

N and P-Channel Enhancement Mode Power MOSFET

Description

The NCE30NP1812K uses advanced trench technology to provide excellent $R_{DS(ON)}$ and low gate charge. The complementary MOSFETs may be used to form a level shifted high side switch, and for a host of other applications.

General Features

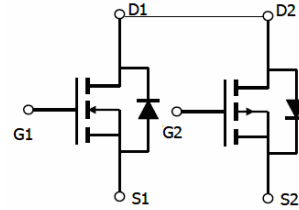
● N-Channel

- $V_{DS} = 30V, I_D = 18A$
- $R_{DS(ON)} < 41m\Omega @ V_{GS}=10V$
- $R_{DS(ON)} < 54m\Omega @ V_{GS}=4.5V$

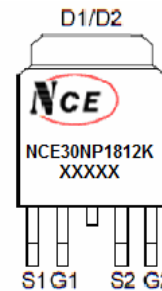
● P-Channel

- $V_{DS} = -30V, I_D = -12A$
- $R_{DS(ON)} < 58m\Omega @ V_{GS}=-10V$
- $R_{DS(ON)} < 85m\Omega @ V_{GS}=-4.5V$

- High power and current handling capability
- Lead free product is acquired
- Surface mount package



Schematic diagram



Marking and pin assignment

100% UIS TESTED!

100% ΔV_{ds} TESTED!

Package Marking and Ordering Information

| Device Marking | Device | Device Package | Reel Size | Tape width | Quantity |
|----------------|--------------|----------------|-----------|------------|----------|
| NCE30NP1812K | NCE30NP1812K | TO-252-4L | - | - | - |

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

| Parameter | Symbol | N-Channel | P-Channel | Unit | |
|--|----------------|------------------|------------|------------|---|
| Drain-Source Voltage | V_{DS} | 30 | -30 | V | |
| Gate-Source Voltage | V_{GS} | ± 12 | ± 12 | V | |
| Continuous Drain Current | I_D | $T_A=25^\circ C$ | 18 | -12 | A |
| | | $T_A=70^\circ C$ | 14.4 | -8.5 | |
| Pulsed Drain Current ^(Note 1) | I_{DM} | 72 | -48 | A | |
| Maximum Power Dissipation | P_D | 25 | 25 | W | |
| Operating Junction and Storage Temperature Range | T_J, T_{STG} | -55 To 150 | -55 To 150 | $^\circ C$ | |

Thermal Characteristic

| | | | | |
|---|-----------------|------|---|--------------|
| Thermal Resistance, Junction-to-Case ^(Note2) | $R_{\theta JC}$ | N-Ch | 5 | $^\circ C/W$ |
| Thermal Resistance, Junction-to-Case ^(Note2) | $R_{\theta JC}$ | P-Ch | 5 | $^\circ C/W$ |

N-CH Electrical Characteristics (T_A=25°C unless otherwise noted)

| Parameter | Symbol | Condition | Min | Typ | Max | Unit |
|---|---------------------|--|-----|-------|------|------|
| Off Characteristics | | | | | | |
| Drain-Source Breakdown Voltage | BV _{DSS} | V _{GS} =0V, I _D =250μA | 30 | - | - | V |
| Zero Gate Voltage Drain Current | I _{DSS} | V _{DS} =30V, V _{GS} =0V | - | - | 1 | μA |
| Gate-Body Leakage Current | I _{GSS} | V _{GS} =±20V, V _{DS} =0V | - | - | ±100 | nA |
| On Characteristics (Note 3) | | | | | | |
| Gate Threshold Voltage | V _{GS(th)} | V _{DS} =V _{GS} , I _D =250μA | 1 | 1.5 | 2.0 | V |
| Drain-Source On-State Resistance | R _{DS(ON)} | V _{GS} =10V, I _D =10A | - | 36 | 41 | mΩ |
| | | V _{GS} =4.5V, I _D =10A | - | 45 | 54 | mΩ |
| Forward Transconductance | g _{FS} | V _{DS} =5V, I _D =10A | | 10 | - | S |
| Dynamic Characteristics (Note4) | | | | | | |
| Input Capacitance | C _{iss} | V _{DS} =15V, V _{GS} =0V, F=1.0MHz | - | 519.9 | - | PF |
| Output Capacitance | C _{oss} | | - | 55.5 | - | PF |
| Reverse Transfer Capacitance | C _{rss} | | - | 49.3 | - | PF |
| Switching Characteristics (Note 4) | | | | | | |
| Turn-on Delay Time | t _{d(on)} | V _{DD} =15V, R _L =1.5Ω V _{GS} =10V, R _{GEN} =3Ω | - | 5 | - | nS |
| Turn-on Rise Time | t _r | | - | 3 | - | nS |
| Turn-Off Delay Time | t _{d(off)} | | - | 15 | - | nS |
| Turn-Off Fall Time | t _f | | - | 3 | - | nS |
| Total Gate Charge | Q _g | V _{DS} =15V, I _D =10A, V _{GS} =10V | - | 14.7 | - | nC |
| Gate-Source Charge | Q _{gs} | | - | 2.5 | - | nC |
| Gate-Drain Charge | Q _{gd} | | - | 3.0 | - | nC |
| Drain-Source Diode Characteristics | | | | | | |
| Diode Forward Voltage (Note 3) | V _{SD} | V _{GS} =0V, I _S =10A | - | 0.8 | 1.2 | V |

