

Complementary MOSFET

ELM56602CA-S

<http://www.elm-tech.com>

■General Description

ELM56602CA-S uses advanced trench technology to provide excellent $R_{ds(on)}$ and low gate charge.

■Features

- | | |
|--|---|
| N-channel | P-channel |
| • $V_{ds}=30V$ | • $V_{ds}=-30V$ |
| • $I_d=3.5A$ | • $I_d=-2.7A$ |
| • $R_{ds(on)}=75m\Omega(V_{gs}=10V)$ | • $R_{ds(on)}=135m\Omega(V_{gs}=-10V)$ |
| • $R_{ds(on)}=100m\Omega(V_{gs}=4.5V)$ | • $R_{ds(on)}=170m\Omega(V_{gs}=-4.5V)$ |

■Maximum Absolute Ratings

$T_a=25^{\circ}\text{C}$. Unless otherwise noted.

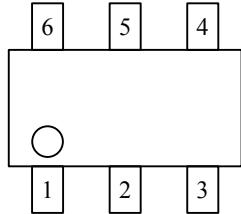
| Parameter | Symbol | N-ch (Max.) | P-ch (Max.) | Unit |
|---|-----------|-------------|-------------|--------------------|
| Drain-source voltage | V_{ds} | 30 | -30 | V |
| Gate-source voltage | V_{gs} | ± 20 | ± 20 | V |
| Continuous drain current($T_j=150^{\circ}\text{C}$) | I_d | 3.5 | -2.7 | A |
| | | 2.6 | -2.1 | |
| Pulsed drain current | I_{dm} | 15 | -15 | A |
| Power dissipation | P_d | 2.0 | 2.0 | W |
| | | 1.3 | 1.3 | |
| Operating junction temperature | T_j | 150 | 150 | $^{\circ}\text{C}$ |
| Storage temperature range | T_{stg} | -55 to 150 | -55 to 150 | $^{\circ}\text{C}$ |

■Thermal Characteristics

| Parameter | Symbol | Device | Typ. | Max. | Unit |
|--|-----------------|--------|------|------|-----------------------------|
| Thermal resistance junction-to-ambient | $R_{\theta ja}$ | N-ch | | 120 | $^{\circ}\text{C}/\text{W}$ |
| Thermal resistance junction-to-ambient | $R_{\theta ja}$ | P-ch | | 120 | $^{\circ}\text{C}/\text{W}$ |

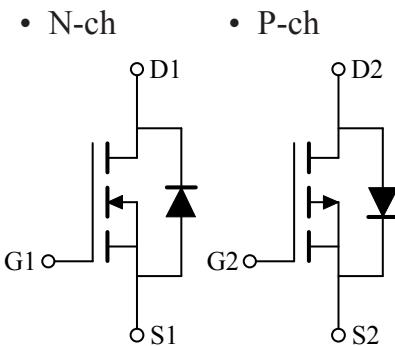
■Pin configuration

SOT-26(TOP VIEW)



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

■Circuit



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■Electrical Characteristics (N-ch)

