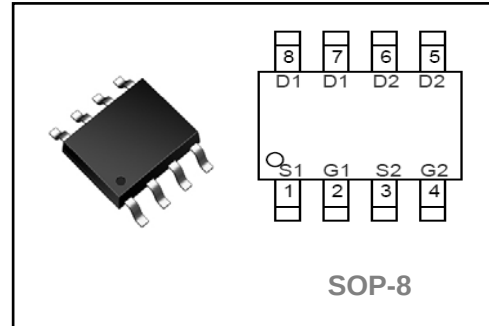


## *N- Channel and P-Channel Silicon MOSFETs*

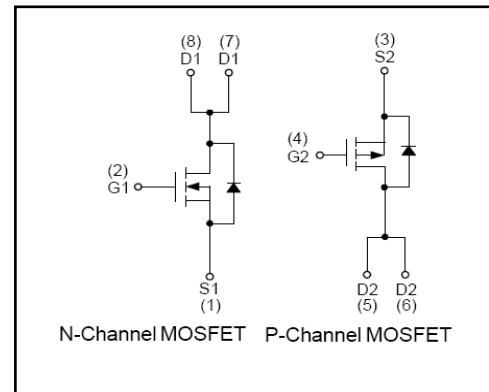
### Features

- Low On-resistance.
- Composite type with an N-channel MOSFET and a P-channel MOSFET driving from a 4.5V/-4.5V supply voltage contained in a single package.
- High-density mounting.
- RoHS compliant.



### Applications

- General-Purpose Switching Device
- For motor drives, inverters.



### Absolute Maximum Ratings at Ta=250C

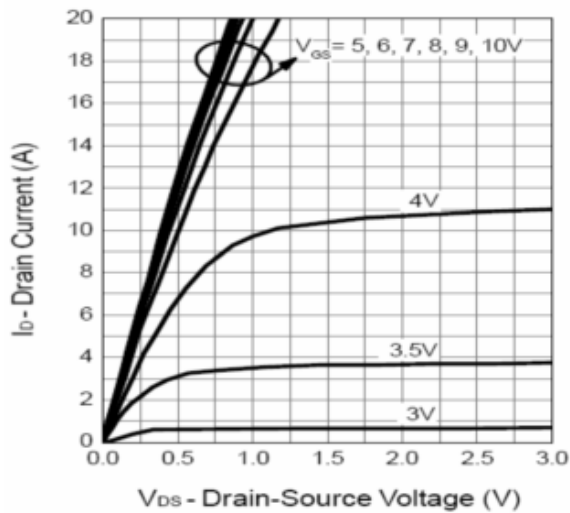
| Parameter                   | Symbol    | Conditions                                                    | Ratings  |      | Unit |
|-----------------------------|-----------|---------------------------------------------------------------|----------|------|------|
|                             |           |                                                               | N-Ch     | P-Ch |      |
| Drain-to-Source Voltage     | $V_{DSS}$ |                                                               | 60       | -60  | V    |
| Gate-to-Source Voltage      | $V_{GSS}$ |                                                               | +25      | +25  | V    |
| Drain Current (DC)          | $I_D$     |                                                               | 5        | -3.5 | A    |
| Drain Current (Pulse)       | $I_{DP}$  | PW≤10uS, duty cycle≤1%                                        | 20       | -14  | A    |
| Allowable Power Dissipation | $P_D$     | Mounted on a ceramic board (1000mm <sup>2</sup> ×0.8mm) 1unit | 1.3      |      | W    |
| Total Dissipation           | $P_T$     | Mounted on a ceramic board (1000mm <sup>2</sup> ×0.8mm)       | 1.7      |      | W    |
| Channel Temperature         | $T_{ch}$  |                                                               | 150      |      | °C   |
| Storage Temperature         | $T_{stg}$ |                                                               | -55~+150 |      | °C   |

