



**WANSEMI**  
万芯半导体

**WP4606K**

# **Enhancement Mode N+P-Channel Power MOSFET**

**SOP8/N+PMOS/30V/ $\pm 20V$ /1.7V/5.5A/14.5m $\Omega$**

**-30V/ $\pm 20V$ /-1.7V/-4.2A/33m $\Omega$**

**Rev0.5**

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## 30V N+P-Channel MOSFET

### 1.Features

- ◆ High power and current handling capability
- ◆ Lead free product is acquired
- ◆ Fast switching
- ◆ Surface mount package

#### ◆ N-Channel

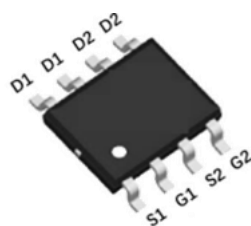
| $V_{DS}$ | $R_{DS(on)}$ Typ. | $I_D$ |
|----------|-------------------|-------|
| 30V      | 14.5mΩ @ 10V      | 5.5A  |
|          | 23.5mΩ @ 4.5V     |       |

#### ◆ P-Channel

| $V_{DS}$ | $R_{DS(on)}$ Typ. | $I_D$ |
|----------|-------------------|-------|
| -30V     | 33mΩ @ -10V       | -4.2A |
|          | 45mΩ @ -4.5V      |       |

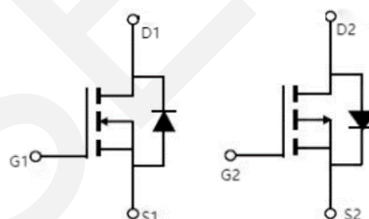
### 2.Applications

- ◆ Power Switching Application
- ◆ Load Switching



SOP8

Pin Description



N-Channel

P-Channel

Schematic Diagram

### 3.Package Marking and Ordering Information

| Part no. | Marking | Package | PCS/Reel | PCS/CTN. |
|----------|---------|---------|----------|----------|
| WP4606K  | *4606   | SOP8    | 4,000    | 48,000   |

### 4.Absolute Max Ratings at Ta=25°C (Note1)

| Parameter                       |          | Symbol    | N-channel | P-channel | Units |
|---------------------------------|----------|-----------|-----------|-----------|-------|
| Drain to Source Voltage         |          | $V_{DSS}$ | 30        | -30       | V     |
| Gate to Source Voltage          |          | $V_{GSS}$ | ±20       | ±20       | V     |
| Drain Current (DC),             | TA=25 °C | $I_D$     | 5.5       | -4.2      | A     |
| Drain Current (Pulse), PW≤300μs |          | $I_{DM}$  | 30        | 30        | A     |
| Avalanche Energy, Single Pulsed |          | $E_{AS}$  | 30        | 25        | mJ    |
| Total Dissipation               | TA=25 °C | $P_D$     | 2.0       | 2.0       | W     |
| Junction Temperature            |          | $T_J$     | 150       | 150       | °C    |

| Parameter           | Symbol    | N-channel   | P-channel   | Units |
|---------------------|-----------|-------------|-------------|-------|
| Storage Temperature | $T_{stg}$ | -55 to +150 | -55 to +150 | °C    |

Note 1: Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

### 5. Thermal Resistance Ratings (Note 2)

| Parameter                   | Symbol          | Value | Unit |
|-----------------------------|-----------------|-------|------|
| Maximum Junction-to-Ambient | $R_{\theta JA}$ | 62.5  | °C/W |

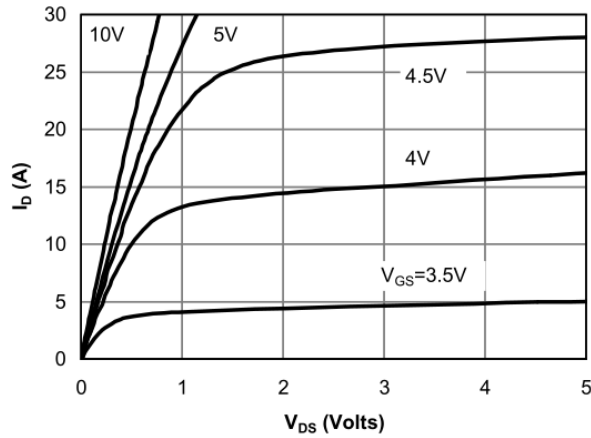
Note 2: When mounted on 1 inch square copper board  $t \leq 10\text{sec}$  The value in any given application depends on the user's specific board design.

