# Complementary MOSFET

## ELM56610CWA-S



## ■General Description

ELM56610CWA-S uses advanced trench technology to provide excellent Rds(on) and low gate charge.

## ■Features

N-channel

- Vds=100V
- Id=2.3A
- Rds(on)=310mΩ(Vgs=10V)
- Rds(on)=320mΩ(Vgs=4.5V)

P-channel

- Vds=-100V
- Id=-1.0A
- Rds(on)=650mΩ(Vgs=-10V)
- Rds(on)=700mΩ(Vgs=-4.5V)

## ■Maximum Absolute Ratings

Ta=25°C. Unless otherwise noted.

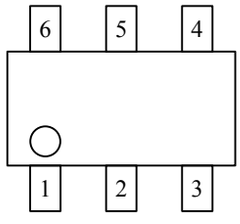
| Parameter | | Symbol | N-ch (Max.) | P-ch (Max.) | Unit |
|---|---|---|---|---|---|
| Drain-source voltage | | Vds | 100 | -100 | V |
| Gate-source voltage | | Vgs | ±20 | ±20 | V |
| Continuous drain current(Tj=150°C) | Ta=25°C | Id | 2.3 | -1.0 | A |
| | Ta=70°C | | 1.8 | -0.5 | |
| Pulsed drain current | | Idm | 4 | -4 | A |
| Power dissipation | Tc=25°C | Pd | 2.0 | 2.0 | W |
| | Tc=70°C | | 1.3 | 1.3 | |
| Operating junction temperature | | Tj | 150 | 150 | °C |
| Storage temperature range | | Tstg | -55 to 150 | -55 to 150 | °C |

## ■Thermal Characteristics

| Parameter | Symbol | Device | Typ. | Max. | Unit |
|---|---|---|---|---|---|
| Maximum junction-to-ambient | Rθja | N-ch | | 120 | °C/W |
| Maximum junction-to-ambient | Rθja | P-ch | | 120 | °C/W |

## ■Pin configuration

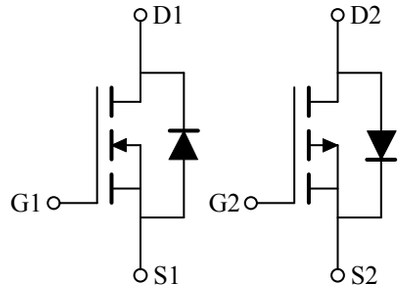
SOT-26(TOP VIEW)




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

## ■Circuit

- N-ch
- P-ch

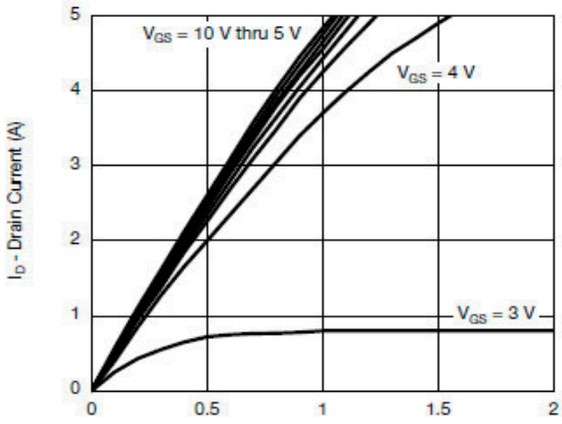


## ■Electrical Characteristics (N-ch)

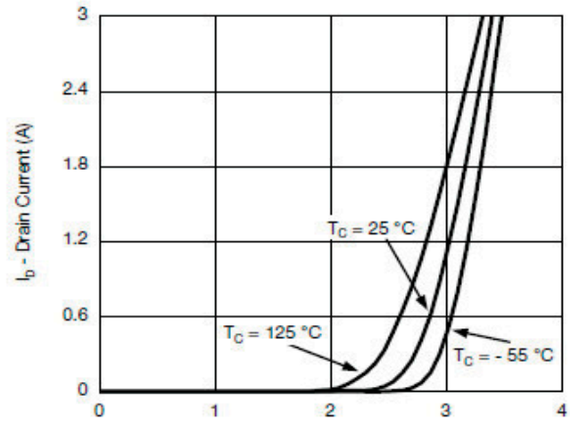
Ta=25°C. Unless otherwise noted.

