

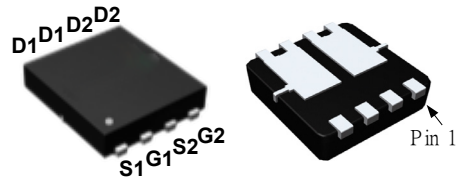
## Features

- N Channel : 100V/15A,  
 $R_{DS(ON)}=100m\Omega(\text{typ.})@V_{GS}=10V$   
 $R_{DS(ON)}=110m\Omega(\text{typ.})@V_{GS}=4.5V$
- P Channel : -100V/-12A,  
 $R_{DS(ON)}=150m\Omega(\text{typ.})@V_{GS}=-10V$   
 $R_{DS(ON)}=170m\Omega(\text{typ.})@V_{GS}=-4.5V$
- 100% UIS +  $R_g$  Tested
- Reliable and Rugged
- Lead Free and Green Devices Available  
(RoHS Compliant)
- Moisture Sensitivity Level MSL1  
(per JEDEC J-STD-020D)

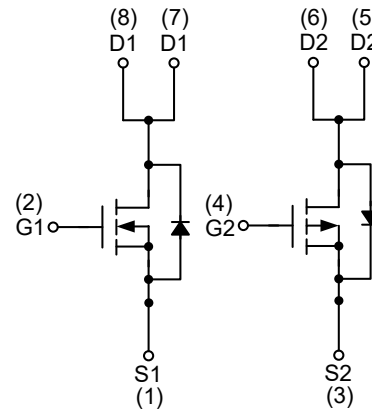
## Applications

- DC Motor Control.

## Pin Description



DFN5x6C-8\_EP2



N-Channel MOSFET

P-Channel MOSFET

### Absolute Maximum Ratings ( $T_A=25^{\circ}\text{C}$ Unless Otherwise Noted)

| Symbol                        | Parameter                              |                       | N Channel  | P Channel | Unit |
|-------------------------------|----------------------------------------|-----------------------|------------|-----------|------|
| Common Ratings                |                                        |                       |            |           |      |
| V <sub>DSS</sub>              | Drain-Source Voltage                   |                       | 100        | -100      | V    |
| V <sub>GSS</sub>              | Gate-Source Voltage                    |                       | ±20        | ±20       |      |
| T <sub>J</sub>                | Maximum Junction Temperature           |                       | 150        |           | °C   |
| T <sub>STG</sub>              | Storage Temperature Range              |                       | -55 to 150 |           |      |
| I <sub>S</sub>                | Diode Continuous Forward Current       | T <sub>C</sub> =25°C  | 15         | -12       | A    |
| I <sub>D</sub>                | Continuous Drain Current               | T <sub>C</sub> =25°C  | 15         | -12       | A    |
|                               |                                        | T <sub>C</sub> =100°C | 6          | -4.8      |      |
| I <sub>DM</sub> <sup>a</sup>  | Pulse Drain Current Tested             | T <sub>C</sub> =25°C  | 45         | -36       | A    |
| P <sub>D</sub>                | Maximum Power Dissipation              | T <sub>C</sub> =25°C  | 17.8       |           | W    |
|                               |                                        | T <sub>C</sub> =100°C | 7.1        |           |      |
| R <sub>θJC</sub>              | Thermal Resistance-Junction to Case    | Steady State          | 7          |           | °C/W |
| I <sub>D</sub>                | Continuous Drain Current               | T <sub>A</sub> =25°C  | 2          | -1.9      | A    |
|                               |                                        | T <sub>A</sub> =70°C  | 1.6        | -1.5      |      |
| P <sub>D</sub>                | Maximum Power Dissipation              | T <sub>A</sub> =25°C  | 1.47       |           | W    |
|                               |                                        | T <sub>A</sub> =70°C  | 0.94       |           |      |
| R <sub>θJA</sub> <sup>b</sup> | Thermal Resistance-Junction to Ambient | Steady State          | 85         |           | °C/W |
| I <sub>AS</sub> <sup>c</sup>  | Avalanche Current, Single pulse        | L=0.5mH               | 5          | -9        | A    |
| E <sub>AS</sub> <sup>c</sup>  | Avalanche Energy, Single pulse         | L=0.5mH               | 6.25       | 20        | mJ   |

Note a : Pulse width limited by max. junction temperature.

Note b : Surface Mounted on  $1\text{in}^2$  pad area.

Note c : UIS tested and pulse width limited by maximum junction temperature (initial temperature  $T_J=25^{\circ}\text{C}$ ).

**N Channel Electrical Characteristics** ( $T_A = 25^\circ\text{C}$  unless otherwise noted)

| Symbol                                   | Parameter                        | Test Conditions                                                                                                 | N Channel |      |      | Unit |
|------------------------------------------|----------------------------------|-----------------------------------------------------------------------------------------------------------------|-----------|------|------|------|
|                                          |                                  |                                                                                                                 | Min.      | Typ. | Max. |      |
| Static Characteristics                   |                                  |                                                                                                                 |           |      |      |      |
| BV <sub>DSS</sub>                        | Drain-Source Breakdown Voltage   | V <sub>GS</sub> =0V, I <sub>DS</sub> =250μA                                                                     | 100       | -    | -    | V    |
| I <sub>DSS</sub>                         | Zero Gate Voltage Drain Current  | V <sub>DS</sub> =80V, V <sub>GS</sub> =0V                                                                       | -         | -    | 1    | μA   |
|                                          |                                  | T <sub>J</sub> =85°C                                                                                            | -         | -    | 30   |      |
| V <sub>GS(th)</sub>                      | Gate Threshold Voltage           | V <sub>DS</sub> =V <sub>GS</sub> , I <sub>DS</sub> =250μA                                                       | 1         | 1.8  | 2.5  | V    |
| I <sub>GSS</sub>                         | Gate Leakage Current             | V <sub>GS</sub> =±20V, V <sub>DS</sub> =0V                                                                      | -         | -    | ±100 | nA   |
| R <sub>DS(ON)</sub> <sup>d</sup>         | Drain-Source On-state Resistance | V <sub>GS</sub> =10V, I <sub>DS</sub> =4A                                                                       | -         | 100  | 110  | mΩ   |
|                                          |                                  | V <sub>GS</sub> =4.5V, I <sub>DS</sub> =3A                                                                      | -         | 110  | 138  |      |
| Diode Characteristics                    |                                  |                                                                                                                 |           |      |      |      |
| V <sub>SD</sub> <sup>d</sup>             | Diode Forward Voltage            | I <sub>SD</sub> =2A, V <sub>GS</sub> =0V                                                                        | -         | 0.8  | 1.3  | V    |
| t <sub>rr</sub>                          | Reverse Recovery Time            | I <sub>SD</sub> =4A, dI <sub>SD</sub> /dt=100A/μs                                                               | -         | 25   | -    | ns   |
| Q <sub>rr</sub>                          | Reverse Recovery Charge          |                                                                                                                 | -         | 32   | -    | nC   |
| Dynamic Characteristics <sup>e</sup>     |                                  |                                                                                                                 |           |      |      |      |
| R <sub>G</sub>                           | Gate Resistance                  | V <sub>GS</sub> =0V,V <sub>DS</sub> =0V,f=1MHz                                                                  | -         | 2.5  |      | Ω    |
| C <sub>iss</sub>                         | Input Capacitance                | V <sub>GS</sub> =0V,<br>V <sub>DS</sub> =30V,<br>Frequency=1.0MHz                                               | -         | 440  | 570  | pF   |
| C <sub>oss</sub>                         | Output Capacitance               |                                                                                                                 | -         | 30   | -    |      |
| C <sub>rss</sub>                         | Reverse Transfer Capacitance     |                                                                                                                 | -         | 16   | -    |      |
| t <sub>d(ON)</sub>                       | Turn-on Delay Time               | V <sub>DD</sub> =30V, R <sub>L</sub> =30Ω,<br>I <sub>DS</sub> =1A, V <sub>GEN</sub> =10V,<br>R <sub>G</sub> =6Ω | -         | 9    | 17   | ns   |
| t <sub>r</sub>                           | Turn-on Rise Time                |                                                                                                                 | -         | 7    | 13   |      |
| t <sub>d(OFF)</sub>                      | Turn-off Delay Time              |                                                                                                                 | -         | 18   | 33   |      |
| t <sub>f</sub>                           | Turn-off Fall Time               |                                                                                                                 | -         | 4    | 8    |      |
| Gate Charge Characteristics <sup>e</sup> |                                  |                                                                                                                 |           |      |      |      |
| Q <sub>g</sub>                           | Total Gate Charge                | V <sub>DS</sub> =50V, V <sub>GS</sub> =4.5V,<br>I <sub>DS</sub> =4A                                             | -         | 4.7  | -    | nC   |
| Q <sub>g</sub>                           | Total Gate Charge                | V <sub>DS</sub> =50V, V <sub>GS</sub> =10V,<br>I <sub>DS</sub> =4A                                              | -         | 10   | 14   |      |
| Q <sub>gs</sub>                          | Gate-Source Charge               |                                                                                                                 | -         | 1.7  | -    |      |
| Q <sub>gd</sub>                          | Gate-Drain Charge                |                                                                                                                 | -         | 1.8  | -    |      |

Note d : Pulse test ; pulse width $\leq 300\mu s$ , duty cycle $\leq 2\%$ .

Note e : Guaranteed by design, not subject to production testing.

**P Channel Electrical Characteristics** ( $T_A = 25^\circ\text{C}$  unless otherwise noted)

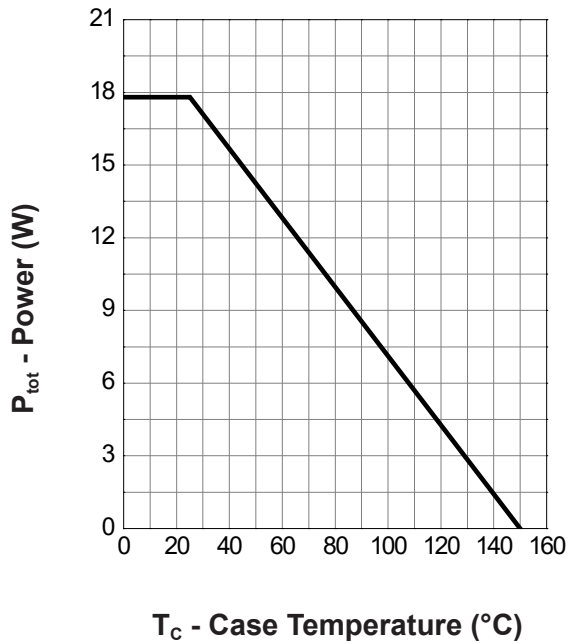
| Symbol                                   | Parameter                        | Test Conditions                                                                                                     | P Channel |      |      | Unit |
|------------------------------------------|----------------------------------|---------------------------------------------------------------------------------------------------------------------|-----------|------|------|------|
|                                          |                                  |                                                                                                                     | Min.      | Typ. | Max. |      |
| Static Characteristics                   |                                  |                                                                                                                     |           |      |      |      |
| BV <sub>DSS</sub>                        | Drain-Source Breakdown Voltage   | V <sub>GS</sub> =0V, I <sub>DS</sub> =-250μA                                                                        | -100      | -    | -    | V    |
| I <sub>DSS</sub>                         | Zero Gate Voltage Drain Current  | V <sub>DS</sub> =-80V, V <sub>GS</sub> =0V                                                                          | -         | -    | -1   | μA   |
|                                          |                                  | T <sub>J</sub> =85°C                                                                                                | -         | -    | -30  |      |
| V <sub>GS(th)</sub>                      | Gate Threshold Voltage           | V <sub>DS</sub> =V <sub>GS</sub> , I <sub>DS</sub> =250μA                                                           | -1        | -1.8 | -2.5 | V    |
| I <sub>GSS</sub>                         | Gate Leakage Current             | V <sub>GS</sub> =±20V, V <sub>DS</sub> =0V                                                                          | -         | -    | ±100 | nA   |
| R <sub>DS(ON)</sub> <sup>d</sup>         | Drain-Source On-state Resistance | V <sub>GS</sub> =-10V, I <sub>DS</sub> =-3A                                                                         | -         | 150  | 180  | mΩ   |
|                                          |                                  | V <sub>GS</sub> =-4.5V, I <sub>DS</sub> =-2A                                                                        | -         | 170  | 210  |      |
| Diode Characteristics                    |                                  |                                                                                                                     |           |      |      |      |
| V <sub>SD</sub> <sup>d</sup>             | Diode Forward Voltage            | I <sub>SD</sub> =-1.5A, V <sub>GS</sub> =0V                                                                         | -         | -0.8 | -1.3 | V    |
| t <sub>rr</sub>                          | Reverse Recovery Time            | I <sub>SD</sub> =-3A, dI <sub>SD</sub> /dt=100A/μs                                                                  | -         | 29   | -    | ns   |
| Q <sub>rr</sub>                          | Reverse Recovery Charge          |                                                                                                                     | -         | 39   | -    | nC   |
| Dynamic Characteristics <sup>e</sup>     |                                  |                                                                                                                     |           |      |      |      |
| R <sub>G</sub>                           | Gate Resistance                  | V <sub>GS</sub> =0V, V <sub>DS</sub> =0V, f=1MHz                                                                    | -         | 10   | -    | Ω    |
| C <sub>iss</sub>                         | Input Capacitance                | V <sub>GS</sub> =0V,<br>V <sub>DS</sub> =-30V,<br>Frequency=1.0MHz                                                  | -         | 700  | 910  | pF   |
| C <sub>oss</sub>                         | Output Capacitance               |                                                                                                                     | -         | 45   | -    |      |
| C <sub>rss</sub>                         | Reverse Transfer Capacitance     |                                                                                                                     | -         | 27   | -    |      |
| t <sub>d(ON)</sub>                       | Turn-on Delay Time               | V <sub>DD</sub> =-30V, R <sub>L</sub> =-30Ω,<br>I <sub>DS</sub> =-1A, V <sub>GEN</sub> =-10V,<br>R <sub>G</sub> =6Ω | -         | 9    | 16.2 | ns   |
| t <sub>r</sub>                           | Turn-on Rise Time                |                                                                                                                     | -         | 5    | 9    |      |
| t <sub>d(OFF)</sub>                      | Turn-off Delay Time              |                                                                                                                     | -         | 54   | 97   |      |
| t <sub>f</sub>                           | Turn-off Fall Time               |                                                                                                                     | -         | 32   | 58   |      |
| Gate Charge Characteristics <sup>e</sup> |                                  |                                                                                                                     |           |      |      |      |
| Q <sub>g</sub>                           | Total Gate Charge                | V <sub>DS</sub> =-50V, V <sub>GS</sub> =-4.5V,<br>I <sub>DS</sub> =-3A                                              | -         | 7.8  | -    | nC   |
| Q <sub>g</sub>                           | Total Gate Charge                | V <sub>DS</sub> =-50V, V <sub>GS</sub> =-10V,<br>I <sub>DS</sub> =-3A                                               | -         | 16   | 22.4 |      |
| Q <sub>gs</sub>                          | Gate-Source Charge               |                                                                                                                     | -         | 2.5  | -    |      |
| Q <sub>gd</sub>                          | Gate-Drain Charge                |                                                                                                                     | -         | 3.1  | -    |      |

Note d : Pulse test ; pulse width $\leq 300\mu s$ , duty cycle $\leq 2\%$ .

