

NCE N-Channel Enhancement Mode Power MOSFET

Description

The NCE3050K 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.

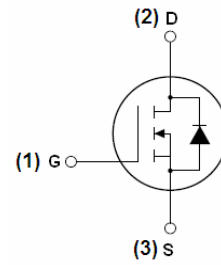
General Features

- $V_{DS} = 30V, I_D = 50A$
 $R_{DS(ON)} < 11m\Omega @ V_{GS} = 10V$
 $R_{DS(ON)} < 16m\Omega @ V_{GS} = 5V$
- 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
- Special process technology for high ESD capability

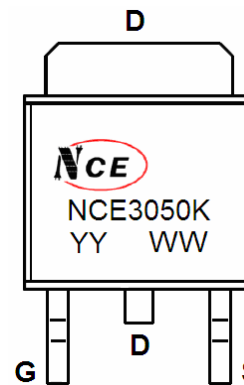
Application

- Power switching application
- Hard switched and high frequency circuits
- Uninterruptible Power Supply

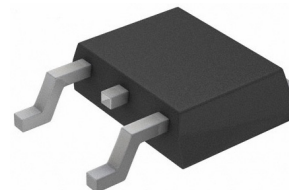
100% UIS TESTED!



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 |
|----------------|----------|----------------|-----------|------------|----------|
| NCE3050K | NCE3050K | TO-252-2L | - | - | - |

Absolute Maximum Ratings (TC=25°C unless otherwise noted)

| Parameter | Symbol | Limit | Unit |
|--|--------------------|------------|------|
| Drain-Source Voltage | V_{DS} | 30 | V |
| Gate-Source Voltage | V_{GS} | ± 20 | V |
| Drain Current-Continuous | I_D | 50 | A |
| Drain Current-Continuous($T_C=100^\circ C$) | $I_D(100^\circ C)$ | 35 | A |
| Pulsed Drain Current | I_{DM} | 140 | A |
| Maximum Power Dissipation | P_D | 60 | W |
| Derating factor | | 0.4 | W/°C |
| Single pulse avalanche energy (Note 5) | E_{AS} | 70 | mJ |
| Operating Junction and Storage Temperature Range | T_J, T_{STG} | -55 To 175 | °C |

Thermal Characteristic

| | | | |
|--|-----------------|-----|---------------|
| Thermal Resistance, Junction-to-Case(Note 2) | $R_{\theta JC}$ | 2.5 | $^{\circ}C/W$ |
|--|-----------------|-----|---------------|