| Parameter | Symbol | Conditions | | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|---|
| STATIC PARAMETERS | | | | | | | |
| Drain-source breakdown voltage | BVdss | Id=250μA, Vgs=0V | | 100 | | | V |
| Zero gate voltage drain current | Idss | Vds=80V, Vgs=0V | | | | 1 | μA |
| | | | Ta=85°C | | | 10 | |
| Gate-body leakage current | Igss | Vds=0V, Vgs=±20V | | | | ±100 | nA |
| Gate threshold voltage | Vgs(th) | Vds=Vgs, Id=250μA | | 1.0 | | 2.0 | V |
| On state drain current | Id(on) | Vgs=4.5V, Vds≥5V | | 5 | | | A |
| Static drain-source on-resistance | Rds(on) | Vgs=10V, Id=2.3A | | | | 310 | mΩ |
| | | Vgs=4.5V, Id=1.8A | | | | 320 | |
| Forward transconductance | Gfs | Vds=20V, Id=1.5A | | | 2 | | S |
| Diode forward voltage | Vsd | Is=1.3A, Vgs=0V | | | 0.85 | 1.20 | V |
| Max.body-diode continuous current | Is | | | | | 1.5 | A |
| DYNAMIC PARAMETERS | | | | | | | |
| Input capacitance | Ciss | Vgs=0V, Vds=50V, f=1MHz | | | 200 | | pF |
| Output capacitance | Coss | | | | 22 | | pF |
| Reverse transfer capacitance | Crss | | | | 13 | | pF |
| SWITCHING PARAMETERS | | | | | | | |
| Total gate charge | Qg | Vgs=4.5V, Vds=50V, Id≡1.6A | | | 2.80 | 5.80 | nC |
| Gate-source charge | Qgs | | | | 0.75 | | nC |
| Gate-drain charge | Qgd | | | | 1.40 | | nC |
| Turn-on delay time | td(on) | Vgs=4.5V, Vds=50V, Id≡1.3A RL=39Ω, Rgen=1Ω | | | 25 | 50 | ns |
| Turn-on rise time | tr | | | | 20 | 50 | ns |
| Turn-off delay time | td(off) | | | | 15 | 30 | ns |
| Turn-off fall time | tf | | | | 10 | 25 | ns |

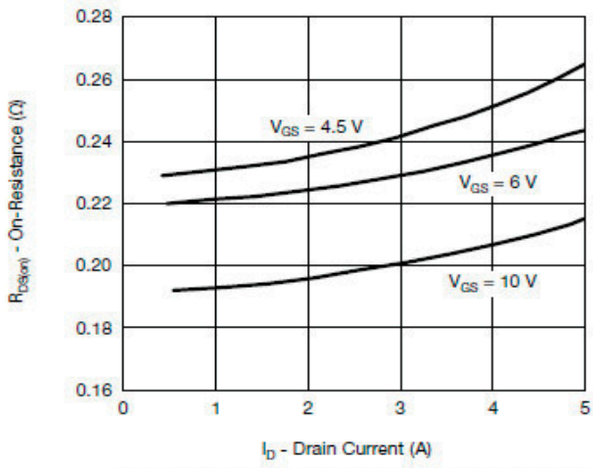
## ■Typical Electrical and Thermal Characteristics (N-ch)