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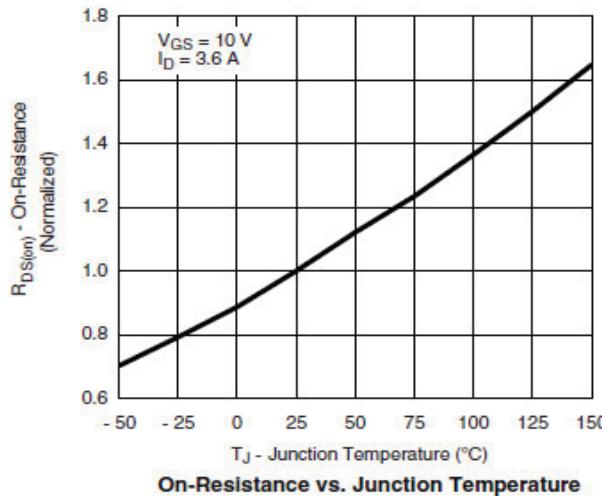
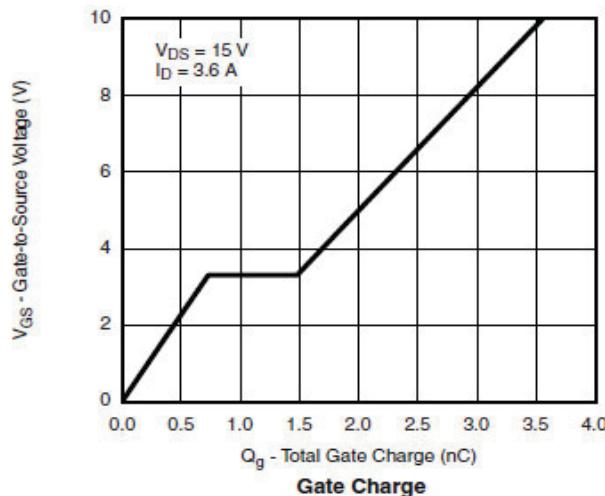
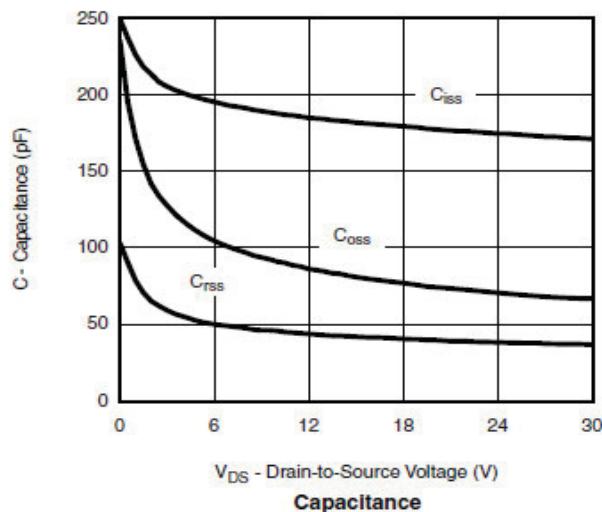
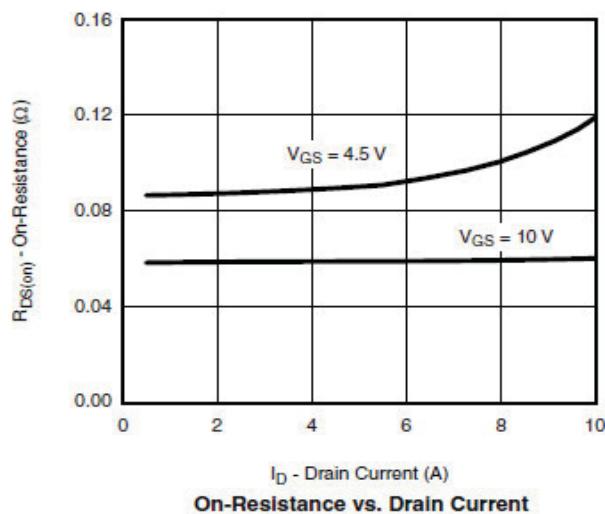
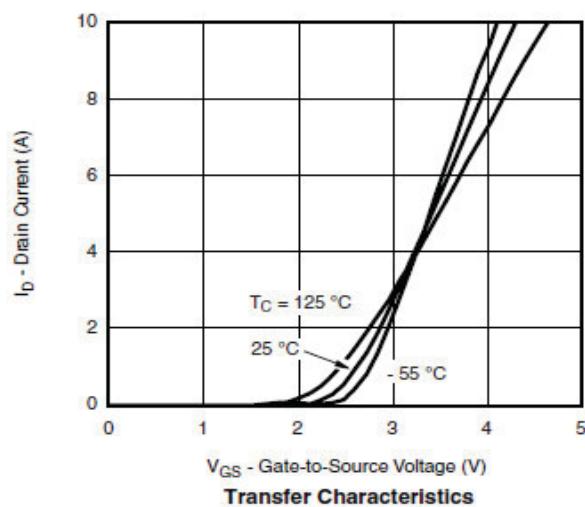
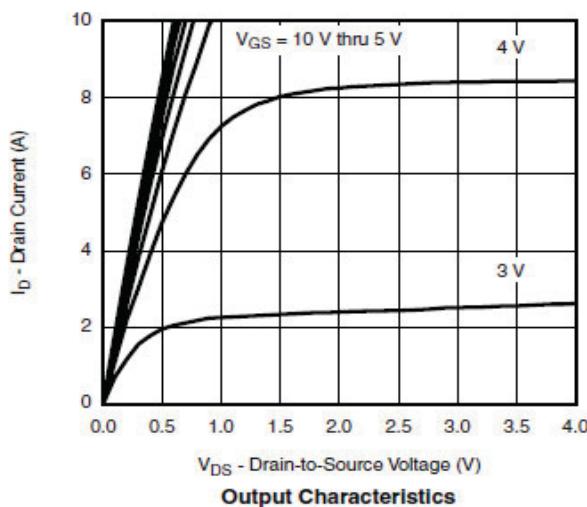
| Parameter | Symbol | Conditions | | Min. | Typ. | Max. | Unit | |
|-----------------------------------|---------|--|---------|------|------|------|------|--|
| STATIC PARAMETERS | | | | | | | | |
| Drain-source breakdown voltage | BVdss | Id=250µA, Vgs=0V | | 30 | | | V | |
| Zero gate voltage drain current | Idss | Vds=30V, Vgs=0V | Ta=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≥4.5V | | 6 | | | A | |
| Static drain-source on-resistance | Rds(on) | Vgs=10V, Id=3.6A | | | 64 | 75 | mΩ | |
| | | Vgs=4.5V, Id=2.6A | | | 88 | 100 | | |
| Forward transconductance | Gfs | Vds=15V, Id=2.8A | | | 11 | | S | |
| Diode forward voltage | Vsd | Is=2.6A, Vgs=0V | | | 0.8 | 1.2 | V | |
| Max.body-diode continuous current | Is | | | | | 1.5 | A | |
| DYNAMIC PARAMETERS | | | | | | | | |
| Input capacitance | Ciss | Vgs=0V, Vds=15V, f=1MHz | | | 230 | | pF | |
| Output capacitance | Coss | | | | 50 | | pF | |
| Reverse transfer capacitance | Crss | | | | 20 | | pF | |
| SWITCHING PARAMETERS | | | | | | | | |
| Total gate charge | Qg | Vgs=4.5V, Vds=15V, Id=3.0A | | | 2.00 | 3.60 | nC | |
| Gate-source charge | Qgs | | | | 0.80 | | nC | |
| Gate-drain charge | Qgd | | | | 0.65 | | nC | |
| Turn-on delay time | td(on) | Vgs=4.5V, Vds=15V, Id=2.0A RL=5.6Ω, Rgen=1.0Ω | | | 10 | 12 | ns | |
| Turn-on rise time | tr | | | | 45 | 60 | ns | |
| Turn-off delay time | td(off) | | | | 12 | 18 | ns | |
| Turn-off fall time | tf | | | | 20 | 30 | ns | |