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

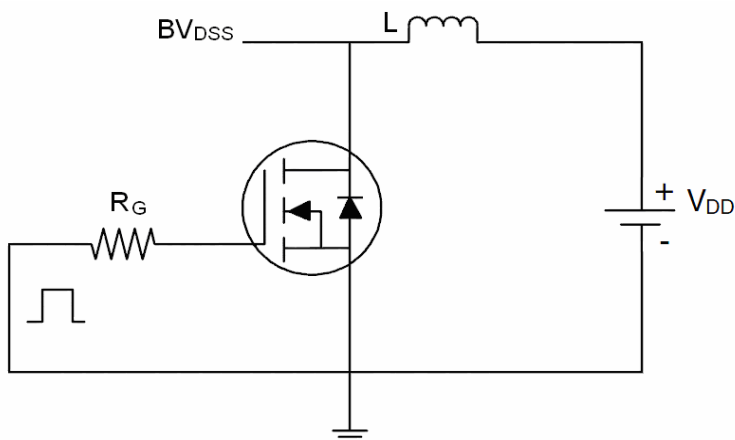
| Parameter | Symbol | Condition | Min | Typ | Max | Unit |
|---|--------------|--|-----|------|-----------|------------|
| Off Characteristics | | | | | | |
| Drain-Source Breakdown Voltage | BV_{DSS} | $V_{GS}=0V, I_D=250\mu A$ | 30 | 33 | - | V |
| Zero Gate Voltage Drain Current | I_{DSS} | $V_{DS}=30V, V_{GS}=0V$ | - | - | 1 | μA |
| Gate-Body Leakage Current | I_{GSS} | $V_{GS}=\pm 20V, V_{DS}=0V$ | - | - | ± 100 | nA |
| On Characteristics (Note 3) | | | | | | |
| Gate Threshold Voltage | $V_{GS(th)}$ | $V_{DS}=V_{GS}, I_D=250\mu A$ | 1 | 1.6 | 3 | V |
| Drain-Source On-State Resistance | $R_{DS(on)}$ | $V_{GS}=10V, I_D=25A$ | - | 8 | 11 | m Ω |
| | | $V_{GS}=5V, I_D=20A$ | - | 10 | 16 | |
| Forward Transconductance | g_{FS} | $V_{DS}=5V, I_D=20A$ | 15 | - | - | S |
| Dynamic Characteristics (Note4) | | | | | | |
| Input Capacitance | C_{iss} | $V_{DS}=15V, V_{GS}=0V,$ $F=1.0MHz$ | - | 2000 | - | PF |
| Output Capacitance | C_{oss} | | - | 280 | - | PF |
| Reverse Transfer Capacitance | C_{rss} | | - | 160 | - | PF |
| Switching Characteristics (Note 4) | | | | | | |
| Turn-on Delay Time | $t_{d(on)}$ | $V_{DD}=15V, I_D=20A$ $V_{GS}=10V, R_{GEN}=1.8\Omega$ | - | 10 | - | nS |
| Turn-on Rise Time | t_r | | - | 8 | - | nS |
| Turn-Off Delay Time | $t_{d(off)}$ | | - | 30 | - | nS |
| Turn-Off Fall Time | t_f | | - | 5 | - | nS |
| Total Gate Charge | Q_g | $V_{DS}=10V, I_D=25A,$ $V_{GS}=10V$ | - | 23 | - | nC |
| Gate-Source Charge | Q_{gs} | | - | 7 | - | nC |
| Gate-Drain Charge | Q_{gd} | | - | 4.5 | - | nC |
| Drain-Source Diode Characteristics | | | | | | |
| Diode Forward Voltage (Note 3) | V_{SD} | $V_{GS}=0V, I_S=25A$ | - | 0.85 | 1.2 | V |
| Diode Forward Current (Note 2) | I_S | | - | - | 40 | A |
| Reverse Recovery Time | t_{rr} | $T_J = 25^{\circ}C, I_F = 40A$ $di/dt = 100A/\mu s$ (Note3) | - | 22 | 35 | nS |
| Reverse Recovery Charge | Q_{rr} | | - | 12 | 20 | nC |
| Forward Turn-On Time | t_{on} | Intrinsic turn-on time is negligible (turn-on is dominated by LS+LD) | | | | |

Notes:

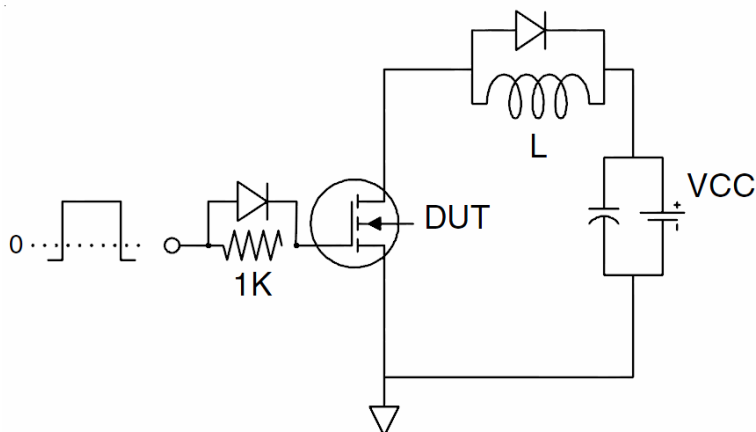
1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Surface Mounted on FR4 Board, $t \leq 10$ sec.
3. Pulse Test: Pulse Width $\leq 300\mu s$, Duty Cycle $\leq 2\%$.
4. Guaranteed by design, not subject to production
5. EAS condition: $T_J=25^{\circ}C, V_{DD}=15V, V_G=10V, L=1mH, R_g=25\Omega$