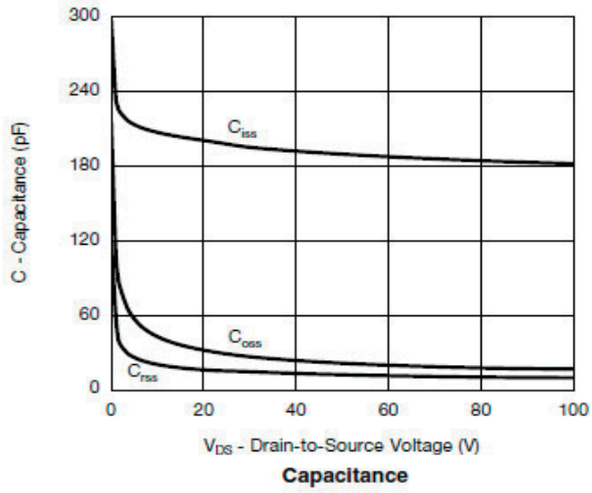

**Output Characteristics**



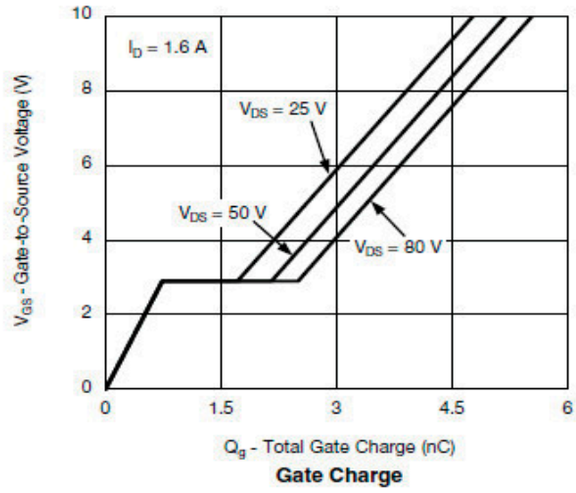

**Transfer Characteristics**



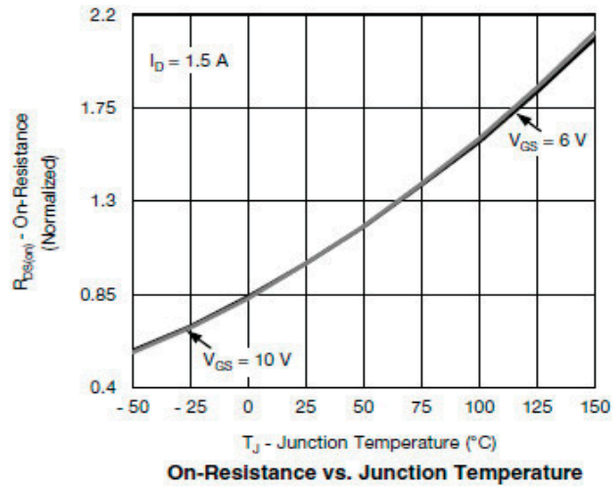

**On-Resistance vs. Drain Current and Gate Voltage**



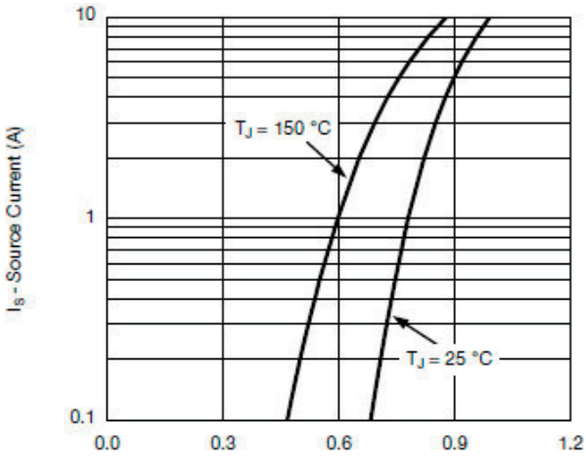

**Capacitance**



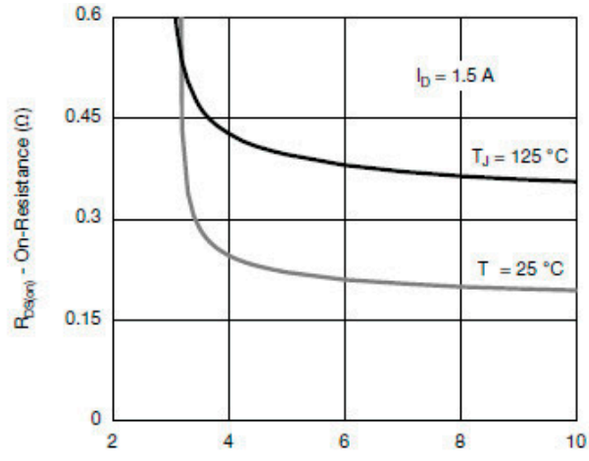

**Gate Charge**



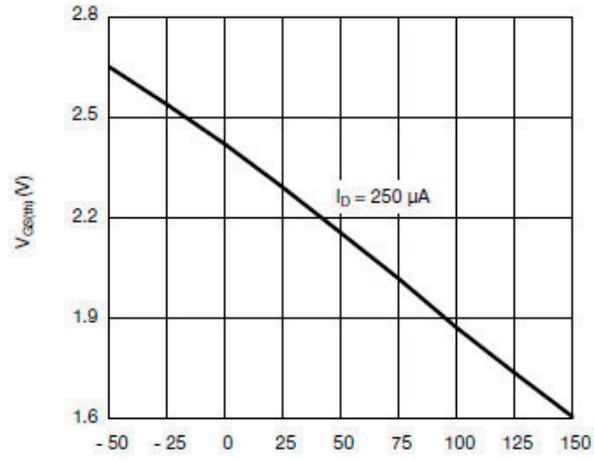