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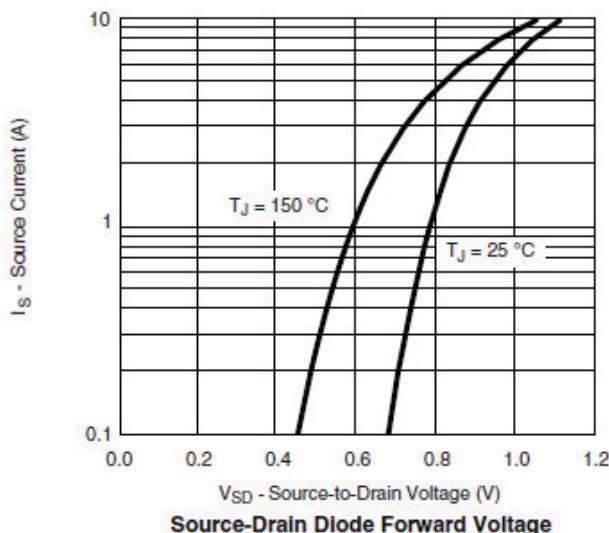
■ Typical Electrical and Thermal Characteristics (N-ch)



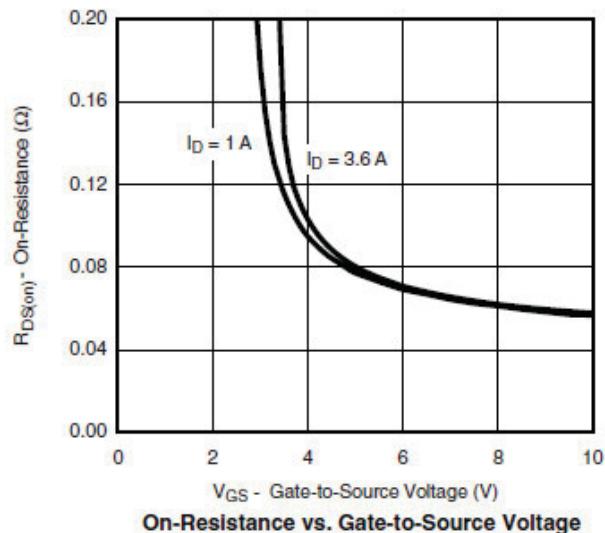
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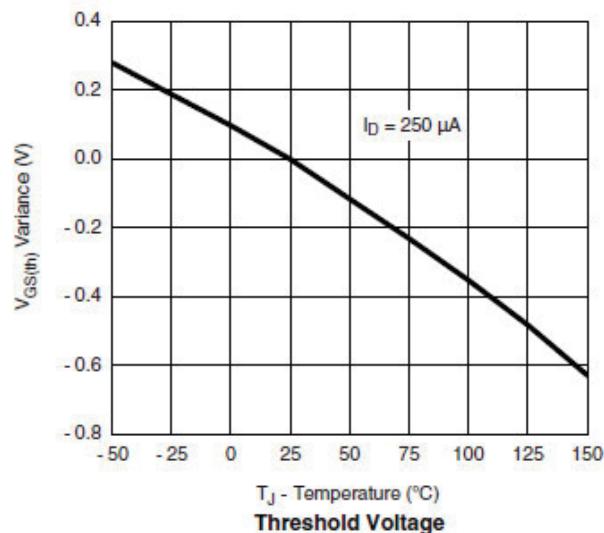
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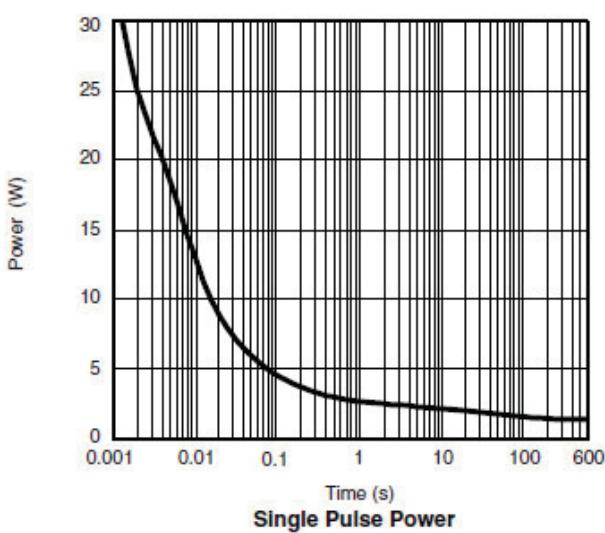
Source-Drain Diode Forward Voltage