**N-Channel Electrical Characteristics at Ta=25°C**

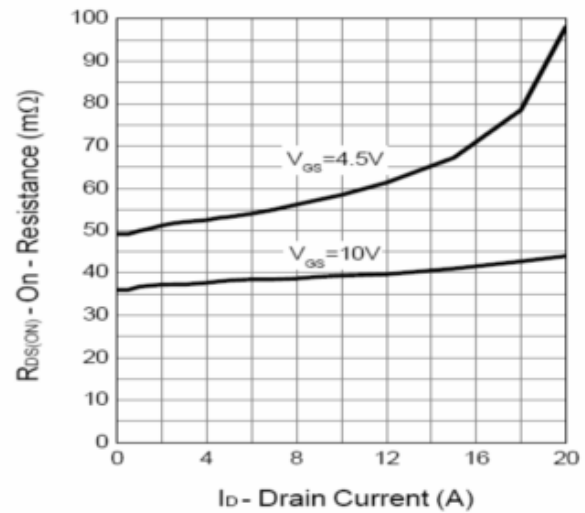
| Parameter                                  | Symbol        | Conditions                                                                      | Ratings |     |           | Unit       |
|--------------------------------------------|---------------|---------------------------------------------------------------------------------|---------|-----|-----------|------------|
|                                            |               |                                                                                 | min     | typ | max       |            |
| Drain-to-Source Breakdown Voltage          | $V_{(BR)DSS}$ | $I_D=250\mu A, V_{GS}=0V$                                                       | 60      | -   | -         | V          |
| Zero-Gate Voltage Drain Current            | $I_{DSS}$     | $V_{DS}=48V, V_{GS}=0V$                                                         | -       | -   | 1         | $\mu A$    |
| Gate-to-Source Leakage Current             | $I_{GSS}$     | $V_{GS}=\pm 25V, V_{DS}=0V$                                                     | -       | -   | $\pm 100$ | nA         |
| Gate Threshold Voltage                     | $V_{GS(th)}$  | $V_{DS}=V_{GS}, I_D=250\mu A$                                                   | 1       | 2   | 2.5       | V          |
| Static Drain-to-Source On-State Resistance | $R_{DS(on)}$  | $I_D=5A, V_{GS}=10V$                                                            | -       | 38  | 52        | m $\Omega$ |
|                                            | $R_{DS(on)}$  | $I_D=4A, V_{GS}=4.5V$                                                           | -       | 55  | 75        | m $\Omega$ |
| Input Capacitance                          | $C_{iss}$     | $V_{DS}=30V,$<br>$V_{GS}=0V,$<br>$f=1MHz$                                       | -       | 915 | -         | pF         |
| Output Capacitance                         | $C_{oss}$     |                                                                                 | -       | 70  | -         |            |
| Reverse Transfer Capacitance               | $C_{rss}$     |                                                                                 | -       | 45  | -         |            |
| Turn-on Delay Time                         | $t_{d(on)}$   | $V_{GEN}=10V,$<br>$V_{DS}=30V,$<br>$R_L=30\Omega, I_D=1A,$<br>$R_{GEN}=6\Omega$ | -       | 9   | 17        | nS         |
| Rise Time                                  | $t_r$         |                                                                                 | -       | 6   | 12        |            |
| Turn-off Delay Time                        | $t_{d(off)}$  |                                                                                 | -       | 25  | 46        |            |
| Fall Time                                  | $t_f$         |                                                                                 | -       | 5   | 10        |            |
| Total Gate Charge                          | $Q_g$         | $V_{DS}=30V,$<br>$V_{GS}=10V,$<br>$I_D=5A$                                      | -       | 19  | 27        | nC         |
| Gate-to-Source Charge                      | $Q_{gs}$      |                                                                                 | -       | 4.4 | -         |            |
| Gate-to-Drain "Miller" Charge              | $Q_{gd}$      |                                                                                 | -       | 4.4 | -         |            |
| Diode Forward Voltage                      | $V_{SD}$      | $I_S=2.5A, V_{GS}=0V$                                                           | -       | 0.8 | 1.1       | V          |

