

NCE N&P-Channel complementary Power MOSFET

Description

The NCE30D2519K 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

N channel

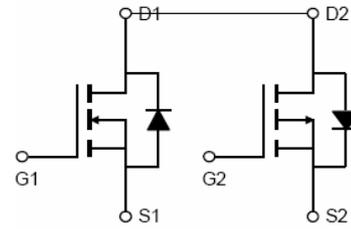
- $V_{DS} = 30V, I_D = 25A$
 $R_{DS(ON)} < 12m\Omega @ V_{GS} = 10V$
 $R_{DS(ON)} < 18m\Omega @ V_{GS} = 4.5V$

p channel

- $V_{DS} = -30V, I_D = -19A$
 $R_{DS(ON)} < 35m\Omega @ V_{GS} = -10V$
 $R_{DS(ON)} < 65m\Omega @ V_{GS} = -4.5V$
- 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

- H-bridge
- Inverters



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 |
|----------------|-------------|----------------|-----------|------------|----------|
| 30D2519K | NCE30D2519K | TO-252-4L | - | - | - |

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

| Parameter | Symbol | N-Channel | P-Channel | Unit | |
|--|----------------|---------------------|-----------|------------|---|
| Drain-Source Voltage | V_{DS} | 30 | -30 | V | |
| Gate-Source Voltage | V_{GS} | ± 20 | ± 20 | V | |
| Continuous Drain Current | I_D | $T_C = 25^\circ C$ | 25 | -19 | A |
| | | $T_C = 100^\circ C$ | 17.7 | -13.4 | |
| Pulsed Drain Current ^(Note 1) | I_{DM} | 90 | -60 | A | |
| Maximum Power Dissipation | P_D | 21 | | W | |
| Operating Junction and Storage Temperature Range | T_J, T_{STG} | -55 To 175 | | $^\circ C$ | |

Thermal Characteristic

| | | | |
|--|-----------------|---|--------------|
| Thermal Resistance, Junction-to-Case ^(Note 2) | $R_{\theta JC}$ | 7 | $^\circ C/W$ |
|--|-----------------|---|--------------|

N-Channel Electrical Characteristics (T_C=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 | 1.0 | 2.0 | 3.0 | V |
| Drain-Source On-State Resistance | R _{DS(ON)} | V _{GS} =10V, I _D =7A | - | 8.5 | 12 | mΩ |
| | | V _{GS} =4.5V, I _D =6A | - | 11.8 | 18 | mΩ |
| Forward Transconductance | g _{FS} | V _{DS} =10V, I _D =7A | - | 29 | - | S |
| Dynamic Characteristics (Note 4) | | | | | | |
| Input Capacitance | C _{iss} | V _{DS} =15V, V _{GS} =0V, F=1.0MHz | - | 450 | - | PF |
| Output Capacitance | C _{oss} | | - | 150 | - | PF |
| Reverse Transfer Capacitance | C _{rss} | | - | 90 | - | PF |
| Switching Characteristics (Note 4) | | | | | | |
| Turn-on Delay Time | t _{d(on)} | V _{DD} =15V, R _L =2.5Ω V _{GS} =10V, R _G =3Ω | - | 5 | - | nS |
| Turn-on Rise Time | t _r | | - | 12 | - | nS |
| Turn-Off Delay Time | t _{d(off)} | | - | 19 | - | nS |
| Turn-Off Fall Time | t _f | | - | 6 | - | nS |
| Total Gate Charge | Q _g | V _{DS} =15V, I _D =6A, V _{GS} =10V | - | 9.5 | | nC |
| Gate-Source Charge | Q _{gs} | | - | 2.0 | | nC |
| Gate-Drain Charge | Q _{gd} | | - | 1.9 | | nC |
| Drain-Source Diode Characteristics | | | | | | |
| Diode Forward Voltage (Note 3) | V _{SD} | V _{GS} =0V, I _S =25A | - | | 1.2 | V |
| Diode Forward Current (Note 2) | I _S | | - | - | 25 | A |

Notes:

1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Surface Mounted on FR4 Board, t ≤ 10 sec.
3. Pulse Test: Pulse Width ≤ 300μs, Duty Cycle ≤ 2%.
4. Guaranteed by design, not subject to production
5. EAS condition: T_j=25°C, V_{DD}=30V, V_G=10V, L=0.5mH, R_G=25Ω

N-Channel Typical Electrical and Thermal Characteristics (Curves)