P-CH Electrical Characteristics ($T_A=25^{\circ}\text{C}$ 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 | - | - | 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 | $V_{GS(th)}$ | $V_{DS}=V_{GS}, I_D=-250\mu A$ | -1.0 | -1.5 | -2.0 | V |
| Drain-Source On-State Resistance | $R_{DS(ON)}$ | $V_{GS}=-10V, I_D=-12A$ | - | 50 | 58 | m Ω |
| | | $V_{GS}=-4.5V, I_D=-10A$ | - | 71 | 85 | m Ω |
| Forward Transconductance | g_{FS} | $V_{DS}=-5V, I_D=-12A$ | - | 10 | - | S |
| Dynamic Characteristics (Note 4) | | | | | | |
| Input Capacitance | C_{ISS} | $V_{DS}=-15V, V_{GS}=0V,$ $F=1.0\text{MHz}$ | - | 464.7 | - | PF |
| Output Capacitance | C_{OSS} | | - | 70.4 | - | PF |
| Reverse Transfer Capacitance | C_{RSS} | | - | 53.8 | - | PF |
| Switching Characteristics (Note 4) | | | | | | |
| Turn-on Delay Time | $t_{d(on)}$ | $V_{DD}=-15V, R_L=1.25\Omega$ $V_{GS}=-10V, R_{GEN}=6\Omega$ | - | 5 | - | nS |
| Turn-on Rise Time | t_r | | - | 3 | - | nS |
| Turn-Off Delay Time | $t_{d(off)}$ | | - | 15 | - | nS |
| Turn-Off Fall Time | t_f | | - | 4 | - | nS |
| Total Gate Charge | Q_g | $V_{DS}=-15V, I_D=-12A$ $V_{GS}=-10V$ | - | 12.6 | - | nC |
| Gate-Source Charge | Q_{gs} | | - | 2.1 | - | nC |
| Gate-Drain Charge | Q_{gd} | | - | 3.0 | - | nC |
| Drain-Source Diode Characteristics | | | | | | |
| Diode Forward Voltage (Note 3) | V_{SD} | $V_{GS}=0V, I_S=-12A$ | - | - | -1.2 | V |

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

N- Channel Typical Electrical and Thermal Characteristics (Curves)