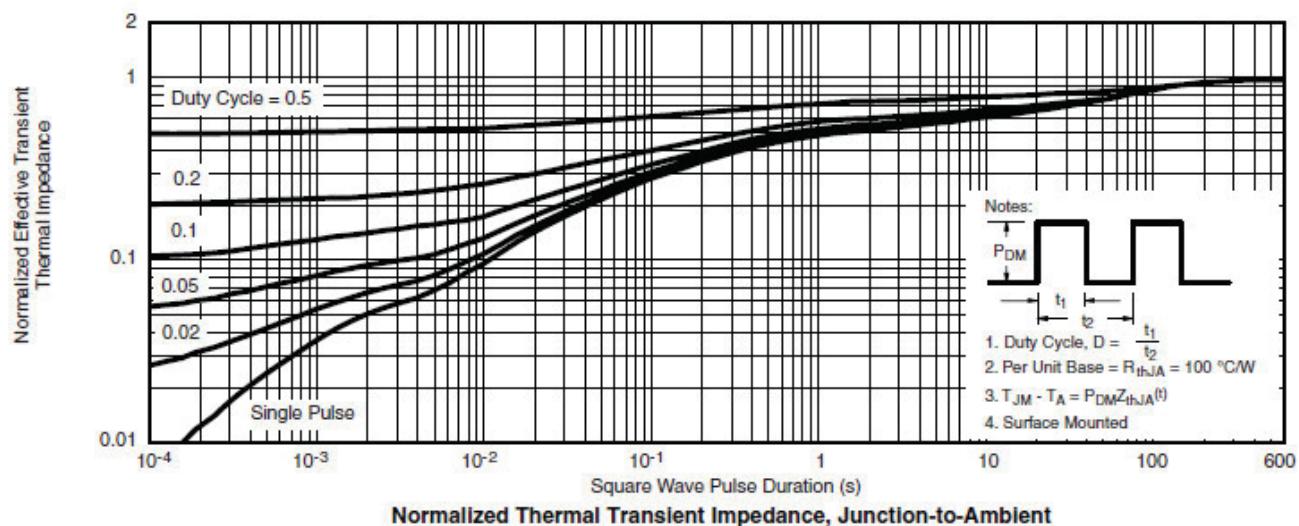
On-Resistance vs. Gate-to-Source Voltage



Threshold Voltage



Single Pulse Power



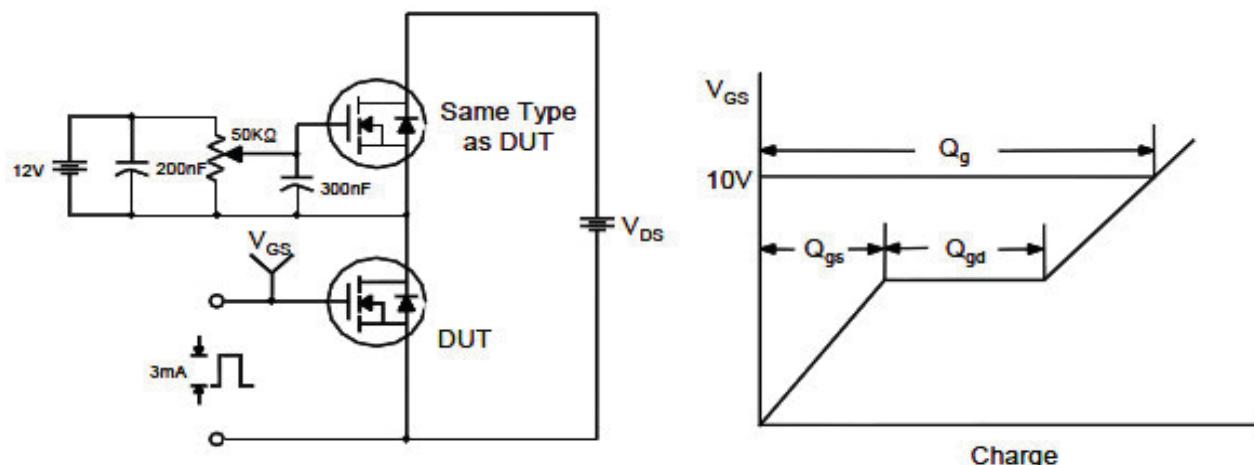
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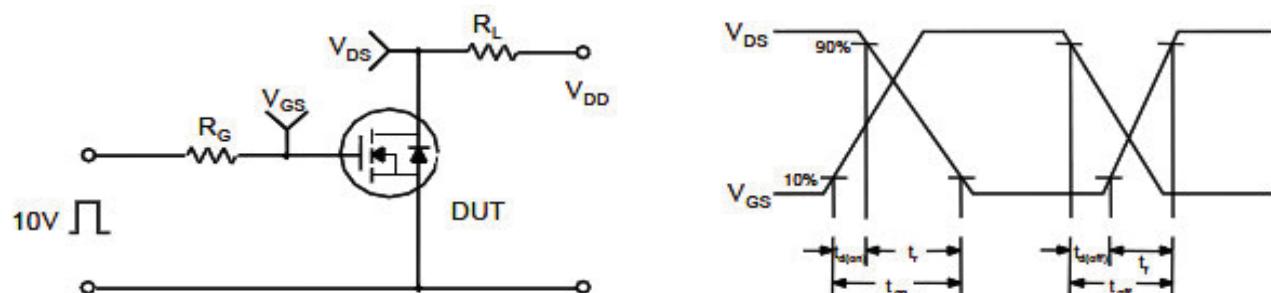
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■ Test circuit and waveform (N-ch)

