

Product Summary

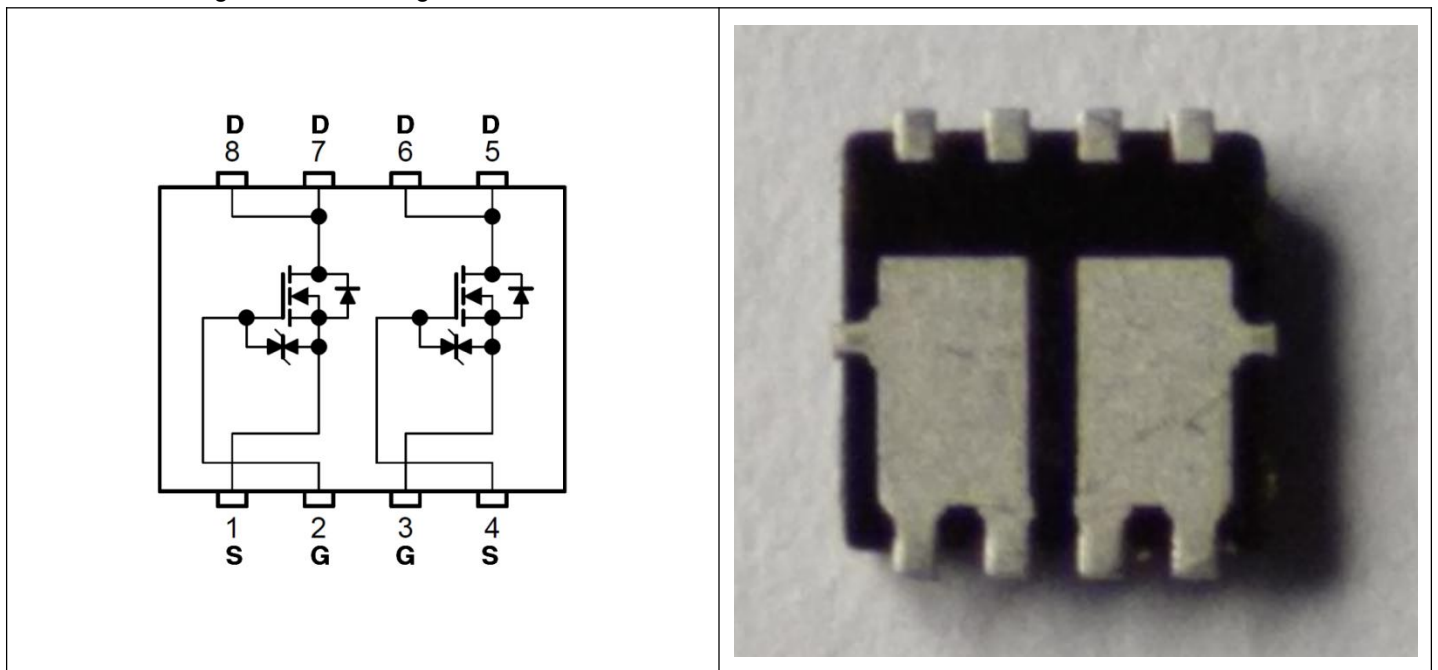
| BV_{DSS} | $R_{DS(ON)}$ | I_D |
|------------|--------------|-------|
| 20V | 22m | 6.5A |
| -20V | 37m | -4A |

Description

These N+P Dual Channel enhancement mode power field effect transistors are using trench DMOS technology. This advanced technology has been especially tailored to minimize on-state resistance, provide superior switching performance, and withstand high energy pulse in the avalanche and commutation mode. These devices are well suited for high efficiency fast switching applications.

Mechanical Data

- Case: DFN 3.3×3.3-8
- Circuit Configuration: See diagram below



Applications

- Notebook
- Networking
- Load Switch
- Hand-held Instruments

Features

- Fast switching
- Green Device Available
- Suit for 1.8V Gate Drive Applications
- High Power and current handing capability

N-CH Electrical Characteristics ($T_J=25\text{ }^\circ\text{C}$, unless otherwise)

(1) ABSOLUTE MAXIMUM RATINGS($T_A=25\text{ }^\circ\text{C}$ unless otherwise noted)

| Parameter | Symbol | Limit | Unit |
|---|----------------|------------|------------------|
| Drain-Source Voltage | V_{DS} | 20 | V |
| Gate-Source Voltage | V_{GS} | ± 8 | V |
| Drain Current-Continuous@ Current-Pulsed (Note 1) | I_D | 6.5 | A |
| | I_{DM} | 30 | A |
| Maximum Power Dissipation | P_D | 1.4 | W |
| Operating Junction and Storage Temperature Range | T_J, T_{STG} | -55 To 150 | $^\circ\text{C}$ |