Test circuit

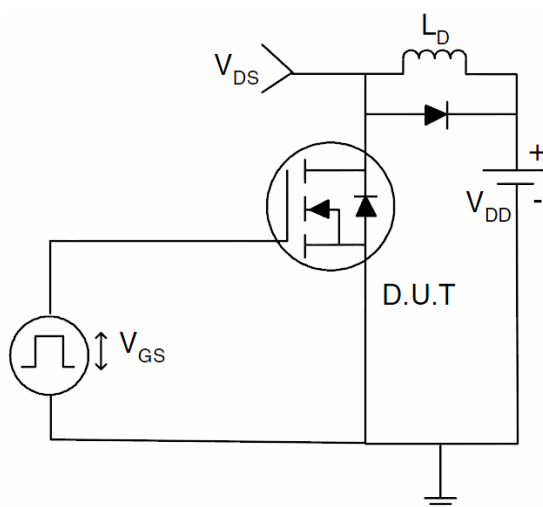
1) E_{AS} test Circuits



2) Gate charge test Circuit:



3) Switch Time Test Circuit:



Typical Electrical And Thermal Characteristics (Curves)

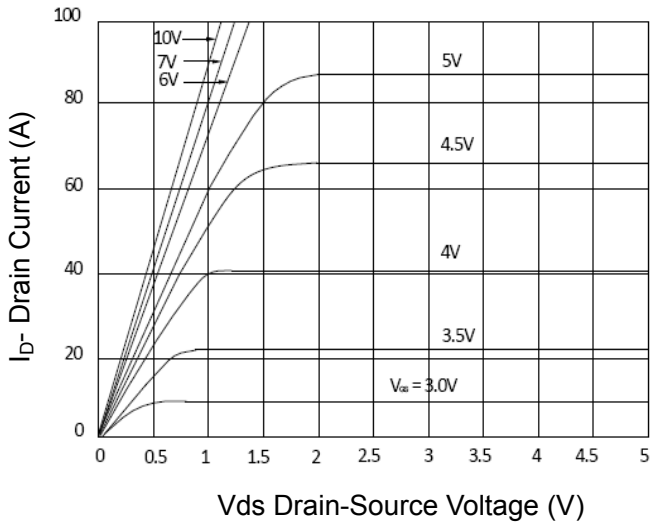


Figure 1 Output Characteristics

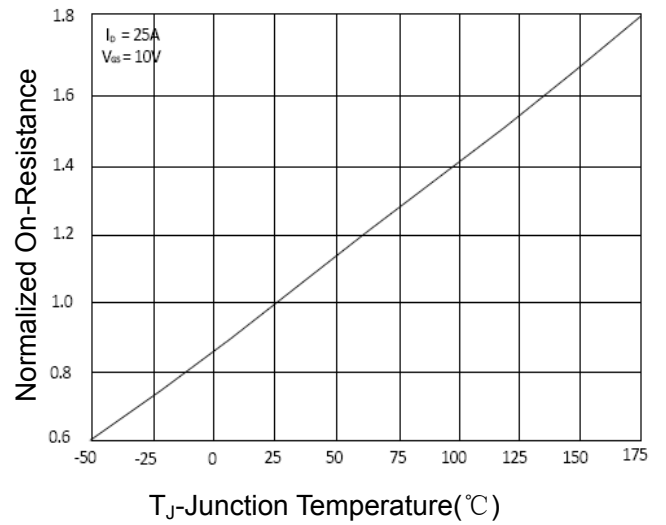


Figure 4 R_{dson} -Junction Temperature