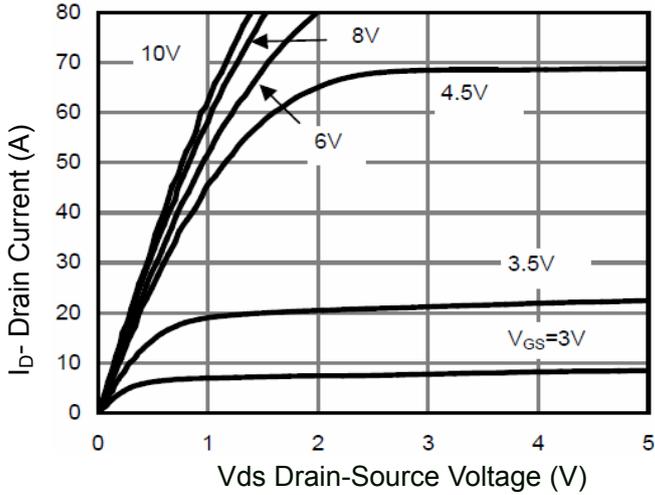


Figure 1 Output Characteristics

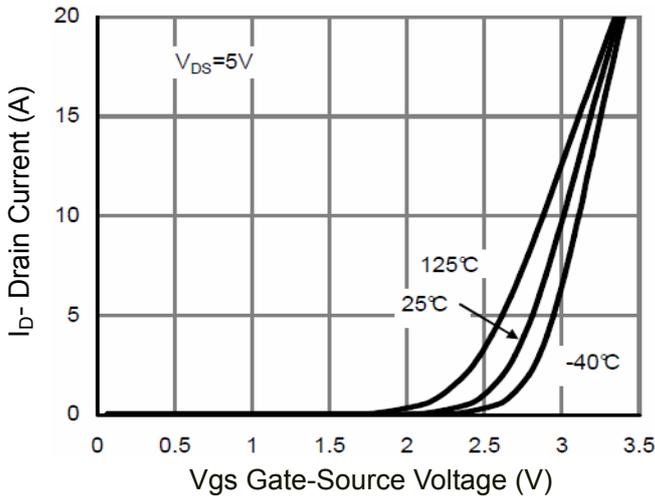


Figure 2 Transfer Characteristics

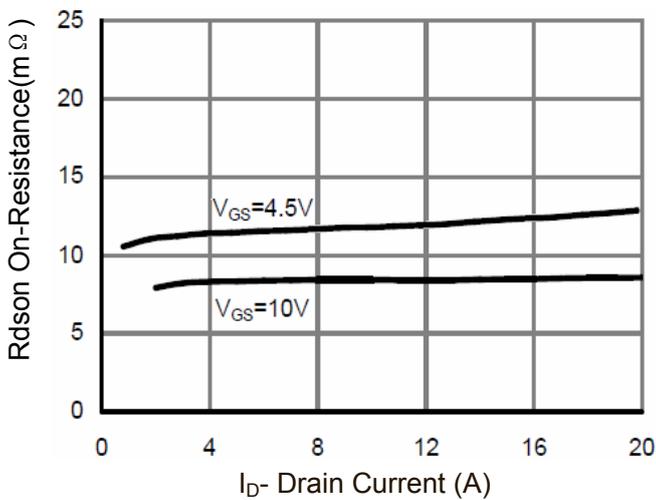


Figure 3 $R_{DS(on)}$ - Drain Current

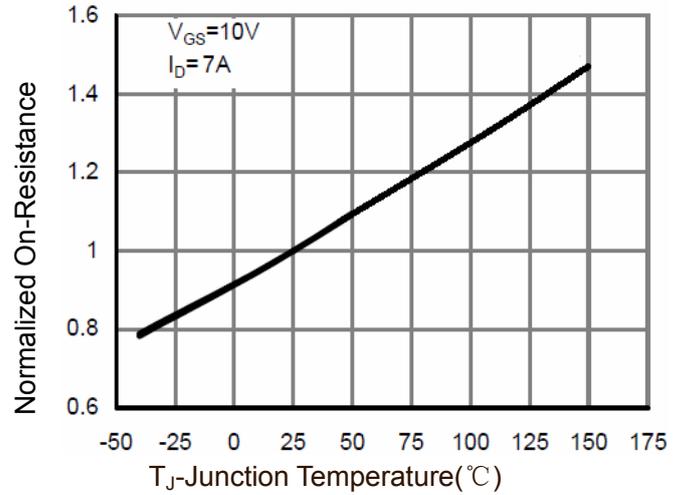


Figure 4 $R_{DS(on)}$ -Junction Temperature

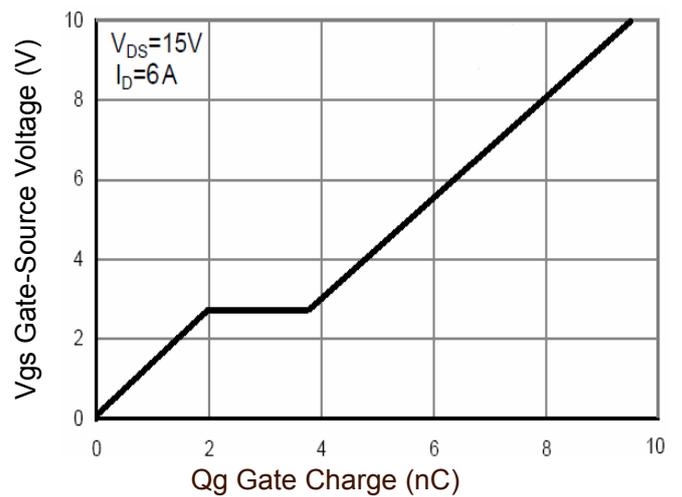


Figure 5 Gate Charge

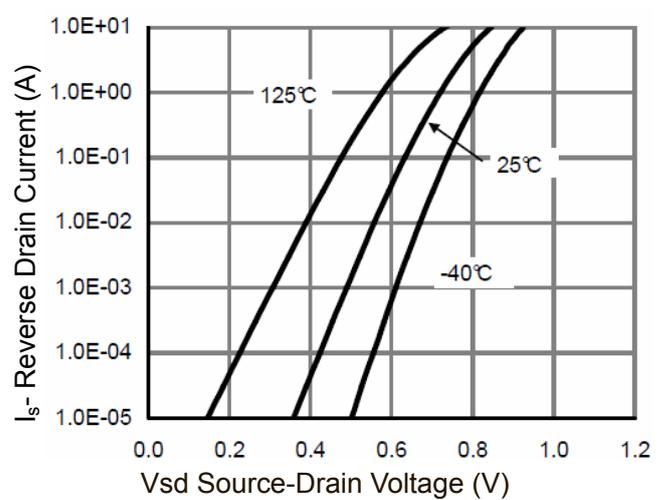


Figure 6 Source- Drain Diode Forward

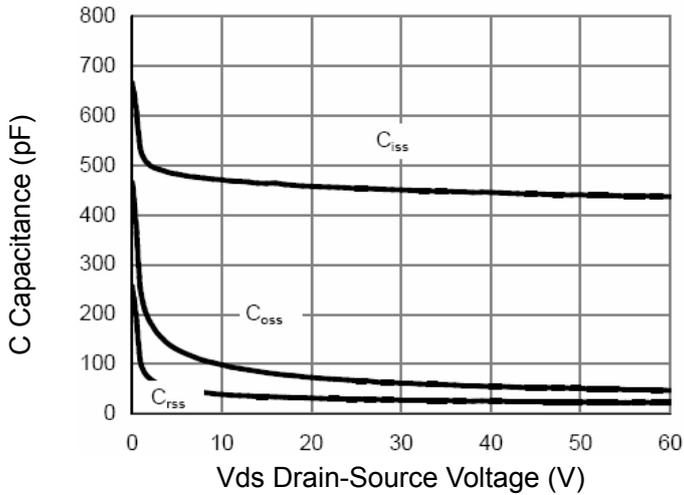


Figure 7 Capacitance vs Vds

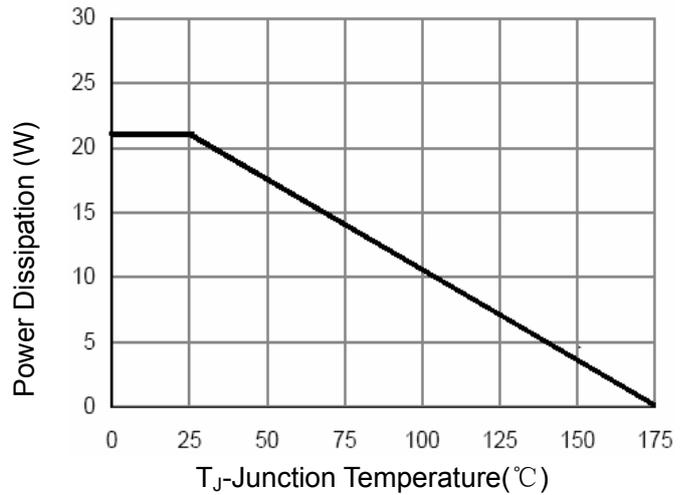


Figure 9 Power De-rating