N-Channel Typical Characteristics at  $T_a=25^\circ\text{C}$

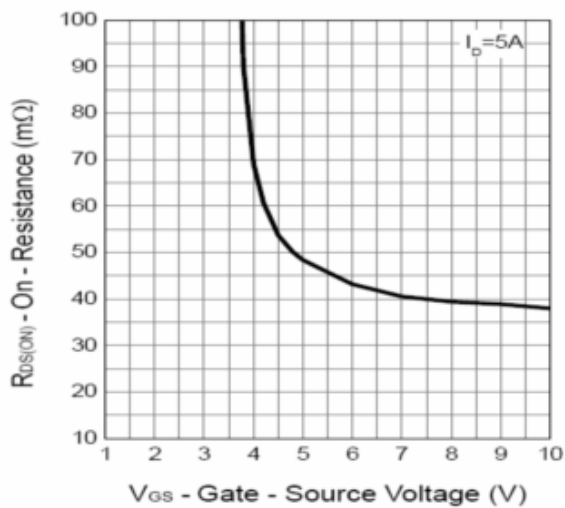
**Output Characteristics**



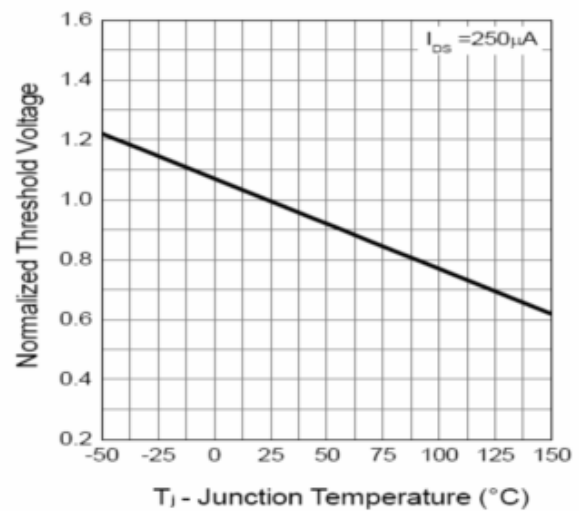
**Drain-Source On Resistance**



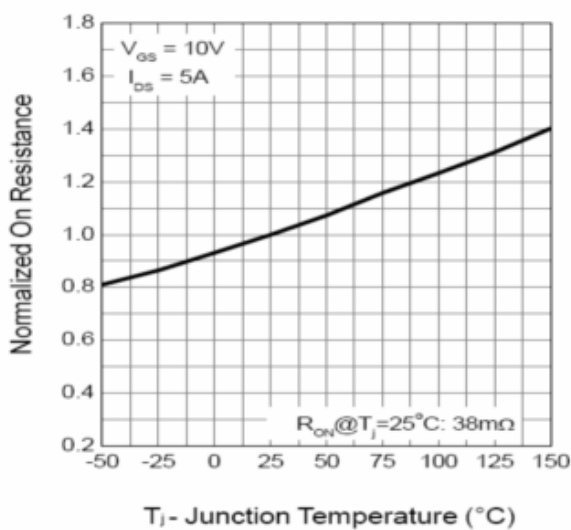
**Drain-Source On Resistance**



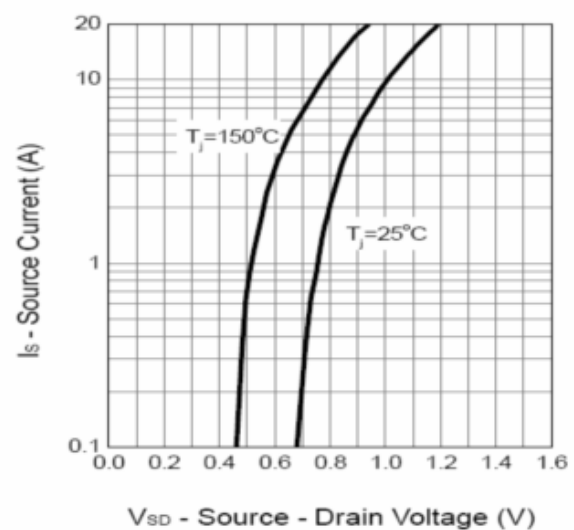
**Gate Threshold Voltage**



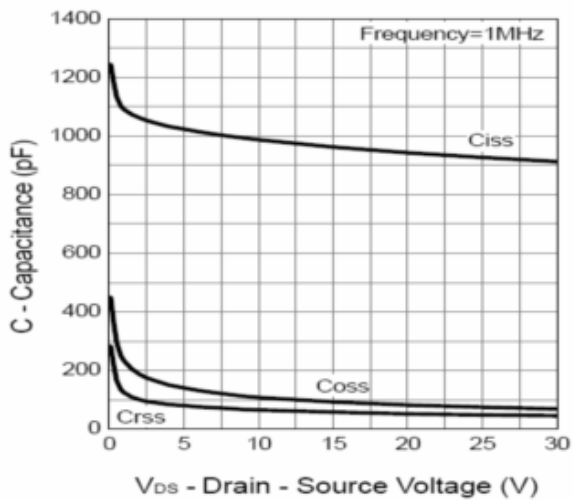
**Drain-Source On Resistance**



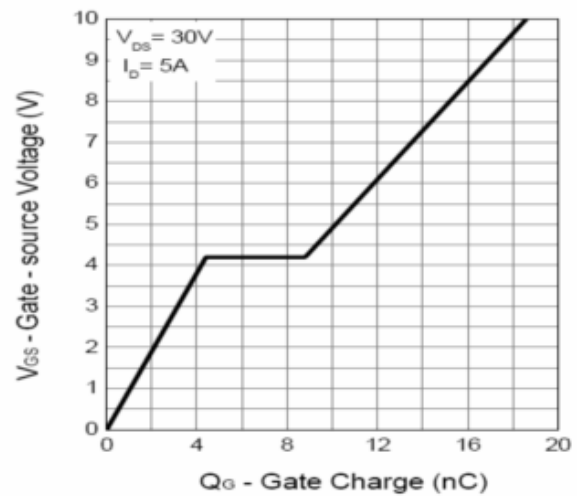
**Source-Drain Diode Forward**



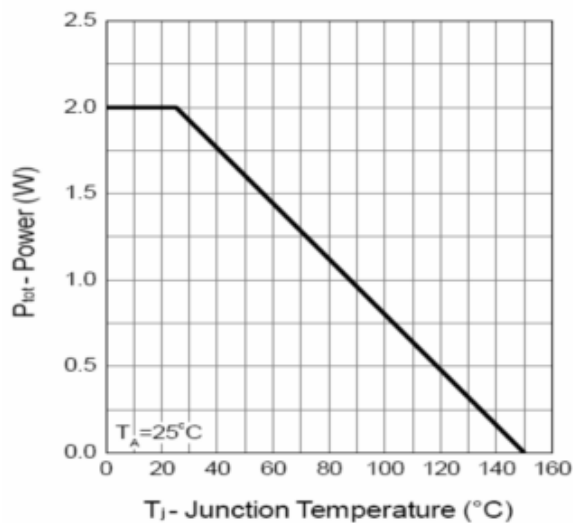
**Capacitance**



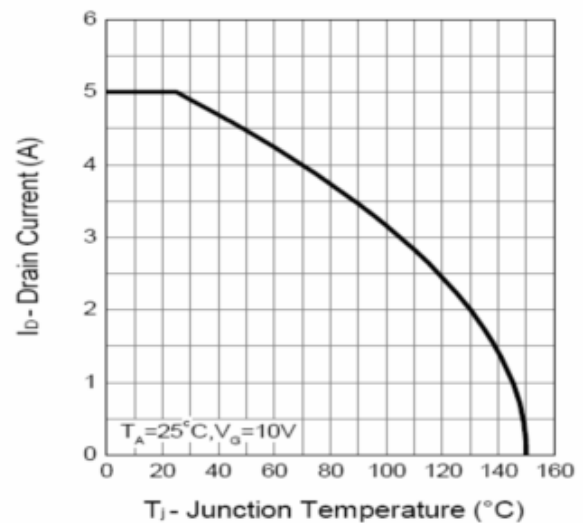
**Gate Charge**



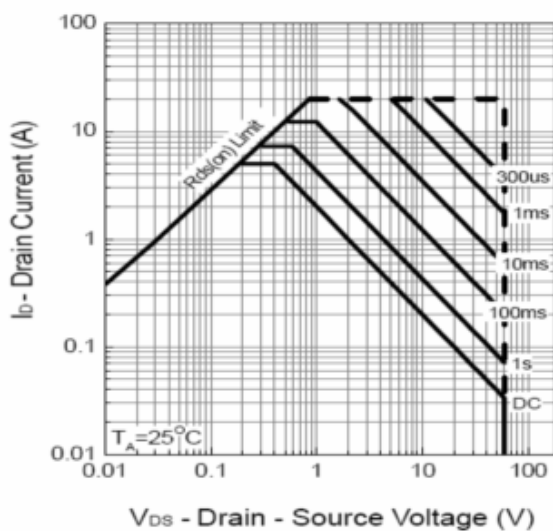
**Power Dissipation**



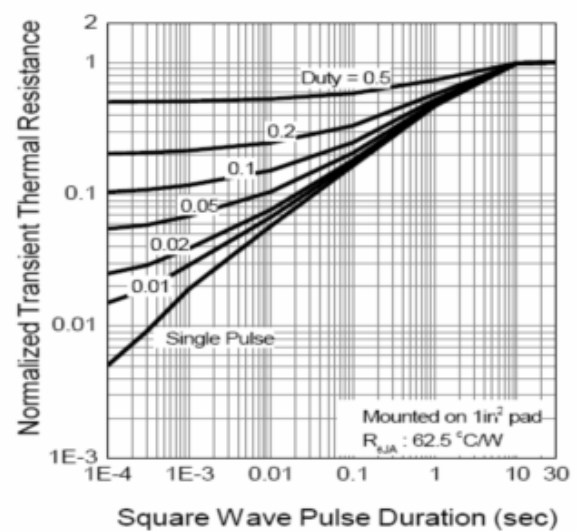
**Drain Current**



**Safe Operation Area**



**Thermal Transient Impedance**

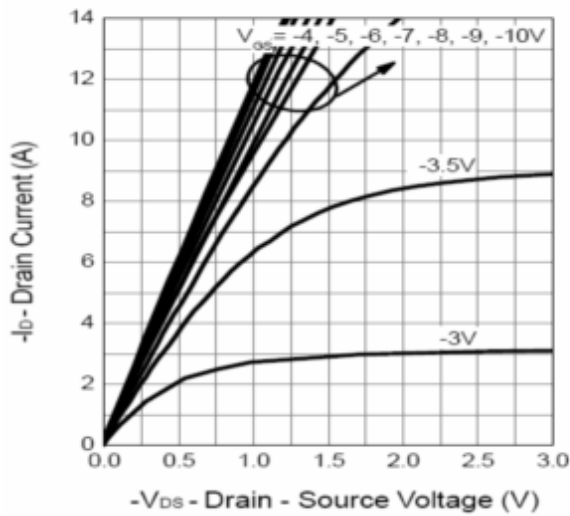


## P-Channel Electrical Characteristics at $T_a=25^{\circ}\text{C}$

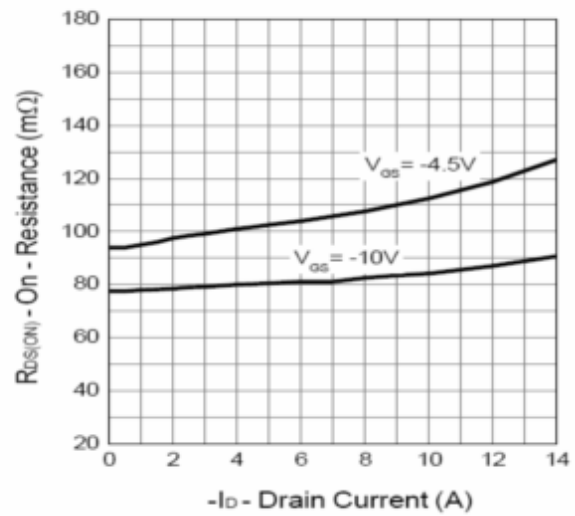