(2) THERMAL CHARACTERISTICS

| | | | |
|--|-----------------|----|--------------------|
| Thermal Resistance, Junction-to-Ambient (Note 2) | $R_{\theta JA}$ | 90 | $^\circ\text{C/W}$ |
|--|-----------------|----|--------------------|

(3) ELECTRICAL CHARACTERISTICS ($T_A=25\text{ }^\circ\text{C}$ unless otherwise noted)

| Parameter | Symbol | Condition | Min | Typ | Max | Unit |
|---|--------------|--|-----|------|----------|------------|
| OFF CHARACTERISTICS | | | | | | |
| Drain-Source Breakdown Voltage | BV_{DSS} | $V_{GS}=0V, I_D=250\mu A$ | 20 | | | V |
| Zero Gate Voltage Drain Current | I_{DSS} | $V_{DS}=20V, V_{GS}=0V$ | | | 1 | μA |
| Gate-Body Leakage Current | I_{GSS} | $V_{GS}=\pm 4.5V, V_{DS}=0V$ | | | ± 1 | μA |
| | | $V_{GS}=\pm 8V, V_{DS}=0V$ | | | ± 10 | μA |
| ON CHARACTERISTICS (Note 3) | | | | | | |
| Gate Threshold Voltage | $V_{GS(th)}$ | $V_{DS}=V_{GS}, I_D=250\mu A$ | 0.4 | 0.6 | 1 | V |
| Drain-Source On-State Resistance | $R_{DS(on)}$ | $V_{GS}=4.5V, I_D=6.5A$ | | 18 | 22 | m Ω |
| | | $V_{GS}=2.5V, I_D=5.5A$ | | 24 | 30 | m Ω |
| | | $V_{GS}=1.8V, I_D=5A$ | | 40 | 55 | m Ω |
| Forward Transconductance | g_{FS} | $V_{DS}=5V, I_D=6.5A$ | | 7 | | S |
| DYNAMIC CHARACTERISTICS (Note 4) | | | | | | |
| Input Capacitance | C_{iss} | $V_{DS}=10V, V_{GS}=0V,$ $F=1.0MHz$ | | 1160 | | PF |
| Output Capacitance | C_{oss} | | | 200 | | PF |
| Reverse Transfer Capacitance | C_{rss} | | | 140 | | PF |
| SWITCHING CHARACTERISTICS (Note 4) | | | | | | |
| Turn-on Delay Time | $t_{d(on)}$ | $V_{DD}=10V, I_D=1A$ $V_{GS}=5V, R_{GEN}=3\Omega$ | | 6.5 | | nS |
| Turn-on Rise Time | t_r | | | 13 | | nS |
| Turn-Off Delay Time | $t_{d(off)}$ | | | 50 | | nS |
| Turn-Off Fall Time | t_f | | | 30 | | nS |
| Total Gate Charge | Q_g | $V_{DS}=10V, I_D=6.5A,$ $V_{GS}=4.5V$ | | 10 | | nC |
| Gate-Source Charge | Q_{gs} | | | 2.3 | | nC |
| Gate-Drain Charge | Q_{gd} | | | 3 | | nC |
| DRAIN-SOURCE DIODE CHARACTERISTICS | | | | | | |
| Diode Forward Voltage (Note 3) | V_{SD} | $V_{GS}=0V, I_S=1A$ | | 0.76 | 1 | 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 testing