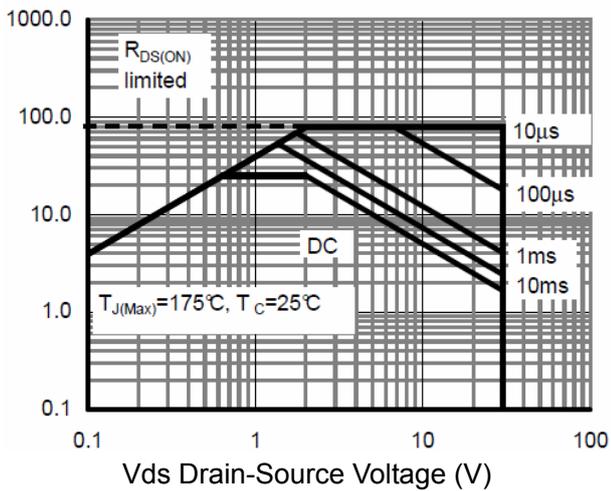


Figure 8 Safe Operation Area

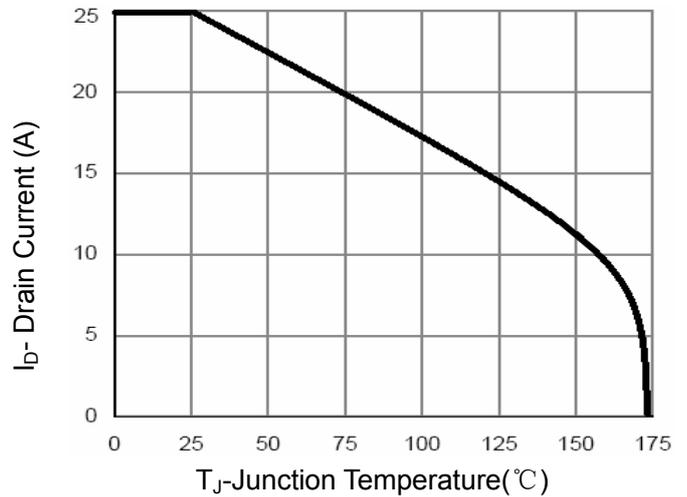


Figure 10 Current De-rating

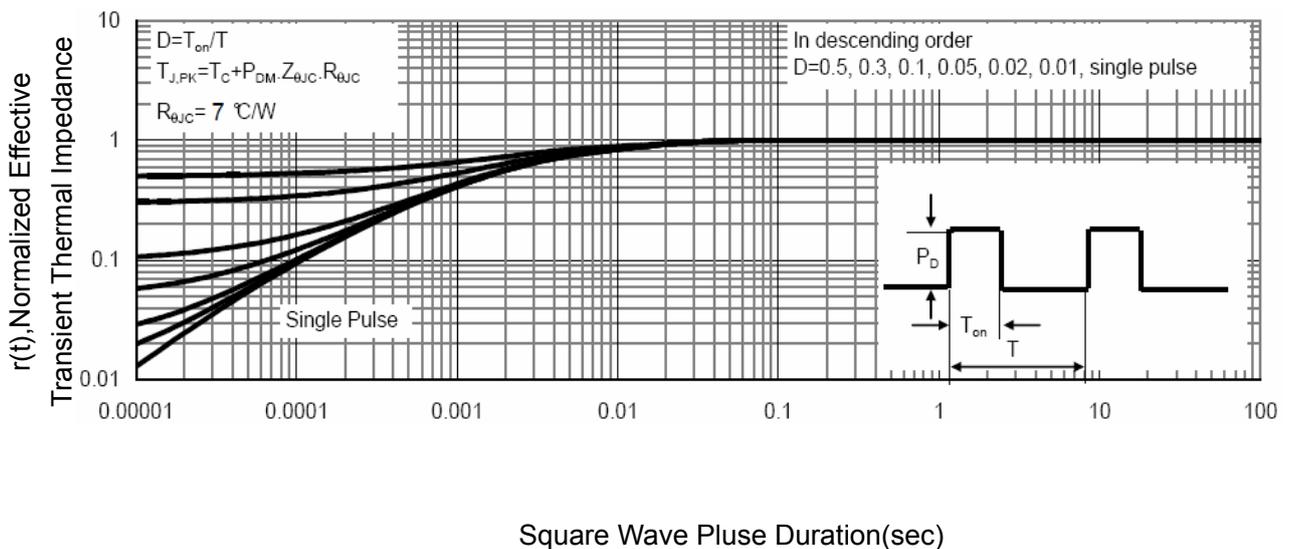


Figure 11 Normalized Maximum Transient Thermal Impedance

P-Channel Electrical Characteristics (T_C=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 | -1.0 | -1.8 | -2.5 | V |
| Drain-Source On-State Resistance | R _{DS(on)} | V _{GS} =-10V, I _D =-6A | - | 28 | 35 | mΩ |
| | | V _{GS} =-4.5V, I _D =-5A | - | 48 | 65 | |
| Forward Transconductance | g _{FS} | V _{DS} =-5V, I _D =-6A | - | 15 | - | S |
