

Description

The SP8M6-TB 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

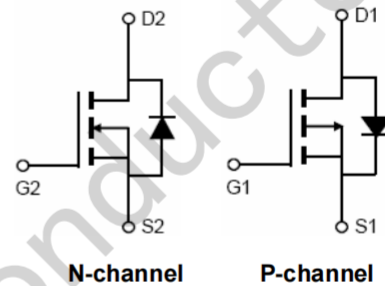
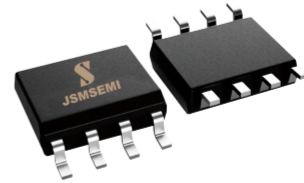
● N-Channel

$V_{DS} = 40V, I_D = 8.0A$
 $R_{DS(ON)} < 22m\Omega @ V_{GS}=10V$
 $R_{DS(ON)} < 31m\Omega @ V_{GS}=4.5V$

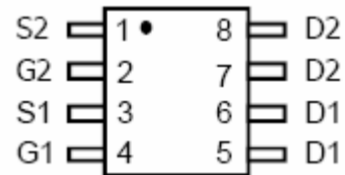
● P-Channel

$V_{DS} = -40V, I_D = -7.0A$
 $R_{DS(ON)} < 35m\Omega @ V_{GS}=-10V$
 $R_{DS(ON)} < 48m\Omega @ V_{GS}=-4.5V$

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



Schematic diagram



Marking and pin assignment

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

| Parameter | Symbol | N-Channel | P-Channel | Unit |
|--|----------------|------------|------------|------------|
| Drain-Source Voltage | V_{DS} | 40 | -40 | V |
| Gate-Source Voltage | V_{GS} | ± 20 | ± 20 | V |
| Continuous Drain Current | I_D | 8.0 | -7.0 | A |
| Pulsed Drain Current ^(Note 1) | I_{DM} | 40 | -30 | A |
| Maximum Power Dissipation | P_D | 2.0 | 2.0 | 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 ^(Note2) | $R_{\theta JA}$ | N-Ch | 62.5 | $^\circ C/W$ |
| Thermal Resistance, Junction-to-Ambient ^(Note2) | $R_{\theta JA}$ | P-Ch | 62.5 | $^\circ C/W$ |

N-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} | $V_{GS}=0V, I_D=250\mu A$ | 40 | - | - | V |
| Zero Gate Voltage Drain Current | I_{DSS} | $V_{DS}=40V, V_{GS}=0V$ | - | - | 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 | 1.4 | 2.0 | V |
| Drain-Source On-State Resistance | $R_{DS(on)}$ | $V_{GS}=10V, I_D=8A$ | - | 17 | 22 | m Ω |
| | | $V_{GS}=4.5V, I_D=6A$ | - | 21 | 31 | m Ω |
| Forward Transconductance | g_{FS} | $V_{DS}=5V, I_D=8A$ | 15 | - | - | S |

Dynamic Characteristics (Note4)

| | | | | | | |
|------------------------------|-----------|--|---|-----|---|----|
| Input Capacitance | C_{iss} | $V_{DS}=20V, V_{GS}=0V,$ $F=1.0MHz$ | - | 415 | - | PF |
| Output Capacitance | C_{oss} | | - | 112 | - | PF |
| Reverse Transfer Capacitance | C_{rss} | | - | 11 | - | PF |

Switching Characteristics (Note 4)

| | | | | | | |
|---------------------|--------------|--|---|-----|---|----|
| Turn-on Delay Time | $t_{d(on)}$ | $V_{DD}=20V, R_L=2.5\Omega$ $V_{GS}=10V, R_{GEN}=3\Omega$ | - | 4.0 | - | nS |
| Turn-on Rise Time | t_r | | - | 3.0 | - | nS |
| Turn-Off Delay Time | $t_{d(off)}$ | | - | 15 | - | nS |
| Turn-Off Fall Time | t_f | | - | 2.0 | - | nS |
| Total Gate Charge | Q_g | $V_{DS}=20V, I_D=8A,$ $V_{GS}=10V$ | - | 12 | - | nC |
| Gate-Source Charge | Q_{gs} | | - | 3.5 | - | nC |
| Gate-Drain Charge | Q_{gd} | | - | 3.1 | - | nC |

Drain-Source Diode Characteristics

| | | | | | | |
|--------------------------------|----------|---------------------|---|------|-----|---|
| Diode Forward Voltage (Note 3) | V_{SD} | $V_{GS}=0V, I_S=8A$ | - | 0.75 | 1.0 | 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)