(4) TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

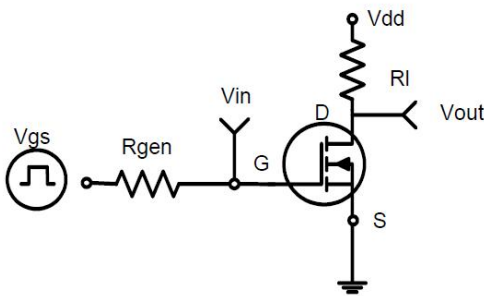


Figure 1: Switching Test Circuit

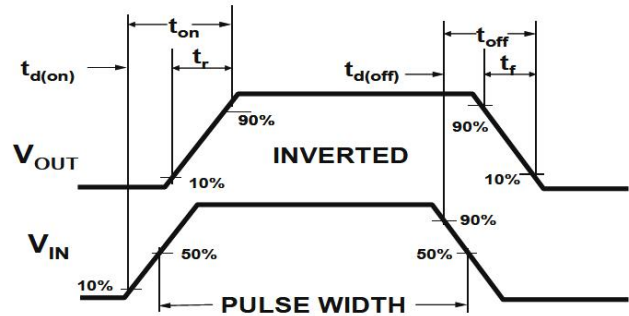


Figure 2: Switching Waveforms

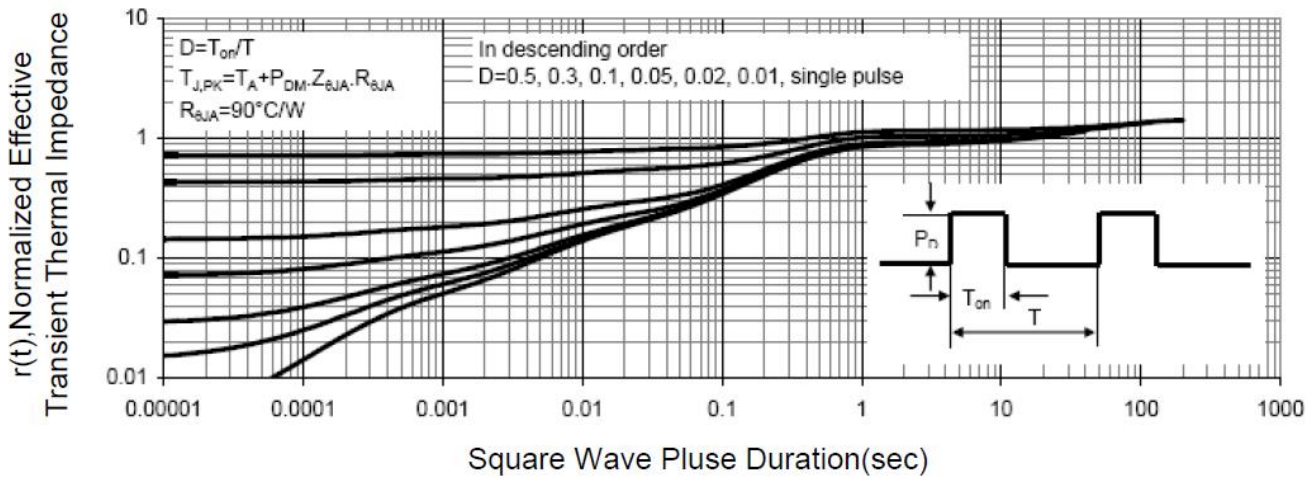


Figure 3 Normalized Maximum Transient Thermal Impedance

P-CH Electrical Characteristics (T_J=25 °C, unless otherwise)

(1) Absolute max Rating: @TA=25°C unless otherwise specified

| Symbol | Parameter | Max. | Units |
|---------------------------------|--|-------------|-------|
| I _D @ TC = 25°C | Continuous Drain Current, V _{GS} @ 10V | -4 ① | A |
| I _D @ TC = 70°C | Continuous Drain Current, V _{GS} @ 10V | -2.4 ① | |
| I _{DM} | Pulsed Drain Current ② | -30 | |
| P _D @TC = 25°C | Power Dissipation ③ | 1.4 | W |
| V _{DS} | Drain-Source Voltage | -20 | V |
| V _{GS} | Gate-to-Source Voltage | ±8 | V |
| T _J T _{STG} | Operating Junction and Storage Temperature Range | -55 to +150 | °C |

(2) Thermal Resistance

| Symbol | Characterizes | Typ. | Max. | Units |
|------------------|---------------------------------|------|------|-------|
| R _{θJA} | Junction-to-ambient (t ≤ 10s) ④ | — | 90 | °C/W |