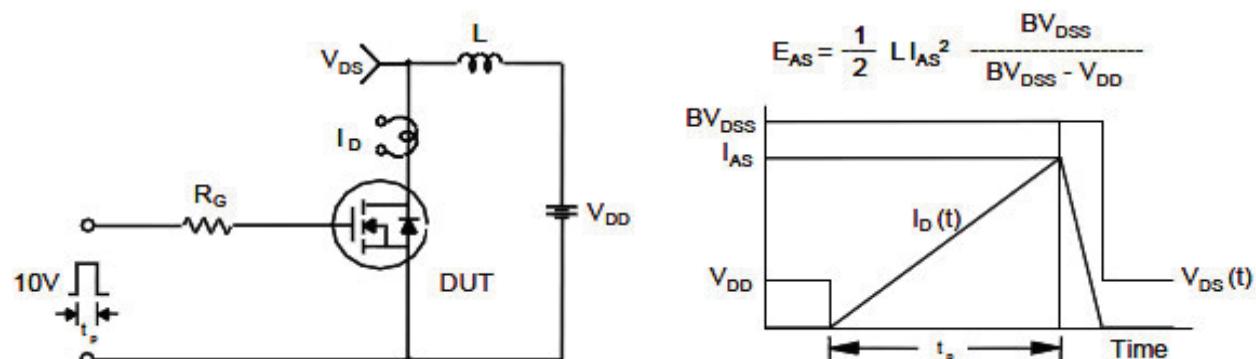
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching Test Circuit & Waveforms



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■Electrical Characteristics (P-ch)

Ta=25°C. Unless otherwise noted.