### 6. NMOS Electrical Characteristics at $T_a=25^\circ\text{C}$ (Note 3)

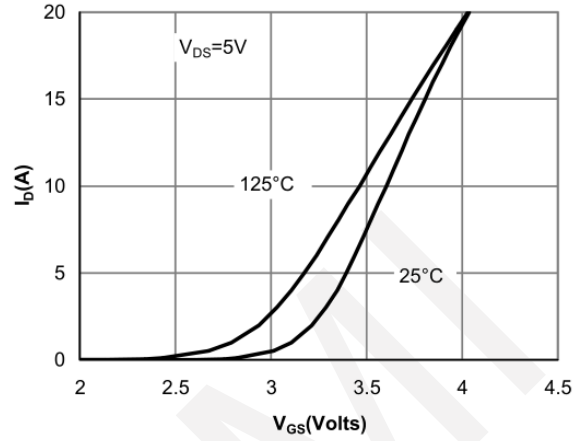
| Parameter                                  | Symbol        | Test Conditions                                                                            | Min. | Typ. | Max.      | Units         |
|--------------------------------------------|---------------|--------------------------------------------------------------------------------------------|------|------|-----------|---------------|
| Drain to Source Breakdown Voltage          | $V_{(BR)DSS}$ | $I_D = 250\mu\text{A}$ , $V_{GS} = 0\text{V}$                                              | 30   |      |           | V             |
| Zero-Gate Voltage Drain Current            | $I_{DSS}$     | $V_{DS} = 30\text{V}$ , $V_{GS} = 0\text{V}$                                               |      |      | 1         | $\mu\text{A}$ |
| Gate to Source Leakage Current             | $I_{GSS}$     | $V_{GS} = \pm 20\text{V}$ , $V_{DS} = 0\text{V}$                                           |      |      | $\pm 100$ | nA            |
| Gate Threshold Voltage                     | $V_{GS(th)}$  | $V_{DS}=V_{GS}$ , $I_{DS}=250\mu\text{A}$                                                  | 1.0  | 1.7  | 2.5       | V             |
| Static Drain to Source On-State Resistance | $R_{DS(on)}$  | $I_D = 5.5\text{A}$ , $V_{GS} = 10\text{V}$                                                |      | 14.5 | 23        | m $\Omega$    |
|                                            |               | $I_D = 5.5\text{A}$ , $V_{GS} = 4.5\text{V}$                                               |      | 23.5 | 35        | m $\Omega$    |
| Input Capacitance                          | $C_{iss}$     | $V_{GS}=0\text{V}$ ,<br>$V_{DS}=15\text{V}$ ,<br>Frequency=1.0MHz                          |      | 457  | -         | pF            |
| Output Capacitance                         | $C_{oss}$     |                                                                                            |      | 74   | -         | pF            |
| Reverse Transfer Capacitance               | $C_{rss}$     |                                                                                            |      | 63   | -         | pF            |
| Turn-ON Delay Time                         | $t_{d(on)}$   | $V_{DD} = 15\text{V}$<br>$V_{GS} = 10\text{V}$<br>$R_{GEN} = 3\Omega$<br>$I_D = 3\text{A}$ |      | 10   | -         | ns            |
| Rise Time                                  | $t_r$         |                                                                                            |      | 15   | -         | ns            |
| Turn-OFF Delay Time                        | $t_{d(off)}$  |                                                                                            |      | 30   | -         | ns            |
| Fall Time                                  | $t_f$         |                                                                                            |      | 6    | -         | ns            |
| Total Gate Charge                          | $Q_g$         | $V_{DS} = 15\text{V}$ ,<br>$V_{GS} = 10\text{V}$ ,<br>$I_D = 5.5\text{A}$                  |      | 10   |           | nC            |
|                                            | $Q_{gs}$      |                                                                                            |      | 1    |           | nC            |
|                                            | $Q_{gd}$      |                                                                                            |      | 2.3  |           | nC            |
| Diode Forward Voltage                      | $V_{FSD}$     | $I_S = 5.5\text{A}$ , $V_{GS} = 0\text{V}$                                                 |      | 0.85 | 1.2       | V             |



