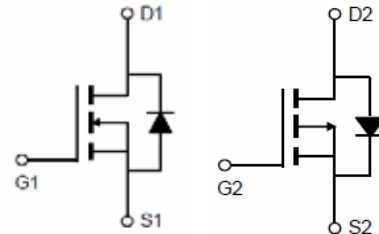


N and P-Channel Enhancement Mode Power MOSFET

Description

The RM3003S6 uses advanced trench technology to provide excellent $R_{DS(ON)}$, low gate charge. This device is suitable for use as a Battery protection or in other Switching application.



General Features

- **N-Channel**

- $V_{DS} = 30V, I_D = 3.5A$

- $R_{DS(ON)} < 58m\Omega @ V_{GS}=10V$

- $R_{DS(ON)} < 95m\Omega @ V_{GS}=4.5V$

- **P-Channel**

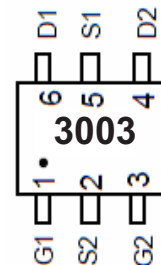
- $V_{DS} = -30V, I_D = -2.7A$

- $R_{DS(ON)} < 100m\Omega @ V_{GS}=-10V$

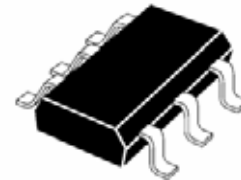
- $R_{DS(ON)} < 150m\Omega @ V_{GS}=-4.5V$

- Low On-Resistance
- Low Input Capacitance
- Fast Switching Speed
- Low Input/Output Leakage
- Halogen-free

N-channel P-channel
Schematic diagram



Marking and pin Assignment



TSOT23-6L top view

Package Marking and Ordering Information

| Device Marking | Device | Device Package | Reel Size | Tape width | Quantity |
|----------------|----------|----------------|-----------|------------|-----------|
| 3003 | RM3003S6 | TSOT23-6L | Ø180mm | 8mm | 3000units |

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} | ± 20 | ± 20 | V | |
| Continuous Drain Current | I_D | $T_A=25^\circ C$ | 3.5 | -2.7 | A |
| | | $T_A=70^\circ C$ | 3 | -2.1 | |
| Pulsed Drain Current ^(Note 1) | I_{DM} | 20 | -15 | A | |
| Maximum Power Dissipation | P_D | $T_A=25^\circ C$ | | 1.2 | 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-Ambient ^(Note 2) | Symbol | N-Ch | P-Ch | Unit |
|---|-----------------|------|------|--------------|
| Thermal Resistance, Junction-to-Ambient ^(Note 2) | $R_{\theta JA}$ | N-Ch | 104 | $^\circ C/W$ |
| Thermal Resistance, Junction-to-Ambient ^(Note 2) | $R_{\theta JA}$ | P-Ch | 104 | $^\circ C/W$ |

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 | 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} =±20V, V _{DS} =0V | - | - | ±100 | nA |
| On Characteristics (Note 3) | | | | | | |
| Gate Threshold Voltage | V _{GS(th)} | V _{DS} =V _{GS} , I _D =250μA | 0.7 | - | 1.3 | V |
| Drain-Source On-State Resistance | R _{DS(on)} | V _{GS} =10V, I _D =3.5A | - | 36 | 58 | mΩ |
| | | V _{GS} =4.5V, I _D =2A | - | 60 | 95 | mΩ |
| Forward Transconductance | g _{FS} | V _{DS} =5V, I _D =3.1A | - | 4 | - | S |
| Dynamic Characteristics (Note 4) | | | | | | |
| Input Capacitance | C _{iss} | V _{DS} =15V, V _{GS} =0V, F=1.0MHz | - | 210 | - | PF |
| Output Capacitance | C _{oss} | | - | 35 | - | PF |
| Reverse Transfer Capacitance | C _{rss} | | - | 23 | - | PF |
| Switching Characteristics (Note 4) | | | | | | |
| Turn-on Delay Time | t _{d(on)} | V _{DD} =15V, R _L =3Ω V _{GS} =10V, R _{GEN} =6Ω | - | 4.5 | - | nS |
| Turn-on Rise Time | t _r | | - | 1.5 | - | nS |
| Turn-Off Delay Time | t _{d(off)} | | - | 18.5 | - | nS |
| Turn-Off Fall Time | t _f | | - | 15.5 | - | nS |
| Total Gate Charge | Q _g | V _{DS} =15V, I _D =3.5A, V _{GS} =10V | - | 5 | - | nC |
| Gate-Source Charge | Q _{gs} | | - | 0.55 | - | nC |
| Gate-Drain Charge | Q _{gd} | | - | 1 | - | nC |
| Drain-Source Diode Characteristics | | | | | | |
| Diode Forward Voltage (Note 3) | V _{SD} | V _{GS} =0V, I _S =3.5A | - | 0.8 | 1.2 | V |
| Diode Forward Current (Note 2) | I _S | | - | - | 3.5 | 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

