

# Complementary MOSFET

## ELM544539A-N

### ■ General Description

ELM544539A-N uses advanced trench technology to provide excellent  $R_{ds(on)}$  and low gate charge.

### ■ Features

- N-channel  
 $V_{ds}=30V$ ,  $I_d=5.0A$ ,  $R_{ds(on)}=36m\Omega(V_{gs}=10V)$   
 $V_{ds}=30V$ ,  $I_d=4.7A$ ,  $R_{ds(on)}=46m\Omega(V_{gs}=4.5V)$
- P-channel  
 $V_{ds}=-30V$ ,  $I_d=-5.4A$ ,  $R_{ds(on)}=62m\Omega(V_{gs}=-10V)$   
 $V_{ds}=-30V$ ,  $I_d=-4.2A$ ,  $R_{ds(on)}=90m\Omega(V_{gs}=-4.5V)$

### ■ Maximum Absolute Ratings

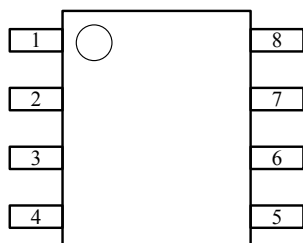
| Parameter                              |                  | Symbol         | N-ch (Max.) | P-ch (Max.) | Unit       |
|--|------------------|----------------|-------------|-------------|------------|
| Drain-source voltage                   |                  | $V_{ds}$       | 30          | -30         | V          |
| Gate-source voltage                    |                  | $V_{gs}$       | $\pm 20$    | $\pm 20$    | V          |
| Continuous drain current               | $T_a=25^\circ C$ | $I_d$          | 5.4         | -5.4        | A          |
|  | $T_a=70^\circ C$ |                | 4.0         | -4.2        |            |
| Pulsed drain current                   |                  | $I_{dm}$       | 20          | -30         | A          |
| Power dissipation                      | $T_a=25^\circ C$ | $P_d$          | 2.8         | 2.8         | W          |
|  | $T_a=70^\circ C$ |                | 1.8         | 1.8         |            |
| Junction and storage temperature range |                  | $T_j, T_{stg}$ | -55 to 150  | -55 to 150  | $^\circ C$ |

### ■ Thermal Characteristics

| Parameter                   |              | Symbol          | Device | Typ. | Max. | Unit         |
|-----------------------------|--------------|-----------------|--------|------|------|--------------|
| Maximum junction-to-ambient | Steady-state | $R_{\theta ja}$ | N-ch   |      | 62.5 | $^\circ C/W$ |
| Maximum junction-to-ambient | Steady-state | $R_{\theta ja}$ | P-ch   |      | 62.5 | $^\circ C/W$ |

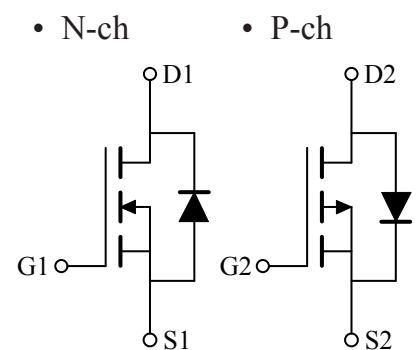
### ■ Pin configuration

SOP-8(TOP VIEW)



| Pin No. | Pin name |
|---------|----------|
| 1       | SOURCE1  |
| 2       | GATE1    |
| 3       | SOURCE2  |
| 4       | GATE2    |
| 5       | DRAIN2   |
| 6       | DRAIN2   |
| 7       | DRAIN1   |
| 8       | DRAIN1   |

### ■ Circuit



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### ■Electrical Characteristics (N-ch)