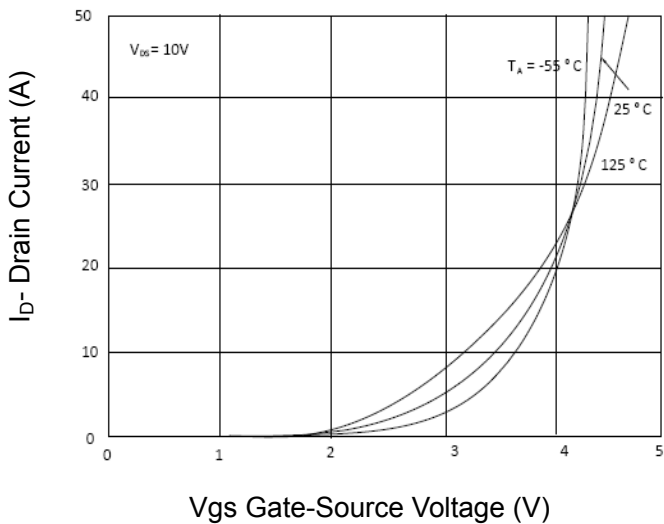


Figure 2 Transfer Characteristics

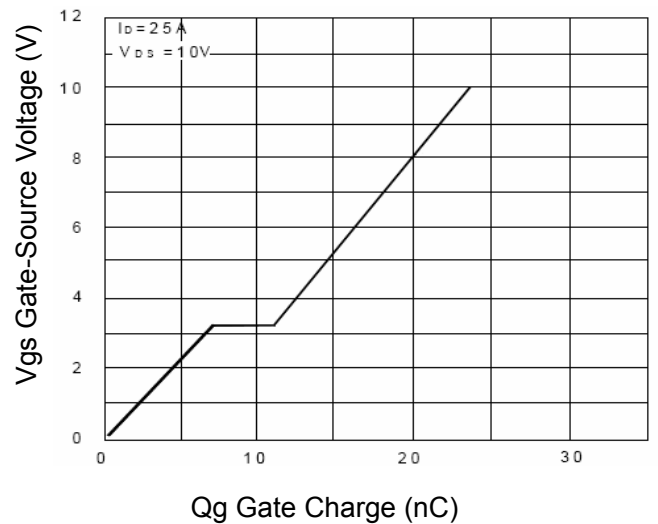


Figure 5 Gate Charge

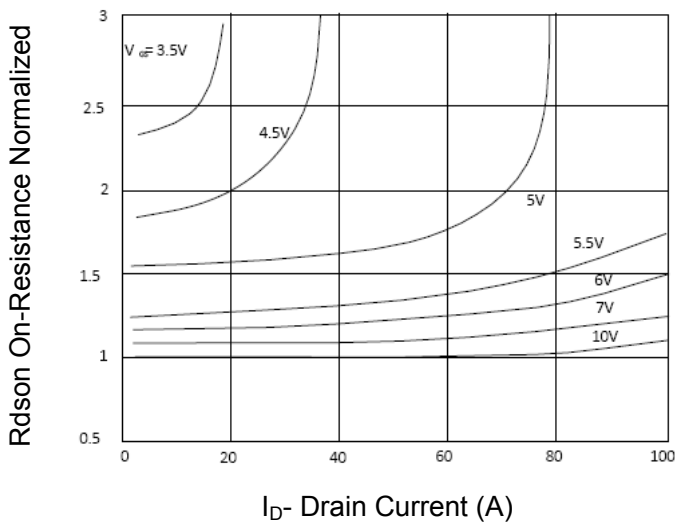


Figure 3 R_{dson} - Drain Current

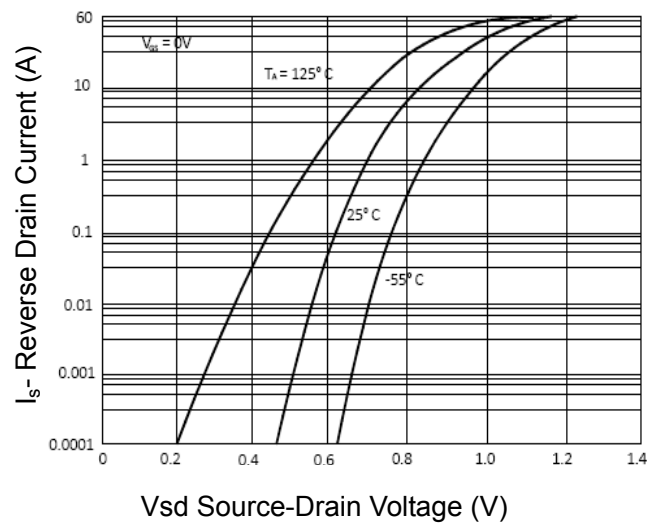
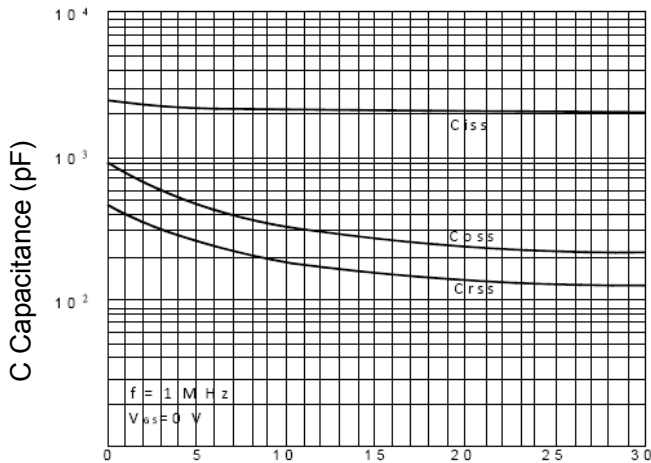
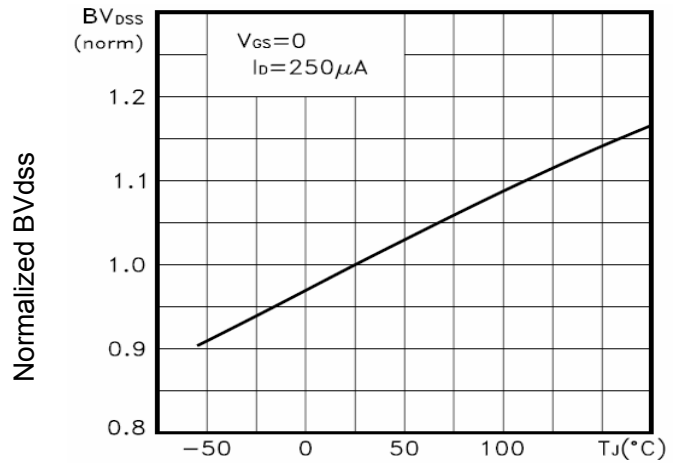