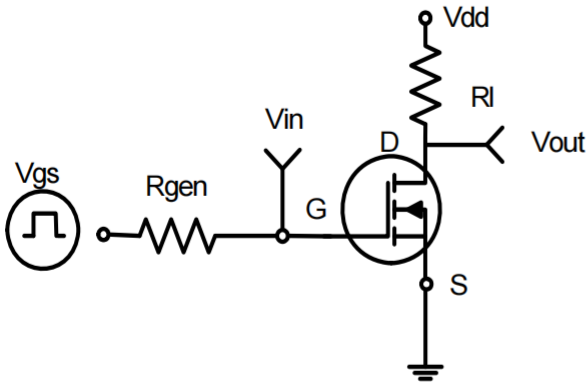


Figure 1: Switching Test Circuit

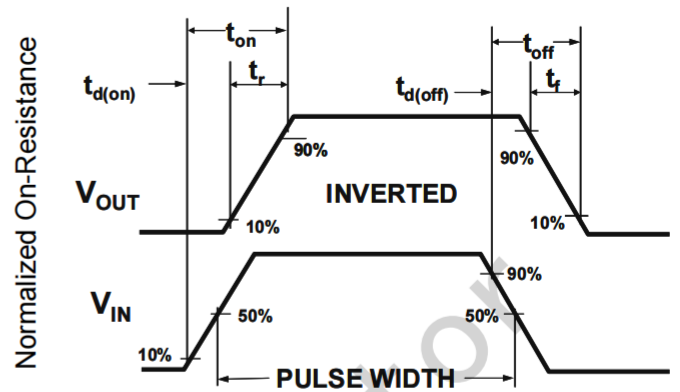


Figure 2: Switching Waveforms

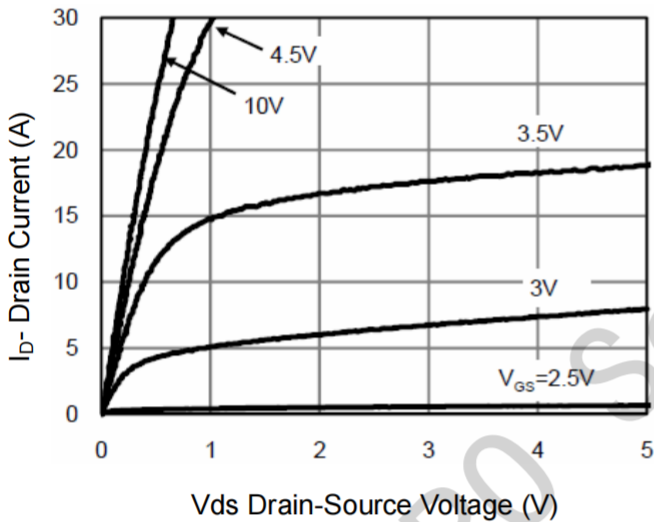


Figure 3 Output Characteristics

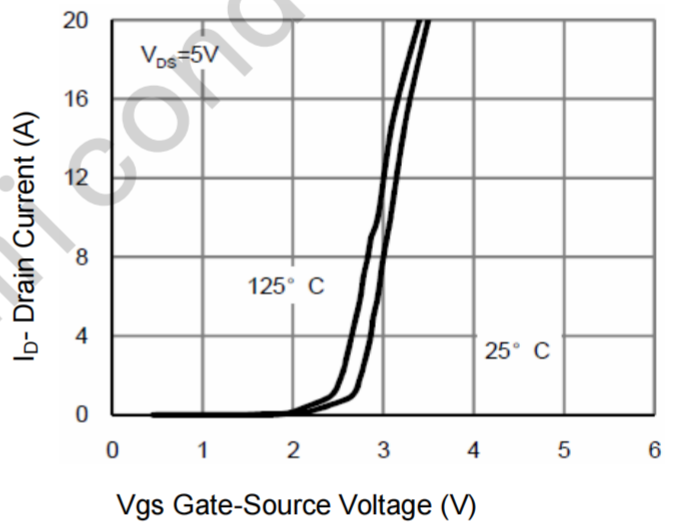


Figure 4 Transfer Characteristics

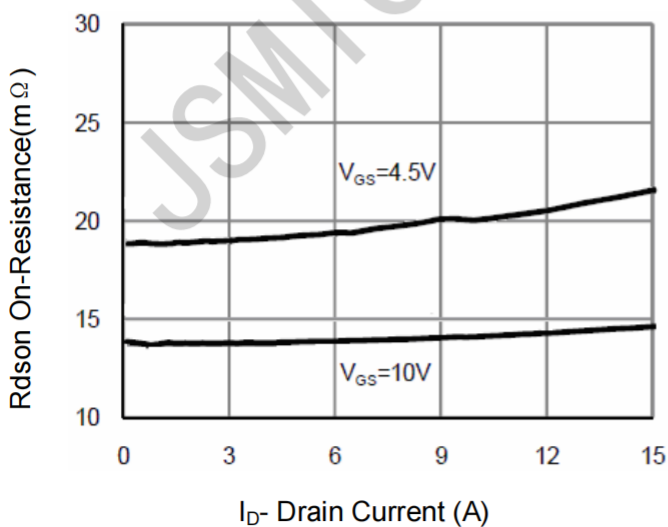