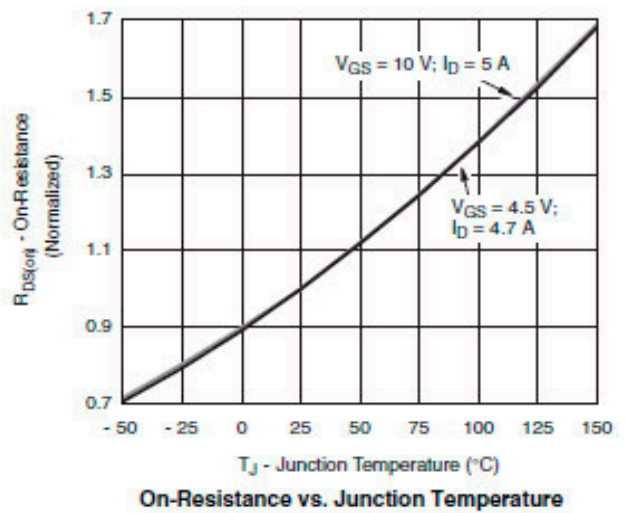
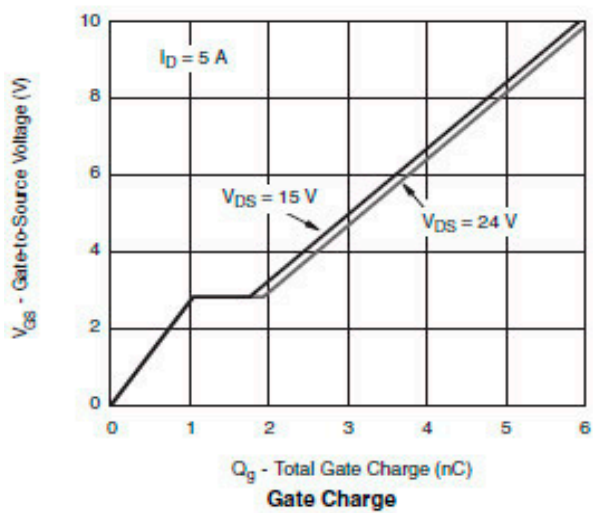
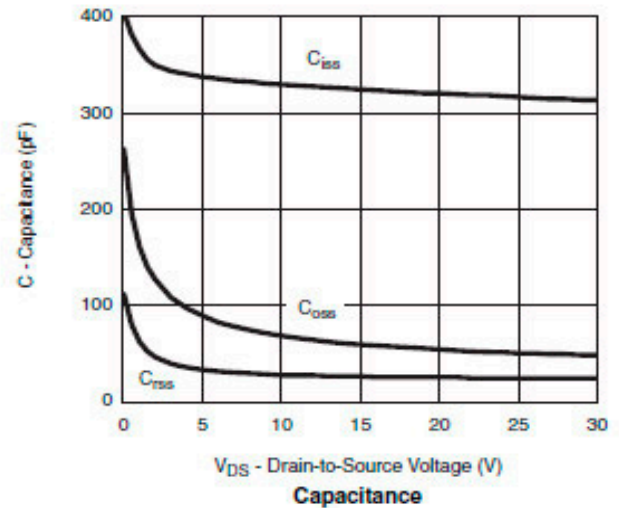
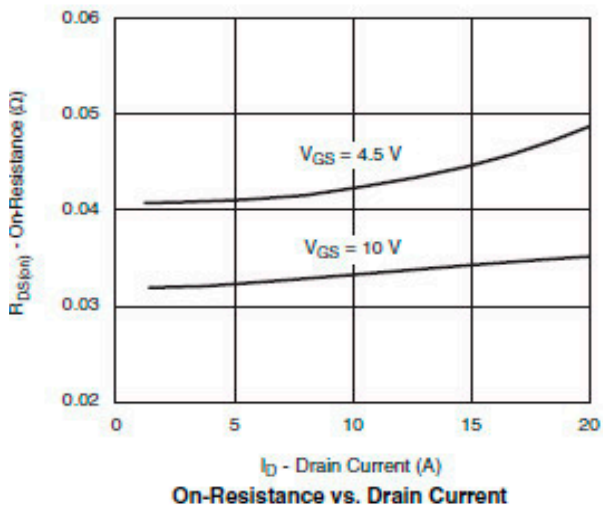
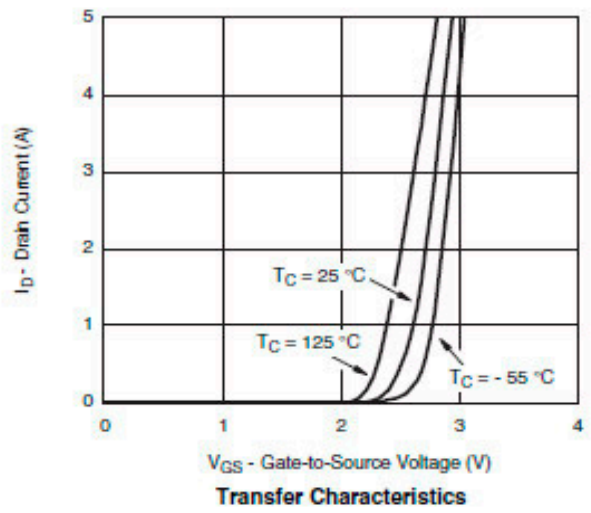
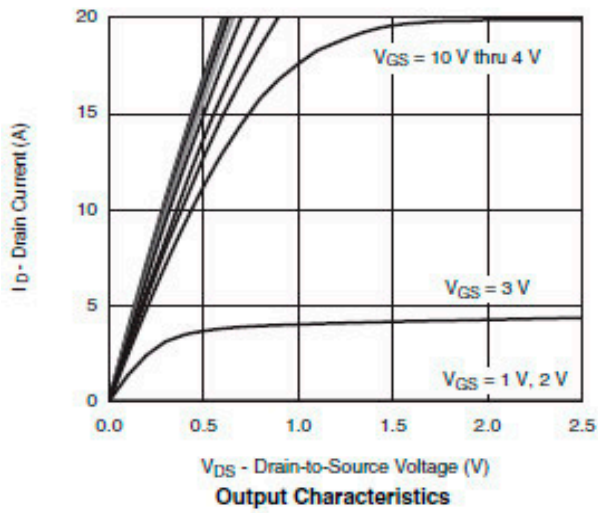
Ta=25°C