(3) Electrical Characterizes @TA=25°C unless otherwise specified

| Symbol | Parameter | Min. | Typ. | Max. | Units | Conditions |
|----------------------|--------------------------------------|------|-------|------|-------|---|
| V _{(BR)DSS} | Drain-to-Source breakdown voltage | -20 | — | — | V | V _{GS} = 0V, I _D = -250μA |
| R _{DS(on)} | Static Drain-to-Source on-resistance | — | 37 | 43 | mΩ | V _{GS} = -4.5V, I _D = -4A |
| | | — | 45 | 54 | | V _{GS} = -2.5V, I _D = -4A |
| V _{GS(th)} | Gate threshold voltage | -0.3 | — | -1.0 | V | V _{DS} = V _{GS} , I _D = -250μA |
| | | — | -0.44 | — | | T _J = 125°C |
| I _{DSS} | Drain-to-Source leakage current | — | — | -1 | μA | V _{DS} = -16V, V _{GS} = 0V |
| | | — | — | -50 | | T _J = 125°C |
| I _{GSS} | Gate-to-Source forward leakage | — | — | 10 | μA | V _{GS} = 8V |
| | | — | — | -10 | | V _{GS} = -8V |
| Q _g | Total gate charge | — | 10 | — | nC | I _D = -4A, V _{DS} = -10V, V _{GS} = -4.5V |
| Q _{gs} | Gate-to-Source charge | — | 0.77 | — | | |
| Q _{gd} | Gate-to-Drain("Miller") charge | — | 3.5 | — | | |
| t _{d(on)} | Turn-on delay time | — | 10 | — | ns | V _{GS} = -4.5V, V _{DS} = -10V, R _{GEN} = 3Ω, |
| t _r | Rise time | — | 8.6 | — | | |
| t _{d(off)} | Turn-Off delay time | — | 29 | — | | |
| t _f | Fall time | — | 13 | — | | |
| C _{iss} | Input capacitance | — | 939 | — | pF | V _{GS} = 0V, V _{DS} = -10V, |
| C _{oss} | Output capacitance | — | 130 | — | | |
| C _{rss} | Reverse transfer capacitance | — | 111 | — | | |

(4) Source-Drain Ratings and Characteristics

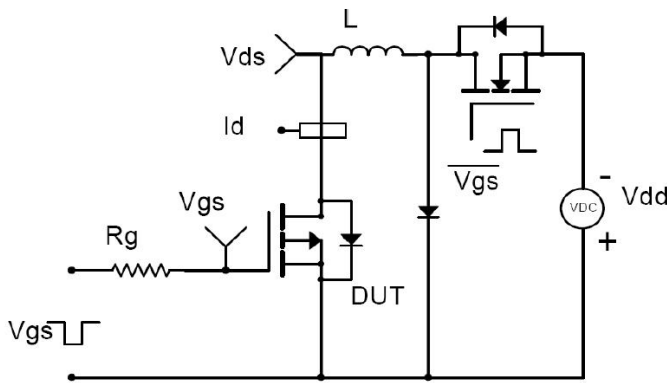
| Symbol | Parameter | Min. | Typ. | Max. | Units | Conditions |
|----------|--|------|-------|------|-------|--|
| I_S | Continuous Source Current (Body Diode) | — | — | -4 ① | A | MOSFET symbol showing the integral reverse p-n junction diode. |
| I_{SM} | Pulsed Source Current (Body Diode) | — | — | -30 | A | |
| V_{SD} | Diode Forward Voltage | — | -0.76 | -1.0 | V | $I_S=1A, V_{GS}=0V$ |
| t_{rr} | Reverse Recovery Time | — | 8.7 | — | ns | $T_J = 25^\circ C, I_F = -4A,$ |
| Q_{rr} | Reverse Recovery Charge | — | 2.3 | — | nC | $di/dt = 100A/\mu s$ |

Notes:

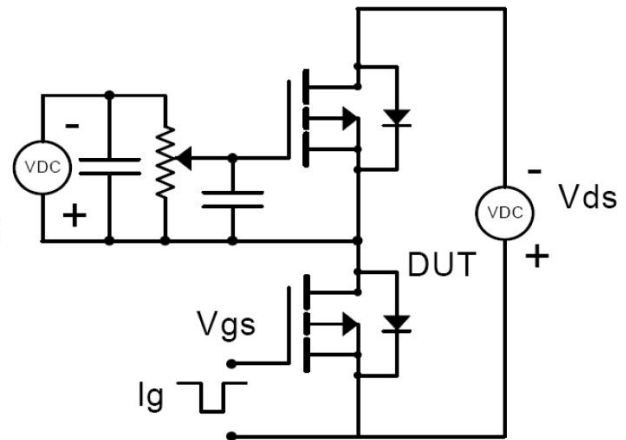
- ① Calculated continuous current based on maximum allowable junction temperature.
- ② Repetitive rating; pulse width limited by max. junction temperature.
- ③ The power dissipation PD is based on max. junction temperature, using junction-to-case thermal resistance.
- ④ The value of $R\theta_{JA}$ is measured with the device mounted on 1 in 2 FR-4 board with 2oz. Copper, in a still air environment with $T_A = 25^\circ C$