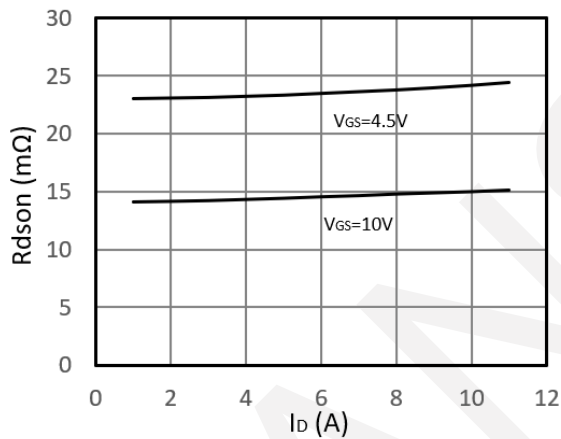
## NMOS Typical electrical and thermal characteristics



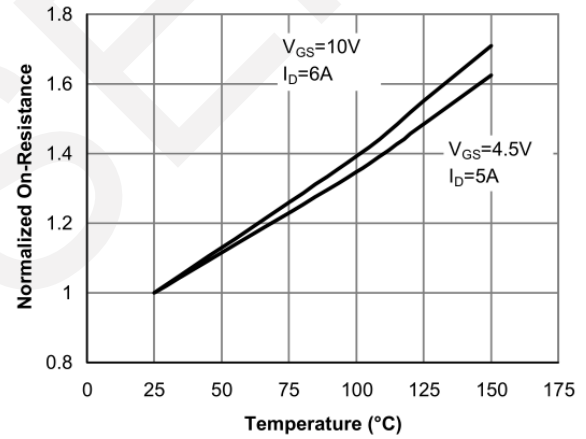
Output Characteristics



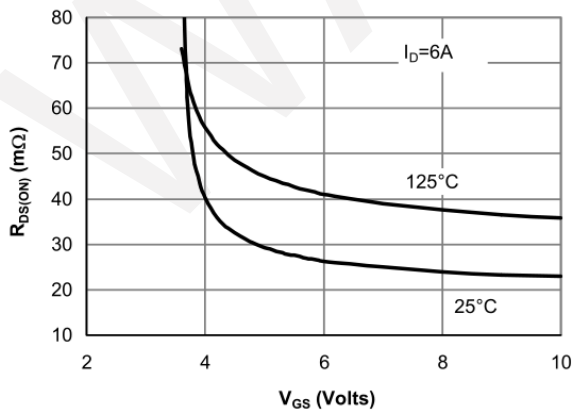
Transfer Characteristics



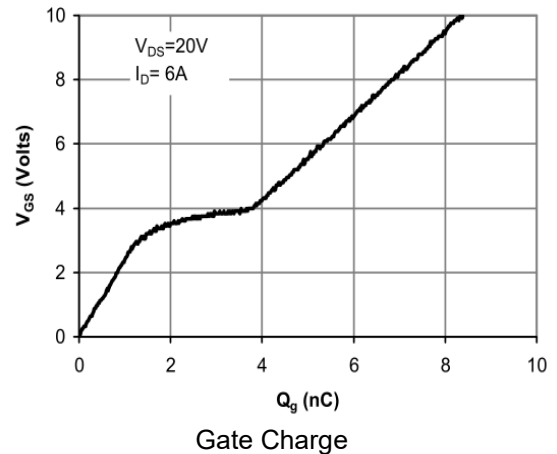
Drain-Source On-Resistance



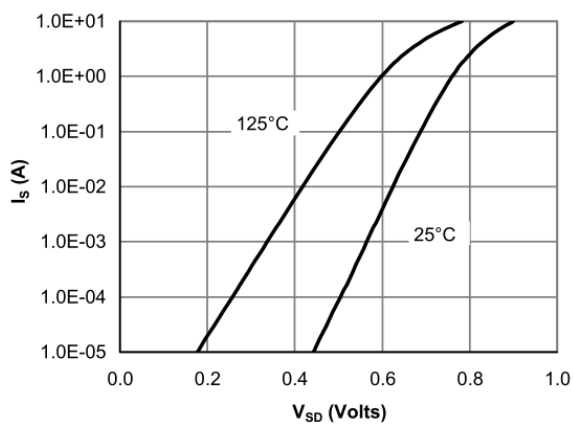
Drain-Source On-Resistance



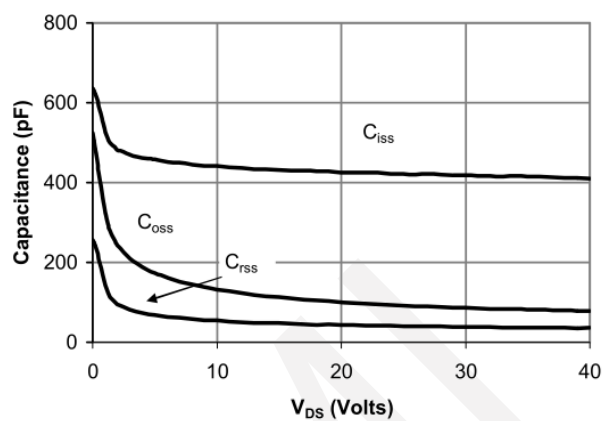
Rdson vs Vgs



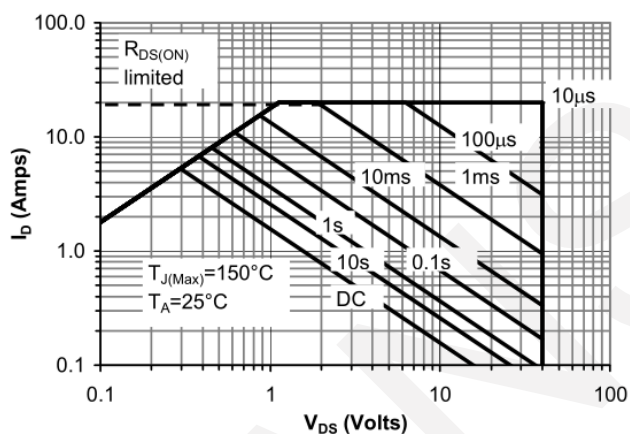
Gate Charge



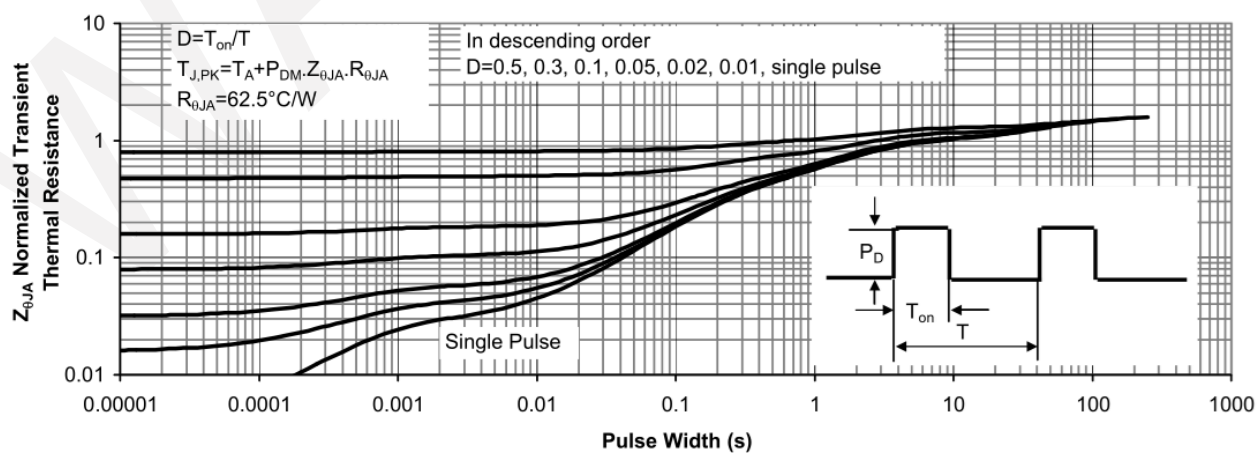
Source- Drain Diode Forward



Capacitance vs Vds



Safe Operating Area



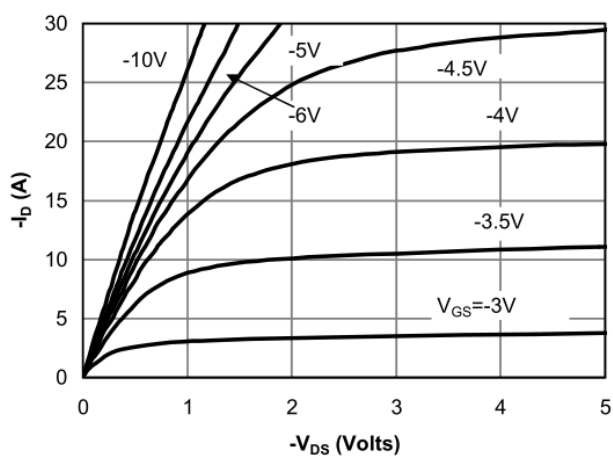
Normalized Maximum Transient Thermal Impedance

**7.PMOS Electrical Characteristics at Ta=25°C**

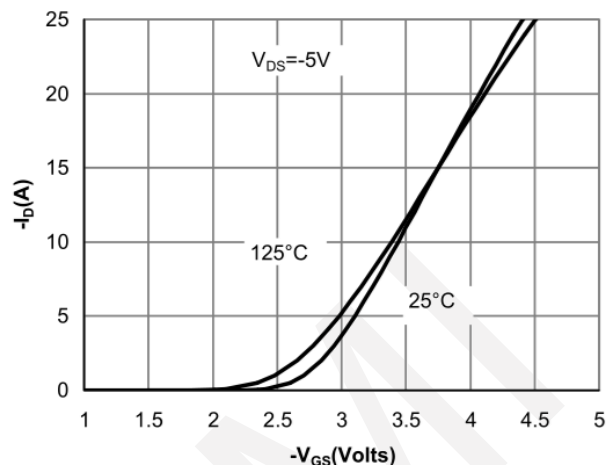
| Parameter                                  | Symbol        | Test Conditions                                                         | Min. | Typ. | Max.      | Units      |
|--------------------------------------------|---------------|-------------------------------------------------------------------------|------|------|-----------|------------|
| Drain to Source Breakdown Voltage          | $V_{(BR)DSS}$ | $I_D = -250\mu A, V_{GS} = 0V$                                          | -30  |      |           | V          |