| Parameter                         | Symbol  | Conditions                                   | Min. | Typ. | Max. | Unit |
|-----------------------------------|---------|--|------|------|------|------|
| <b>STATIC PARAMETERS</b>          |         |  |      |      |      |      |
| Drain-source breakdown voltage    | BVdss   | Id=250μA, Vgs=0V                             | 30   |      |      | V    |
| Zero gate voltage drain current   | Idss    | Vds=24V, Vgs=0V<br>Tj=85°C                   |      |      | 1    | μA   |
|                                   |         |  |      |      | 30   |      |
| Gate-body leakage current         | Igss    | Vds=0V, Vgs=±20V                             |      |      | ±100 | nA   |
| Gate threshold voltage            | Vgs(th) | Vds=Vgs, Id=250μA                            | 1.3  |      | 2.1  | V    |
| On state drain current            | Id(on)  | Vgs=4.5V, Vds=5V                             | 10   |      |      | A    |
| Static drain-source on-resistance | Rds(on) | Vgs=10V, Id=5.0A                             |      | 30   | 36   | mΩ   |
|                                   |         | Vgs=4.5V, Id=4.7A                            |      | 40   | 46   |      |
| Forward transconductance          | Gfs     | Vds=15V, Id=5.2A                             |      | 13   |      | S    |
| Diode forward voltage             | Vsd     | Is=1.6A, Vgs=0V                              |      | 0.8  | 1.3  | V    |
| Max.body-diode continuous current | Is      |  |      |      | 1.5  | A    |
| <b>DYNAMIC PARAMETERS</b>         |         |  |      |      |      |      |
| Input capacitance                 | Ciss    | Vgs=0V, Vds=20V, f=1MHz                      |      | 700  |      | pF   |
| Output capacitance                | Coss    |  |      | 75   |      | pF   |
| Reverse transfer capacitance      | Crss    |  |      | 45   |      | pF   |
| <b>SWITCHING PARAMETERS</b>       |         |  |      |      |      |      |
| Total gate charge                 | Qg      | Vgs=4.5V, Vds=20V, Id=5.2A                   |      | 8.0  | 12.0 | nC   |
| Gate-source charge                | Qgs     |  |      | 1.6  |      | nC   |
| Gate-drain charge                 | Qgd     |  |      | 2.4  |      | nC   |
| Turn-on delay time                | td(on)  | Vgs=10V, Vds=15V, Id=1.0A<br>RL=15Ω, Rgen=6Ω |      | 8    | 12   | ns   |
| Turn-on rise time                 | tr      |  |      | 12   | 18   | ns   |
| Turn-off delay time               | td(off) |  |      | 28   | 40   | ns   |
| Turn-off fall time                | tf      |  |      | 10   | 18   | ns   |