**On-Resistance vs. Junction Temperature**



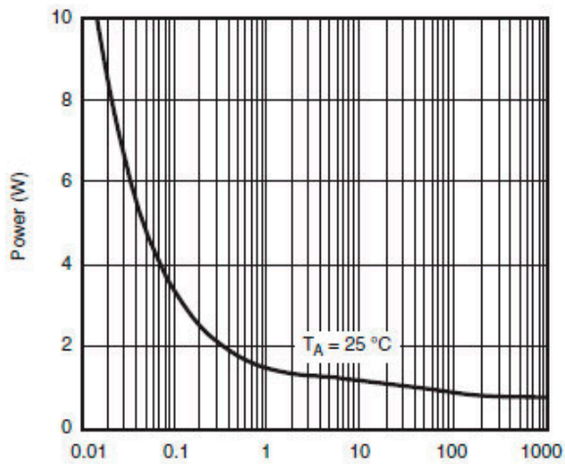

**Source-Drain Diode Forward Voltage**



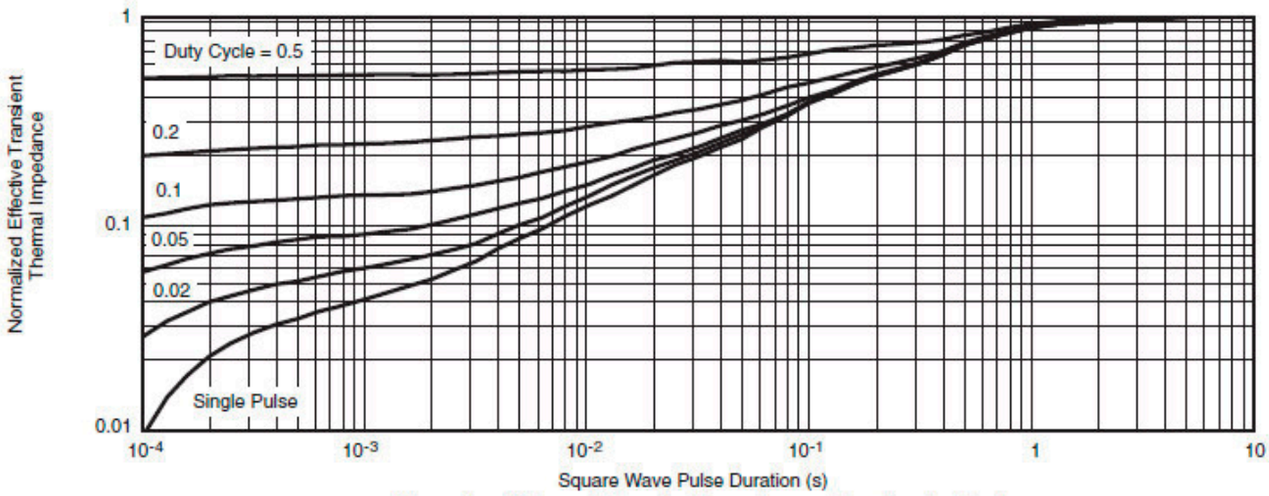

**On-Resistance vs. Gate-to-Source Voltage**




**Threshold Voltage**



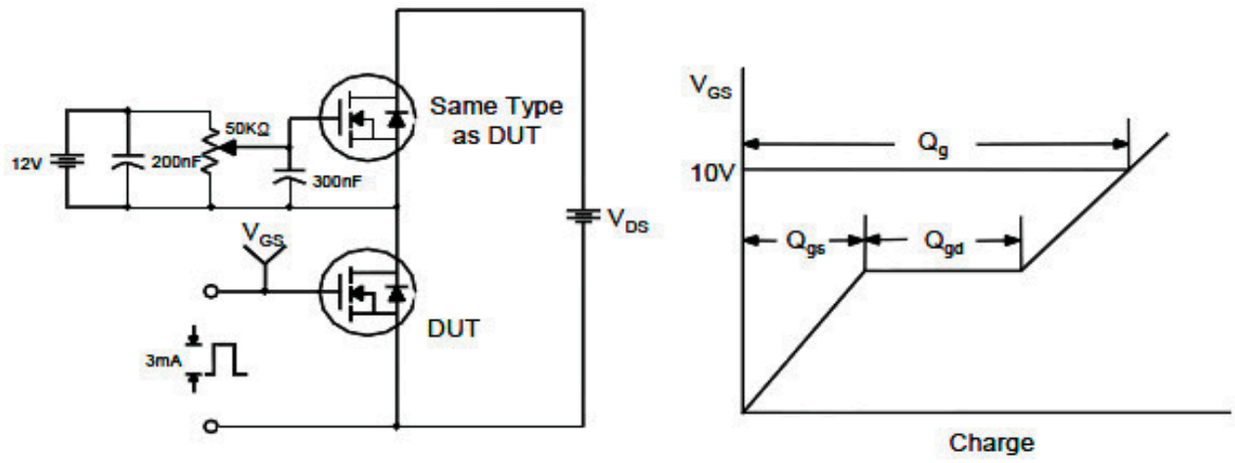

**Single Pulse Power**



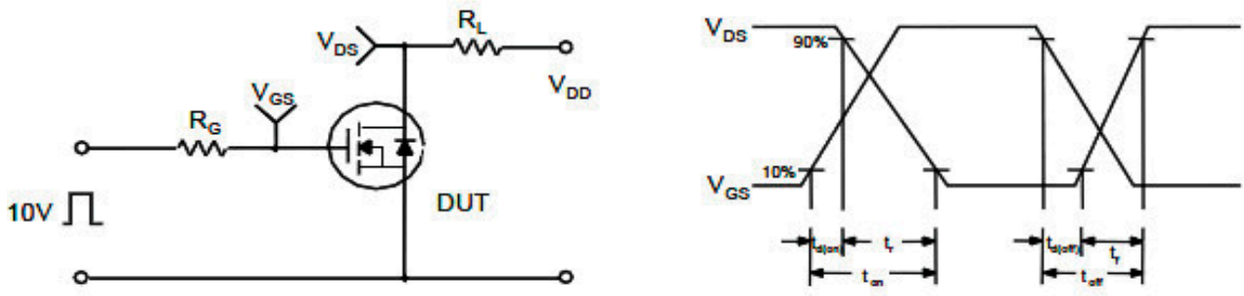