Figure 5 Drain-Source On-Resistance

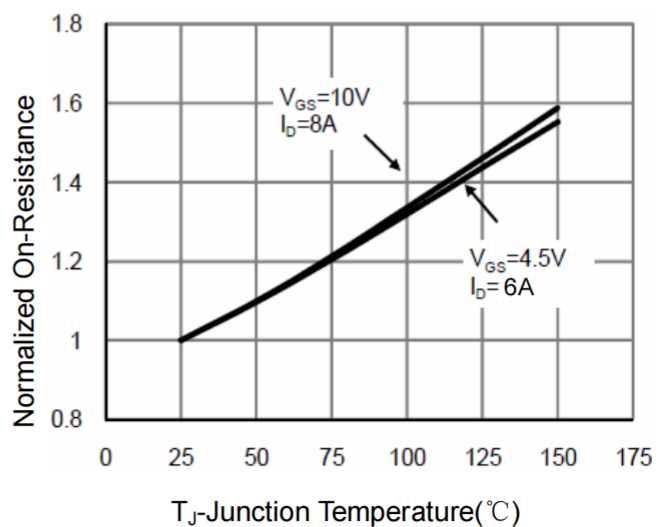
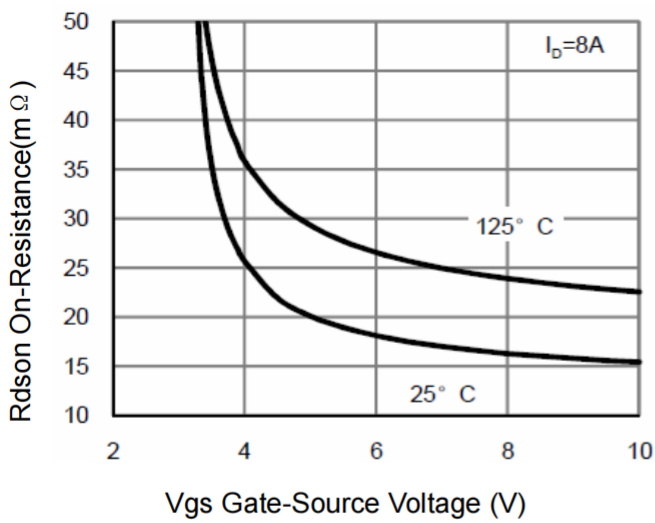
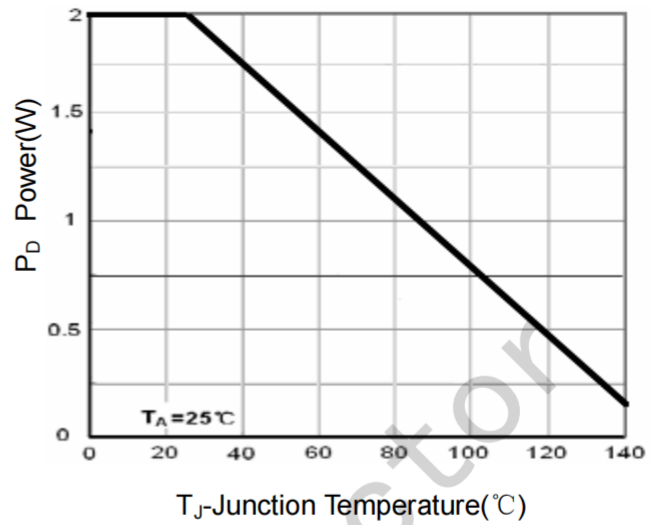


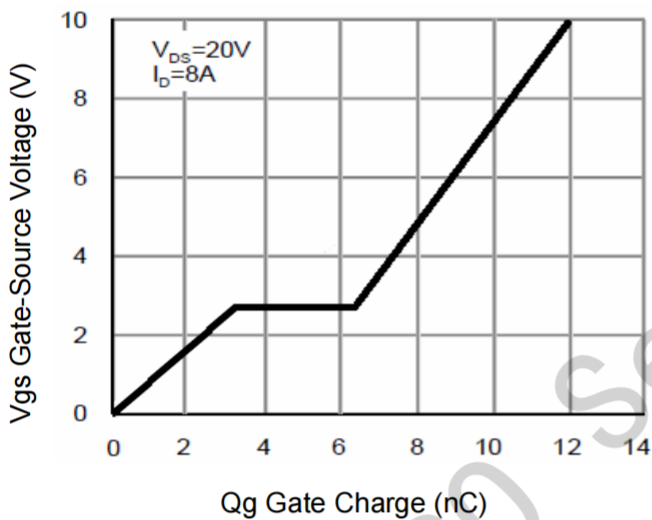
Figure 6 Drain-Source On-Resistance



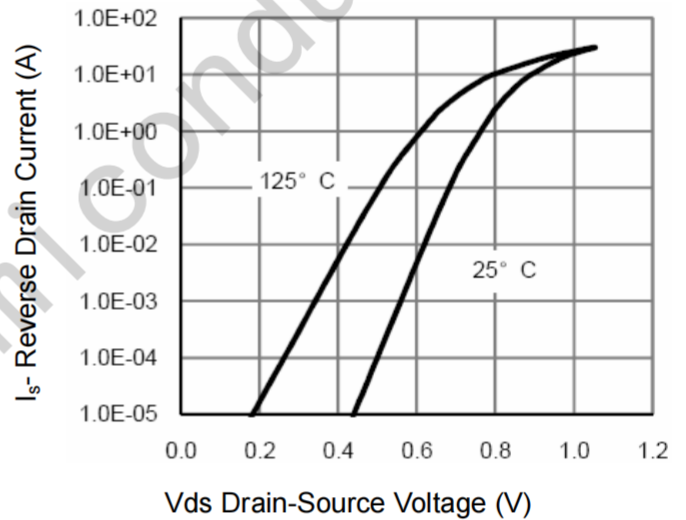
Vgs Gate-Source Voltage (V)
Figure 7 Rdson vs Vgs