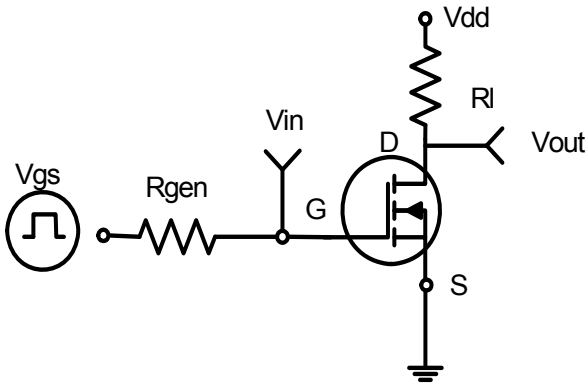


Figure 1: Switching Test Circuit

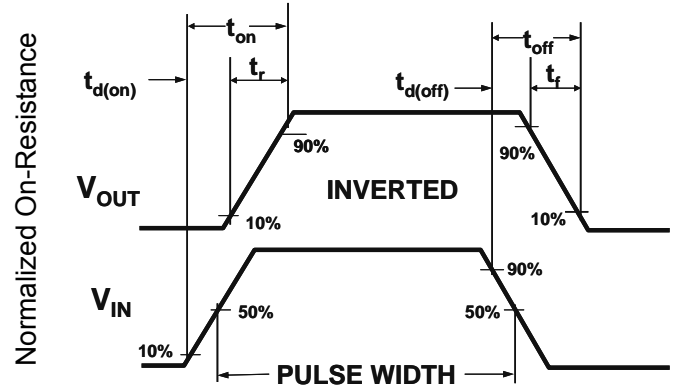


Figure 2: Switching Waveforms

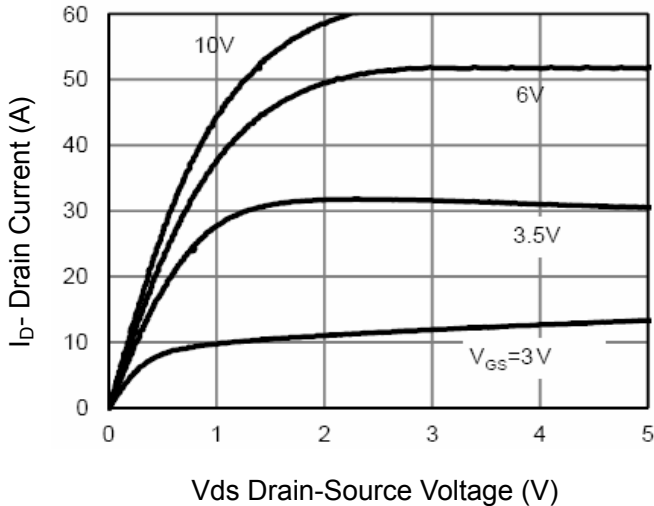


Figure 3 Output Characteristics

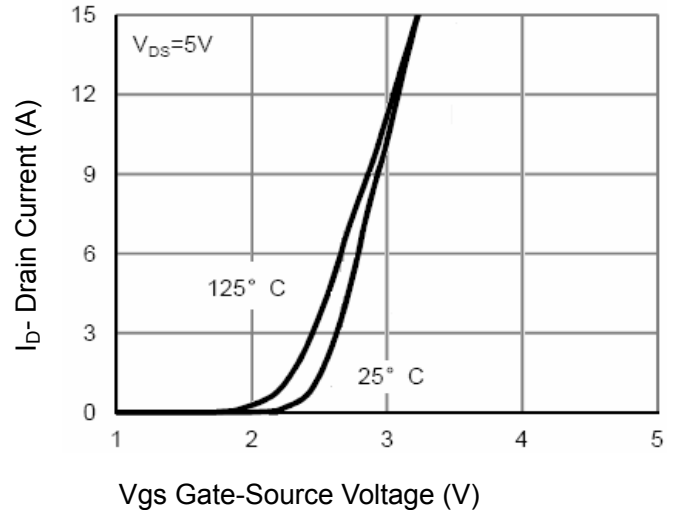


Figure 4 Transfer Characteristics

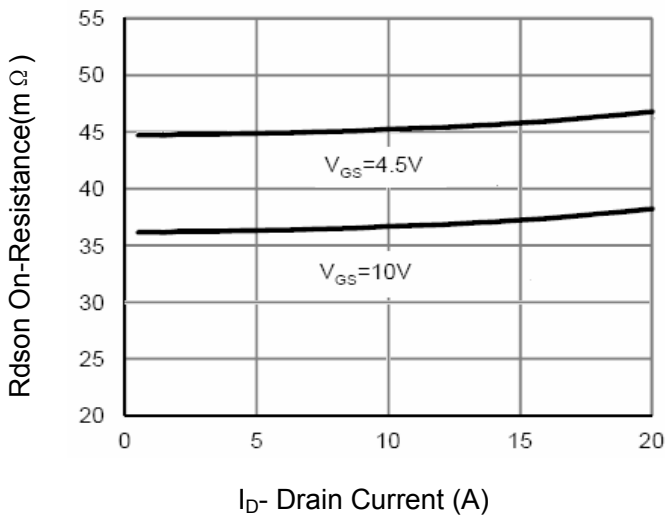