| Dynamic Characteristics (Note 4) | | | | | | |
| Input Capacitance | C _{iss} | V _{DS} =-30V, V _{GS} =0V, F=1.0MHz | - | 920 | - | PF |
| Output Capacitance | C _{oss} | | - | 140 | - | PF |
| Reverse Transfer Capacitance | C _{rss} | | - | 90 | - | PF |
| Switching Characteristics (Note 4) | | | | | | |
| Turn-on Delay Time | t _{d(on)} | V _{DD} =-15V, R _L =2.5Ω V _{GS} =-10V, R _G =3Ω | - | 8 | - | nS |
| Turn-on Rise Time | t _r | | - | 30 | - | nS |
| Turn-Off Delay Time | t _{d(off)} | | - | 22 | - | nS |
| Turn-Off Fall Time | t _f | | - | 26 | - | nS |
| Total Gate Charge | Q _g | V _{DS} =-15V, I _D =-6A, V _{GS} =-10V | - | 16.2 | - | nC |
| Gate-Source Charge | Q _{gs} | | - | 2.9 | - | nC |
| Gate-Drain Charge | Q _{gd} | | - | 3.6 | - | nC |
| Drain-Source Diode Characteristics | | | | | | |
| Diode Forward Voltage (Note 3) | V _{SD} | V _{GS} =0V, I _S =-6A | - | - | -1.2 | V |
| Diode Forward Current (Note 2) | I _S | | - | - | -19 | A |
| Reverse Recovery Time | t _{rr} | T _J = 25°C, I _F = -6A di/dt = 100A/μs (Note 3) | - | 23 | - | nS |
| Reverse Recovery Charge | Q _{rr} | | - | 14 | - | nC |

P-Channel Typical Electrical and Thermal Characteristics (Curves)