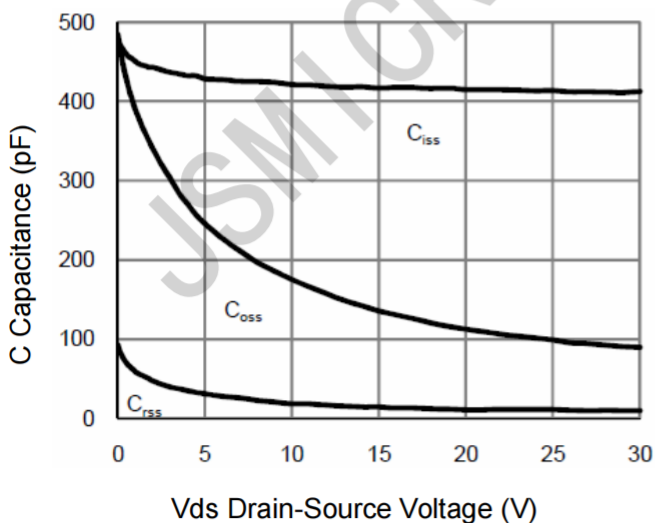
T_J-Junction Temperature(°C)
Figure 8 Power Dissipation



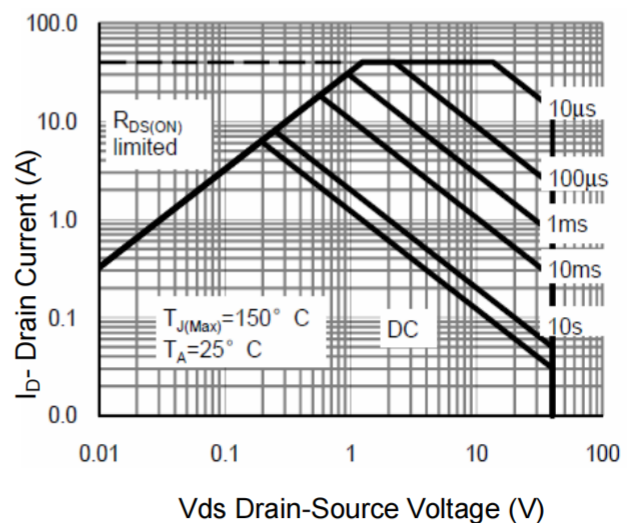
Qg Gate Charge (nC)
Figure 9 Gate Charge



V_{DS} Drain-Source Voltage (V)
Figure 10 Source- Drain Diode Forward



V_{DS} Drain-Source Voltage (V)
Figure 11 Capacitance vs Vds



V_{DS} Drain-Source Voltage (V)
Figure 12 Safe Operation Area

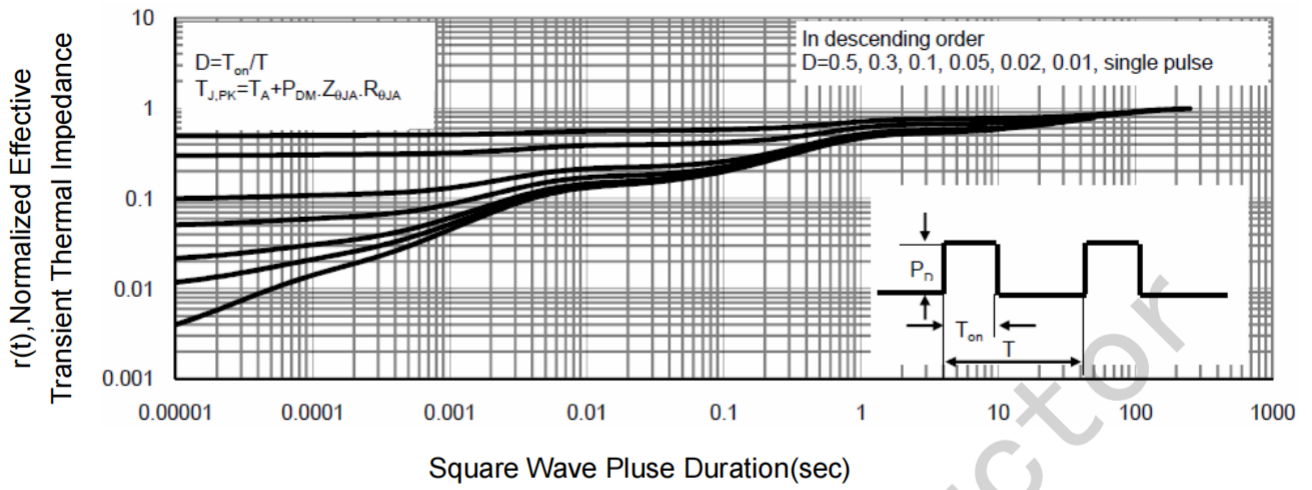


Figure 13 Normalized Maximum Transient Thermal Impedance

JSMICRO Semiconductor

P-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 | -40 | - | - | V |
| Zero Gate Voltage Drain Current | I _{DSS} | V _{DS} =-40V, 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 | -1.8 | -2.5 | V |
| Drain-Source On-State Resistance | R _{DS(ON)} | V _{GS} =-10V, I _D =-7.0A | - | 30 | 35 | mΩ |
| | | V _{GS} =-4.5V, I _D =-4.0A | - | 43 | 48 | mΩ |
| Forward Transconductance | g _{FS} | V _{DS} =-5V, I _D =-7.0A | 15 | - | - | S |