Figure 5 Drain-Source On-Resistance

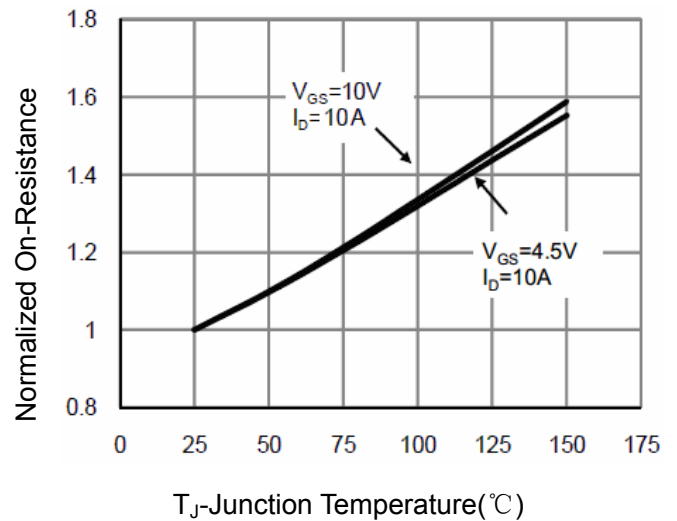


Figure 6 Drain-Source On-Resistance

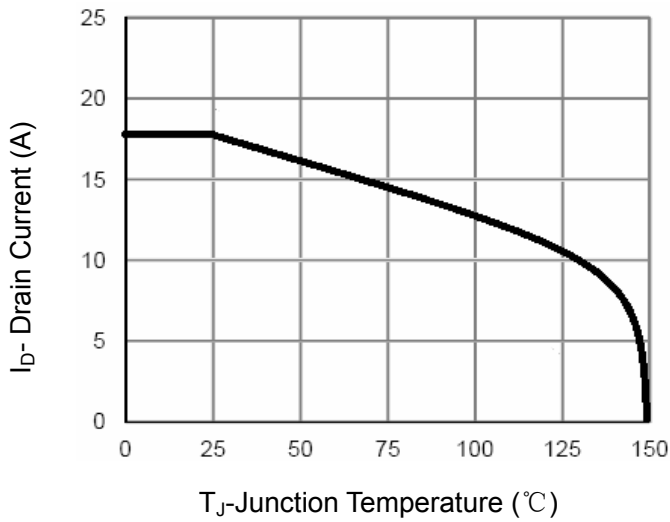


Figure 7 Current De-rating

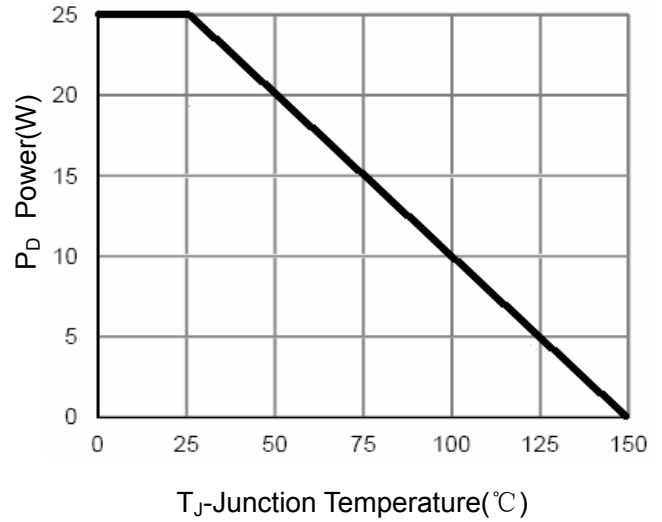


Figure 8 Power Dissipation

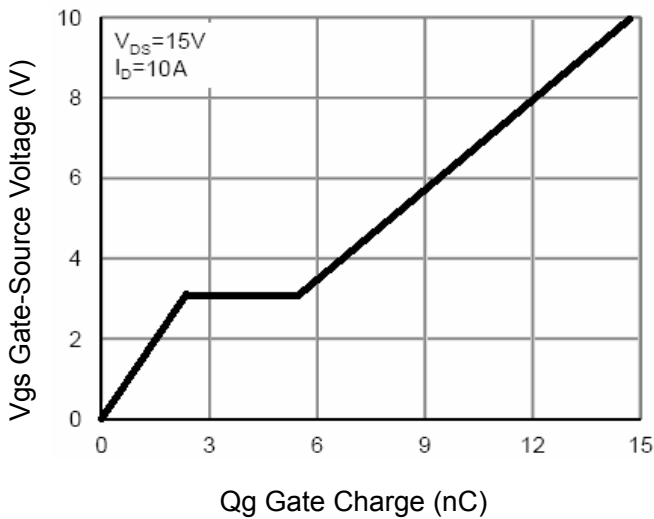


Figure 9 Gate Charge

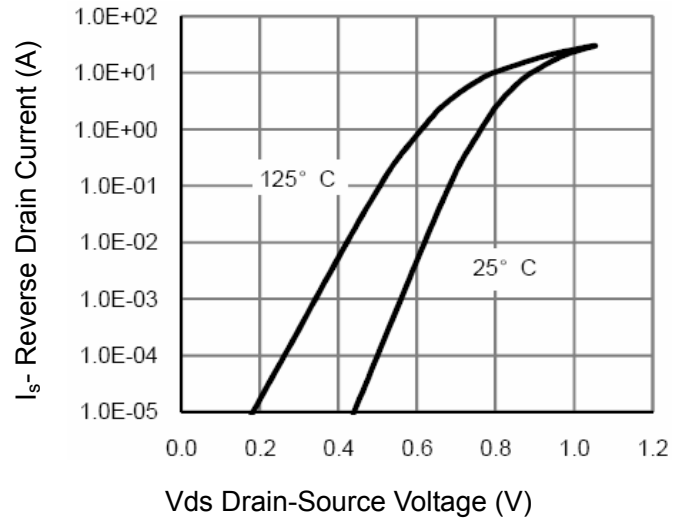


