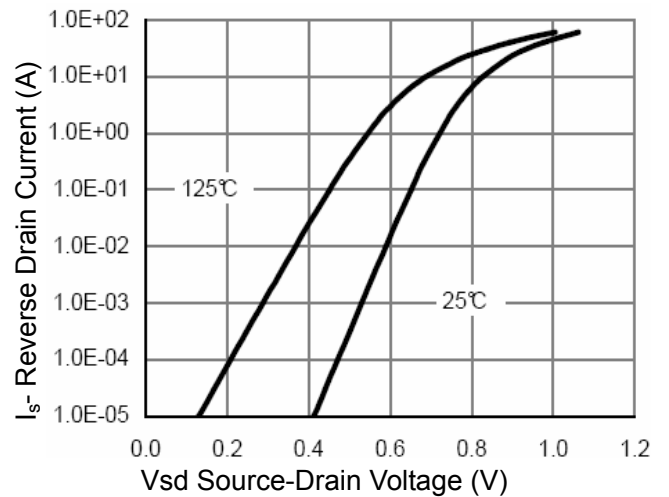


Figure 6 Source- Drain Diode Forward

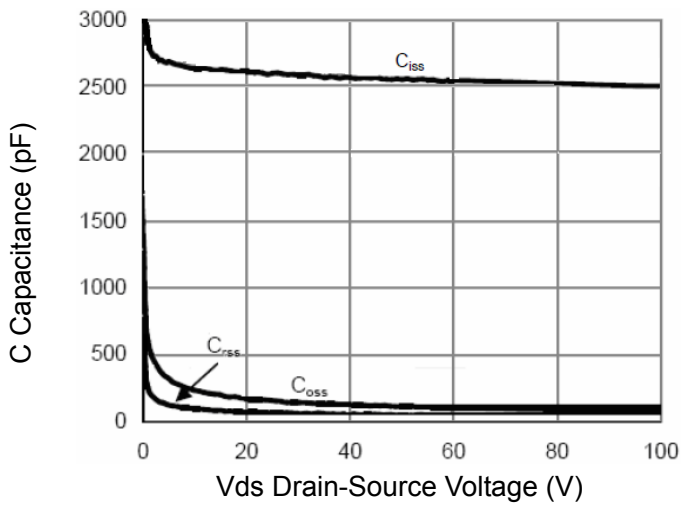


Figure 7 Capacitance vs Vds

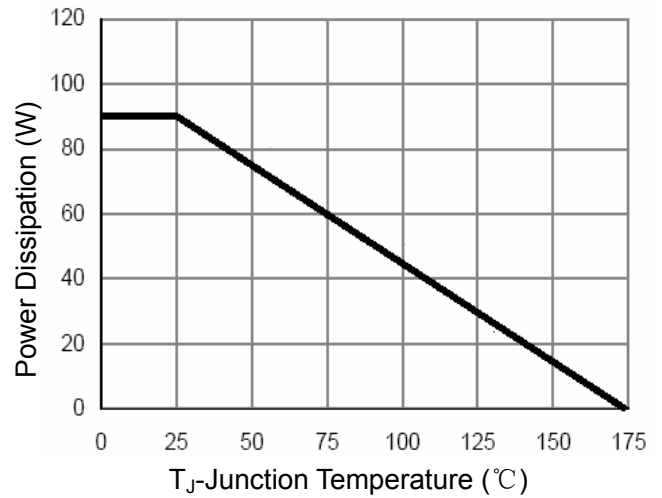


Figure 9 Power De-rating

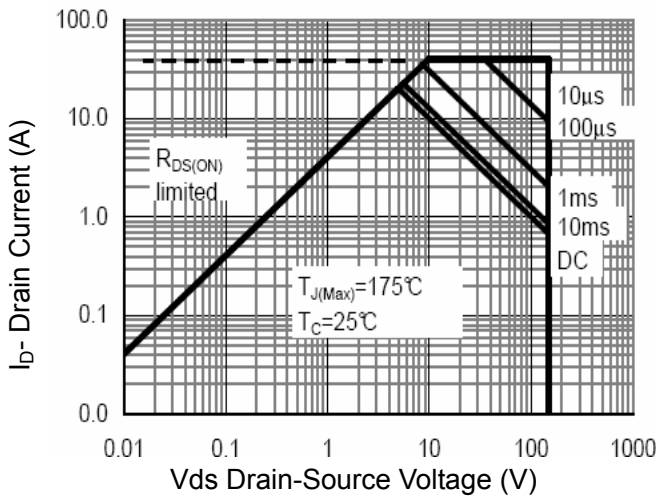


Figure 8 Safe Operation Area

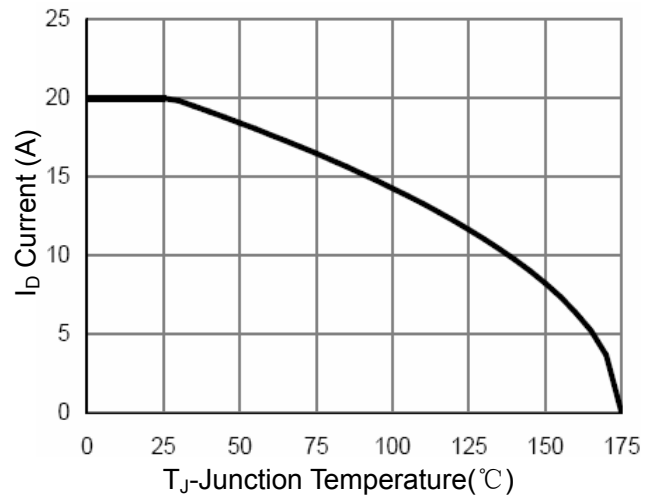


Figure 10 Id Current- Junction Temperature

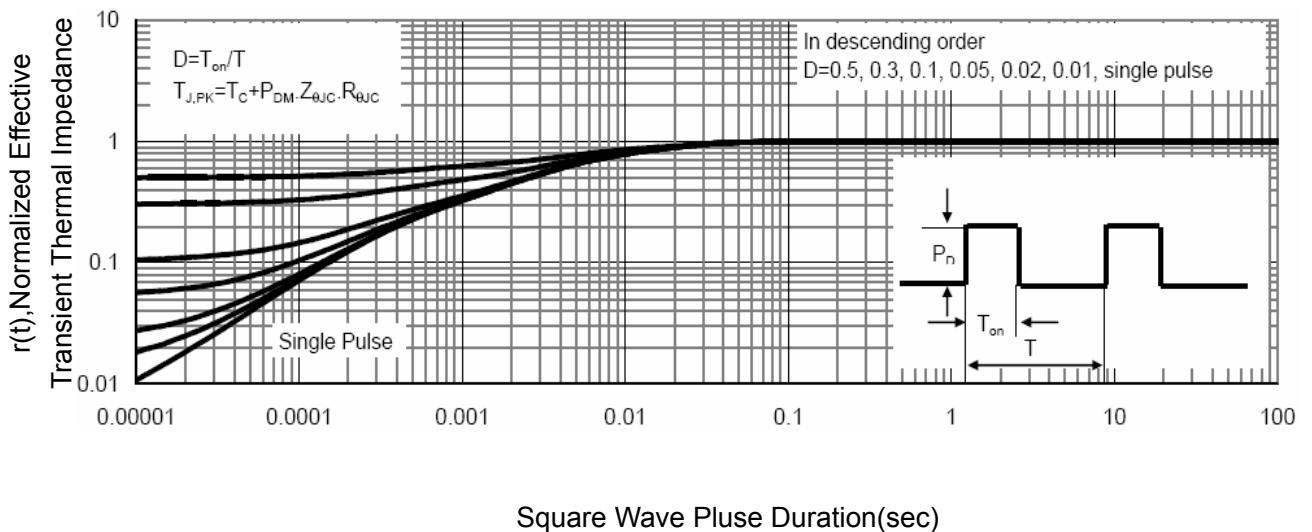