**Normalized Thermal Transient Impedance, Junction-to-Foot**

■Test circuit and waveform **(N-ch)**

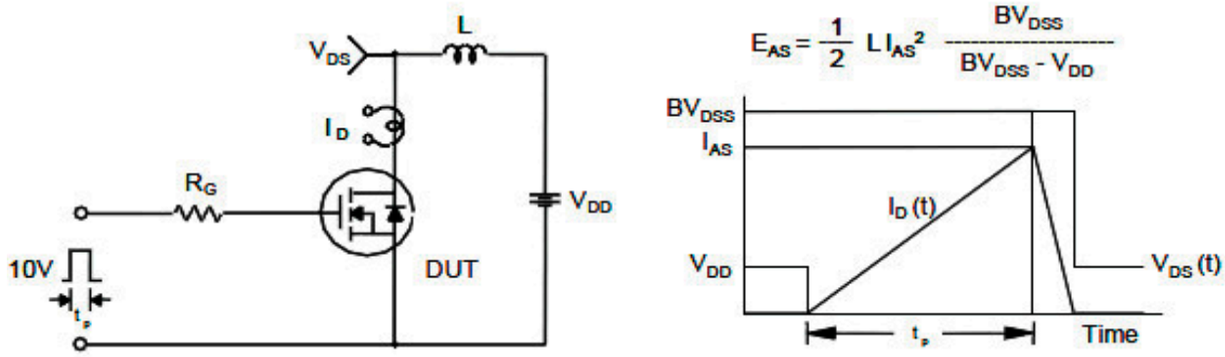
Gate Charge Test Circuit & Waveform




Resistive Switching Test Circuit & Waveforms




Unclamped Inductive Switching Test Circuit & Waveforms

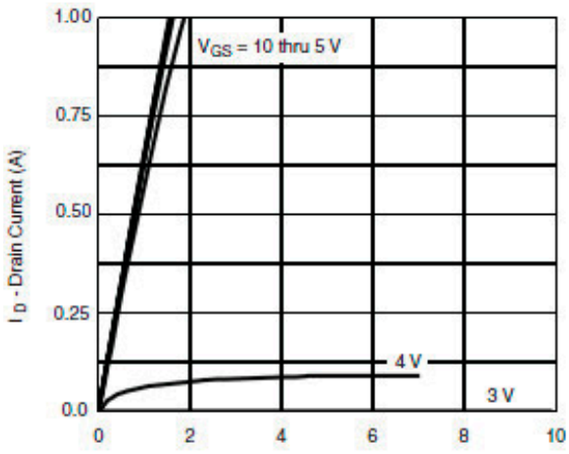


## ■Electrical Characteristics (P-ch)

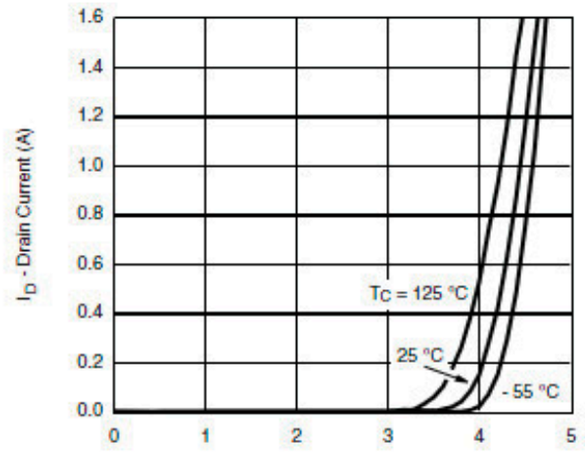
Ta=25°C. Unless otherwise noted.