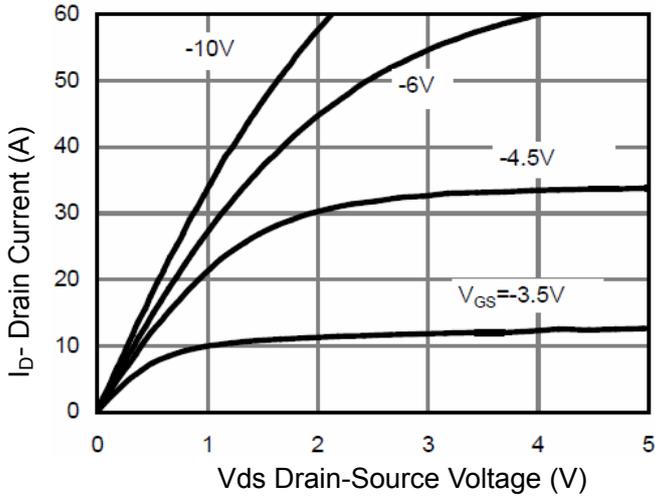


Figure 1 Output Characteristics

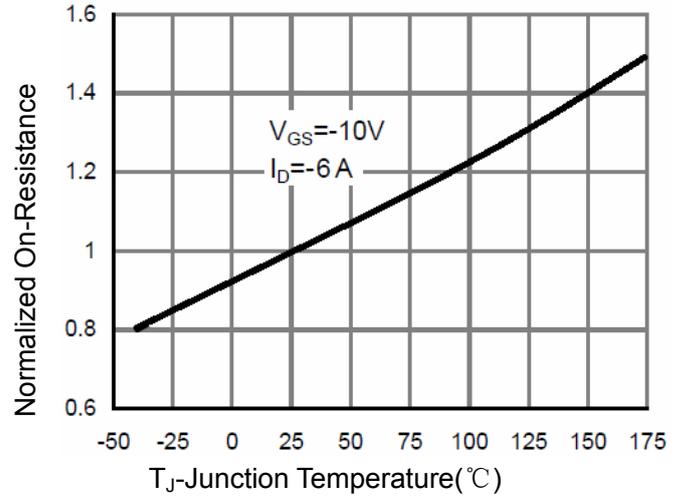


Figure 4 R_{dson} -Junction Temperature

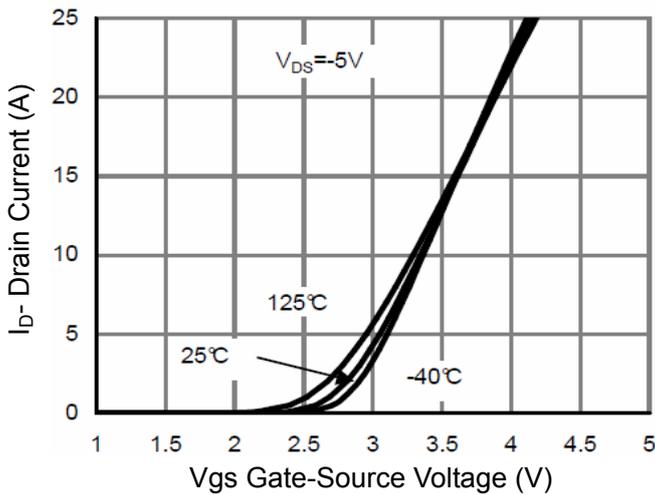


Figure 2 Transfer Characteristics

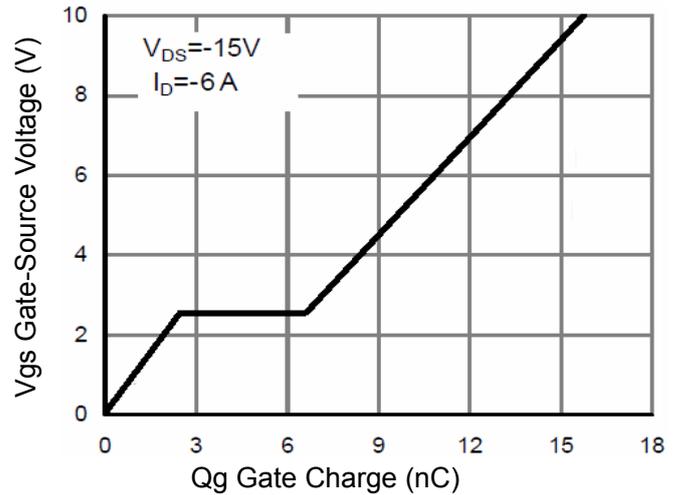


Figure 5 Gate Charge

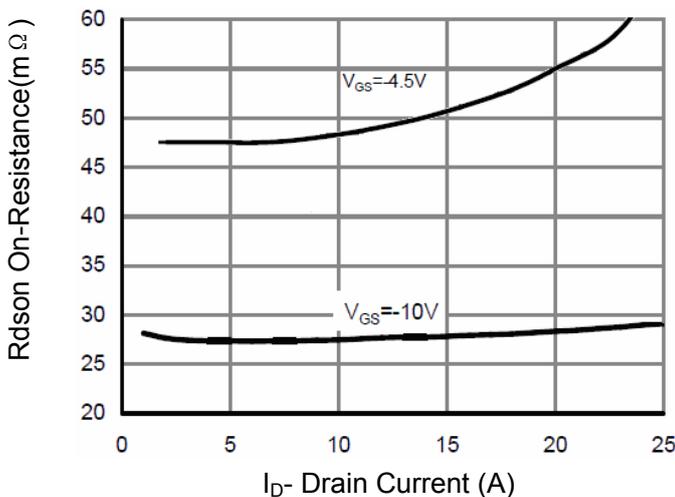