Figure 10 Source- Drain Diode Forward

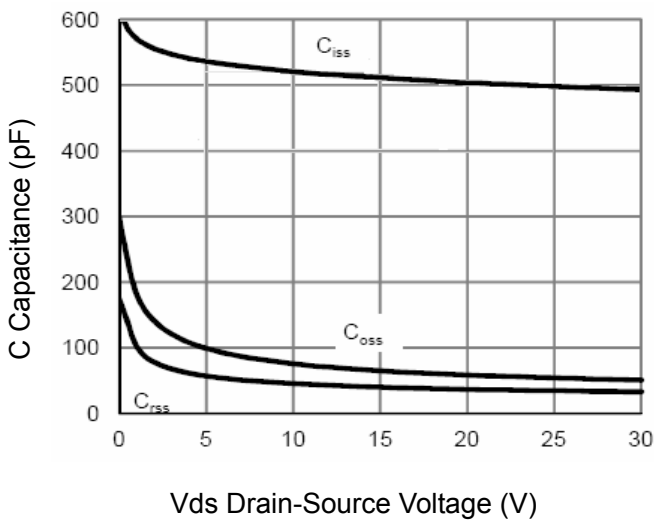


Figure 11 Capacitance vs Vds

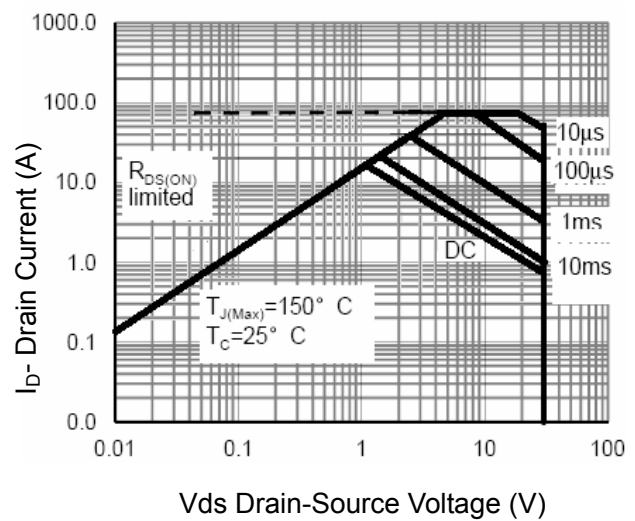


Figure 12 Safe Operation Area

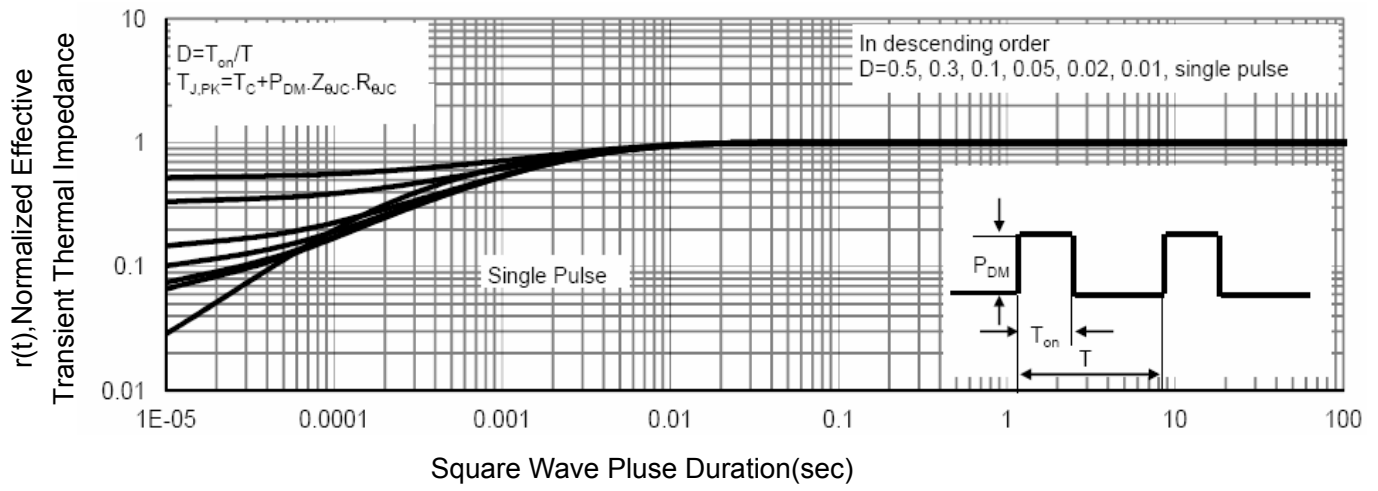


Figure 13 Normalized Maximum Transient Thermal Impedance

P- Channel Typical Electrical and Thermal Characteristics (Curves)