(5) Test circuits and Waveforms

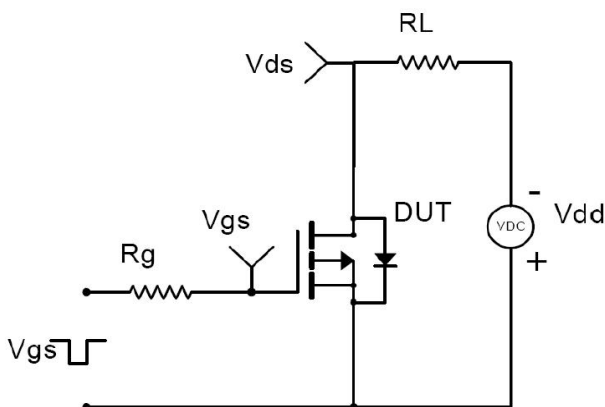
EAS test circuit:



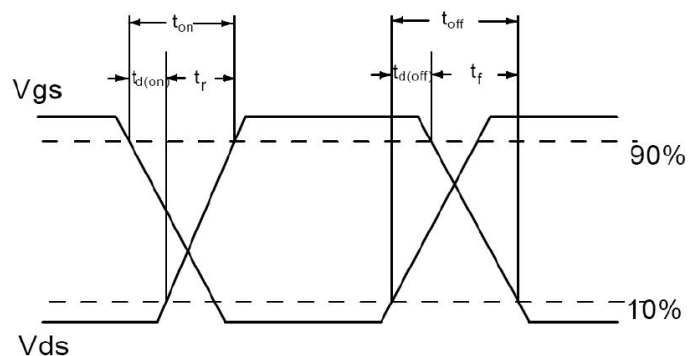
Gate charge test circuit:



Switching time test circuit:



Switch Waveforms:



(6) Typical electrical and thermal characteristics

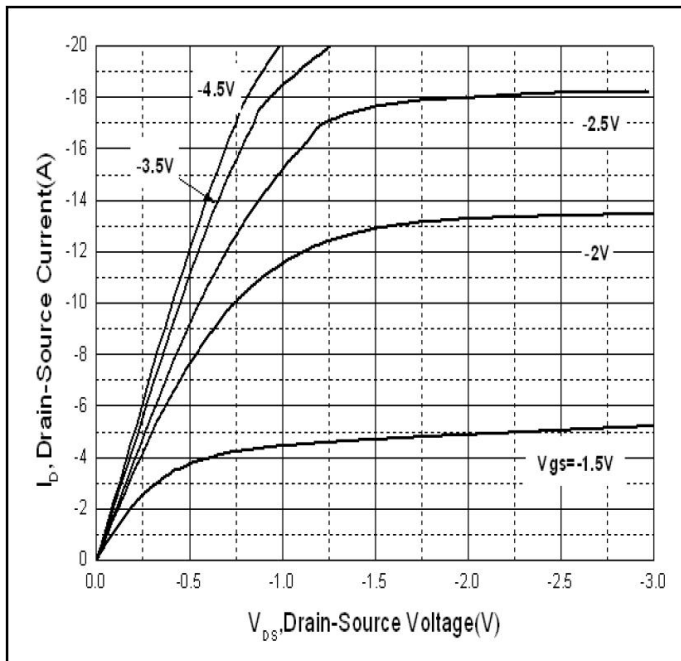


Figure 1: Typical Output Characteristics

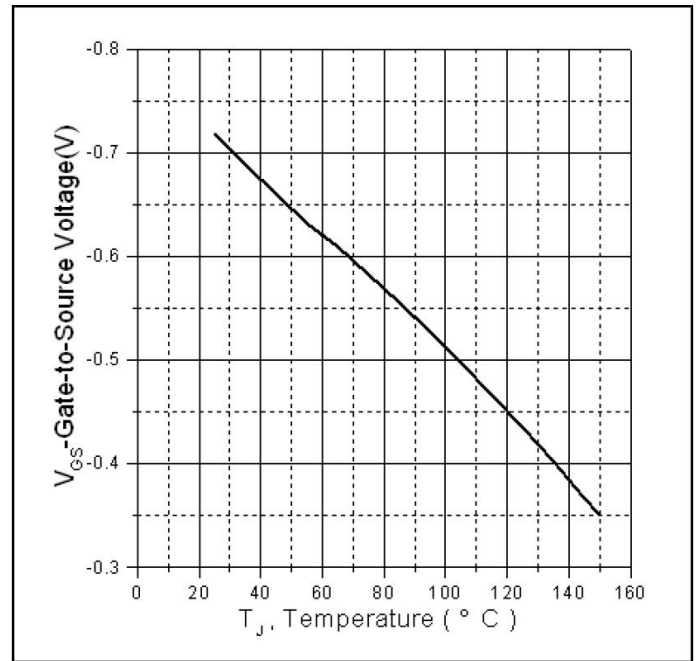


Figure 2. Gate to source cut-off voltage

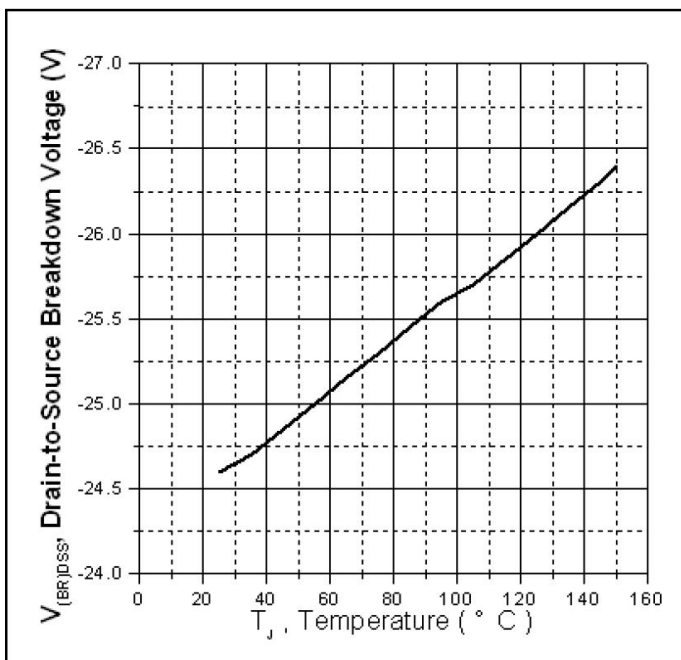


Figure 3: Drain-to-Source Breakdown Voltage Vs. Case Temperature

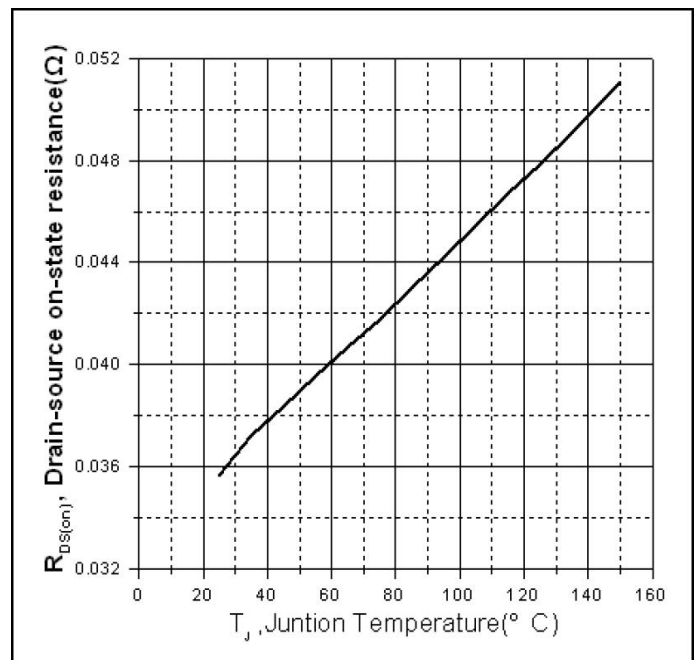


Figure 4: Normalized On-Resistance Vs. Case Temperature

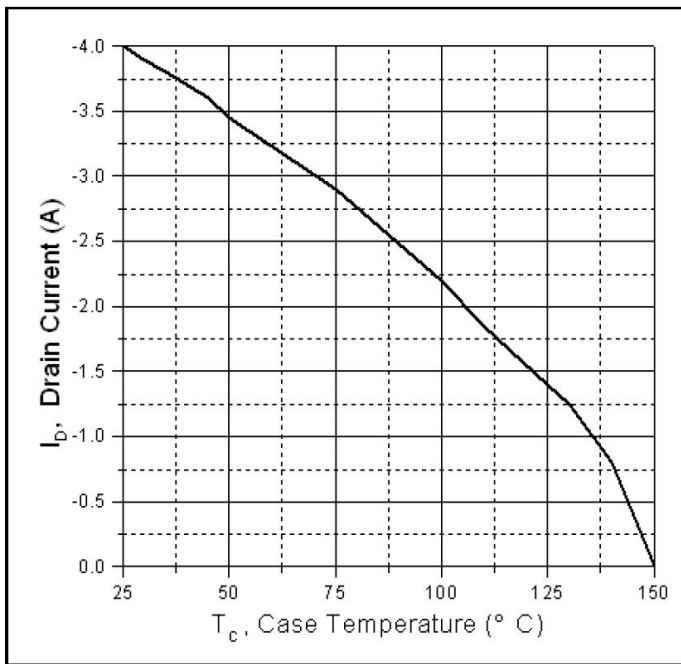


Figure 5: Maximum Drain Current Vs. Case Temperature

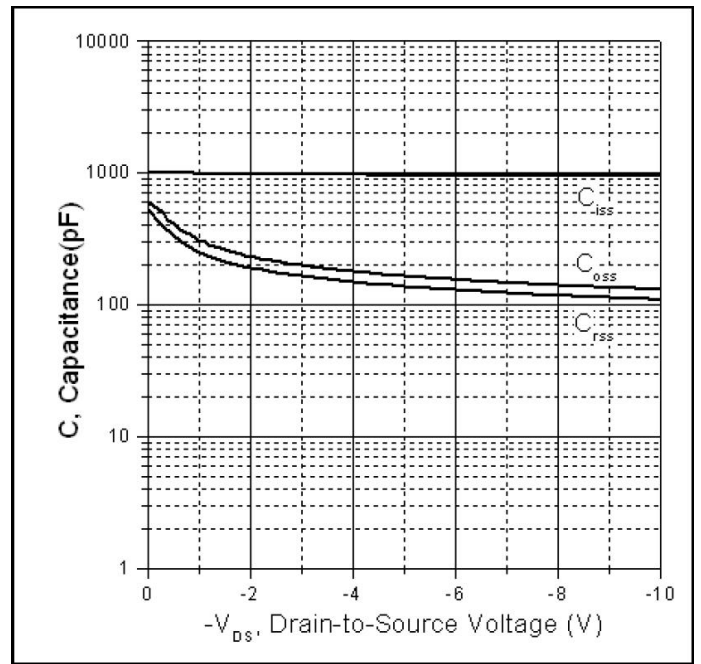