Figure 3 R_{dson} - Drain Current

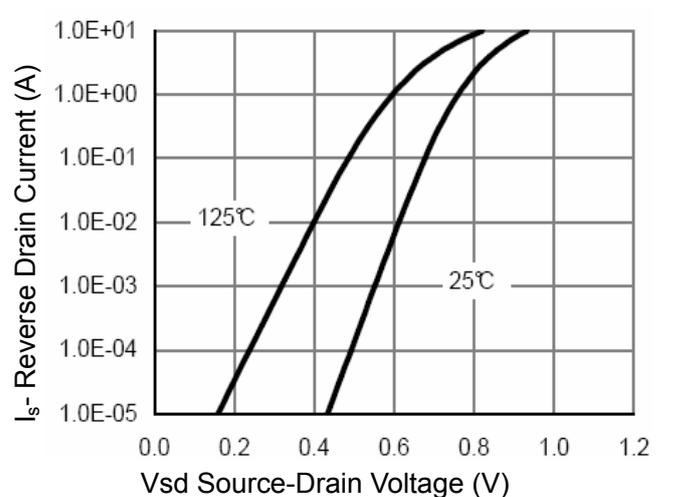


Figure 6 Source- Drain Diode Forward

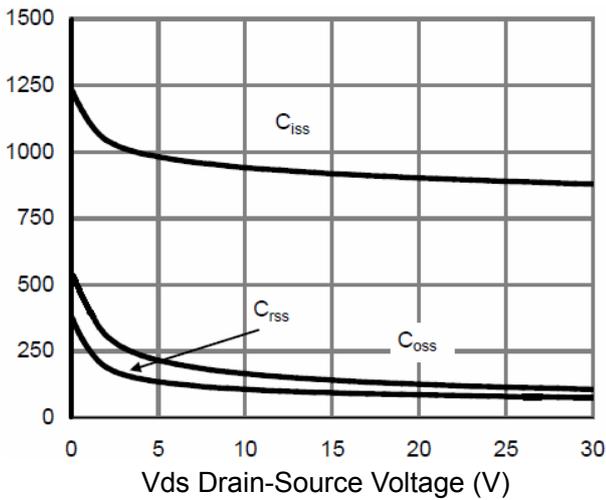


Figure 7 Capacitance vs Vds

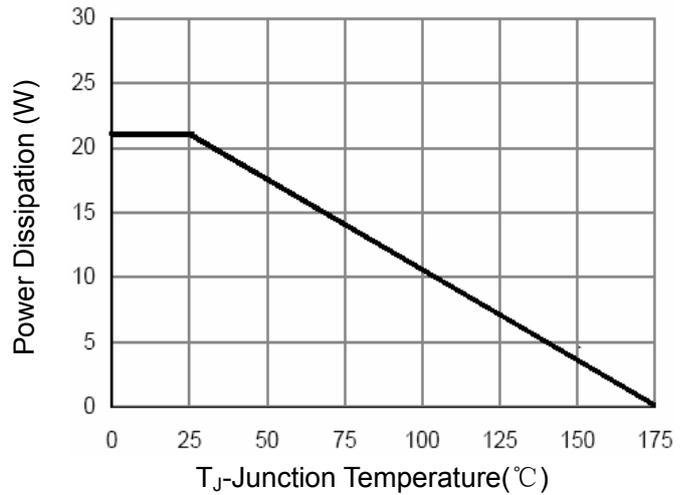


Figure 9 Power De-rating

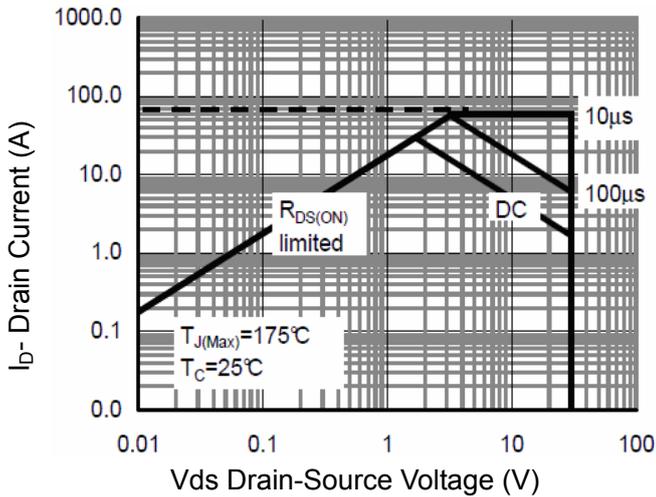


Figure 8 Safe Operation Area