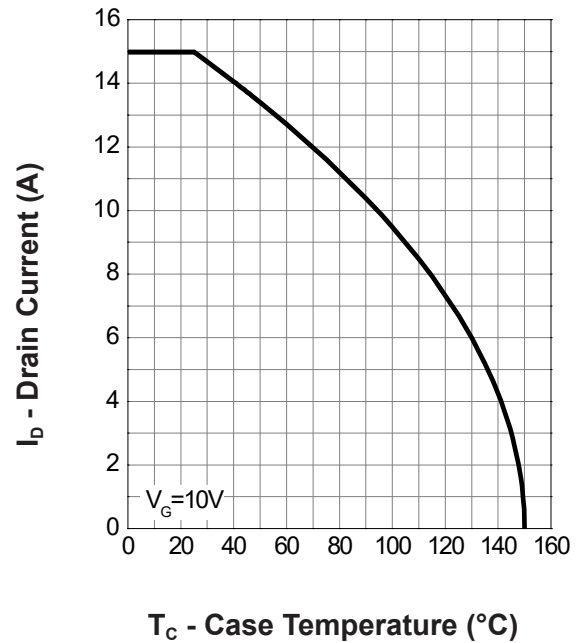
Note e : Guaranteed by design, not subject to production testing.

### N Channel Typical Operating Characteristics

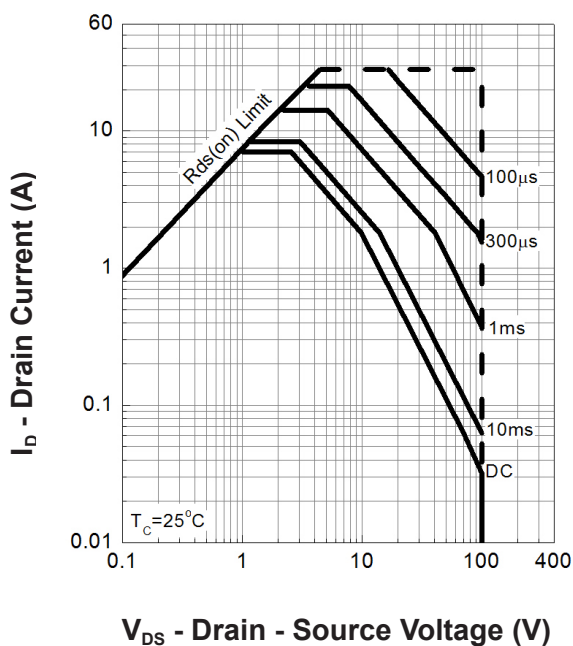
**Power Dissipation**



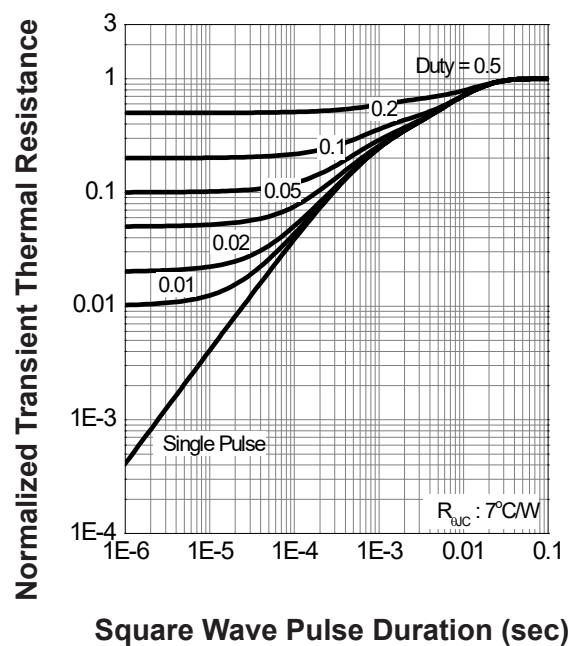
**Drain Current**



**Safe Operation Area**

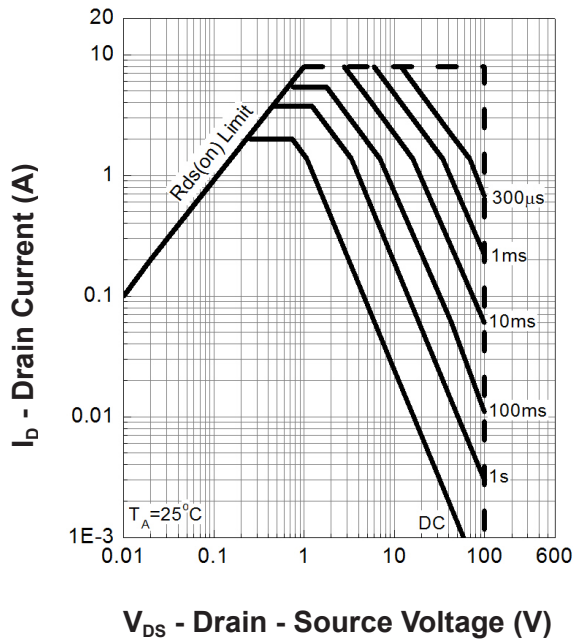


**Thermal Transient Impedance**

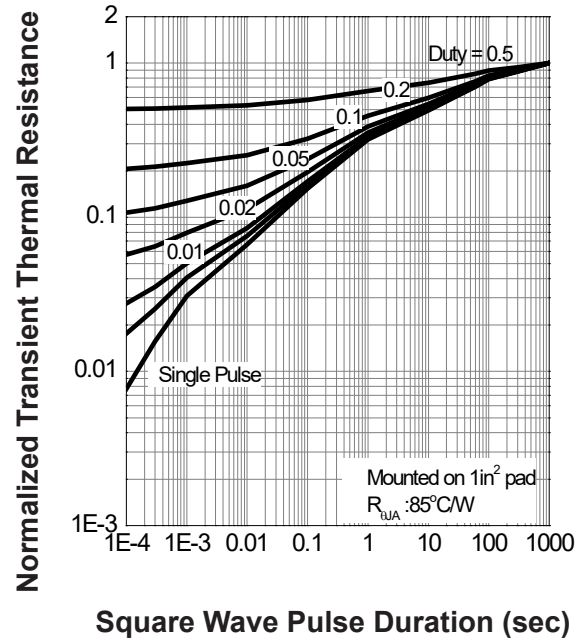


### N Channel Typical Operating Characteristics(Cont.)

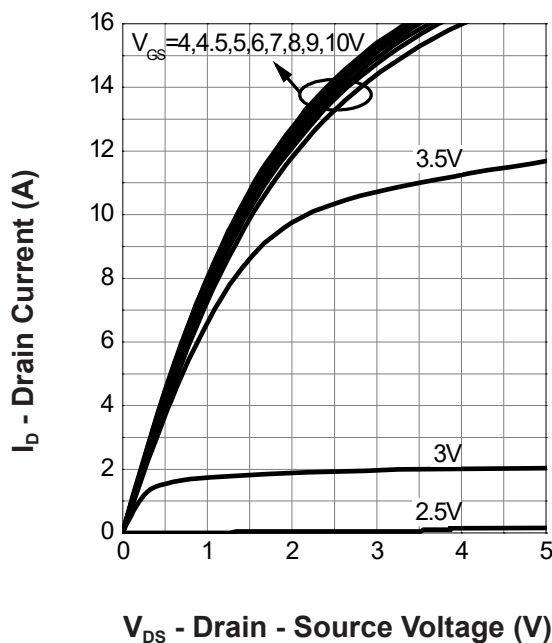
Safe Operation Area



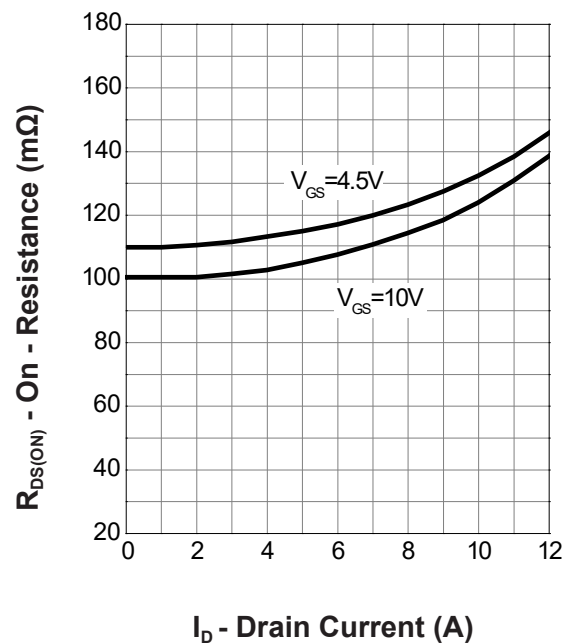
Thermal Transient Impedance



Output Characteristics

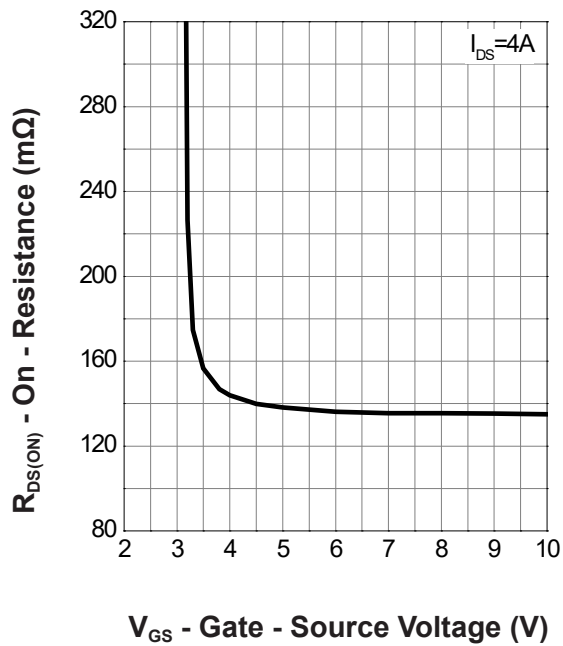


Drain-Source On Resistance

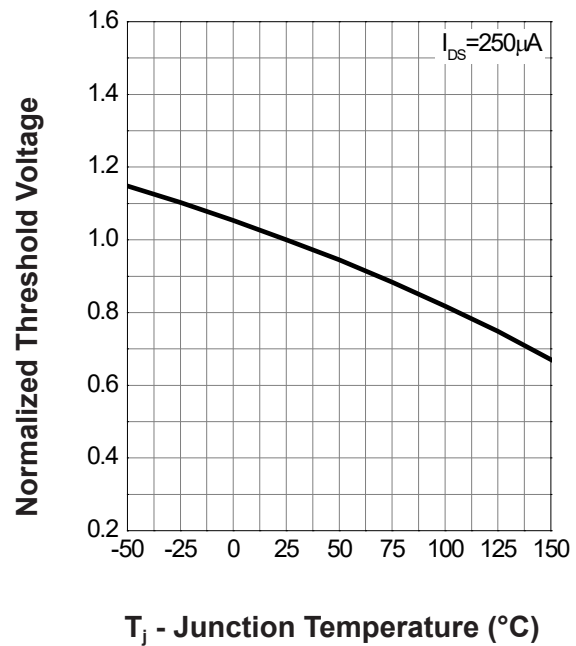


### N Channel Typical Operating Characteristics(Cont.)

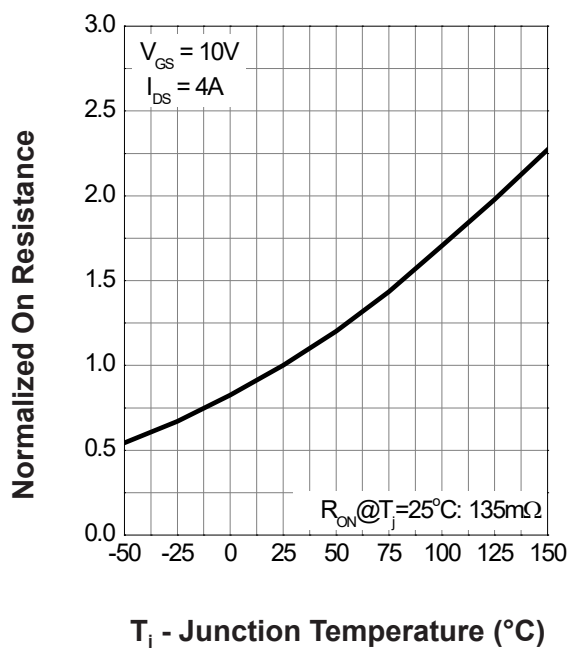
Gate-Source On Resistance



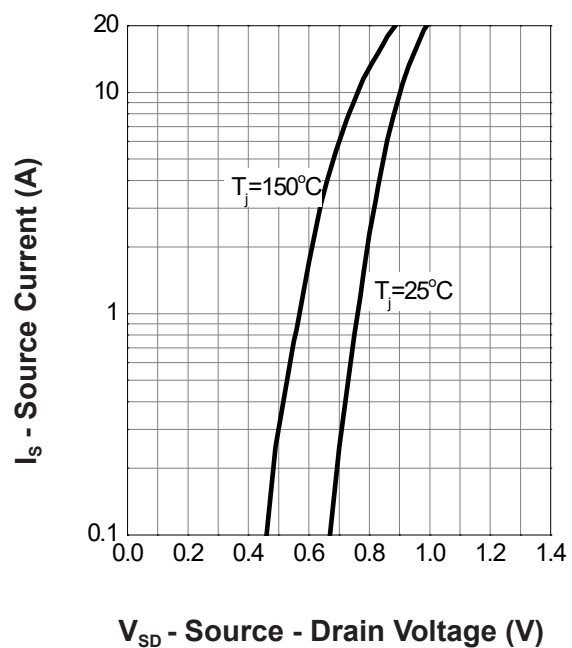
Gate Threshold Voltage



Drain-Source On Resistance

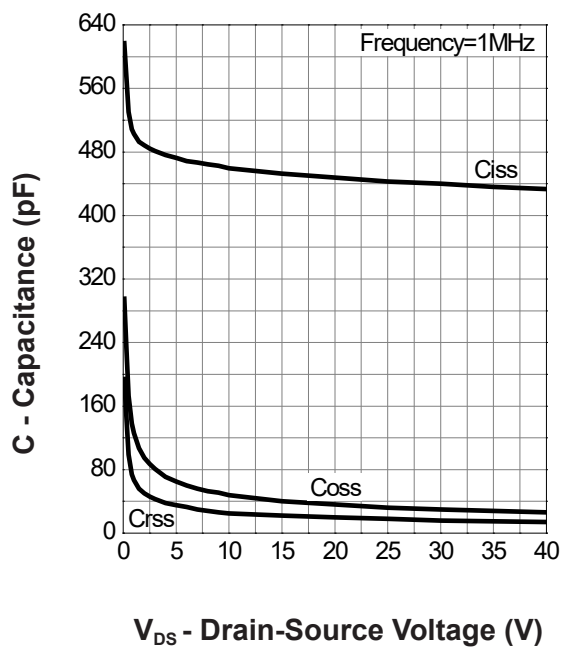


Source-Drain Diode Forward

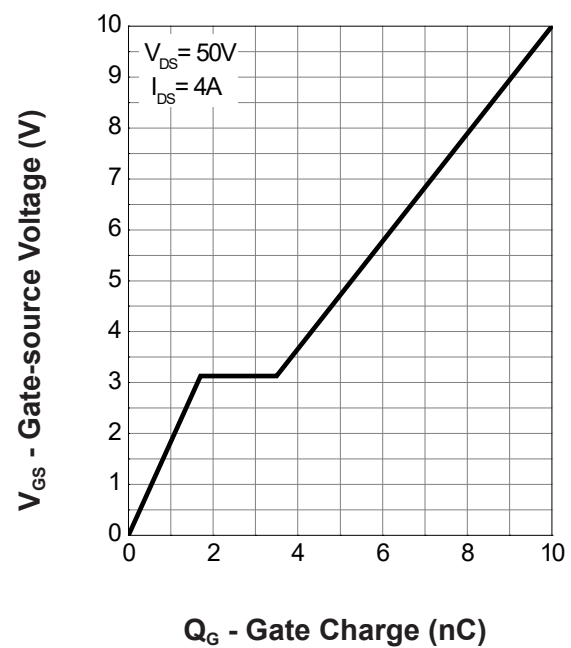


### N Channel Typical Operating Characteristics(Cont.)

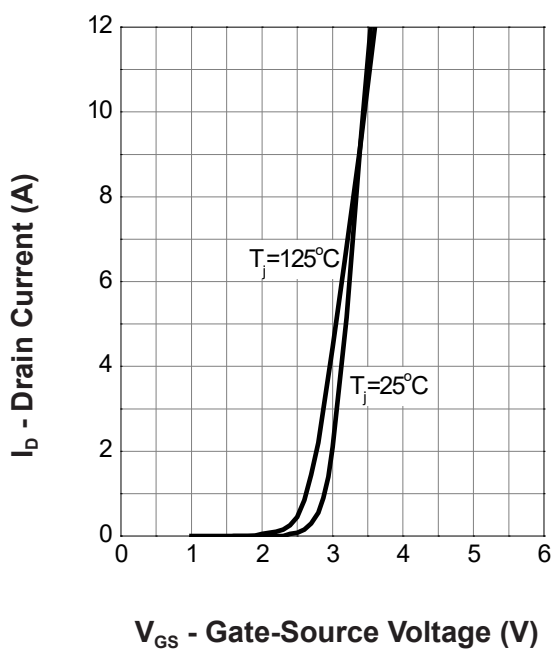
**Capacitance**



**Gate Charge**



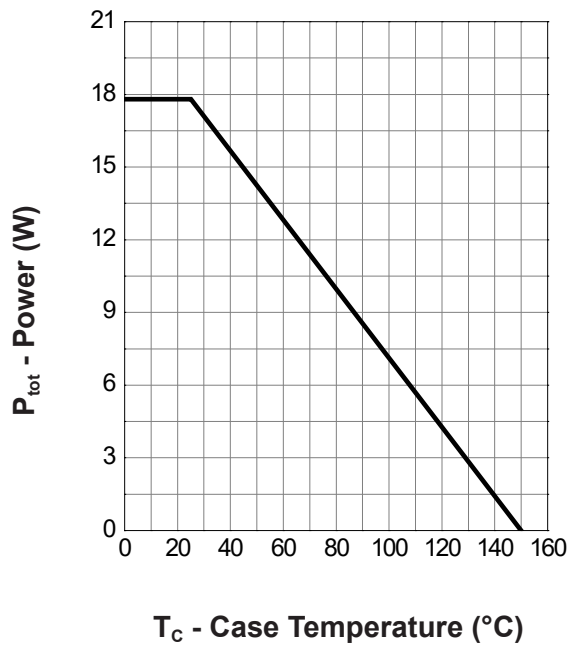