| Parameter | Symbol | Conditions | | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|---|
| STATIC PARAMETERS | | | | | | | |
| Drain-source breakdown voltage | BVdss | Id=-250μA, Vgs=0V | | -100 | | | V |
| Zero gate voltage drain current | Idss | Vds=-80V, Vgs=0V | | | | -1 | μA |
| | | | Ta=85°C | | | -30 | |
| Gate-body leakage current | Igss | Vds=0V, Vgs=±12V | | | | ±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≥-15V | | -1.6 | | | A |
| Static drain-source on-resistance | Rds(on) | Vgs=-10V, Id=-1.0A | | | 600 | 650 | mΩ |
| | | Vgs=-4.5V, Id=-0.5A | | | 620 | 700 | |
| Forward transconductance | Gfs | Vds=-15V, Id=-0.5A | | | 2.8 | | S |
| Diode forward voltage | Vsd | Is=-0.5A, Vgs=0V | | | -0.75 | -1.30 | V |
| Max. body-diode continuous current | Is | | | | | -1.5 | A |
| DYNAMIC PARAMETERS | | | | | | | |
| Input capacitance | Ciss | Vgs=0V, Vds=-25V, f=1MHz | | | 450 | 650 | pF |
| Output capacitance | Coss | | | | 50 | | pF |
| Reverse transfer capacitance | Crss | | | | 30 | | pF |
| SWITCHING PARAMETERS | | | | | | | |
| Total gate charge | Qg | Vgs=-10V, Vds=-75V Id≡-0.5A | | | 9.0 | 20.0 | nC |
| Gate-source charge | Qgs | | | | 2.5 | | nC |
| Gate-drain charge | Qgd | | | | 3.5 | | nC |
| Turn-on delay time | td(on) | Vgs=-10V, Vds=-75V Id≡-1.0A, RL=75Ω Rgen=6Ω | | | 10 | 20 | ns |
| Turn-on rise time | tr | | | | 15 | 30 | ns |
| Turn-off delay time | td(off) | | | | 20 | 40 | ns |
| Turn-off fall time | tf | | | | 15 | 30 | ns |

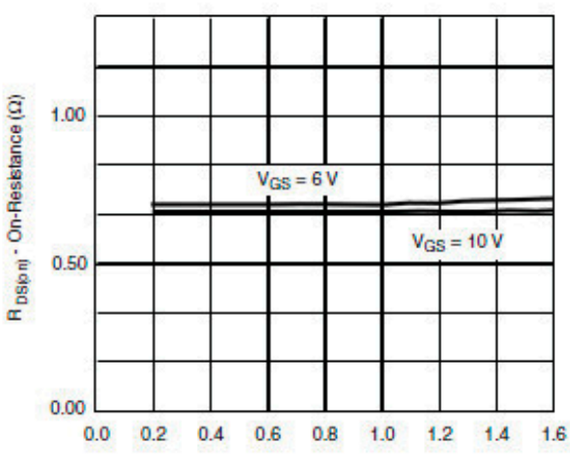
## ■Typical Electrical and Thermal Characteristics (P-ch)