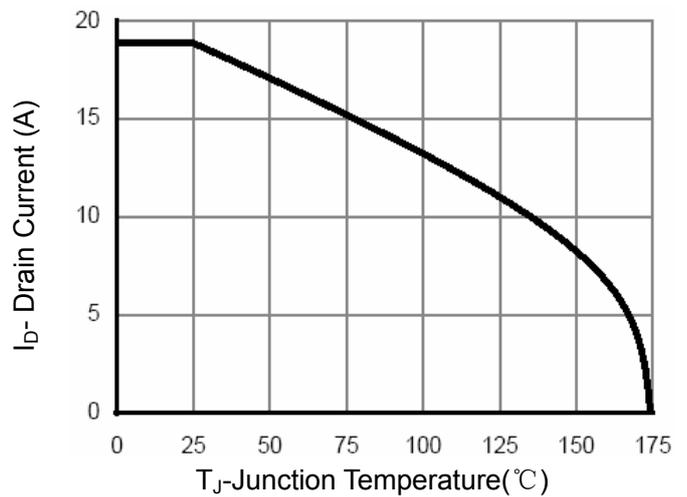


Figure 10 Current De-rating

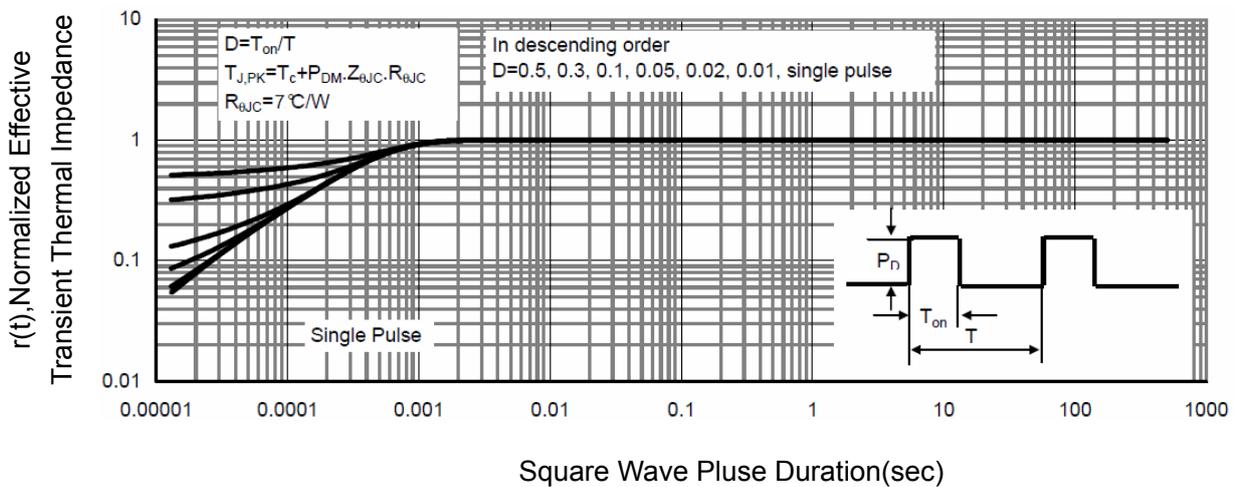
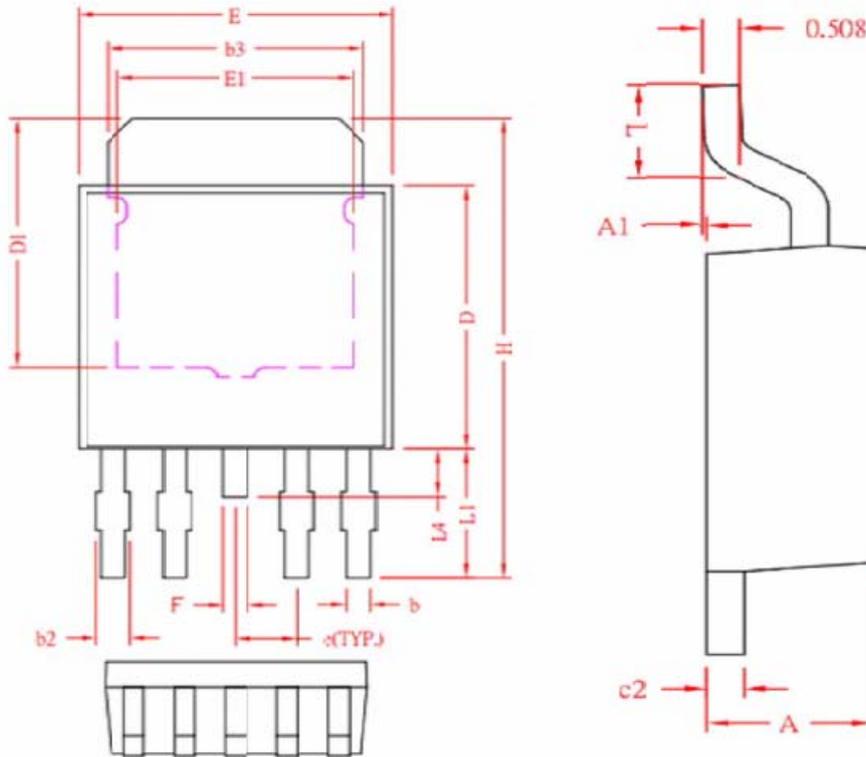


Figure 11 Normalized Maximum Transient Thermal Impedance

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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