| Zero-Gate Voltage Drain Current            | $I_{DSS}$     | $V_{DS} = -30V, V_{GS} = 0V$                                            |      |      | 1         | $\mu A$    |
| Gate to Source Leakage Current             | $I_{GSS}$     | $V_{GS} = \pm 20V, V_{DS} = 0V$                                         |      |      | $\pm 100$ | nA         |
| Gate Threshold Voltage                     | $V_{GS(th)}$  | $V_{DS}=V_{GS}, I_{DS}=-250\mu A$                                       | -1.0 | -1.7 | -2.5      | V          |
| Static Drain to Source On-State Resistance | $R_{DS(on)}$  | $I_D = -5A, V_{GS} = -10V$                                              |      | 33   | 40        | m $\Omega$ |
|                                            |               | $I_D = -5A, V_{GS} = -4.5V$                                             |      | 45   | 65        | m $\Omega$ |
| Input Capacitance                          | $C_{iss}$     | $V_{GS}=0V,$<br>$V_{DS}=-15V,$<br>Frequency=1.0MHz                      |      | 550  | -         | pF         |
| Output Capacitance                         | $C_{oss}$     |                                                                         |      | 85   | -         | pF         |
| Reverse Transfer Capacitance               | $C_{rss}$     |                                                                         |      | 75   | -         | pF         |
| Turn-ON Delay Time                         | $t_{d(on)}$   | $V_{DD} = -15V$<br>$V_{GS} = -10V$<br>$R_{GEN}=3\Omega,$<br>$I_D = -3A$ |      | 9.5  | -         | ns         |
| Rise Time                                  | $t_r$         |                                                                         |      | 5.5  | -         | ns         |
| Turn-OFF Delay Time                        | $t_{d(off)}$  |                                                                         |      | 42.5 | -         | ns         |
| Fall Time                                  | $t_f$         |                                                                         |      | 13.6 | -         | ns         |
| Total Gate Charge                          | $Q_g$         | $V_{DS} = -15V,$<br>$V_{GS} = -10V,$<br>$I_D = -1A$                     |      | 11   |           | nC         |
|                                            | $Q_{gs}$      |                                                                         |      | 2.5  |           | nC         |
|                                            | $Q_{gd}$      |                                                                         |      | 3    |           | nC         |
| Diode Forward Voltage                      | $V_{FSD}$     | $I_S = -4.2A, V_{GS} = 0V$                                              |      |      | -1.2      | V          |