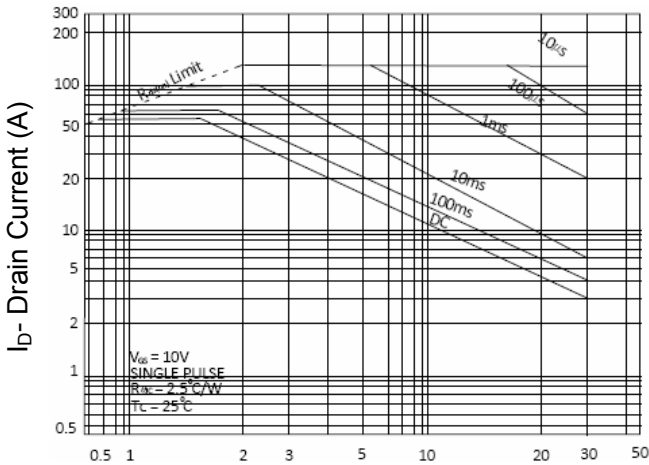
Figure 6 Source- Drain Diode Forward



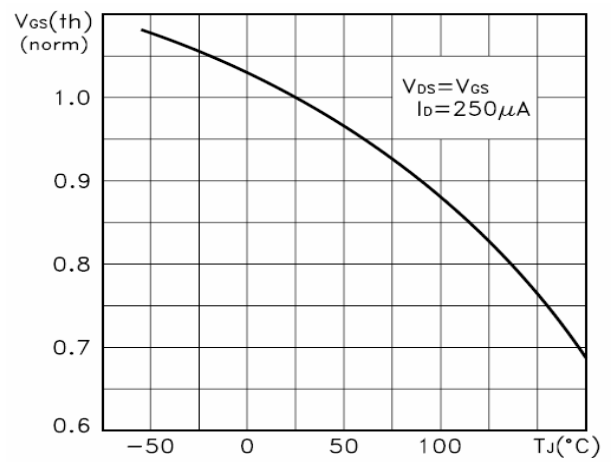
Vds Drain-Source Voltage (V)
Figure 7 Capacitance vs Vds



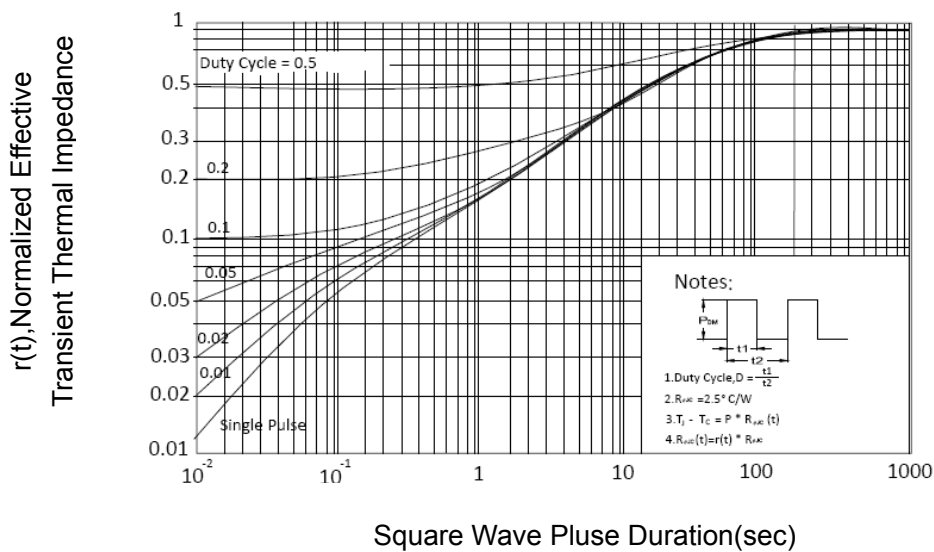
T_J-Junction Temperature(°C)
Figure 9 BV_{DSS} vs Junction Temperature