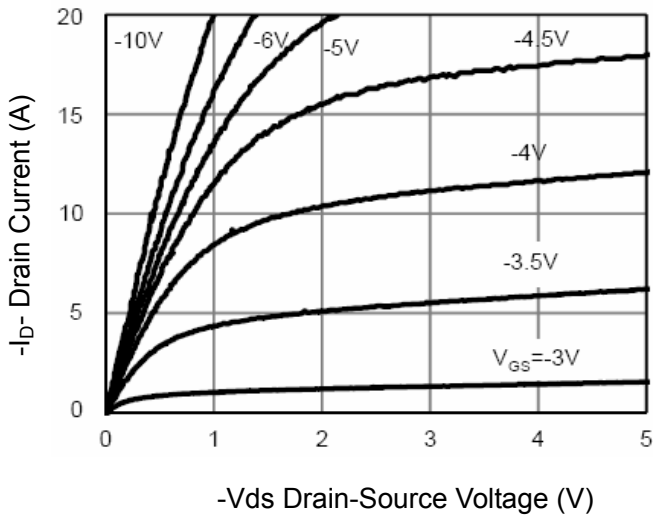


Figure 1 Output Characteristics

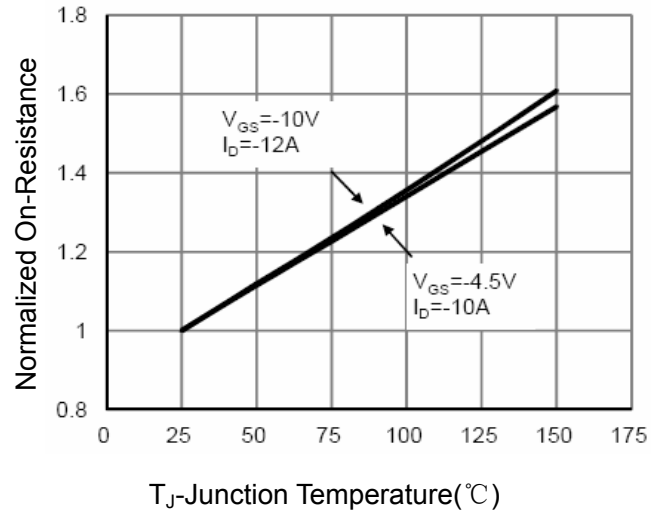


Figure 4 Rdson-Junction Temperature

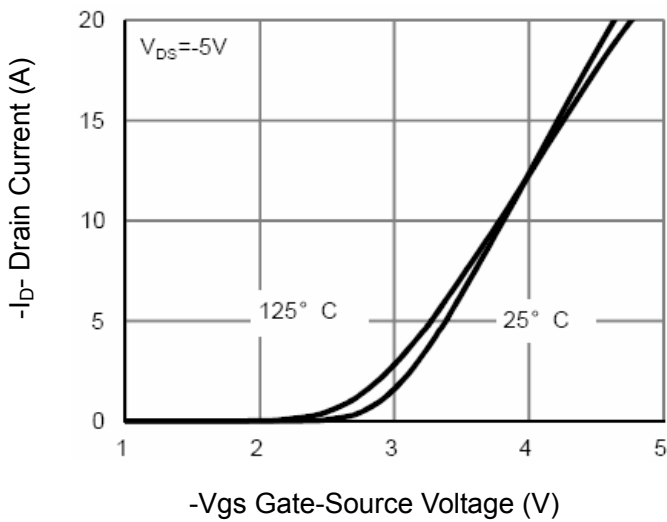


Figure 2 Transfer Characteristics

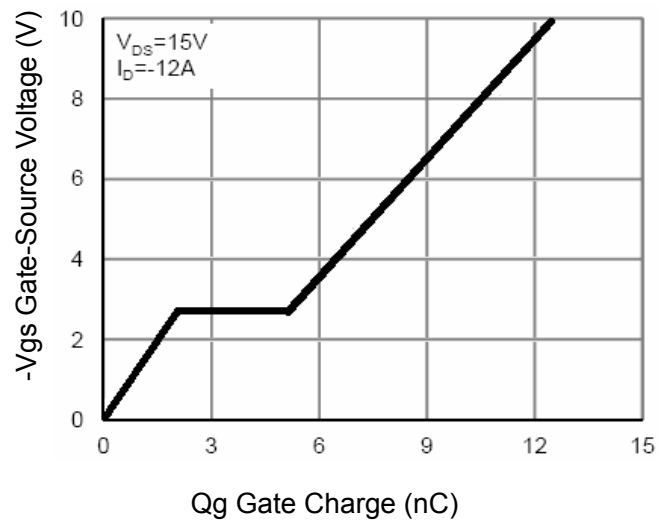


Figure 5 Gate Charge

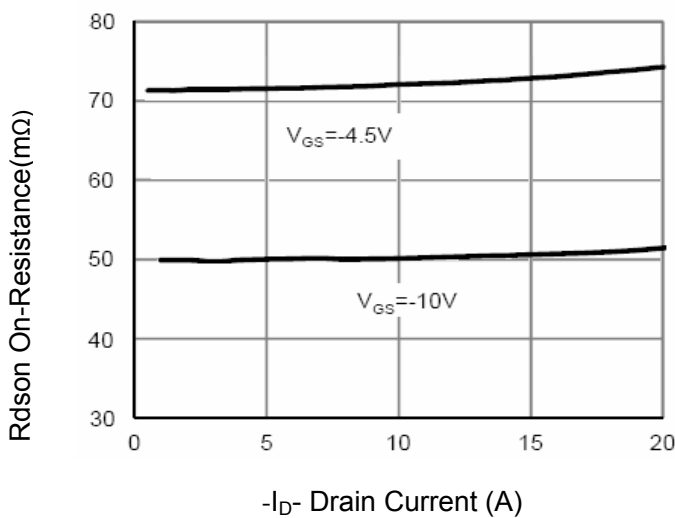