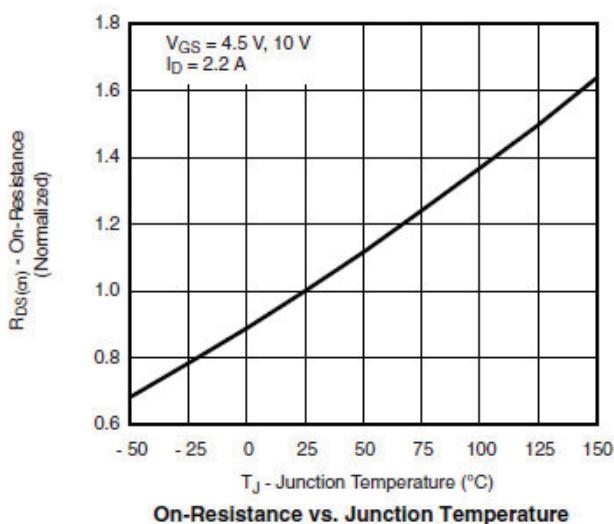
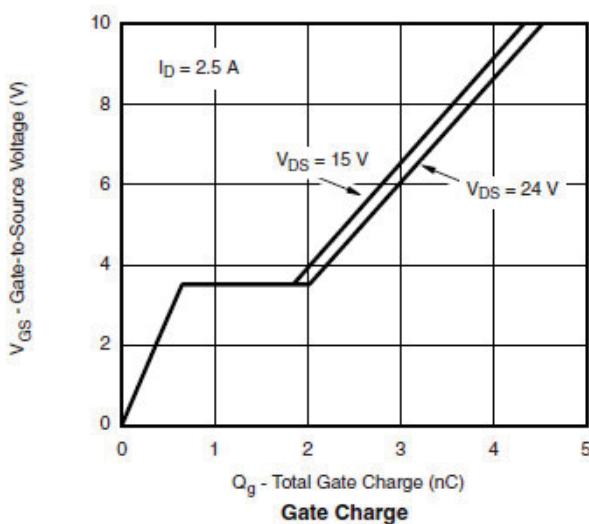
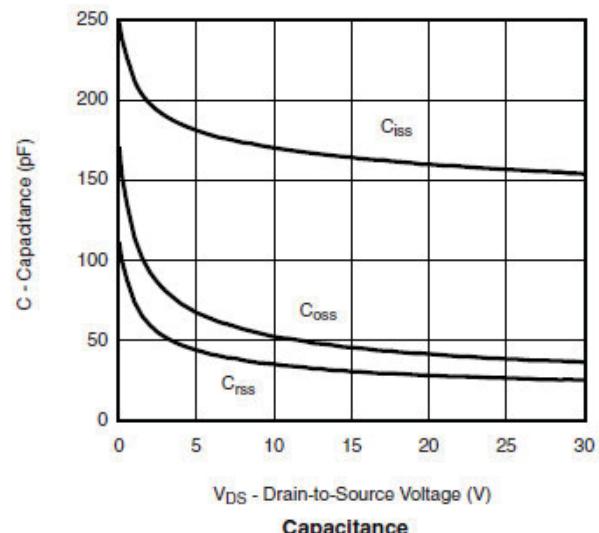
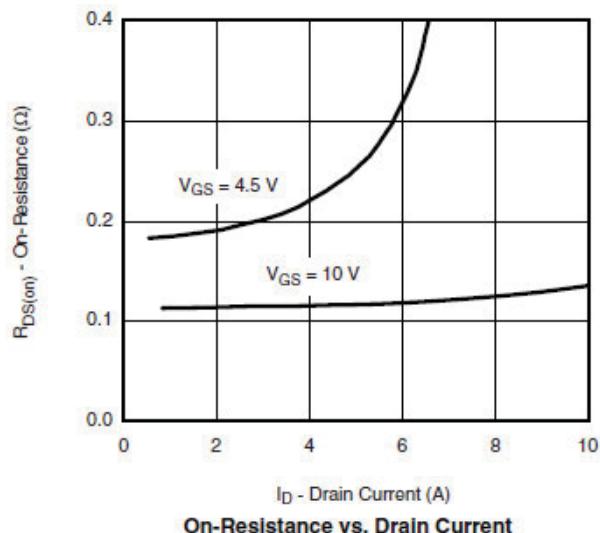
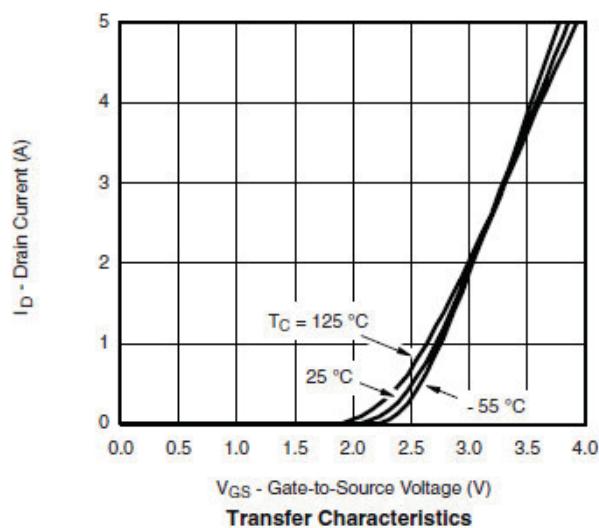
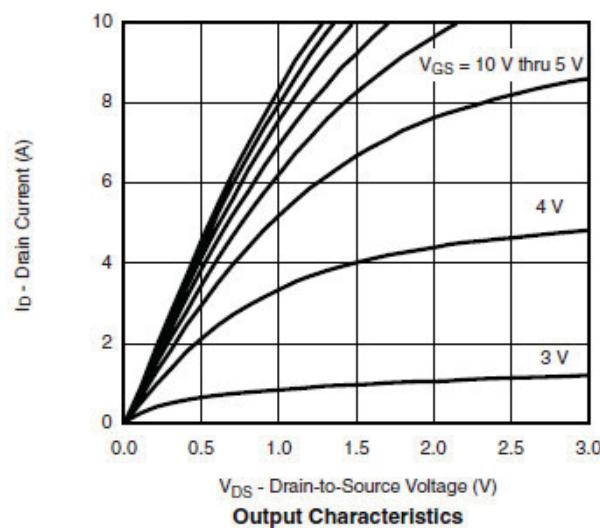
| Parameter | Symbol | Conditions | | Min. | Typ. | Max. | Unit | |
|------------------------------------|---------|--|---------|------|------|------|------|--|
| STATIC PARAMETERS | | | | | | | | |
| Drain-source breakdown voltage | BVdss | Id=-250μA, Vgs=0V | | -30 | | | V | |
| Zero gate voltage drain current | Idss | Vds=-24V, Vgs=0V | Ta=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 | | -10 | | | A | |
| Static drain-source on-resistance | Rds(on) | Vgs=-10V, Id=-2.7A | | | 115 | 135 | mΩ | |
| | | Vgs=-4.5V, Id=-2.1A | | | 150 | 170 | | |
| Forward transconductance | Gfs | Vds=-5V, Id=-1.6A | | | 10 | | S | |
| Diode forward voltage | Vsd | Is=-1.7A, Vgs=0V | | | -0.7 | -1.3 | V | |
| Max. body-diode continuous current | Is | | | | | -1.5 | A | |
| DYNAMIC PARAMETERS | | | | | | | | |
| Input capacitance | Ciss | Vgs=0V, Vds=-15V, f=1MHz | | | 170 | | pF | |
| Output capacitance | Coss | | | | 50 | | pF | |
| Reverse transfer capacitance | Crss | | | | 30 | | pF | |
| SWITCHING PARAMETERS | | | | | | | | |
| Total gate charge | Qg | Vgs=-4.5V, Vds=-15V Id=-1.6A | | | 2.5 | | nC | |
| Gate-source charge | Qgs | | | | 0.8 | | nC | |
| Gate-drain charge | Qgd | | | | 1.0 | | nC | |
| Turn-on delay time | td(on) | Vgs=-10V, Vds=-15V Id=-1.6A, RL=7.5Ω Rgen=1.0Ω | | | 5 | 10 | ns | |
| Turn-on rise time | tr | | | | 10 | 16 | ns | |
| Turn-off delay time | td(off) | | | | 10 | 16 | ns | |
| Turn-off fall time | tf | | | | 5 | 10 | ns | |