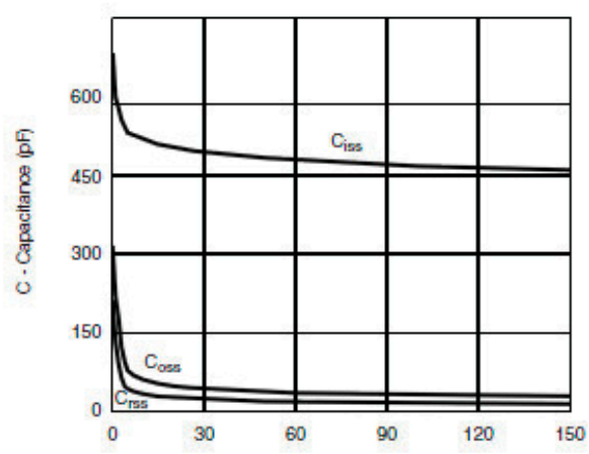

**Output Characteristics**



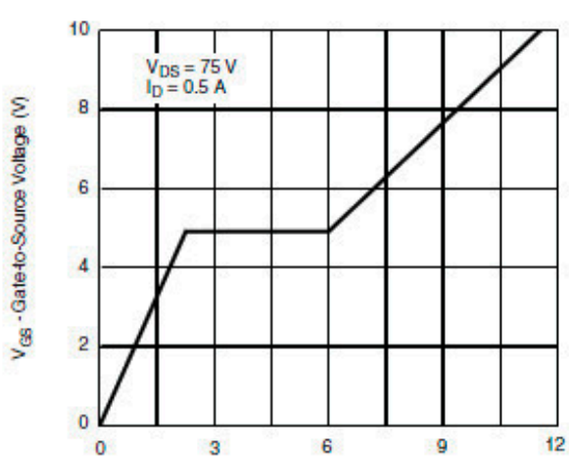

**Transfer Characteristics**



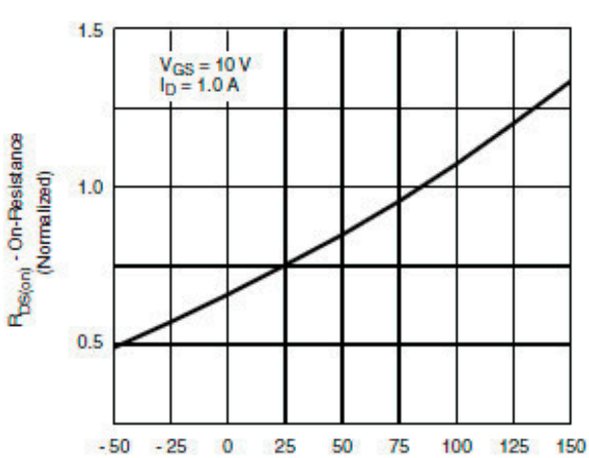

**On-Resistance vs. Drain Current**



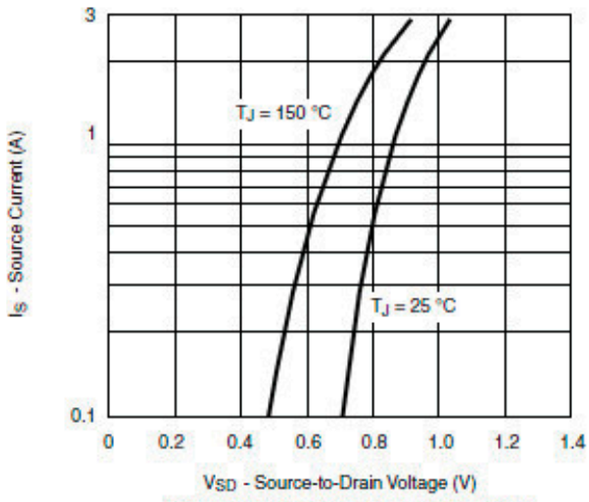

**Capacitance**



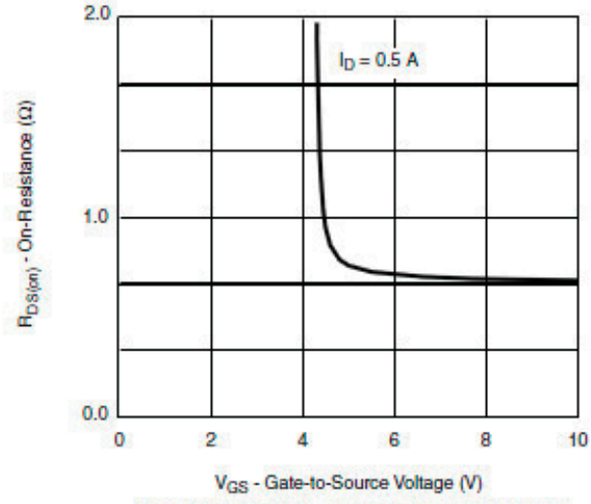

**Gate Charge**



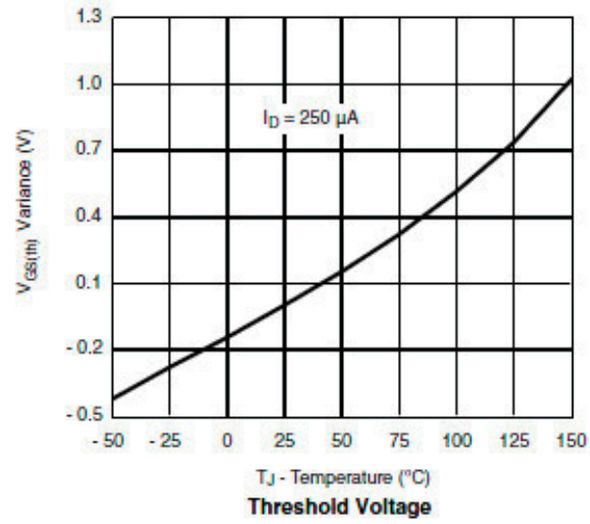

**On-Resistance vs. Junction Temperature**



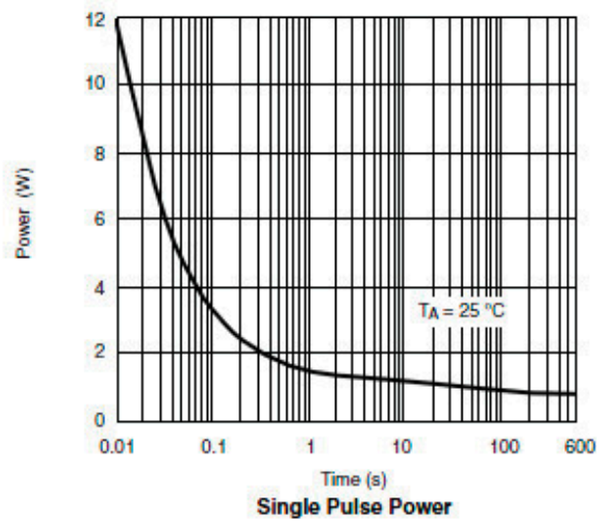

**Source-Drain Diode Forward Voltage**



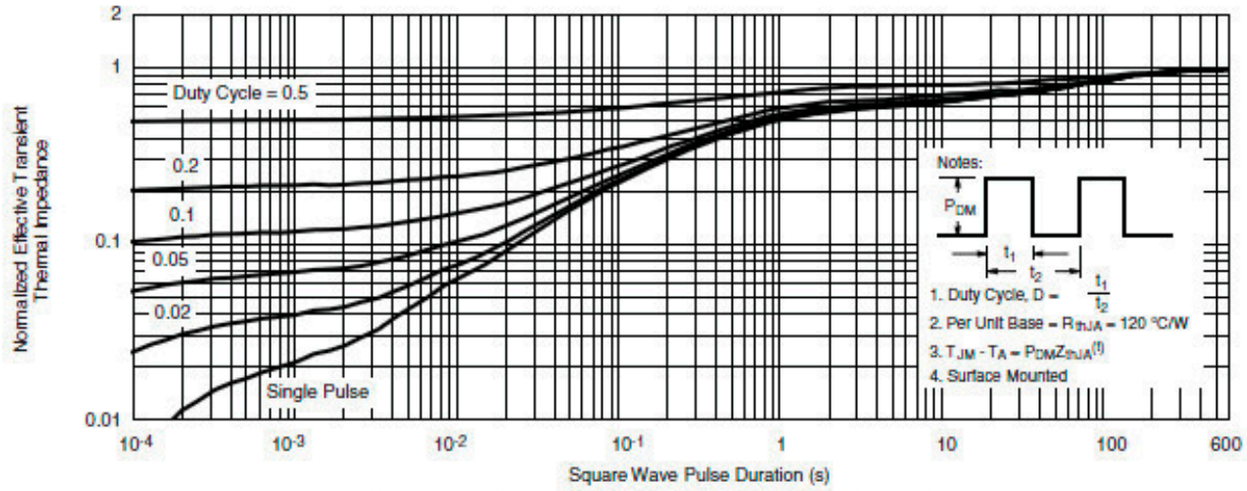