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 | -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 | -2.5 | V |
| Drain-Source On-State Resistance | $R_{DS(ON)}$ | $V_{GS}=-10V, I_D=-2.7A$ | - | 69 | 100 | m Ω |
| | | $V_{GS}=-4.5V, I_D=-2A$ | - | 110 | 150 | m Ω |
| Forward Transconductance | g_{FS} | $V_{DS}=-10V, I_D=-2.7A$ | | 2 | - | S |
| Dynamic Characteristics (Note 4) | | | | | | |
| Input Capacitance | C_{ISS} | $V_{DS}=-15V, V_{GS}=0V,$ $F=1.0MHz$ | - | 199 | - | PF |
| Output Capacitance | C_{OSS} | | - | 47 | - | PF |
| Reverse Transfer Capacitance | C_{RSS} | | - | 28 | - | PF |
| Switching Characteristics (Note 4) | | | | | | |
| Turn-on Delay Time | $t_{d(on)}$ | $V_{DD}=-15V, R_L=15\Omega$ $V_{GS}=-10V, R_{GEN}=6\Omega$ | - | 8 | - | nS |
| Turn-on Rise Time | t_r | | - | 5 | - | nS |
| Turn-Off Delay Time | $t_{d(off)}$ | | - | 12 | - | nS |
| Turn-Off Fall Time | t_f | | - | 4 | - | nS |
| Total Gate Charge | Q_g | $V_{DS}=-15V, I_D=-2.7A, V_{GS}=-10V$ | - | 5 | - | nC |
| Gate-Source Charge | Q_{gs} | | - | 0.7 | - | nC |
| Gate-Drain Charge | Q_{gd} | | - | 1.1 | - | nC |
| Drain-Source Diode Characteristics | | | | | | |
| Diode Forward Voltage (Note 3) | V_{SD} | $V_{GS}=0V, I_S=-2.7A$ | - | - | -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