| Parameter                                  | Symbol        | Conditions                                   | Ratings |      |           | Unit             |
|--------------------------------------------|---------------|----------------------------------------------|---------|------|-----------|------------------|
|                                            |               |                                              | min     | typ  | max       |                  |
| Drain-to-Source Breakdown Voltage          | $V_{(BR)DSS}$ | $I_D=-250\mu\text{A}$ , $V_{GS}=0\text{V}$   | - 60    | -    | -         | V                |
| Zero-Gate Voltage Drain Current            | $I_{DSS}$     | $V_{DS}=-48\text{V}$ , $V_{GS}=0\text{V}$    | -       | -    | -1        | $\mu\text{A}$    |
| Gate-to-Source Leakage Current             | $I_{GSS}$     | $V_{GS}=\pm 25\text{V}$ , $V_{DS}=0\text{V}$ | -       | -    | $\pm 100$ | nA               |
| Gate Threshold Voltage                     | $V_{GS(th)}$  | $V_{DS}=V_{GS}$ , $I_D=-250\mu\text{A}$      | -1      | -2   | -2.5      | V                |
| Static Drain-to-Source On-State Resistance | $R_{DS(ON)}$  | $I_D=-3.5\text{A}$ , $V_{GS}=-10\text{V}$    | -       | 80   | 100       | $\text{m}\Omega$ |
|                                            | $R_{DS(ON)}$  | $I_D=-3.1\text{A}$ , $V_{GS}=-4.5\text{V}$   | -       | 100  | 135       | $\text{m}\Omega$ |
| Input Capacitance                          | $C_{iss}$     | $V_{DS}=-30\text{V}$ ,                       | -       | 1050 | -         | pF               |
| Output Capacitance                         | $C_{oss}$     | $V_{GS}=0\text{V}$ ,                         | -       | 70   | -         |                  |
| Reverse Transfer Capacitance               | $C_{rss}$     | $f=1\text{MHz}$                              | -       | 50   | -         |                  |
| Turn-on Delay Time                         | $t_{d(on)}$   | $V_{GEN}=-10\text{V}$ ,                      | -       | 7    | 14        | nS               |
| Rise Time                                  | $t_r$         | $V_{DS}=-30\text{V}$ ,                       | -       | 8    | 15        |                  |
| Turn-off Delay Time                        | $t_{d(off)}$  | $R_L=30\Omega$ , $I_D=-1\text{A}$ ,          | -       | 47   | 86        |                  |
| Fall Time                                  | $t_f$         | $R_{GEN}=6\Omega$                            | -       | 17   | 32        |                  |
| Total Gate Charge                          | $Q_g$         | $V_{DS}=-30\text{V}$ ,                       | -       | 22   | 31        | nC               |
| Gate-to-Source Charge                      | $Q_{gs}$      | $V_{GS}=-10\text{V}$ ,                       | -       | 2.8  | -         |                  |
| Gate-to-Drain "Miller" Charge              | $Q_{gd}$      | $I_D=-3.5\text{A}$                           | -       | 5    | -         |                  |
| Diode Forward Voltage                      | $V_{SD}$      | $I_S=-2.5\text{A}$ , $V_{GS}=0\text{V}$      | -       | -0.8 | -1.1      | V                |