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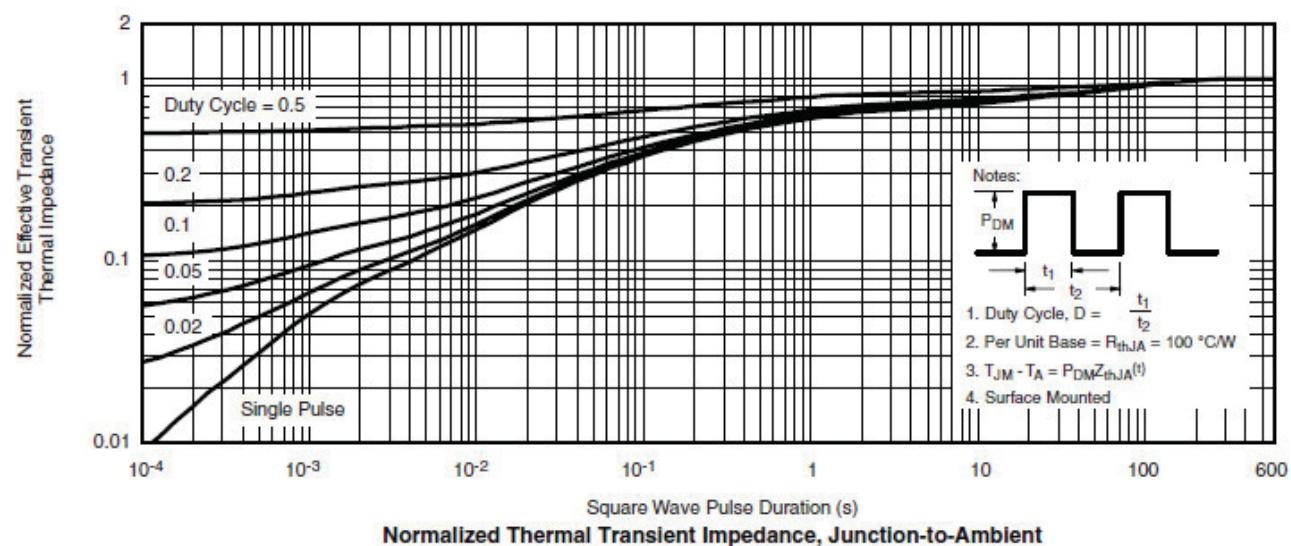
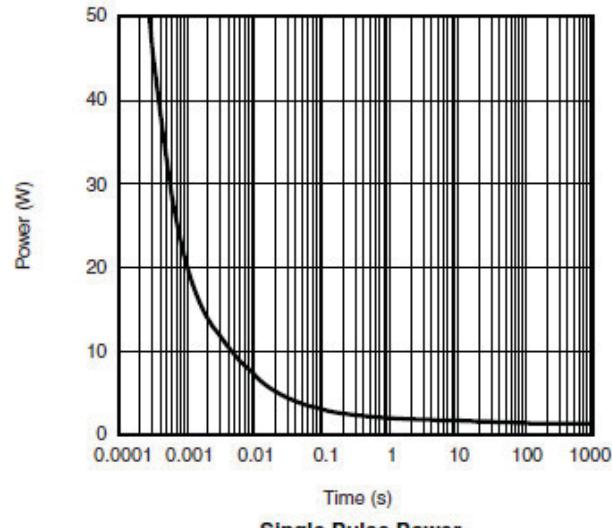
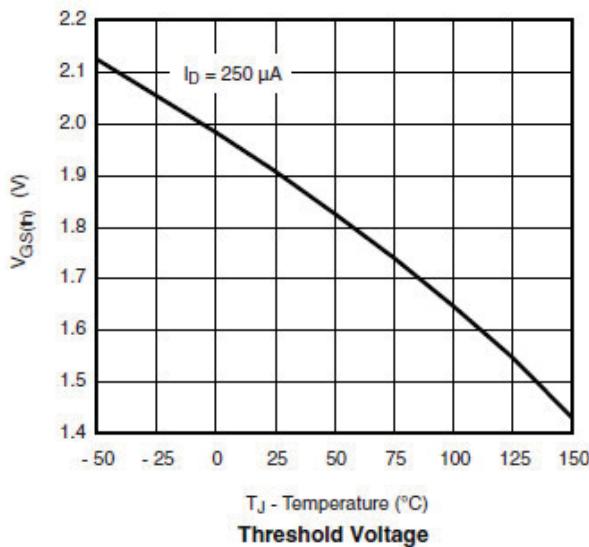
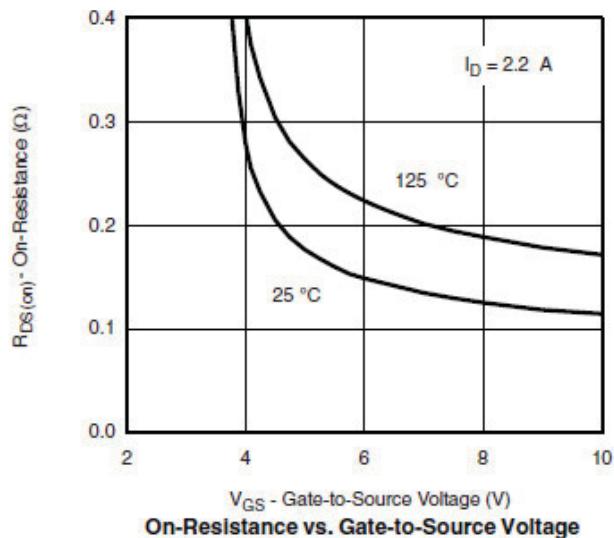
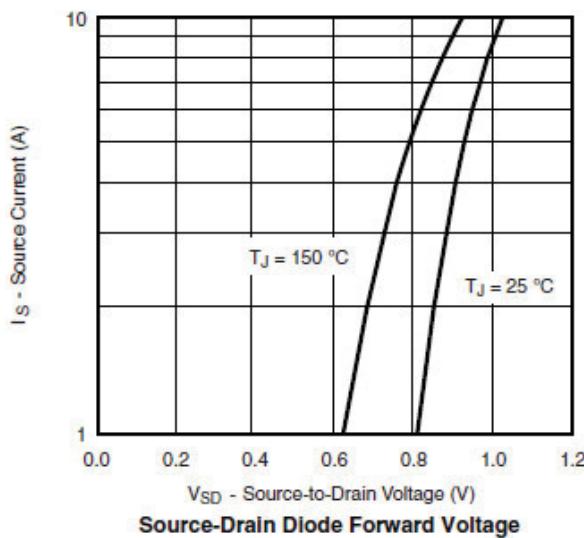
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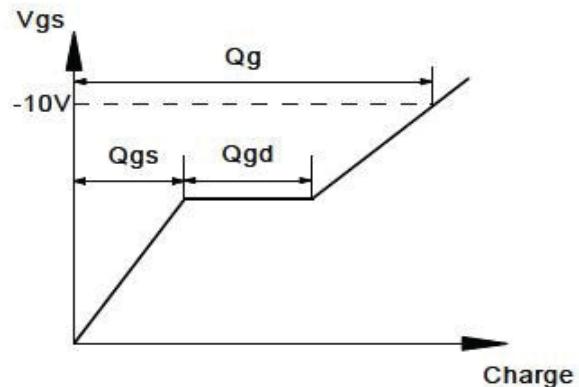