Vds Drain-Source Voltage (V)
Figure 8 Safe Operation Area

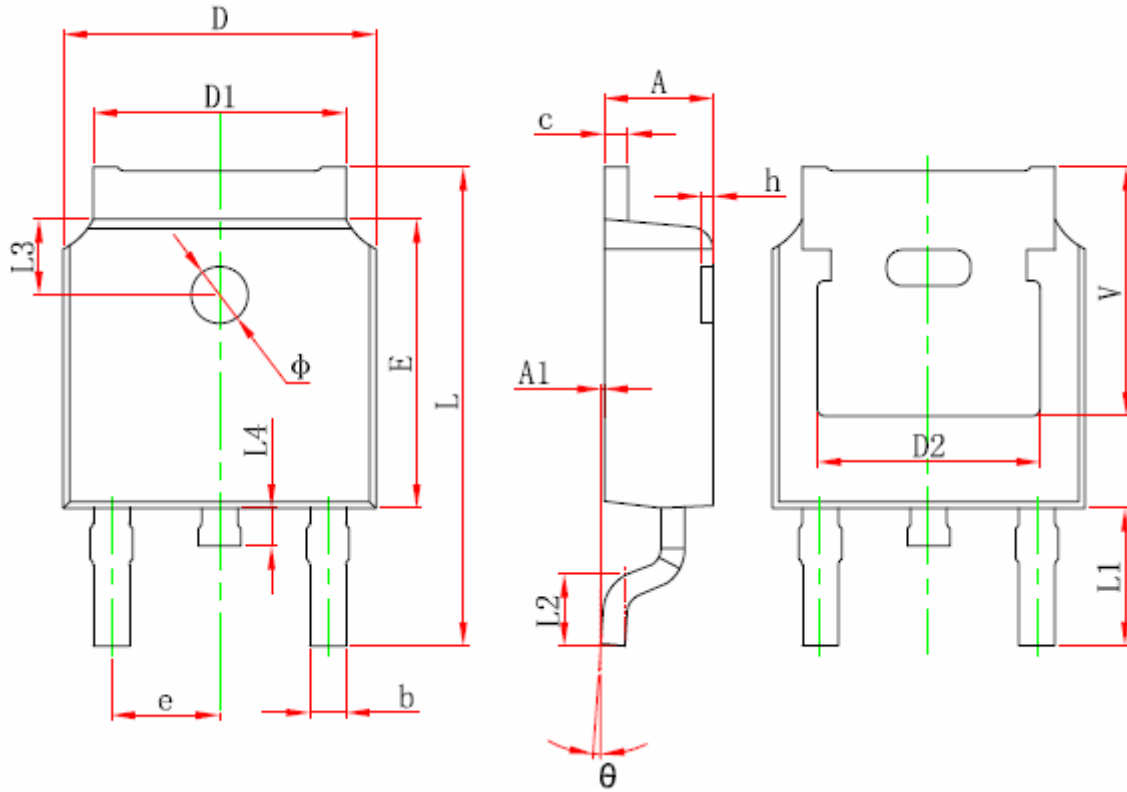


T_J-Junction Temperature(°C)
Figure 10 V_{GS(th)} vs Junction Temperature



Square Wave Pluse Duration(sec)
Figure 11 Normalized Maximum Transient Thermal Impedance

TO-252-2L 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 REF. | | 0.190 REF. | |
| 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 REF. | | 0.114 REF. | |
| L2 | 1.400 | 1.700 | 0.055 | 0.067 |
| L3 | 1.600 REF. | | 0.063 REF. | |
| 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 REF. | | 0.211 REF. | |

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