P-Channel Typical Characteristics at  $T_a=25^{\circ}\text{C}$

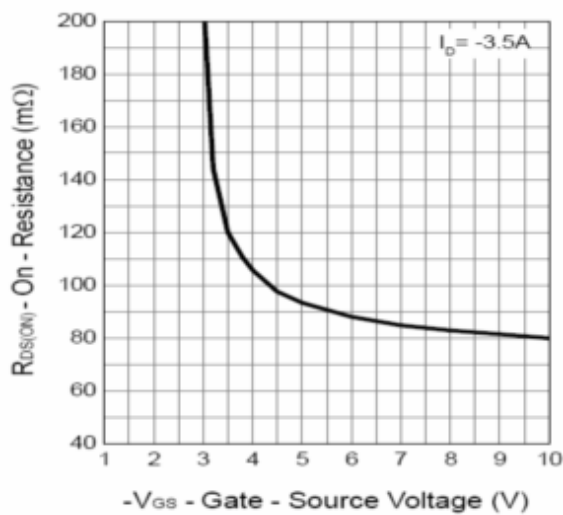
**Output Characteristics**



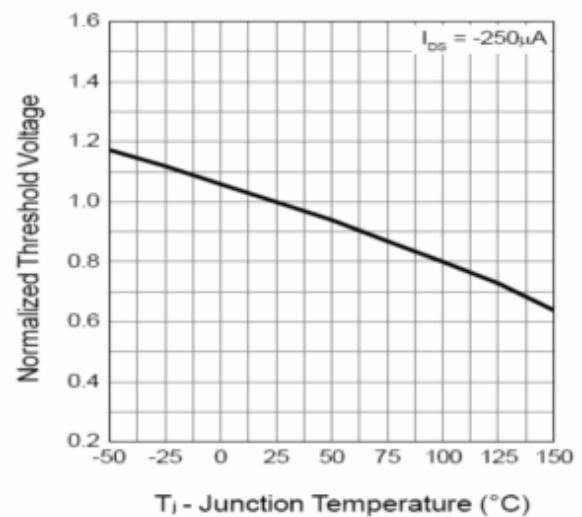
**Drain-Source On Resistance**



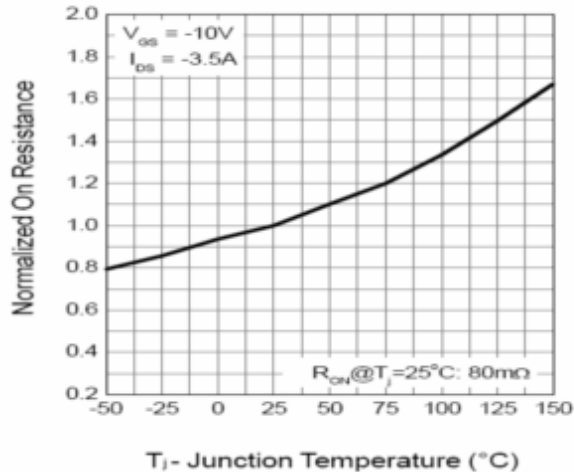
**Drain-Source On Resistance**



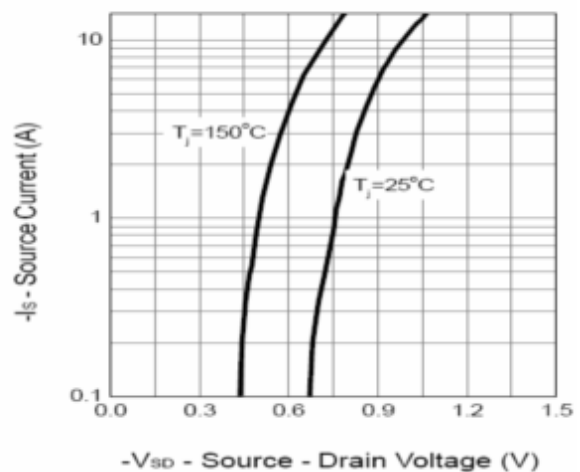
**Gate Threshold Voltage**



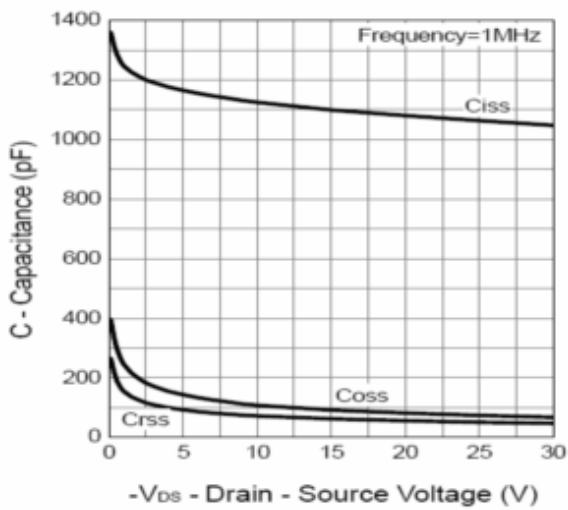