**On-Resistance vs. Gate-to-Source Voltage**




**Threshold Voltage**



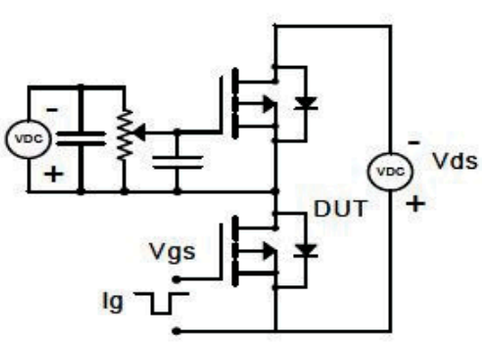

**Single Pulse Power**

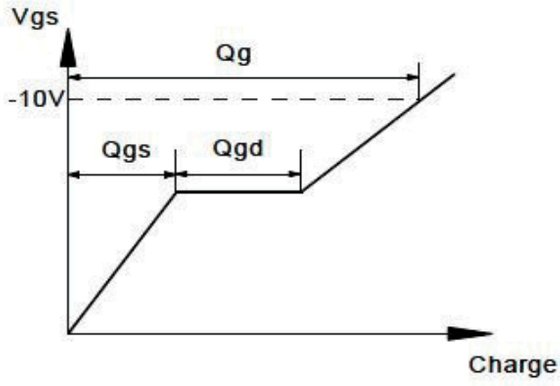



**Normalized Thermal Transient Impedance, Junction-to-Ambient**

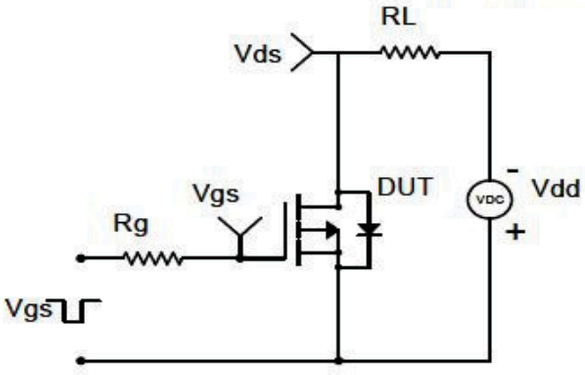
■Test circuit and waveform **(P-ch)**

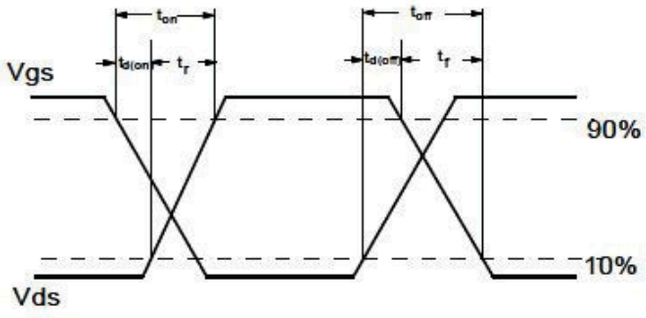
Gate Charge Test Circuit & Waveform




Resistive Switching Test Circuit & Waveforms




Diode Recovery Test Circuit & Waveforms