Figure 3 Rdson- Drain Current

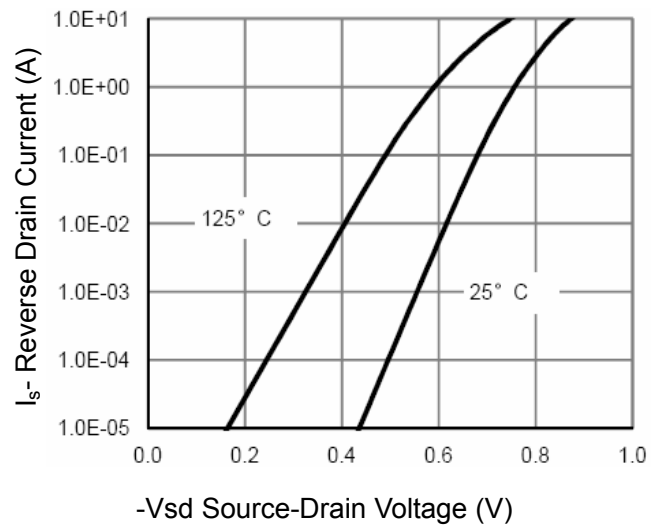
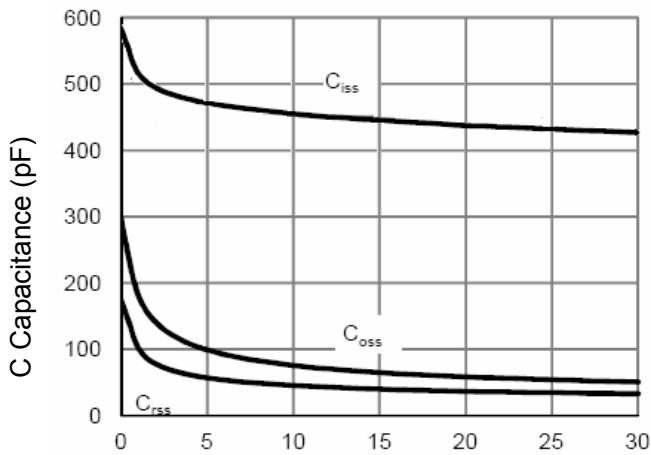
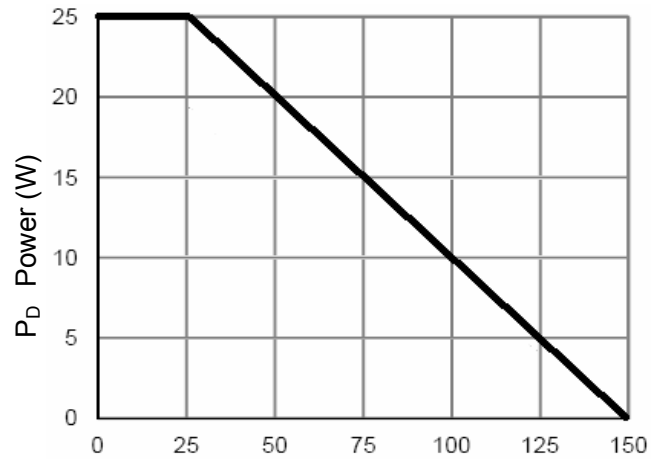


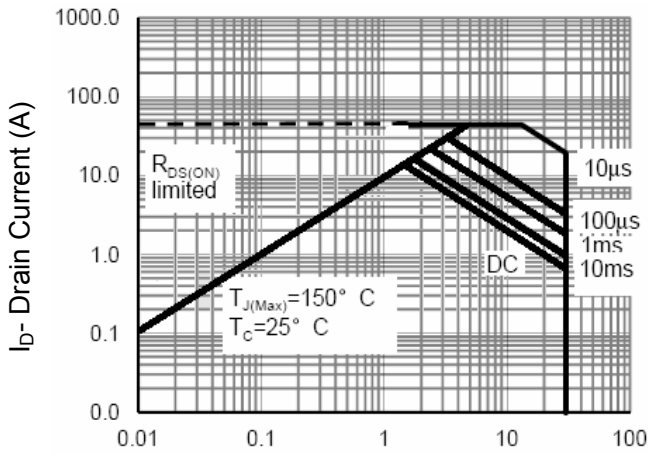
Figure 6 Source- Drain Diode Forward



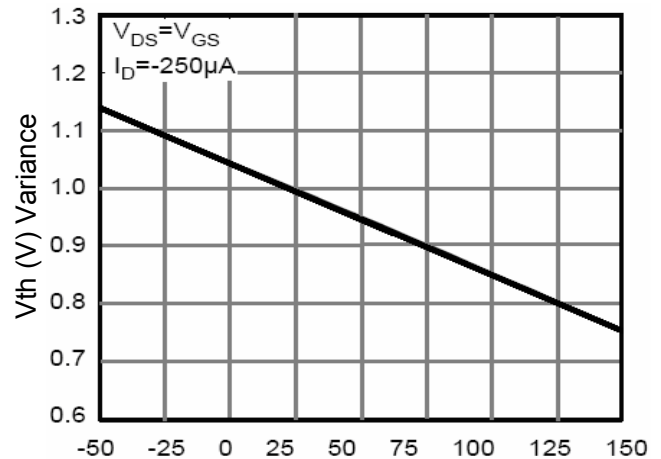
-Vds Drain-Source Voltage (V)
Figure 7 Capacitance vs Vds