**Drain-Source On Resistance**



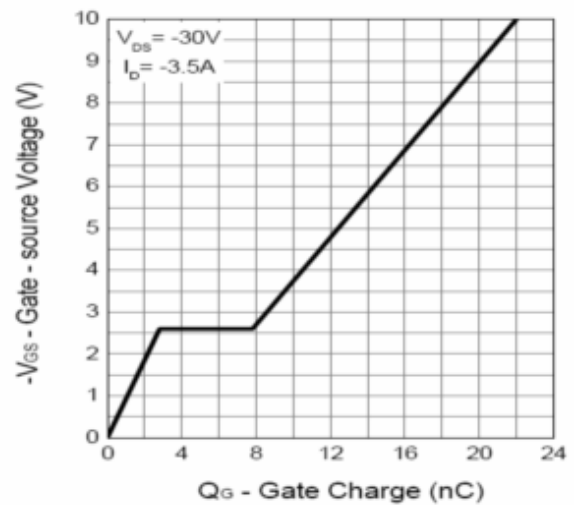
**Source-Drain Diode Forward**



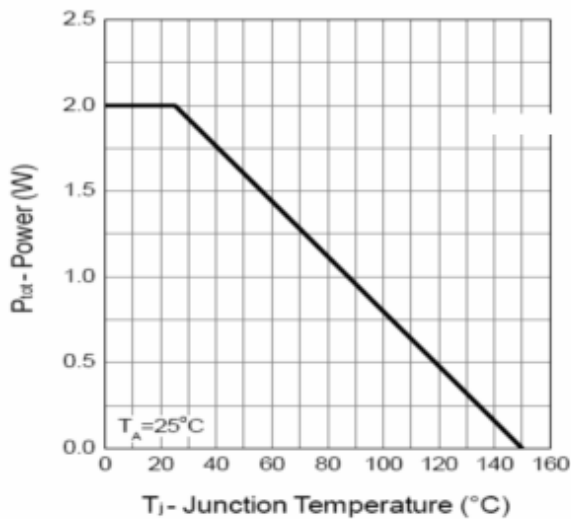
**Capacitance**



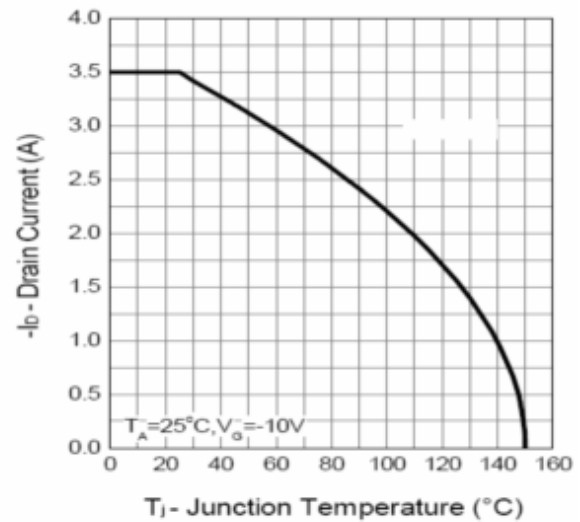
**Gate Charge**



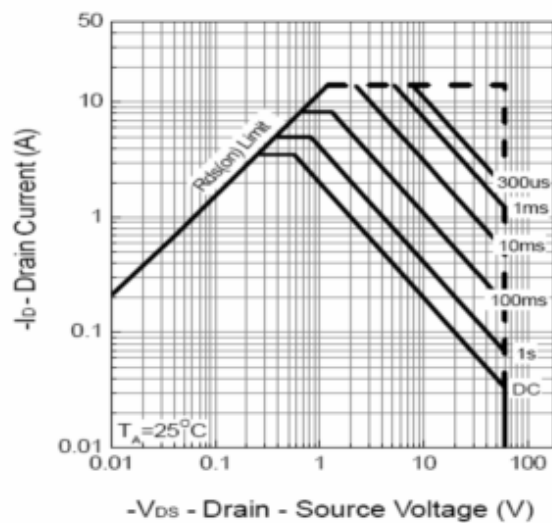
**Power Dissipation**



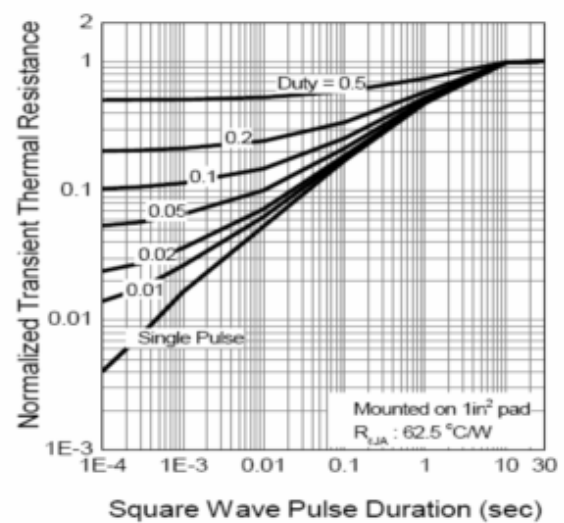
**Drain Curre.**



**Safe Operation Area**



**Thermal Transient Impedance**



**SOP8 Package Dimension**