Note 3: Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

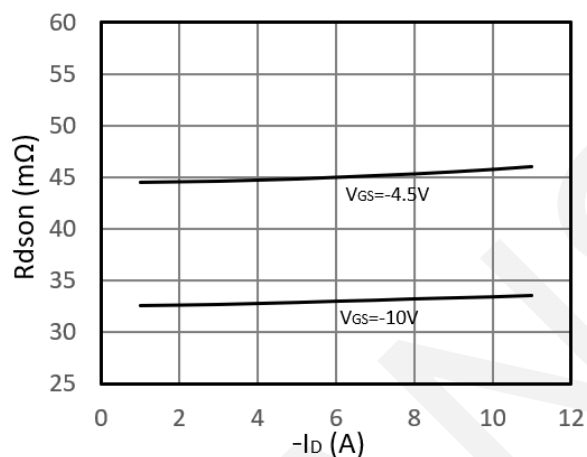
**PMOS Typical electrical and thermal characteristics**



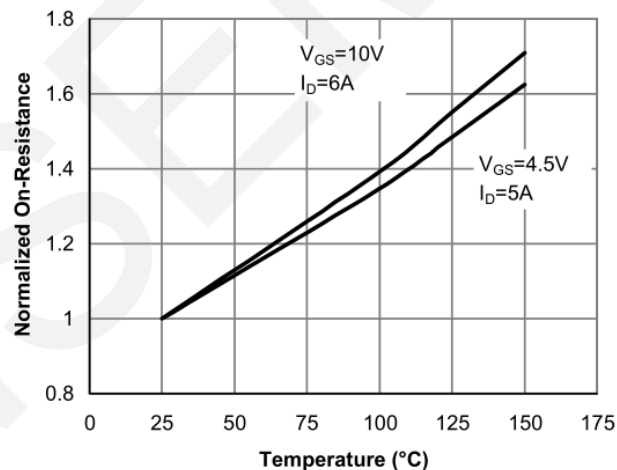
Output Characteristics



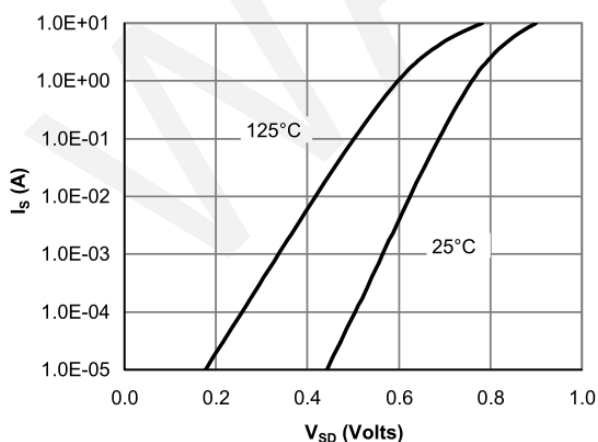
Transfer Characteristics



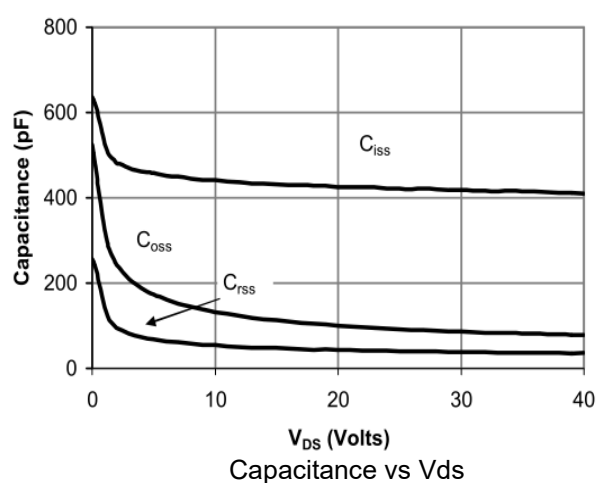
$R_{DS(on)}$ - Drain Current



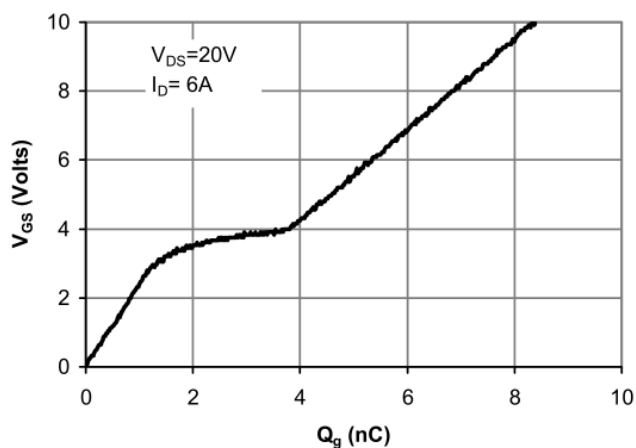
$R_{DS(on)}$ -Junction Temperature



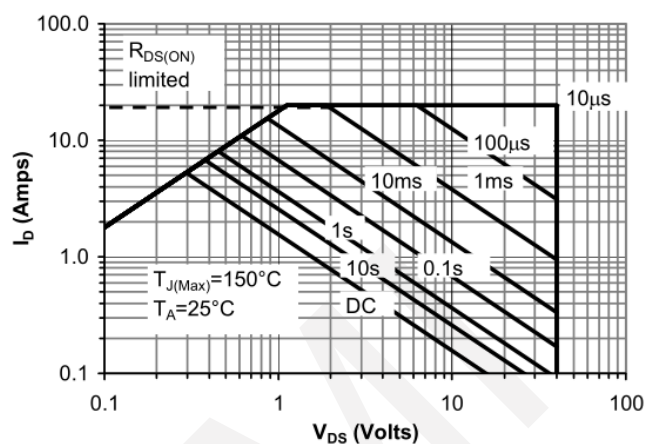