Figure 6: Typical Capacitance Vs. Drain-to-Source Voltage

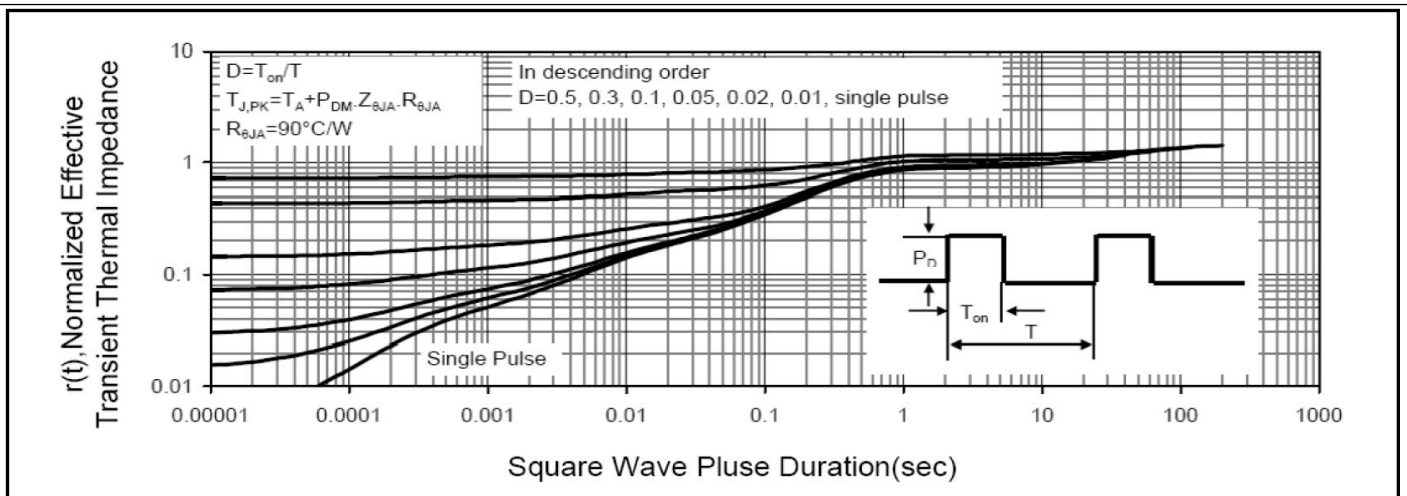
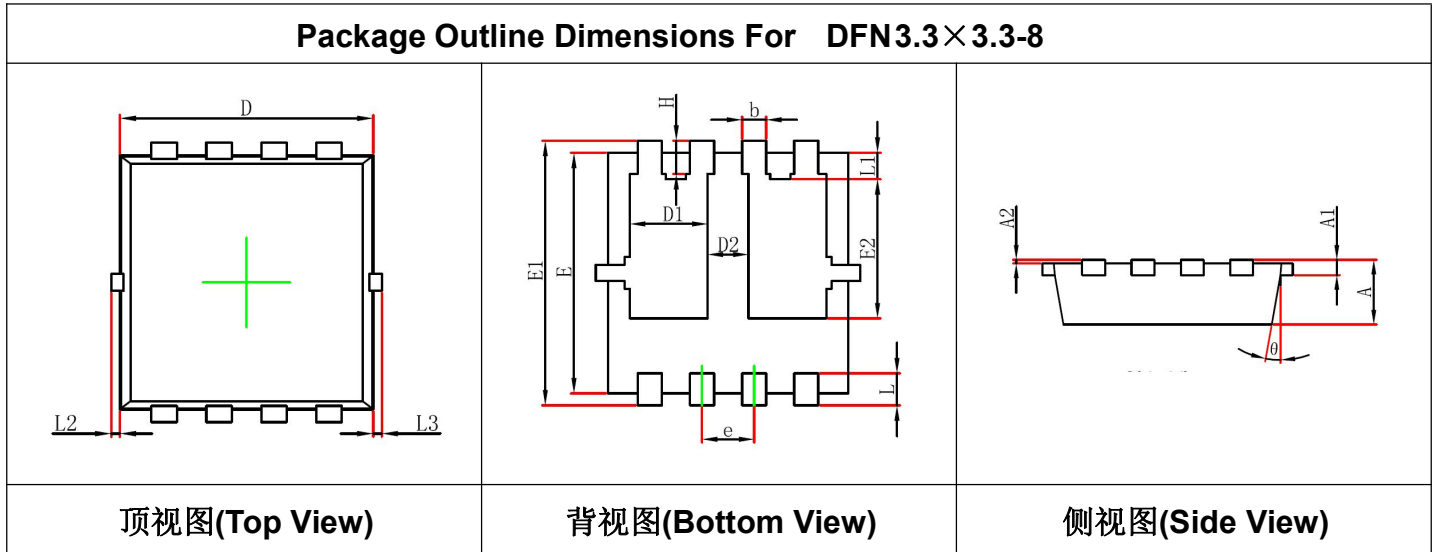


Figure 7. Maximum Effective Transient Thermal Impedance Junction-to-Case

Package Outline Dimensions

Package Outline Dimensions For DFN3.3×3.3-8



顶视图(Top View)

背视图(Bottom View)

侧视图(Side View)

| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|----------|---------------------------|-------|----------------------|-------|
| | Min. | Max. | Min. | Max. |
| A | 0.650 | 0.850 | 0.026 | 0.033 |
| A1 | 0.152 REF. | | 0.006 REF. | |
| A2 | 0~0.05 | | 0~0.002 | |
| D | 2.900 | 3.100 | 0.114 | 0.122 |
| D1 | 0.935 | 1.135 | 0.037 | 0.045 |
| D2 | 0.280 | 0.480 | 0.011 | 0.019 |
| E | 2.900 | 3.100 | 0.114 | 0.122 |
| E1 | 3.150 | 3.450 | 0.124 | 0.136 |
| E2 | 1.535 | 1.935 | 0.060 | 0.076 |
| b | 0.200 | 0.400 | 0.008 | 0.016 |
| e | 0.550 | 0.750 | 0.022 | 0.030 |
| L | 0.300 | 0.500 | 0.012 | 0.020 |
| L1 | 0.180 | 0.480 | 0.007 | 0.019 |
| L2 | 0~0.100 | | 0~0.004 | |
| L3 | 0~0.100 | | 0~0.004 | |
| H | 0.315 | 0.515 | 0.012 | 0.020 |
| θ | 9° | 13° | 9° | 13° |