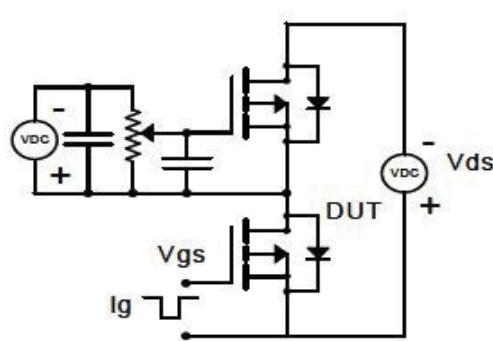
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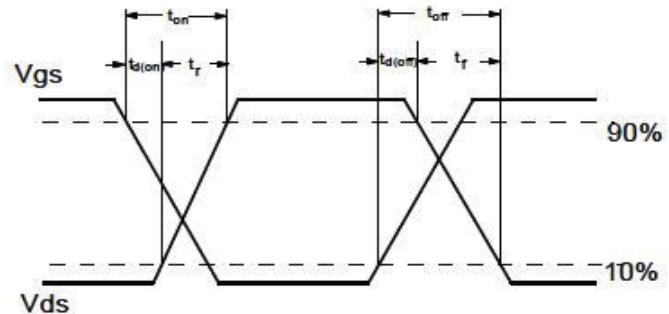
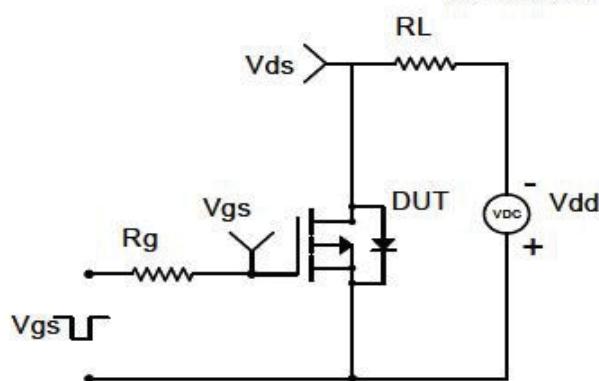
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■ Test circuit and waveform (P-ch)

Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms