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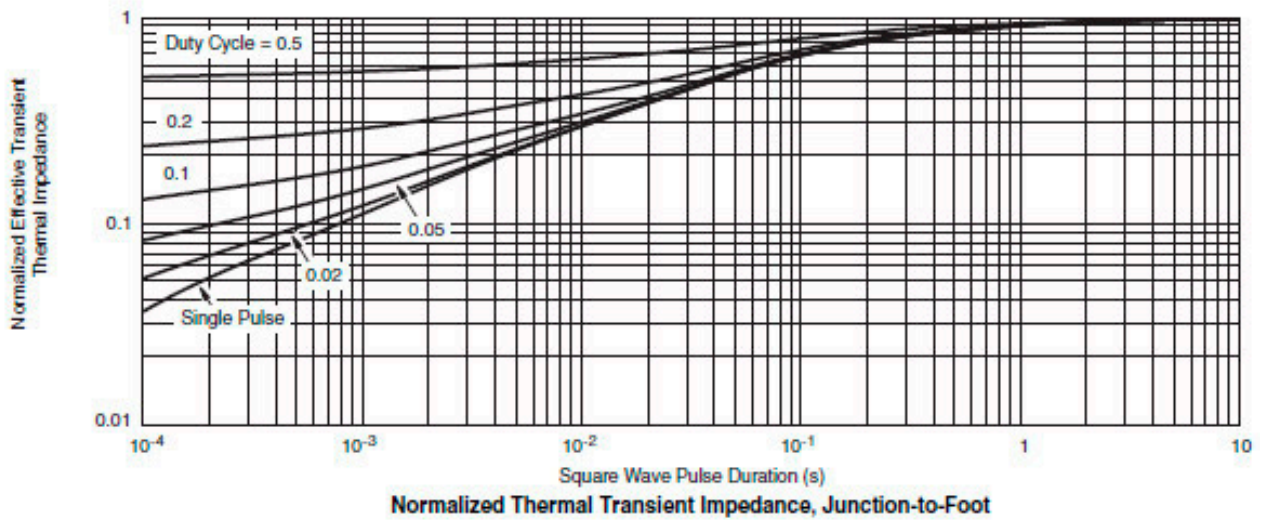
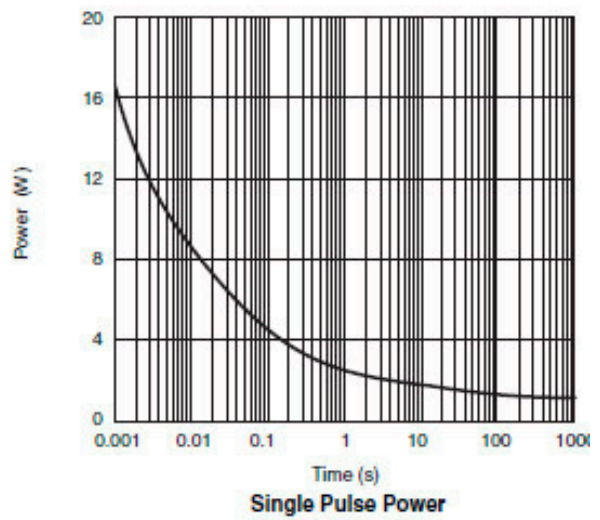
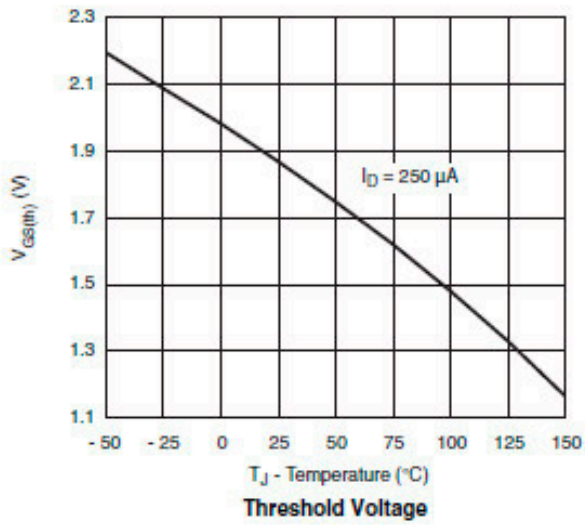
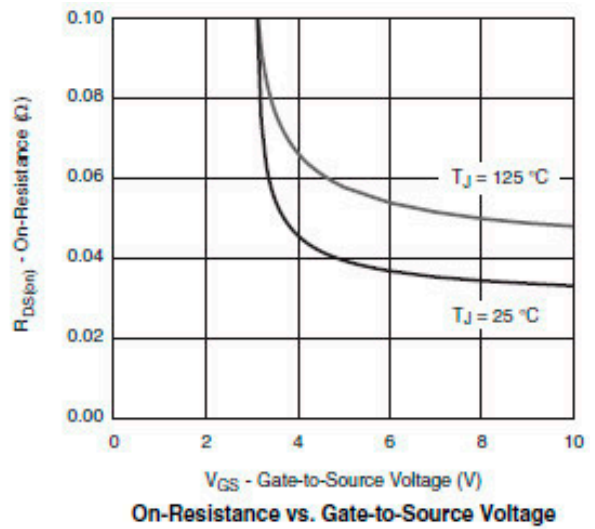
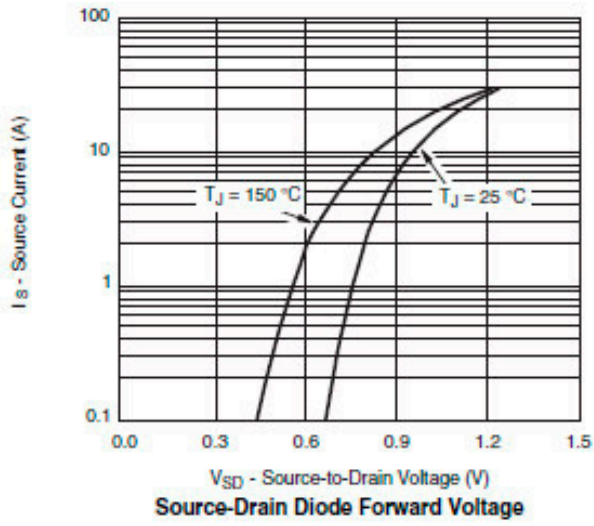
ELM544539A-N