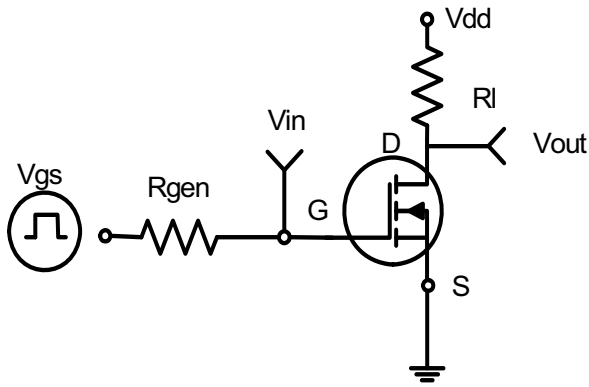


Figure 1: Switching Test Circuit

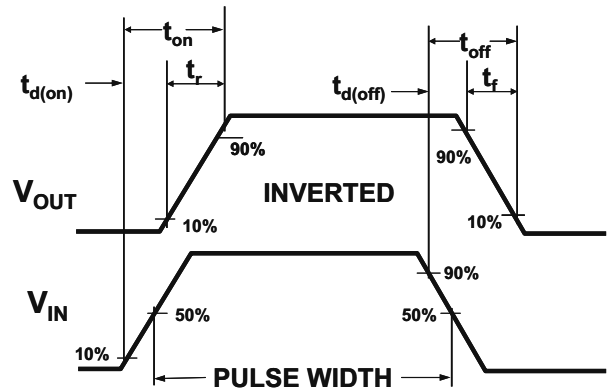


Figure 2: Switching Waveforms

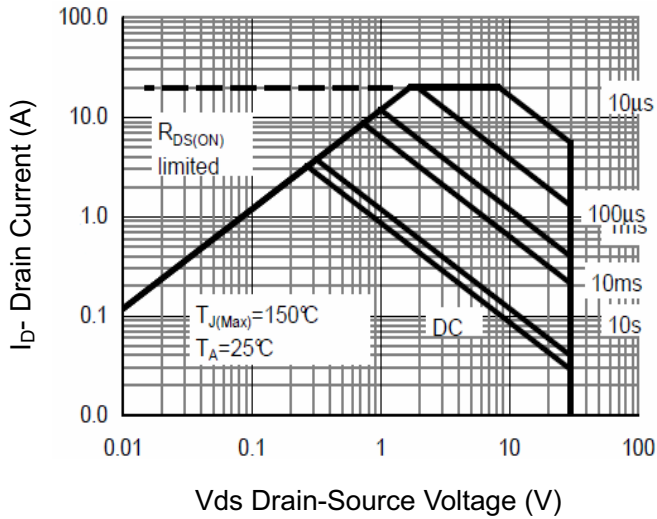


Figure 3 Safe Operation Area

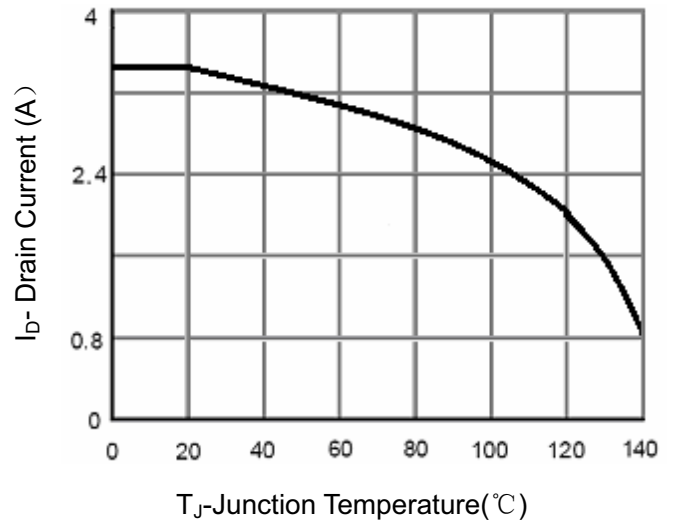


Figure 4 Drain Current

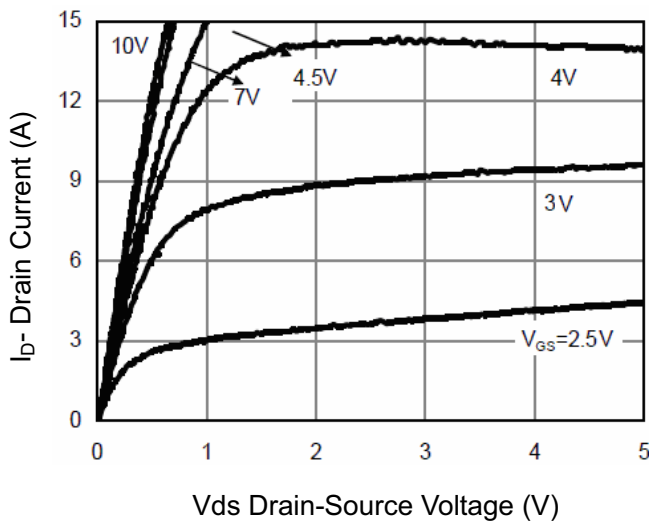


Figure 5 Output Characteristics

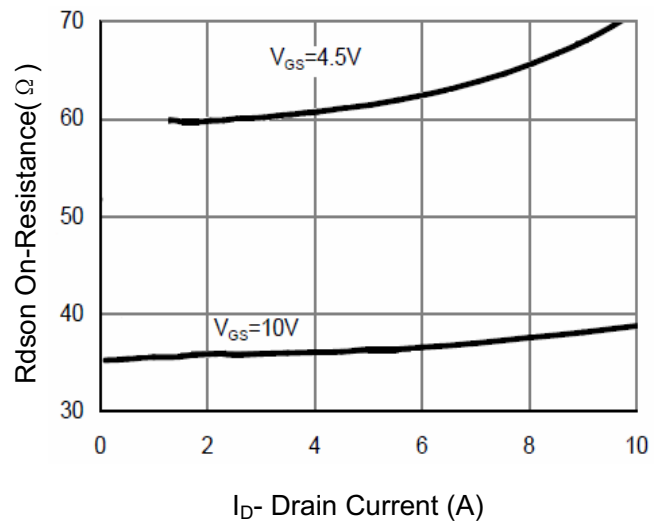
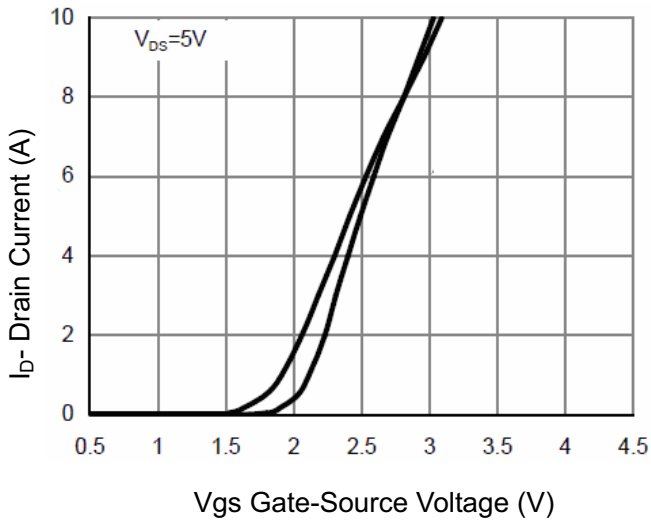
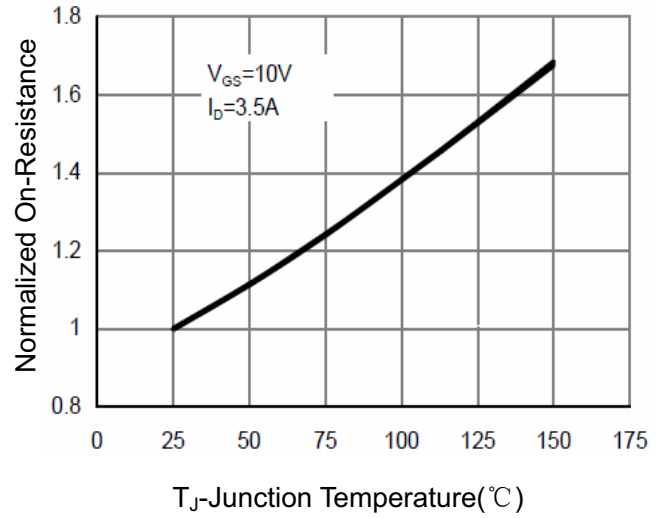