**Transfer Characteristics**



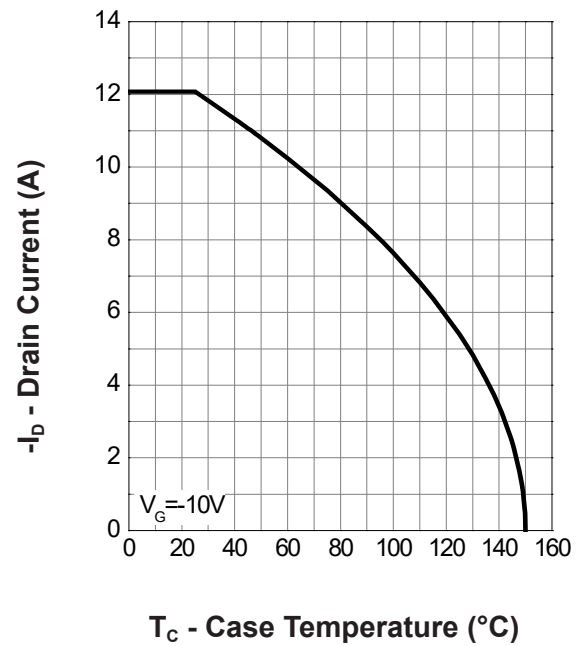


### P Channel Typical Operating Characteristics

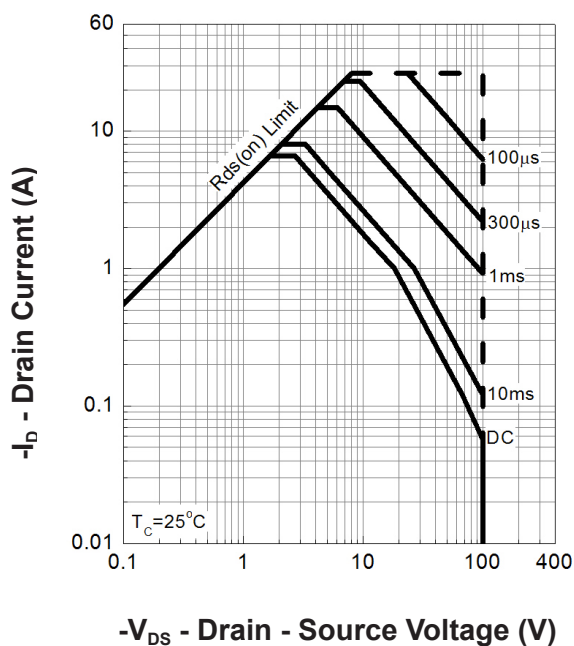
**Power Dissipation**



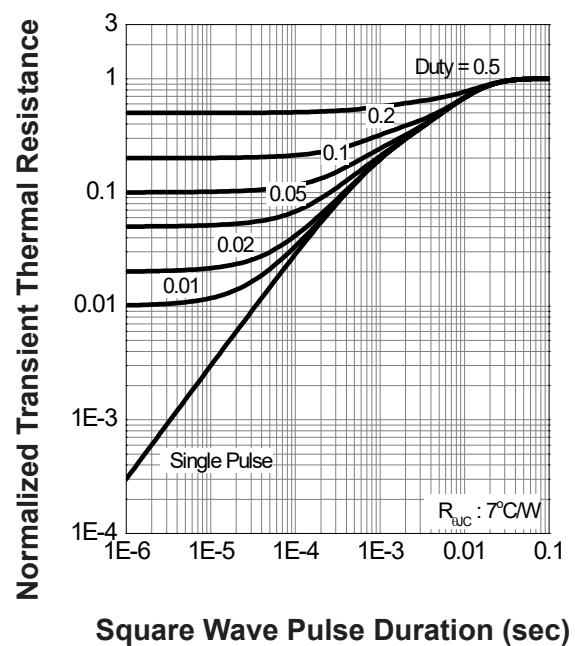
**Drain Current**



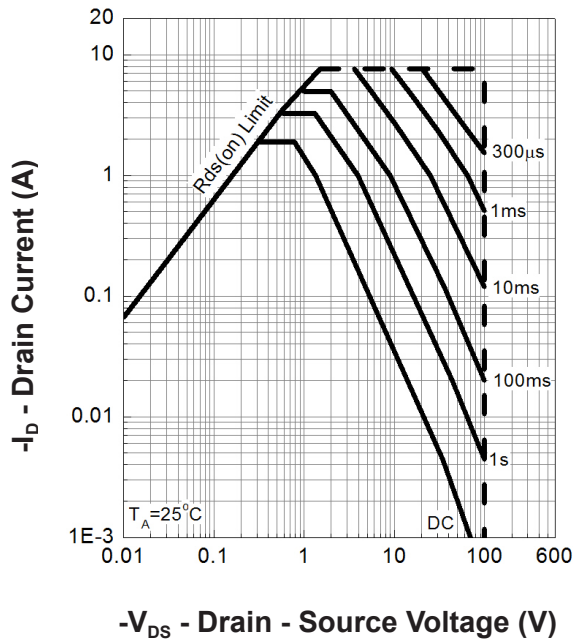
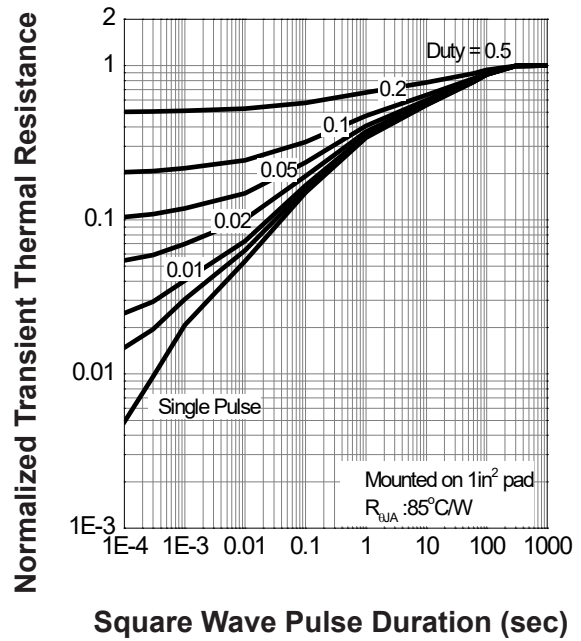
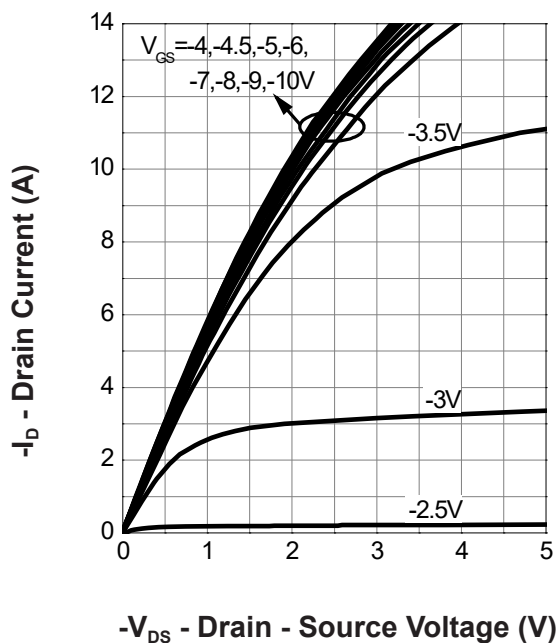
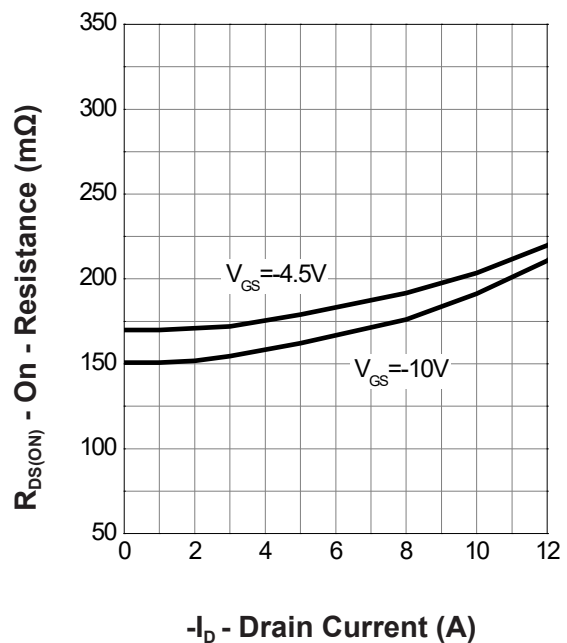
**Safe Operation Area**