## ■ Typical Electrical and Thermal Characteristics (N-ch)



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# Complementary MOSFET

## ELM544539A-N

### ■Electrical Characteristics (P-ch)

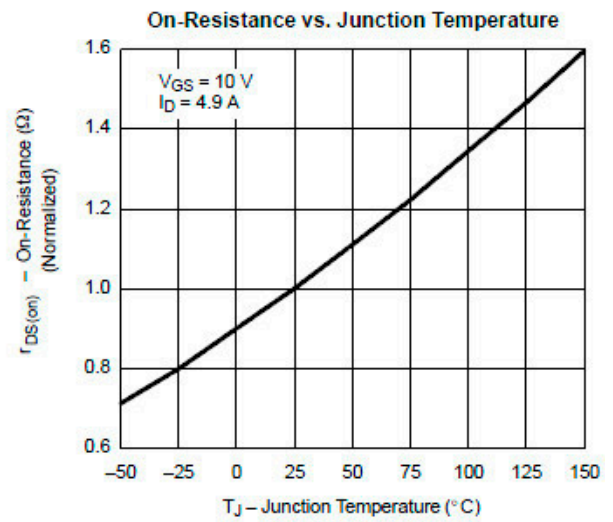
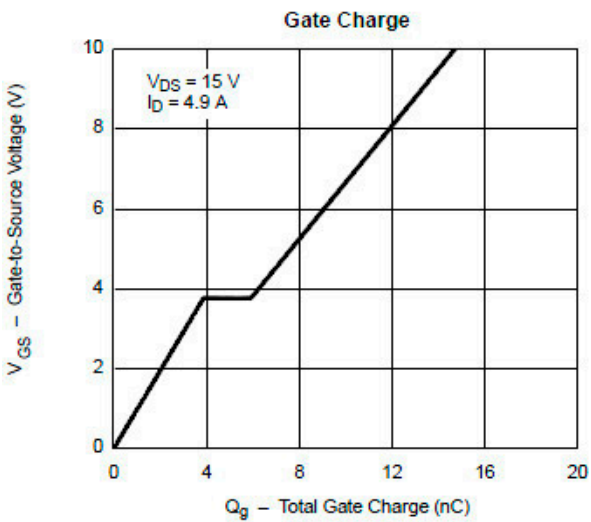
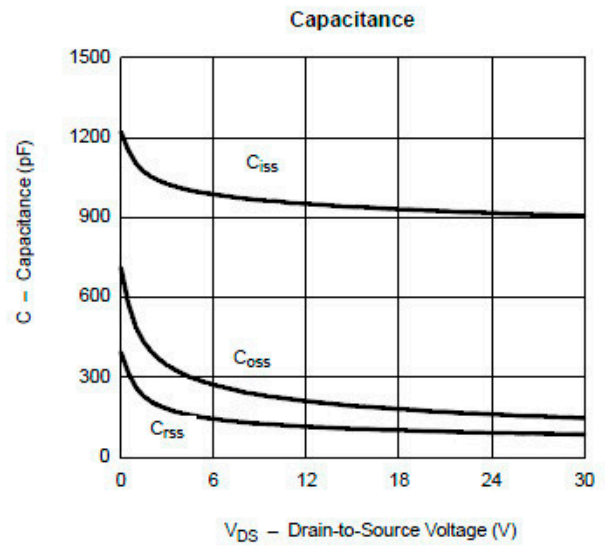
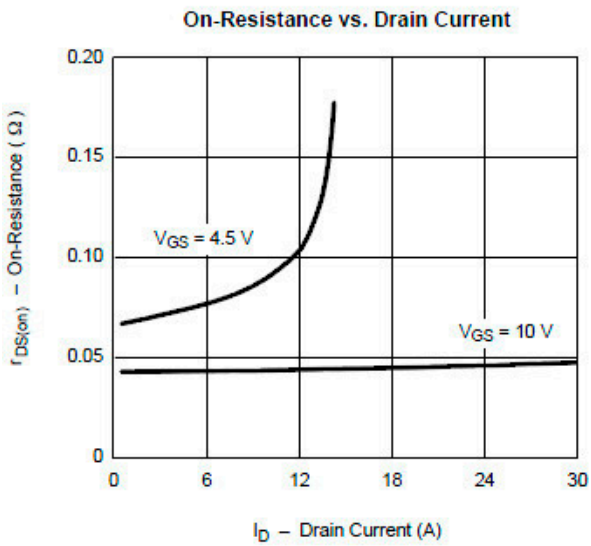
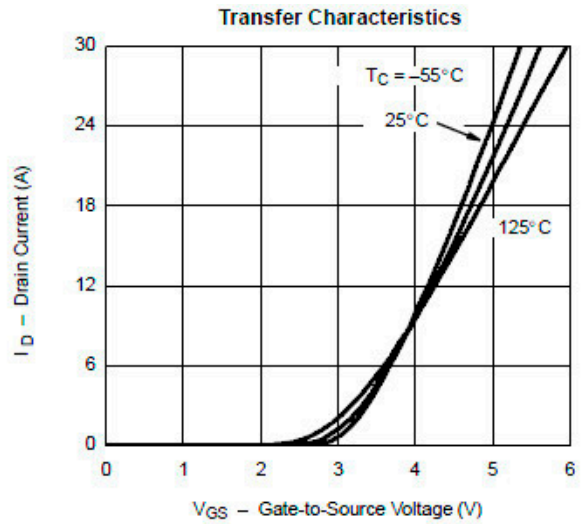
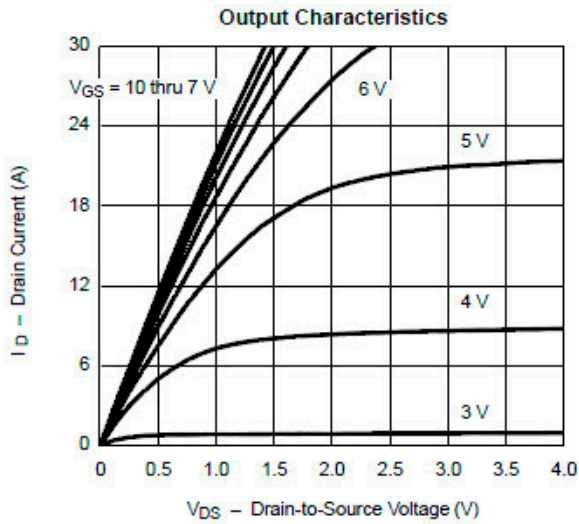
Ta=25°C