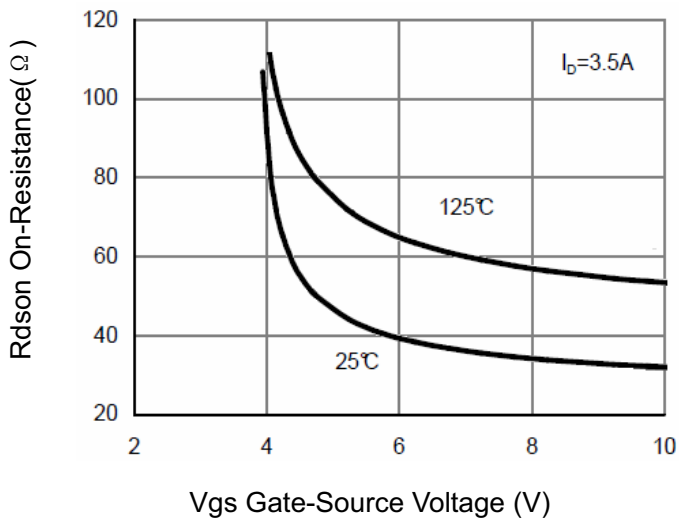
Figure 6 Drain-Source On-Resistance



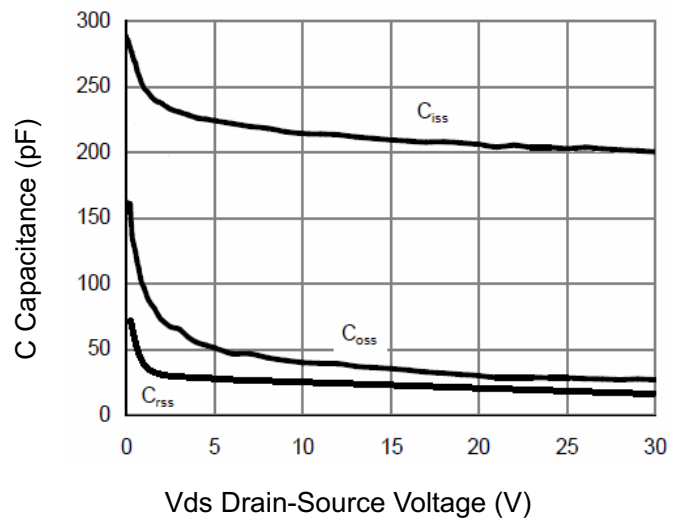
Vgs Gate-Source Voltage (V)
Figure 7 Transfer Characteristics



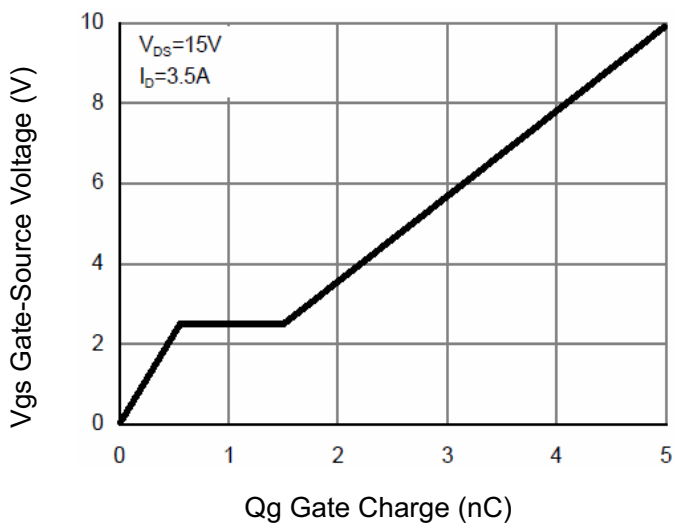
T_J -Junction Temperature($^{\circ}C$)
Figure 8 Drain-Source On-Resistance



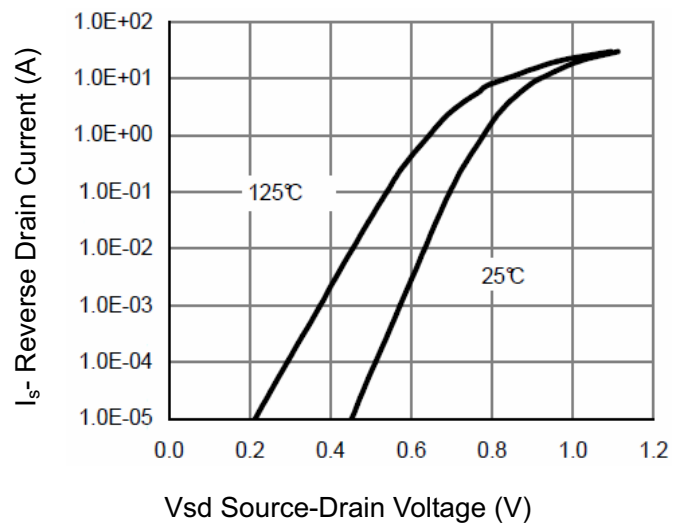
Vgs Gate-Source Voltage (V)
Figure 9 Rdson vs Vgs