Dynamic Characteristics (Note4)

| | | | | | | |
|------------------------------|------------------|---|---|-----|---|----|
| Input Capacitance | C _{iss} | V _{DS} =-20V, V _{GS} =0V, F=1.0MHz | - | 520 | - | PF |
| Output Capacitance | C _{oss} | | - | 100 | - | PF |
| Reverse Transfer Capacitance | C _{rss} | | - | 65 | - | PF |

Switching Characteristics (Note 4)

| | | | | | | |
|---------------------|---------------------|--|---|-----|---|----|
| Turn-on Delay Time | t _{d(on)} | V _{DD} =-20V, R _L =2.3Ω V _{GS} =-10V, R _{GEN} =6Ω | - | 7.5 | - | nS |
| Turn-on Rise Time | t _r | | - | 5.5 | - | nS |
| Turn-Off Delay Time | t _{d(off)} | | - | 19 | - | nS |
| Turn-Off Fall Time | t _f | | - | 7 | - | nS |
| Total Gate Charge | Q _g | V _{DS} =-20V, I _D =-7.0A V _{GS} =-10V | - | 13 | - | nC |
| Gate-Source Charge | Q _{gs} | | - | 3.8 | - | nC |
| Gate-Drain Charge | Q _{gd} | | - | 3.1 | - | nC |

Drain-Source Diode Characteristics

| | | | | | | |
|--------------------------------|-----------------|--|---|------|------|---|
| Diode Forward Voltage (Note 3) | V _{SD} | V _{GS} =0V, I _S =-7.0A | - | 0.75 | -1.0 | V |
|--------------------------------|-----------------|--|---|------|------|---|

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- Channel Typical Electrical and Thermal Characteristics (Curves)