| Parameter                          | Symbol  | Conditions                                      | Min. | Typ. | Max. | Unit |
|------------------------------------|---------|---|------|------|------|------|
| <b>STATIC PARAMETERS</b>           |         |   |      |      |      |      |
| Drain-source breakdown voltage     | BVdss   | Id=-250μA, Vgs=0V                               | -30  |      |      | V    |
| Zero gate voltage drain current    | Idss    | Vds=-24V, Vgs=0V<br>Tj=85°C                     |      |      | -1   | μA   |
|                                    |         |   |      |      | -30  |      |
| Gate-body leakage current          | Igss    | Vds=0V, Vgs=±20V                                |      |      | ±100 | nA   |
| Gate threshold voltage             | Vgs(th) | Vds=Vgs, Id=-250μA                              | -1.0 |      | -2.5 | V    |
| On state drain current             | Id(on)  | Vgs=-10V, Vds=-5V                               | -25  |      |      | A    |
| Static drain-source on-resistance  | Rds(on) | Vgs=-10V, Id=-5.4A                              |      | 52   | 62   | mΩ   |
|                                    |         | Vgs=-4.5V, Id=-4.2A                             |      | 70   | 90   | mΩ   |
| Forward transconductance           | Gfs     | Vds=-10V, Id=-4.9A                              |      | 10   |      | S    |
| Diode forward voltage              | Vsd     | Is=-1.7A, Vgs=0V                                |      | -0.8 | -1.3 | V    |
| Max. body-diode continuous current | Is      |   |      |      | -1.7 | A    |
| <b>DYNAMIC PARAMETERS</b>          |         |   |      |      |      |      |
| Input capacitance                  | Ciss    | Vgs=0V, Vds=-15V, f=1MHz                        |      | 500  |      | pF   |
| Output capacitance                 | Coss    |   |      | 100  |      | pF   |
| Reverse transfer capacitance       | Crss    |   |      | 55   |      | pF   |
| <b>SWITCHING PARAMETERS</b>        |         |   |      |      |      |      |
| Total gate charge                  | Qg      | Vgs=-10V, Vds=-15V<br>Id=-5.0A                  |      | 10.0 | 18.0 | nC   |
| Gate-source charge                 | Qgs     |   |      | 1.6  |      | nC   |
| Gate-drain charge                  | Qgd     |   |      | 3.0  |      | nC   |
| Turn-on delay time                 | td(on)  | Vgs=-10V, Vds=-15V<br>Id=-1.0A, RL=15Ω, Rgen=6Ω |      | 8    | 18   | ns   |
| Turn-on rise time                  | tr      |   |      | 8    | 18   | ns   |
| Turn-off delay time                | td(off) |   |      | 25   | 50   | ns   |
| Turn-off fall time                 | tf      |   |      | 25   | 35   | ns   |