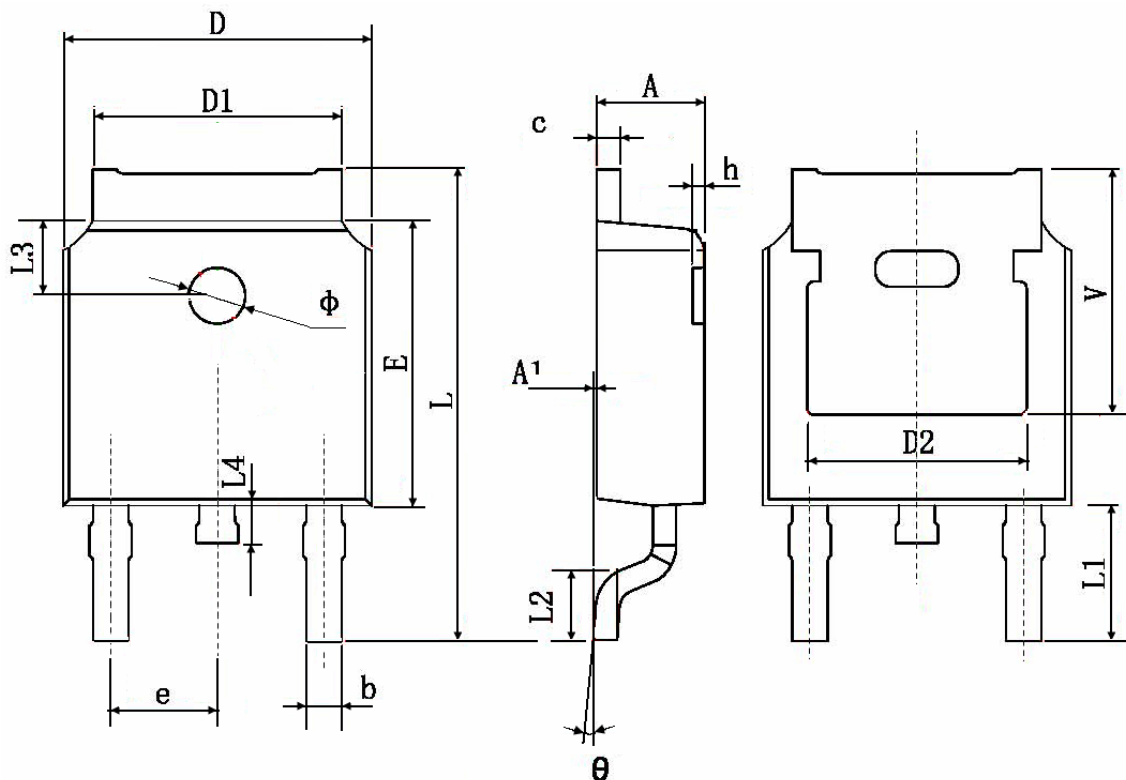


Figure 11 Normalized Maximum Transient Thermal Impedance

TO-252 Package Information


| 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 | 0.660 | 0.860 | 0.026 | 0.034 |
| c | 0.460 | 0.580 | 0.018 | 0.023 |
| D | 6.500 | 6.700 | 0.256 | 0.264 |
| D1 | 5.100 | 5.460 | 0.201 | 0.215 |
| D2 | 4.830 TYP. | | 0.190 TYP. | |
| E | 6.000 | 6.200 | 0.236 | 0.244 |
| e | 2.186 | 2.386 | 0.086 | 0.094 |
| L | 9.800 | 10.400 | 0.386 | 0.409 |
| L1 | 2.900 TYP. | | 0.114 TYP. | |
| L2 | 1.400 | 1.700 | 0.055 | 0.067 |
| L3 | 1.600 TYP. | | 0.063 TYP. | |
| L4 | 0.600 | 1.000 | 0.024 | 0.039 |
| Φ | 1.100 | 1.300 | 0.043 | 0.051 |
| θ | 0° | 8° | 0° | 8° |
| h | 0.000 | 0.300 | 0.000 | 0.012 |
| V | 5.350 TYP. | | 0.211 TYP. | |

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