Source- Drain Diode Forward



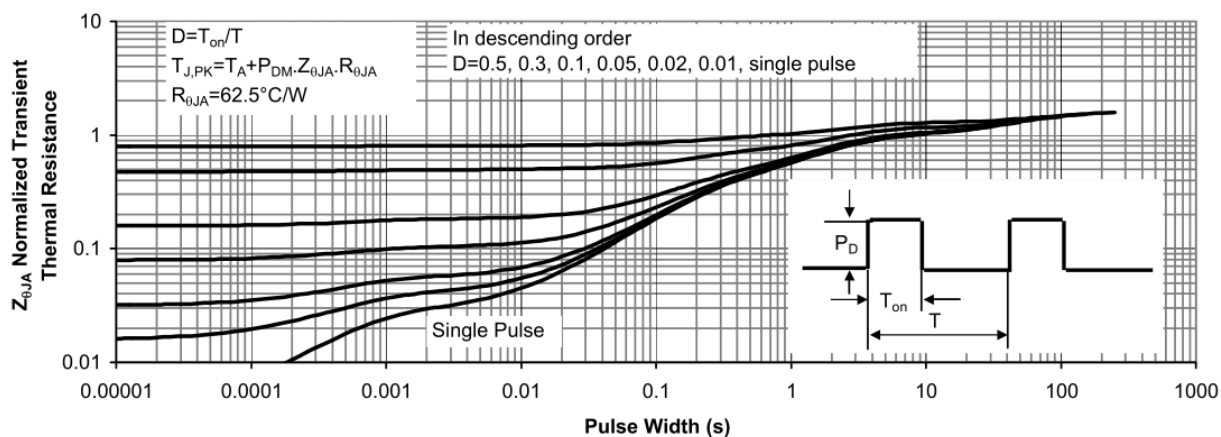
Capacitance vs  $V_{ds}$



Gate-Charge

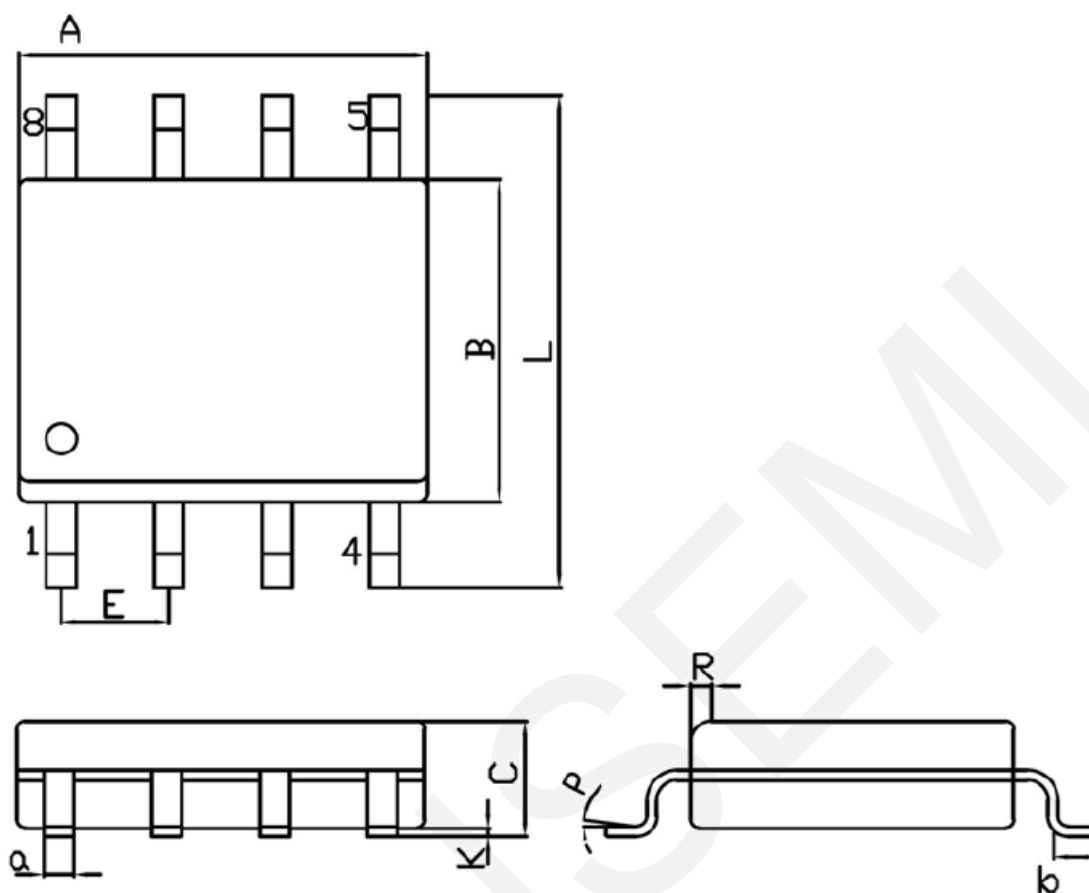


Safe Operation Area



Normalized Maximum Transient Thermal Impedance

## 8.Package Dimensions



| Symbol | Dimensions In Millimeters |      | Symbol | Dimensions In Millimeters |      |
|--------|---------------------------|------|--------|---------------------------|------|
|        | Min                       | Max  |        | Min                       | Max  |
| A      | 4.70                      | 5.10 | C      | 1.35                      | 1.75 |
| B      | 3.70                      | 4.10 | a      | 0.35                      | 0.49 |
| L      | 5.80                      | 6.20 | R      | 0.30                      | 0.60 |
| E      | 1.27BSC                   |      | P      | 0°                        | 7°   |
| K      | 0.12                      | 0.22 | b      | 0.40                      | 1.25 |

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