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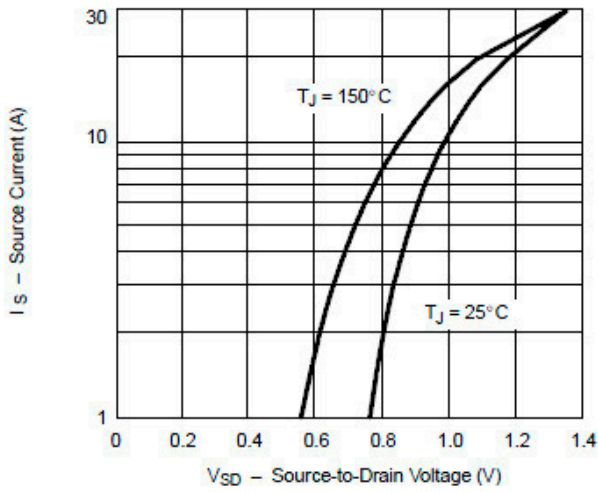
## ■ Typical Electrical and Thermal Characteristics (P-ch)



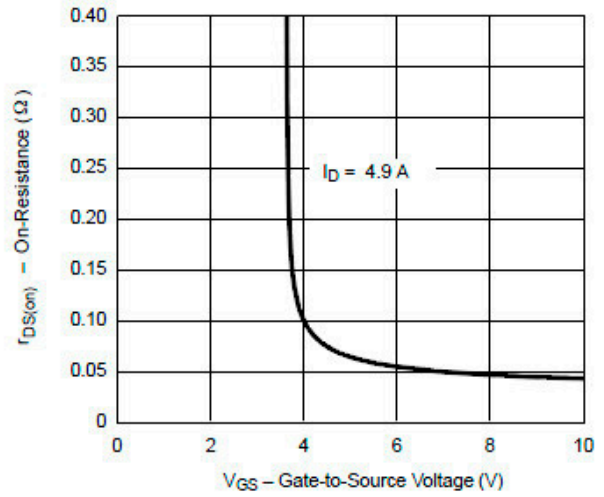
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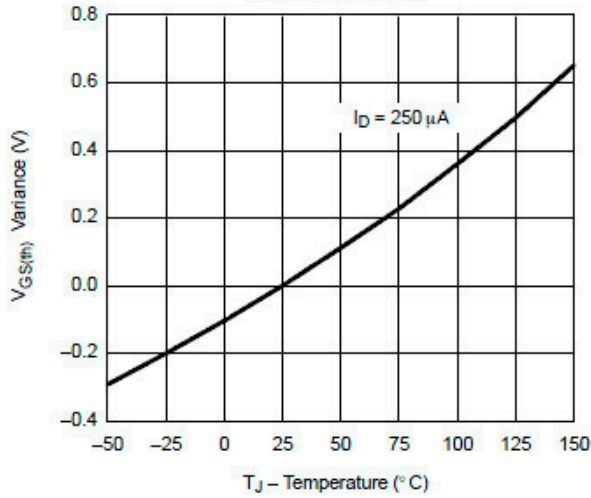
Source-Drain Diode Forward Voltage



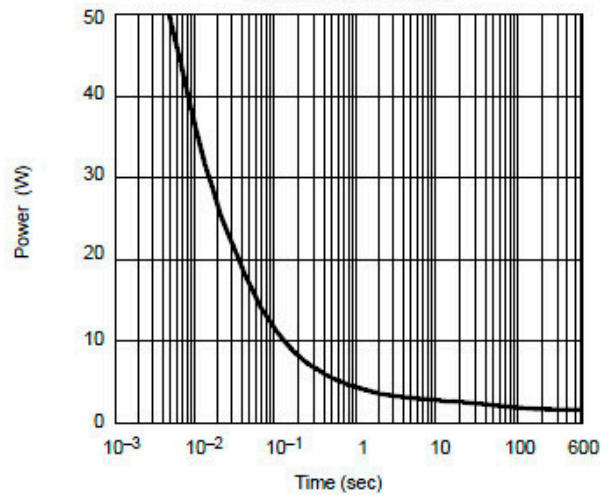
On-Resistance vs. Gate-to-Source Voltage