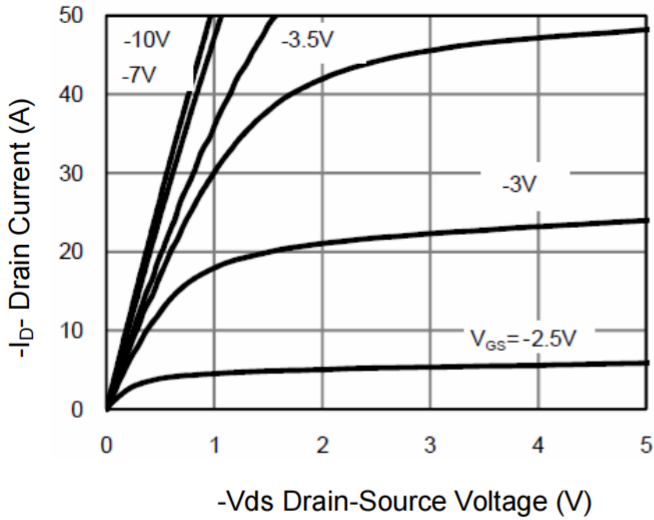


Figure 1 Output Characteristics

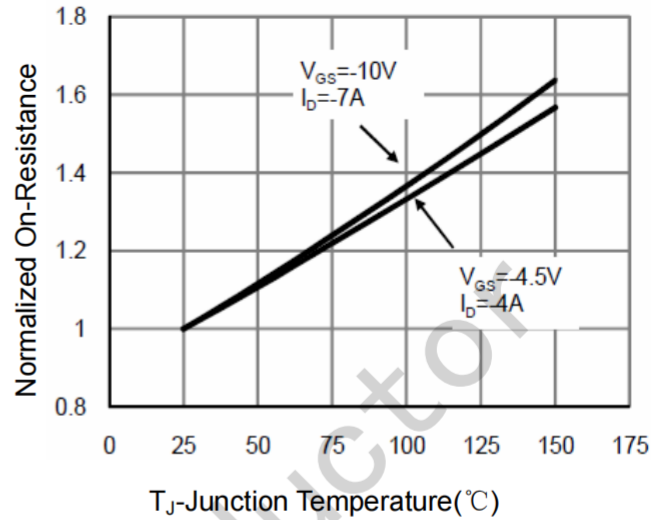


Figure 4 R_{dson} -Junction Temperature

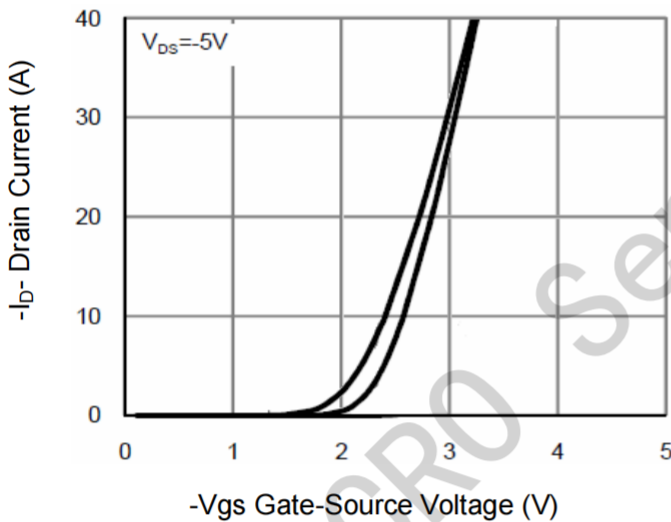


Figure 2 Transfer Characteristics

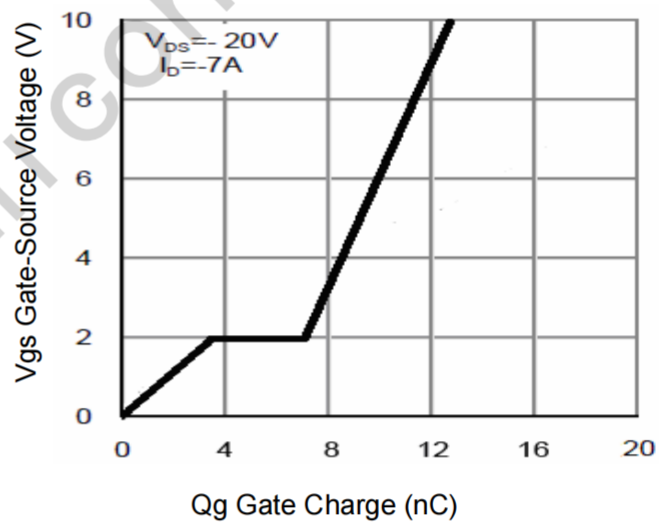


Figure 5 Gate Charge

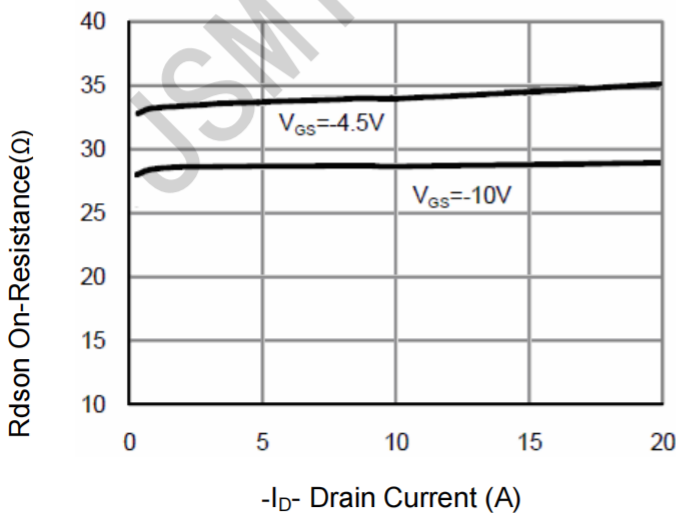


Figure 3 R_{dson} - Drain Current

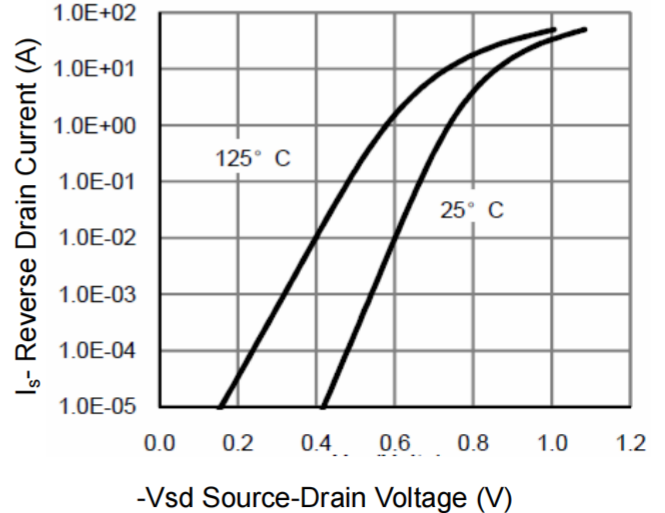


Figure 6 Source- Drain Diode Forward

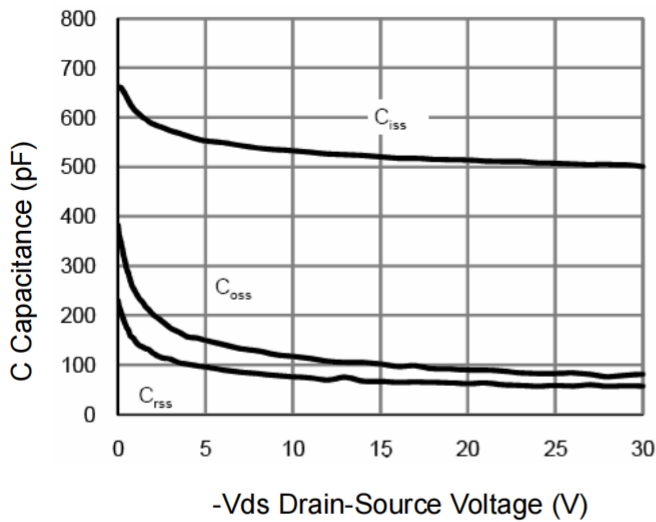


Figure 7 Capacitance vs Vds

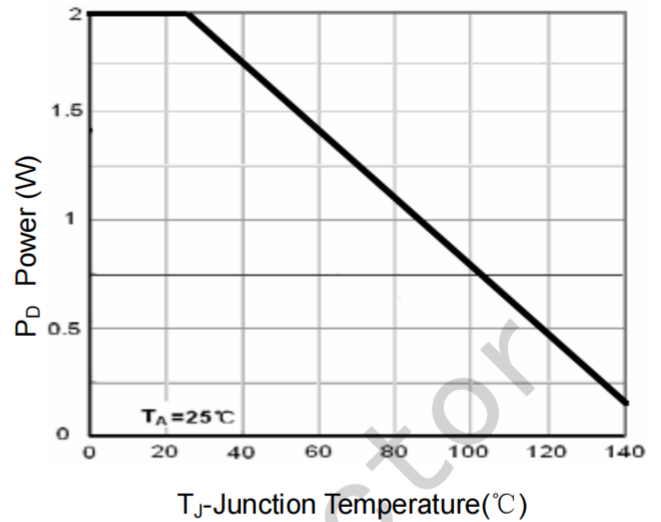


Figure 9 Power Dissipation