Vds Drain-Source Voltage (V)
Figure 10 Capacitance vs Vds



Qg Gate Charge (nC)
Figure 11 Gate Charge



Vsd Source-Drain Voltage (V)
Figure 12 Source- Drain Diode Forward

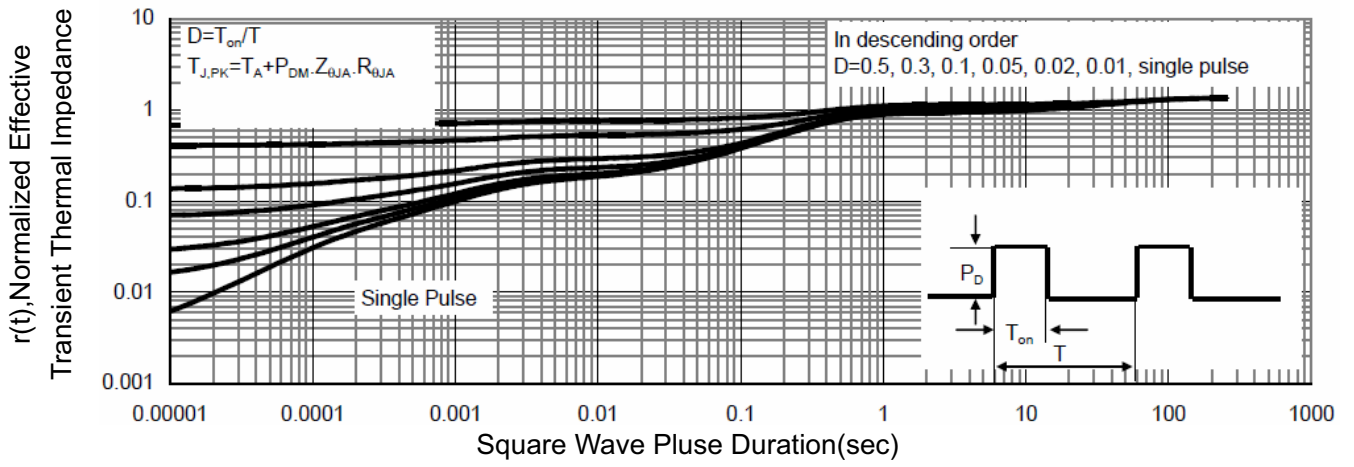


Figure 13 Normalized Maximum Transient Thermal Impedance

P- Channel Typical Electrical and Thermal Characteristics

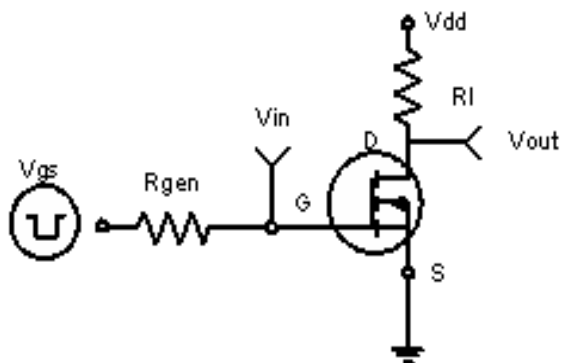


Figure 1: Switching Test Circuit

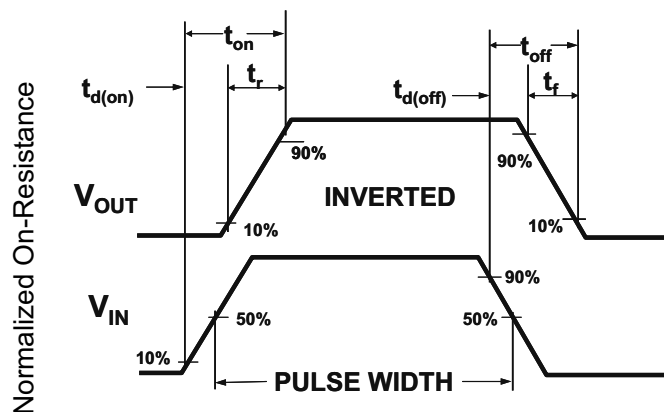


Figure 2: Switching Waveforms

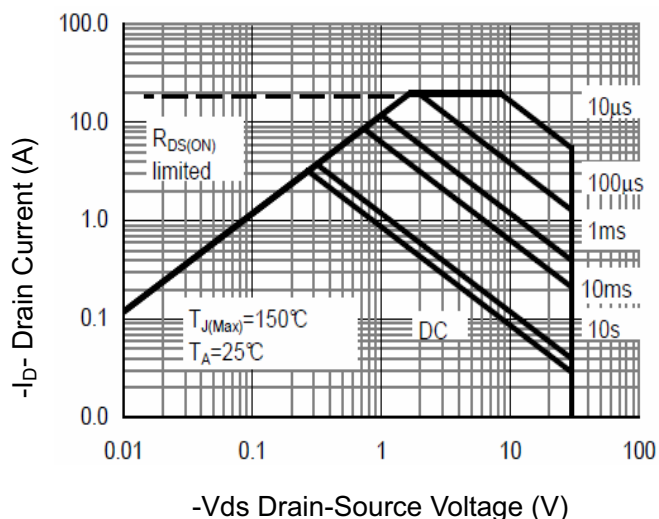


Figure 3 Safe Operation Area

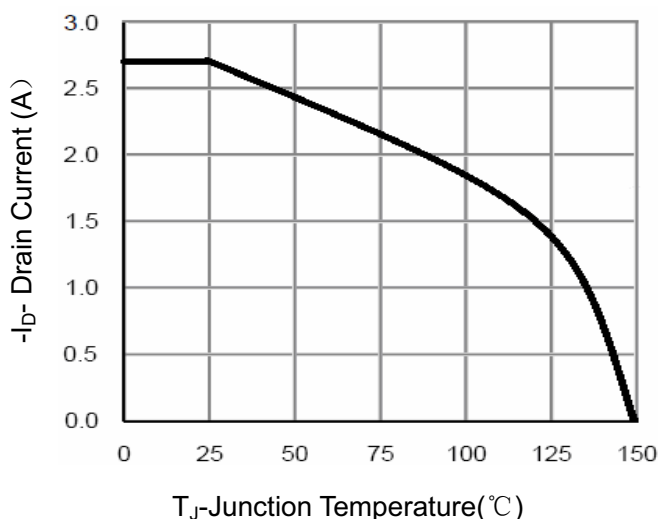


Figure 4 Drain Current

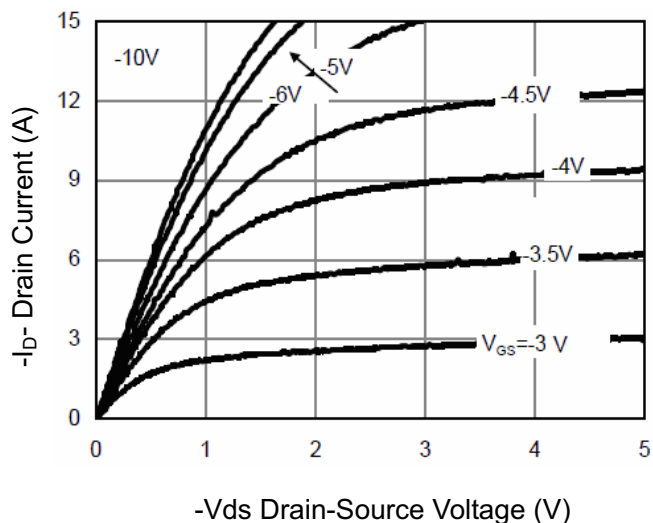


Figure 5 Output Characteristics

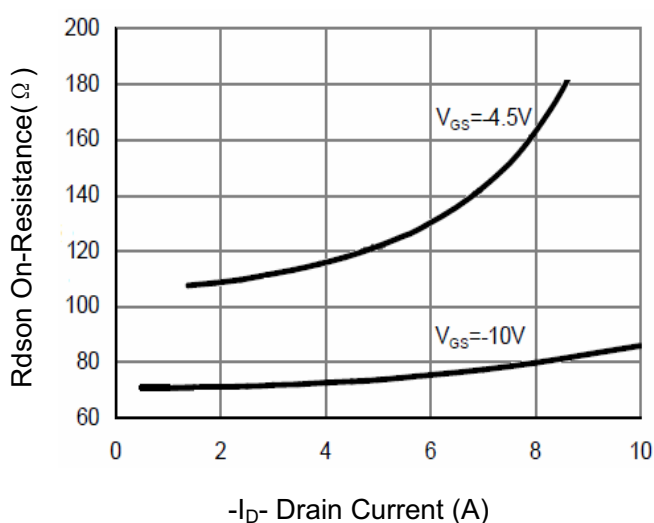


Figure 6 Drain-Source On-Resistance

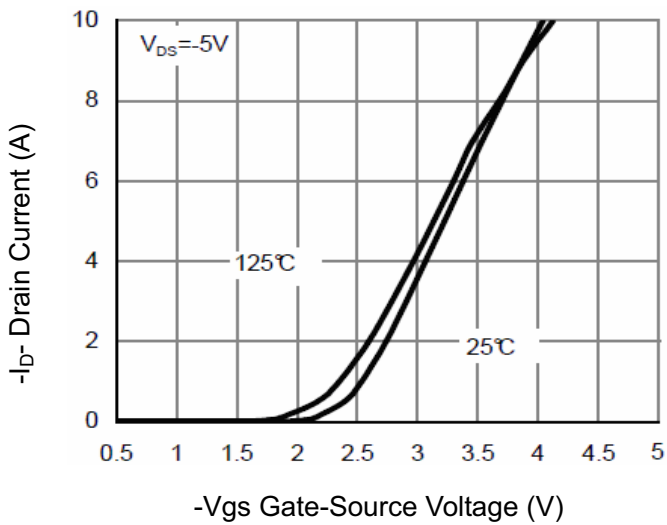


Figure 7 Transfer Characteristics

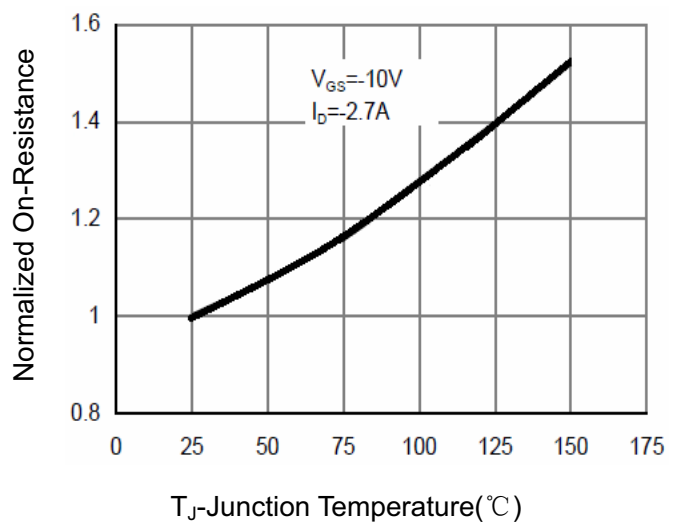


Figure 8 Drain-Source On-Resistance

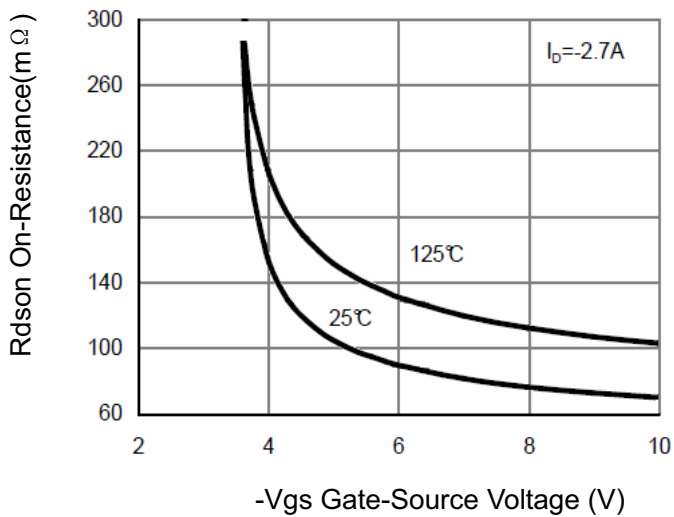


Figure 9 Rdson vs Vgs

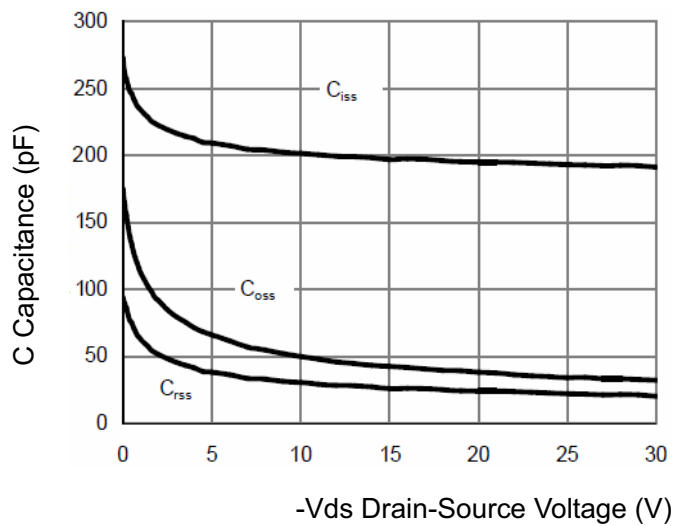


Figure 10 Capacitance vs Vds

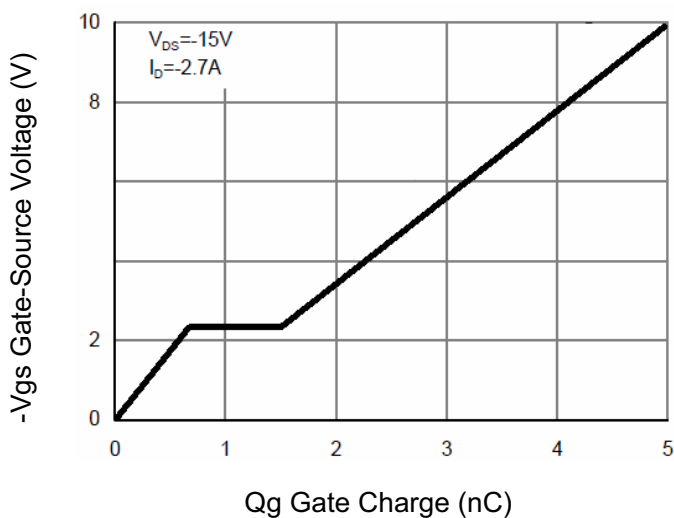


Figure 11 Gate Charge

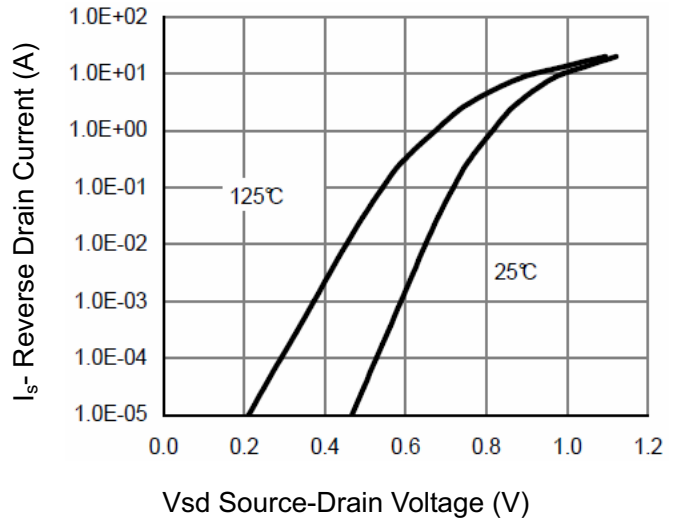


Figure 12 Source- Drain Diode Forward

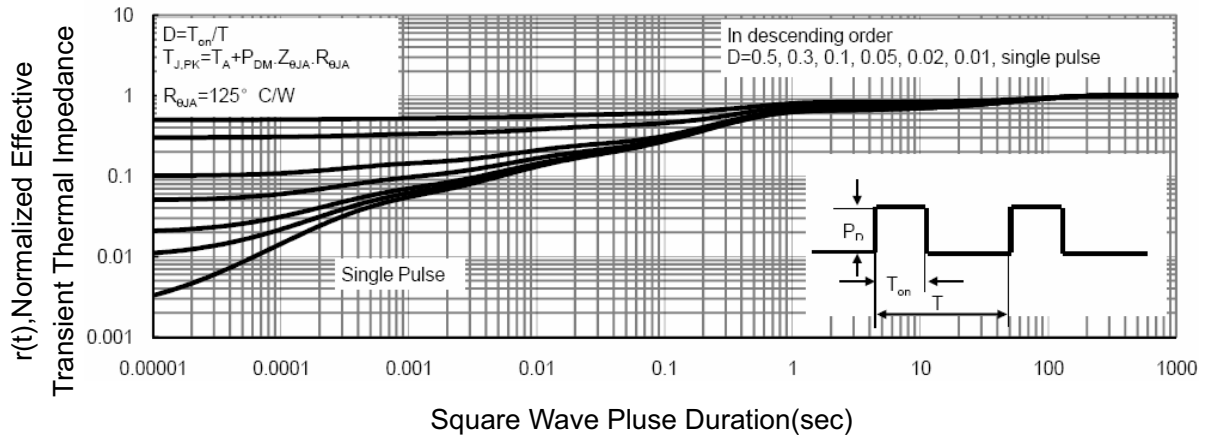
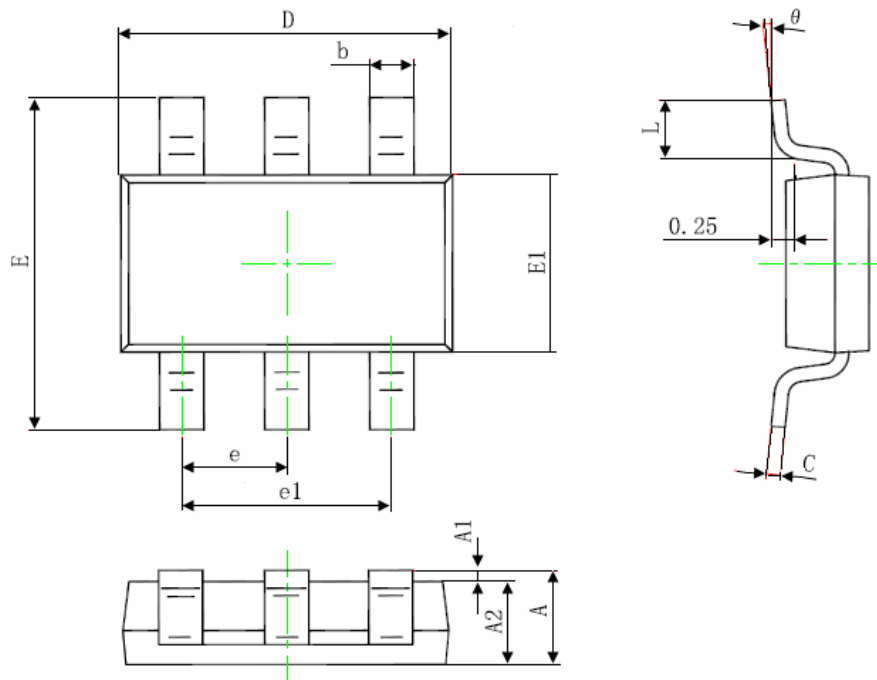


Figure 13 Normalized Maximum Transient Thermal Impedance

TSOT23-6L Package Information



| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|----------|---------------------------|-------|----------------------|-------|
| | Min | Max | Min | Max |
| A | --- | 0.900 | --- | 0.035 |
| A1 | 0.000 | 0.100 | 0.000 | 0.004 |
| A2 | 0.700 | 0.800 | 0.028 | 0.031 |
| b | 0.350 | 0.500 | 0.014 | 0.020 |
| c | 0.080 | 0.200 | 0.003 | 0.008 |
| D | 2.820 | 3.020 | 0.111 | 0.119 |
| E1 | 1.600 | 1.700 | 0.063 | 0.067 |
| E | 2.650 | 2.950 | 0.104 | 0.116 |
| e | 0.95 (BSC) | | 0.037(BSC) | |
| e1 | 1.90 (BSC) | | 0.075(BSC) | |
| L | 0.300 | 0.600 | 0.012 | 0.024 |
| θ | 0° | 8° | 0° | 8° |

| Package | Tube (pcs/tube) | Tube (pcs/inner box) | Tube (pcs/cartoon) | Tape&Reel (pcs/reel) | Tape&Reel (pcs/inner box) | Tape&Reel (pcs/cartoon) |
|---------------|--------------------|-------------------------|-----------------------|-------------------------|------------------------------|----------------------------|
| DFN | 100 | 10,000 | 100,000 | 2,500 | 5,000 | 40,000 |
| SOP-8 | 100 | 10,000 | 100,000 | 4,000 | 4,000 | 20,000 |
| TSSOP-8 | 100 | 32,000 | 128,000 | 3,000 | 6,000 | 48,000 |
| SOT-23-3L | — | — | — | 3,000 | 30,000 | 120,000 |
| SOT-23-6L | — | — | — | 3,000 | 30,000 | 120,000 |
| SOT-23(6R) | — | — | — | 3,000 | 30,000 | 120,000 |
| SOT-363 | — | — | — | 3,000 | 30,000 | 120,000 |
| SOT-523 | — | — | — | 3,000 | 30,000 | 120,000 |
| SOT223 | — | — | — | 2,500 | 2,500 | 20,000 |
| TO-220 | 50 | 1,000 | 5,000 | — | — | — |
| TO-220F | 50 | 1,000 | 10,000 | — | — | — |
| TO-247 | 30 | 300 | 1,200 | — | — | — |
| TO-251 | 80 | 4,000 | 40,000 | — | — | — |
| TO-251S(4R) | 80 | 4,000 | 40,000 | — | — | — |
| TO-252-2L(4R) | 80 | 4,000 | 40,000 | 2,500 | 2,500 | 25,000 |
| TO-263-2L | 50 | 1,000 | 10,000 | 800 | 800 | 8,000 |
| TO-3P | 30 | 300 | 3,000 | — | — | — |
| TO-92 | — | — | — | 1,000(袋装) | 10,000 | 100,000 |

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