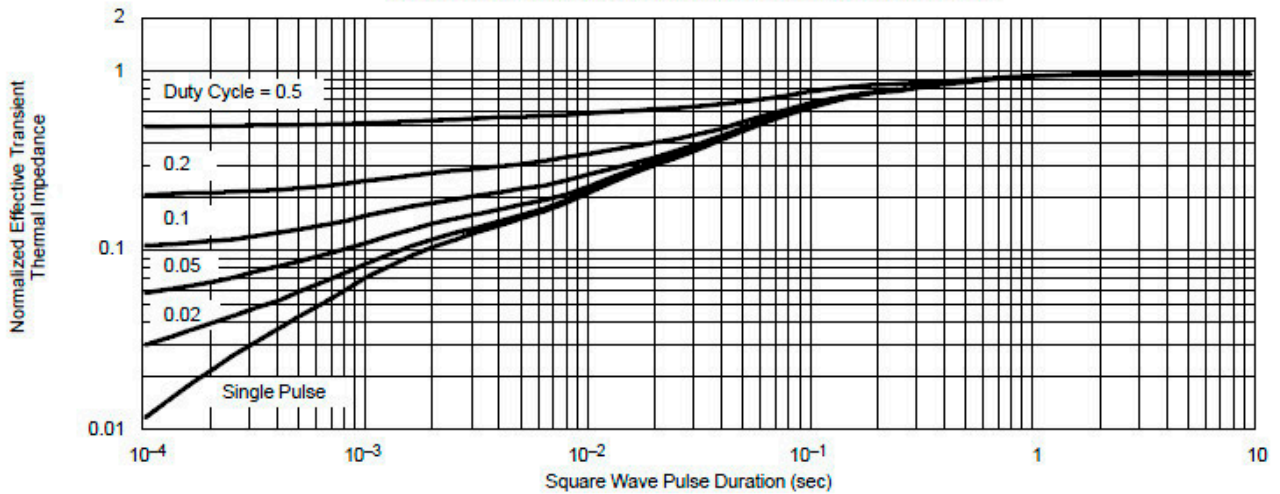
Threshold Voltage



Single Pulse Power



Normalized Thermal Transient Impedance, Junction-to-Foot

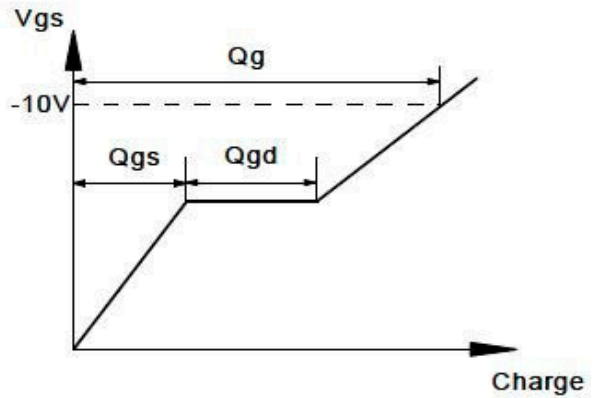
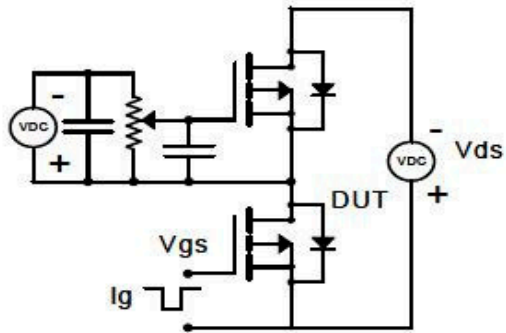


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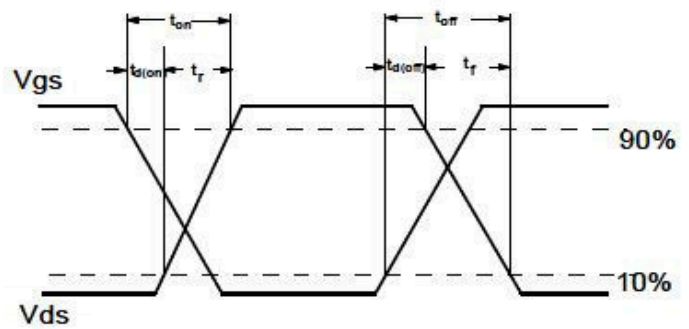
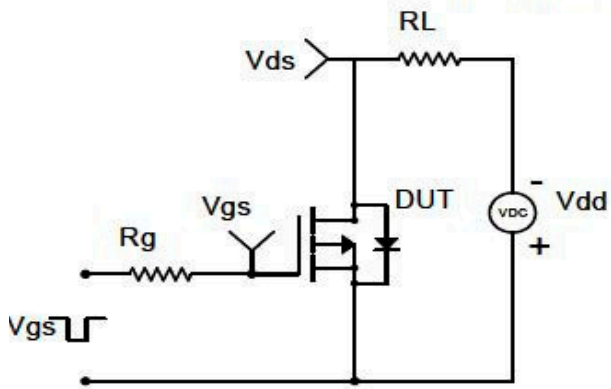
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## ■ Test circuit and waveform

Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms