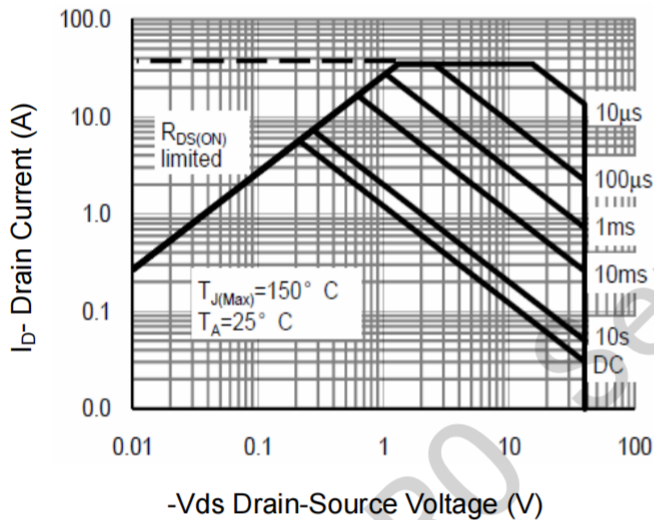


Figure 8 Safe Operation Area

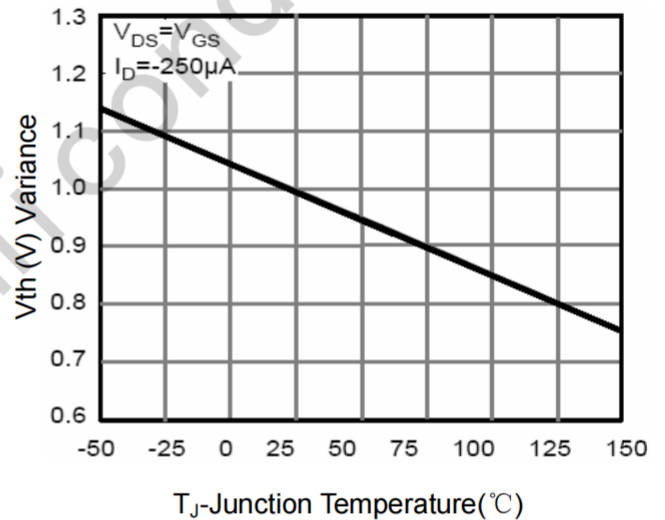


Figure 10 VGS(th) vs Junction Temperature

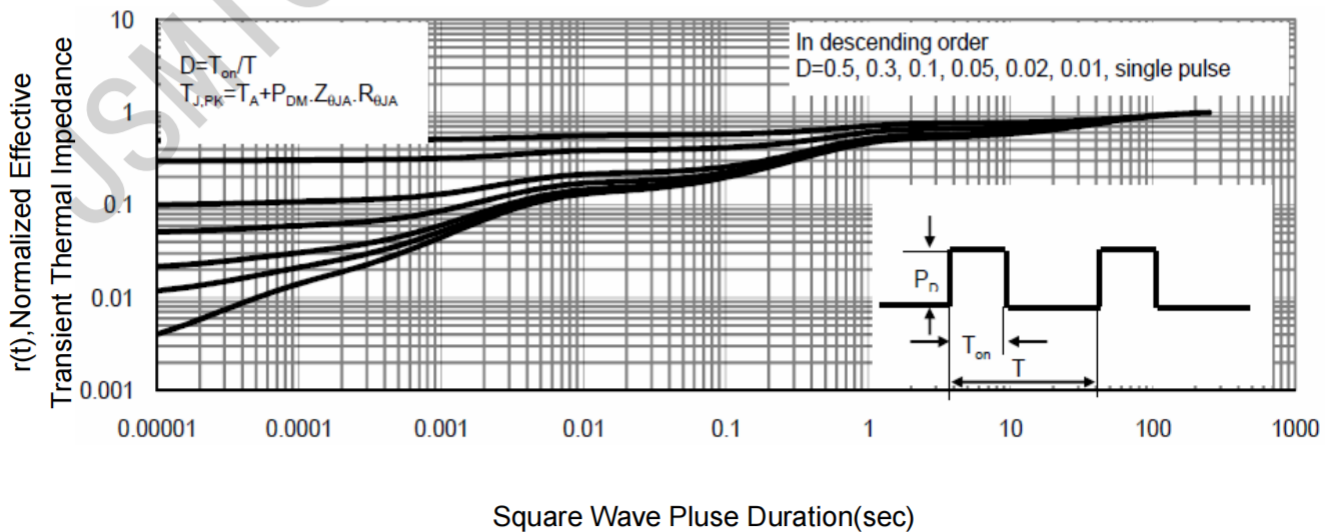
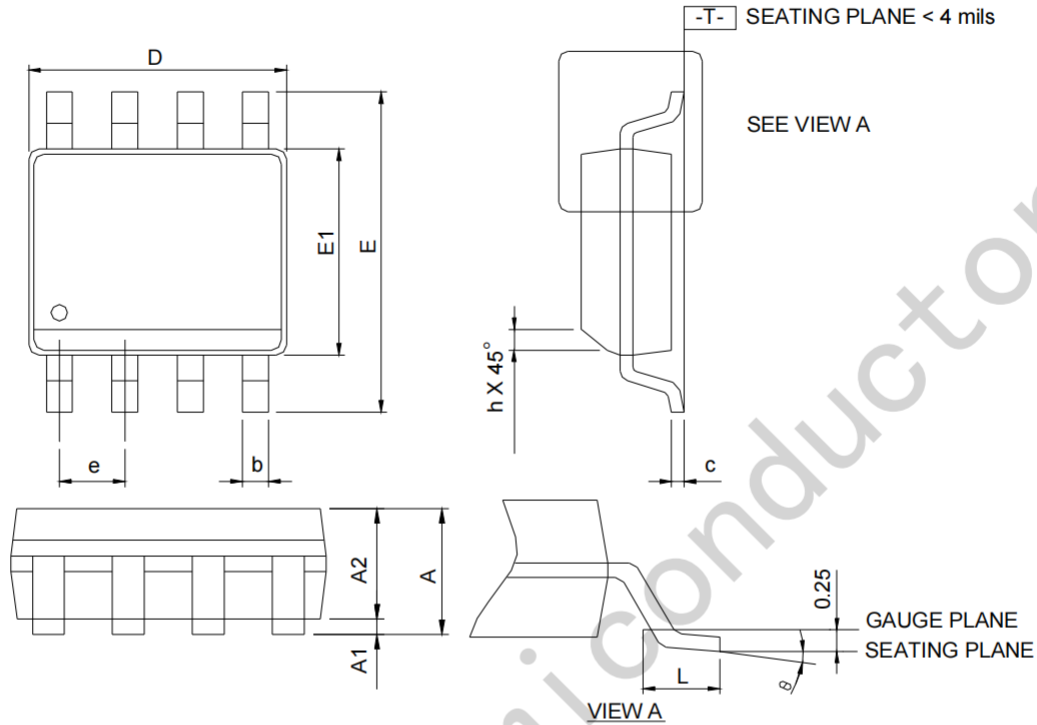


Figure 11 Normalized Maximum Transient Thermal Impedance

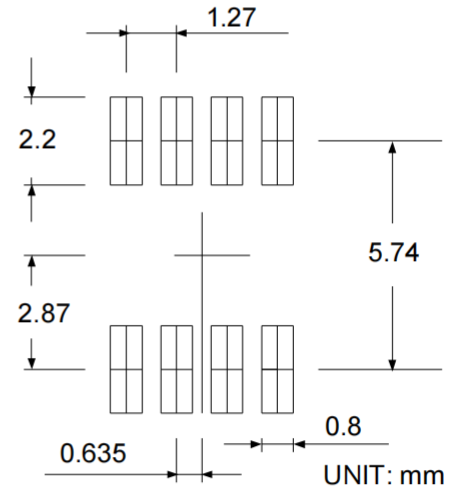
Package Information

SOP-8



| SYMBOLS | SOP-8 | | | |
|---------|-------------|------|-----------|-------|
| | MILLIMETERS | | INCHES | |
| | MIN. | MAX. | MIN. | MAX. |
| A | - | 1.75 | - | 0.069 |
| A1 | 0.10 | 0.25 | 0.004 | 0.010 |
| A2 | 1.25 | - | 0.049 | - |
| b | 0.31 | 0.51 | 0.012 | 0.020 |
| c | 0.17 | 0.25 | 0.007 | 0.010 |
| D | 4.80 | 5.00 | 0.189 | 0.197 |
| E | 5.80 | 6.20 | 0.228 | 0.244 |
| E1 | 3.80 | 4.00 | 0.150 | 0.157 |
| e | 1.27 BSC | | 0.050 BSC | |
| h | 0.25 | 0.50 | 0.010 | 0.020 |
| L | 0.40 | 1.27 | 0.016 | 0.050 |
| θ | 0° | 8° | 0° | 8° |

RECOMMENDED LAND PATTERN



Note: 1. Follow JEDEC MS-012 AA.

2. Dimension "D" does not include mold flash, protrusions or gate burrs. Mold flash, protrusion or gate burrs shall not exceed 6 mil per side.

3. Dimension "E" does not include inter-lead flash or protrusions. Inter-lead flash and protrusions shall not exceed 10 mil per side.