T_J-Junction Temperature(°C)
Figure 9 Power Dissipation



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



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

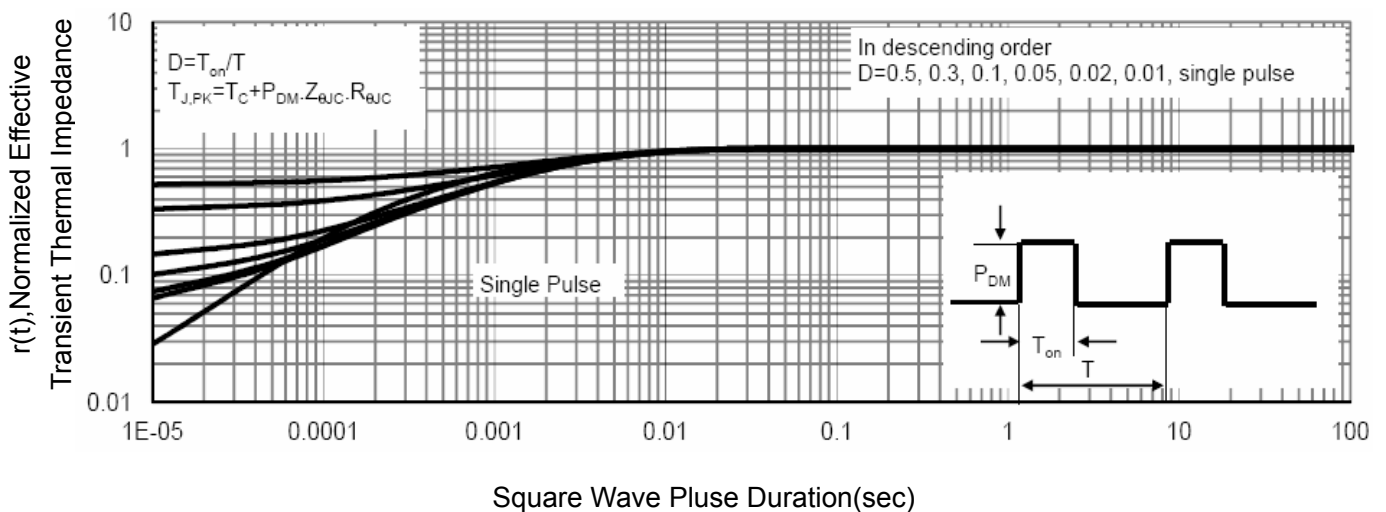
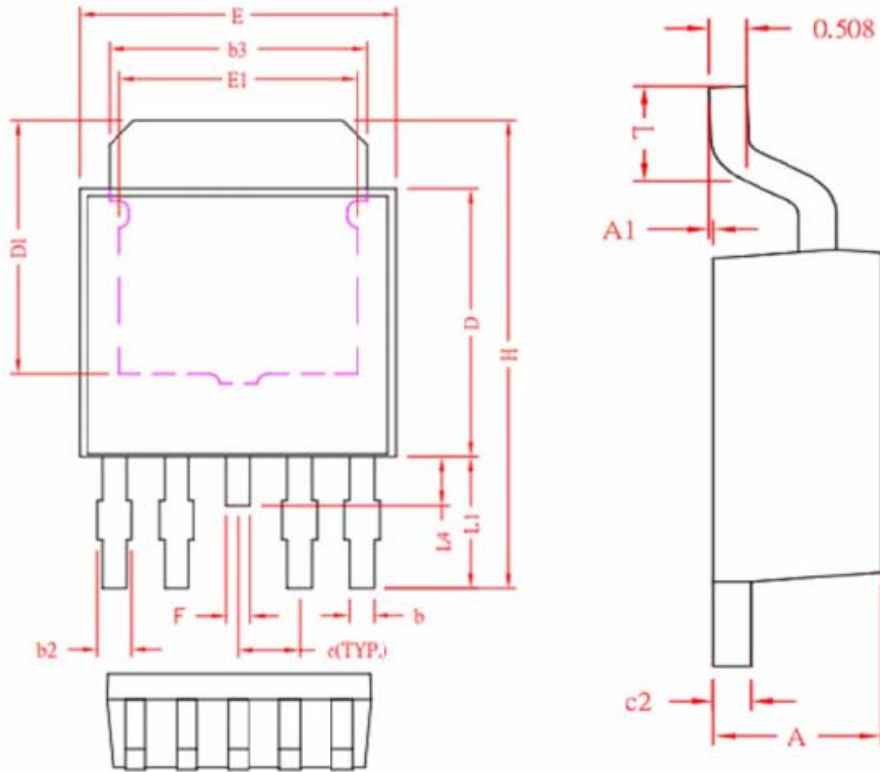


Figure 11 Normalized Maximum Transient Thermal Impedance

TO-252-4L Package Information



COMMON DIMENSIONS
(UNITS OF MEASURE=MILLIMETER)

| SYMBOL | MIN | NOM | MAX |
|--------|-----------|------|-------|
| A | 2.20 | 2.30 | 2.40 |
| A1 | 0 | 0.08 | 0.15 |
| b | 0.45 | 0.53 | 0.60 |
| b2 | 0.50 | 0.65 | 0.80 |
| b3 | 5.20 | 5.35 | 5.50 |
| c2 | 0.45 | 0.50 | 0.55 |
| D | 5.40 | 5.60 | 5.80 |
| D1 | 4.57 | - | - |
| E | 6.40 | 6.60 | 6.80 |
| E1 | 3.81 | - | - |
| e | 1.27 REF. | | |
| F | 0.40 | 0.50 | 0.60 |
| H | 9.40 | 9.80 | 10.20 |
| L | 1.40 | 1.59 | 1.77 |
| L1 | 2.40 | 2.70 | 3.00 |
| L4 | 0.80 | 1.00 | 1.20 |

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