**Thermal Transient Impedance**

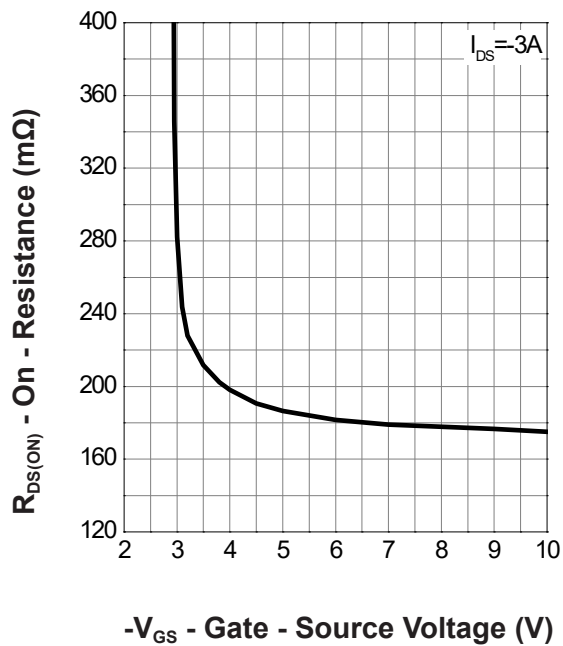


## P Channel Typical Operating Characteristics(Cont.)

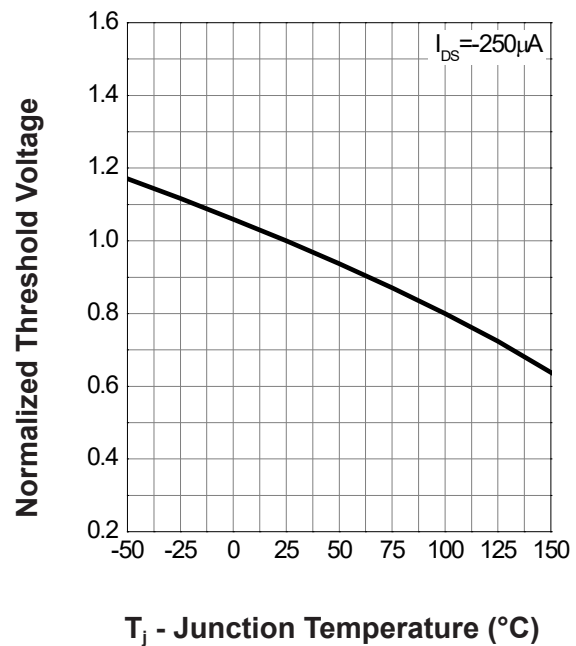
**Safe Operation Area**

**Thermal Transient Impedance**

**Output Characteristics**

**Drain-Source On Resistance**


### P Channel Typical Operating Characteristics(Cont.)

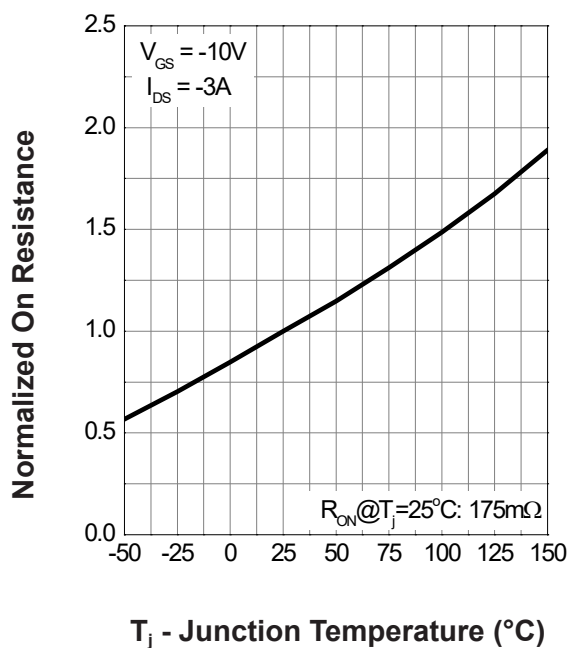
Gate-Source On Resistance



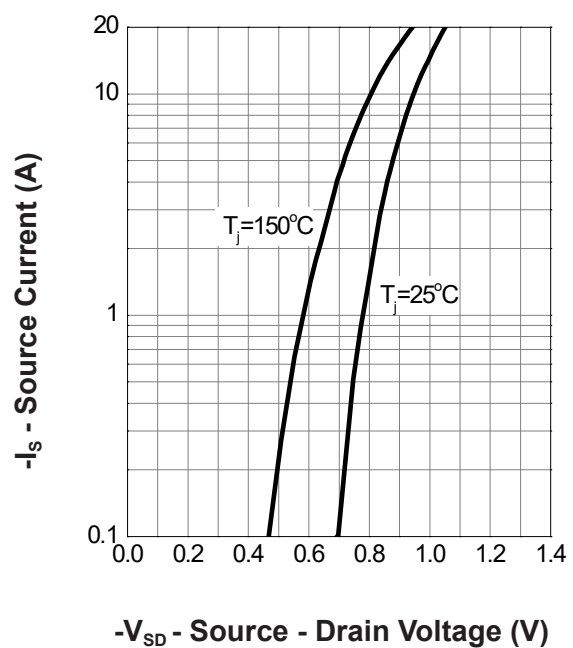
Gate Threshold Voltage



Drain-Source On Resistance

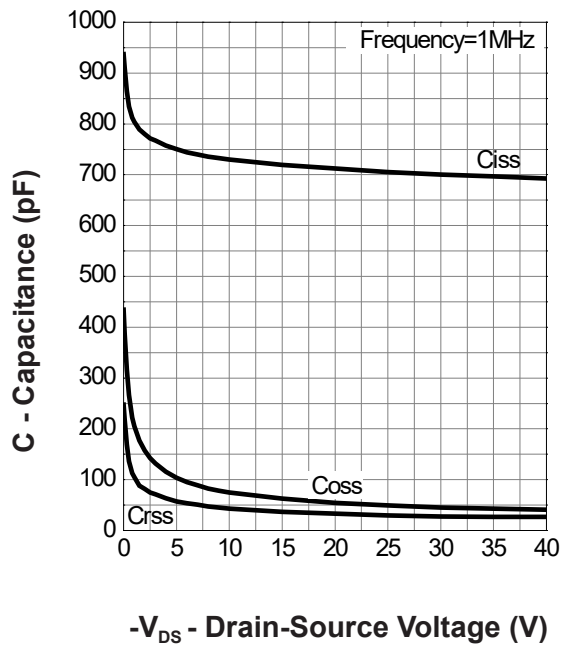


Source-Drain Diode Forward

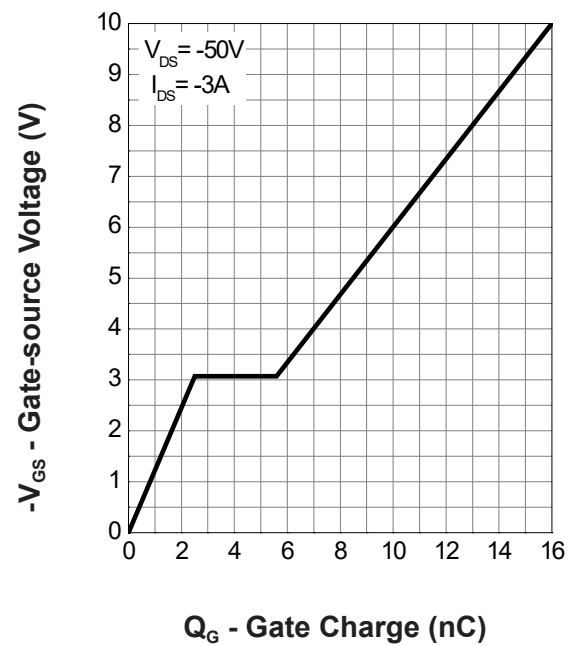


### P Channel Typical Operating Characteristics(Cont.)

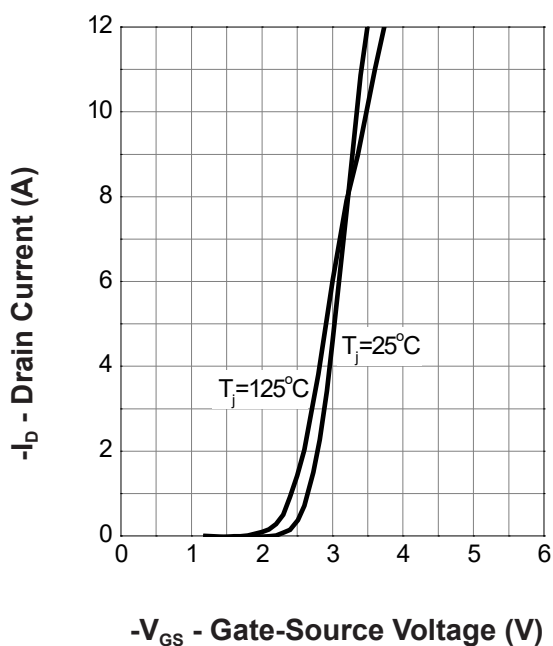
Capacitance



Gate Charge

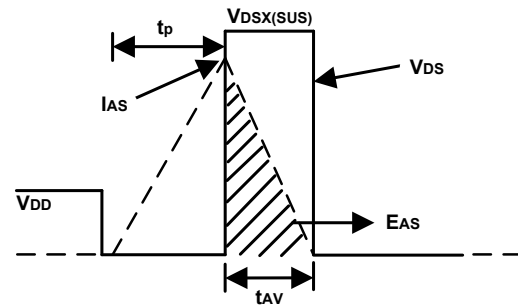
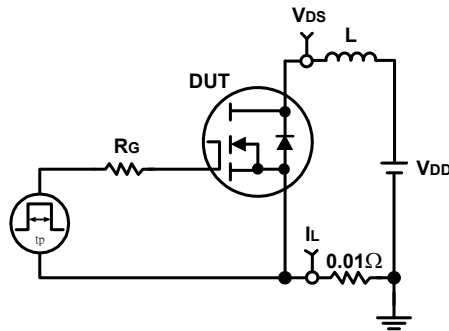


Transfer Characteristics

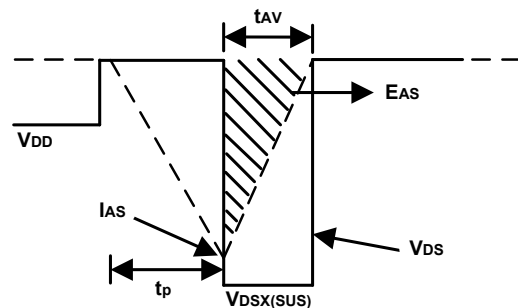
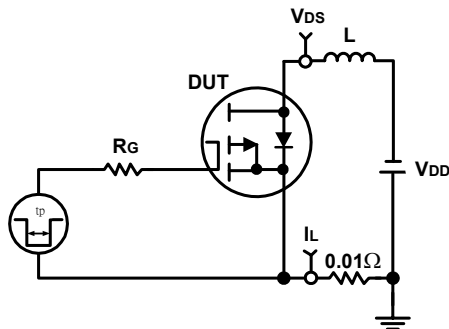


### Avalanche Test Circuit and Waveforms

#### N Channel

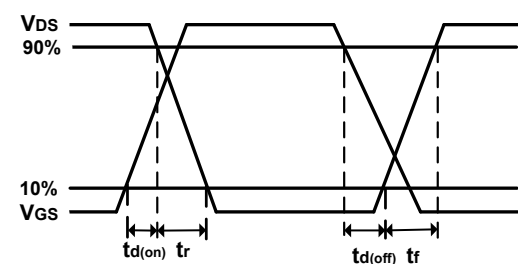
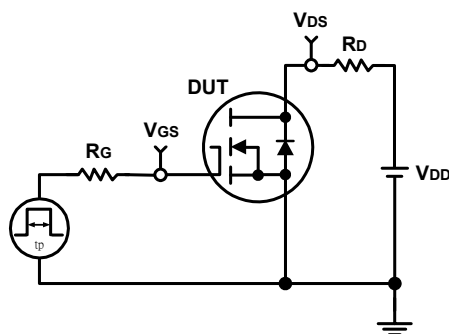


#### P Channel

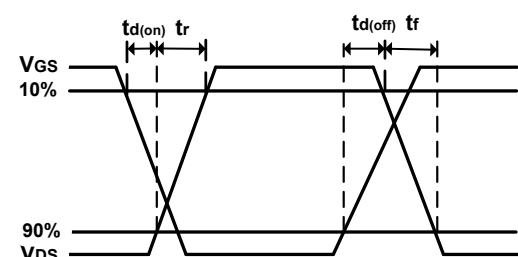
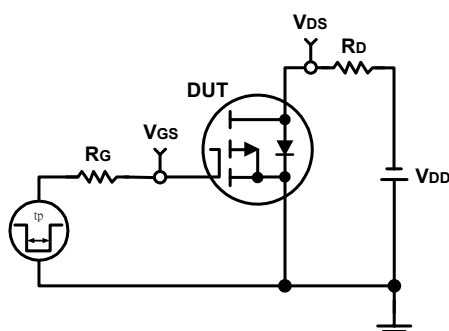


### Switching Time Test Circuit and Waveforms

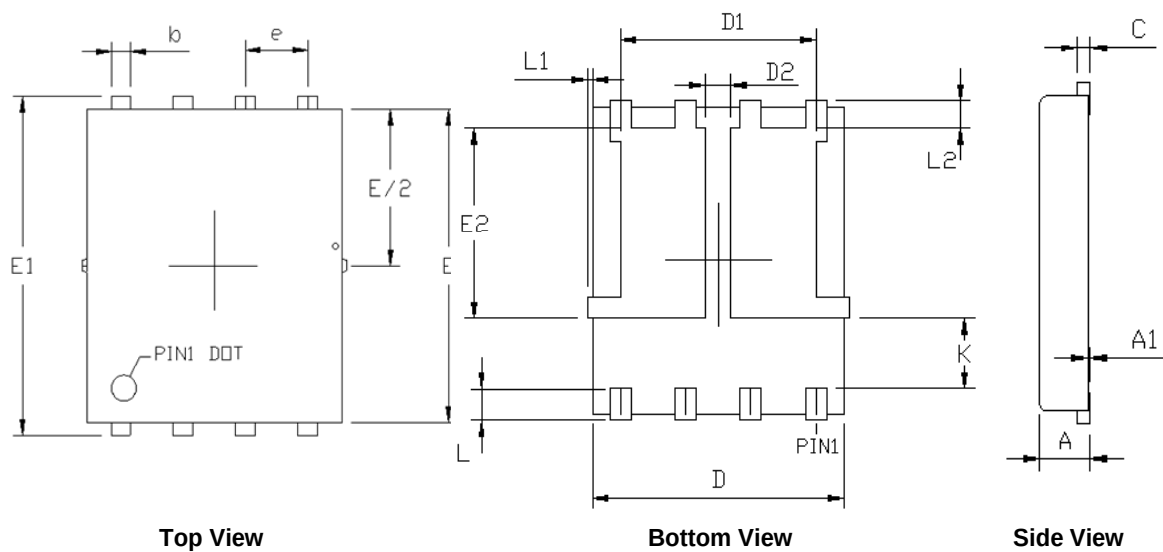
#### N Channel



#### P Channel

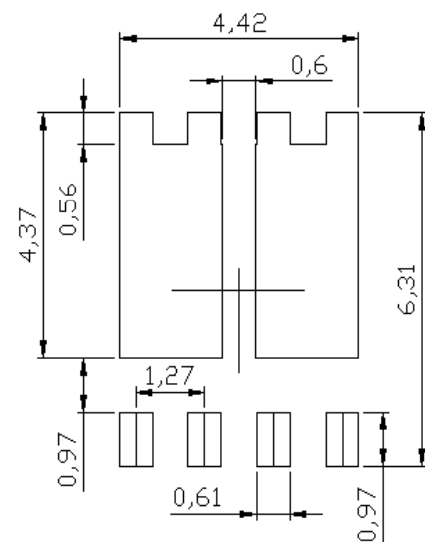


## Package Information

**DFN5x6C-8**


| SYMBOLS | DFN5x6C-8_EP2_P |       |           |       |
|---------|-----------------|-------|-----------|-------|
|         | MILLIMETERS     |       | INCHES    |       |
|         | MIN.            | MAX.  | MIN.      | MAX.  |
| A       | 0.900           | 1.200 | 0.035     | 0.047 |
| A1      | 0.000           | 0.050 | 0.000     | 0.002 |
| b       | 0.300           | 0.500 | 0.012     | 0.020 |
| c       | 0.150           | 0.300 | 0.006     | 0.012 |
| D       | 4.800           | 5.000 | 0.189     | 0.197 |
| D1      | 3.550           | 4.550 | 0.140     | 0.179 |
| D2      | 0.500           | 0.910 | 0.020     | 0.036 |
| E       | 5.650           | 5.850 | 0.222     | 0.230 |
| E1      | 5.900           | 6.200 | 0.232     | 0.244 |
| E2      | 3.200           | 3.780 | 0.126     | 0.149 |
| e       | 1.27 BSC        |       | 0.050 BSC |       |
| K       | 1.100           | -     | 0.043     | -     |
| L       | 0.500           | 0.800 | 0.020     | 0.031 |
| L1      | 0.000           | 0.150 | 0.000     | 0.006 |
| L2      | 0.325           | 0.610 | 0.013     | 0.024 |

### RECOMMENDED LAND PATTERN



UNIT: mm