

# 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

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

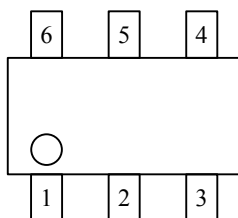
Parameter	Symbol	N-ch (Max.)	P-ch (Max.)	Unit
Drain-source voltage	$V_{ds}$	30	-30	V
Gate-source voltage	$V_{gs}$	$\pm 20$	$\pm 20$	V
Continuous drain current( $T_j=150^\circ C$ )	$I_d$	$T_a=25^\circ C$	3.5	-2.7
		$T_a=70^\circ C$	2.6	-2.1
Pulsed drain current	$I_{dm}$	15	-15	A
Power dissipation	$P_d$	$T_c=25^\circ C$	2.0	2.0
		$T_c=70^\circ C$	1.3	1.3
Operating junction temperature	$T_j$	150	150	$^\circ C$
Storage temperature range	$T_{stg}$	-55 to 150	-55 to 150	$^\circ C$

### ■ Thermal Characteristics

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

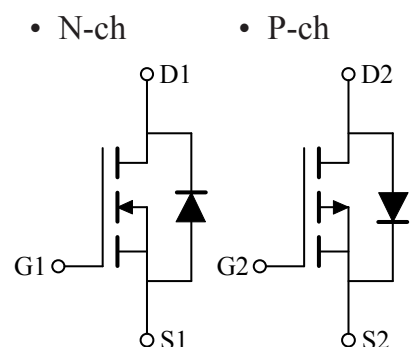
### ■ Pin configuration

SOT-26(TOP VIEW)



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

### ■ Circuit



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### ■Electrical Characteristics (N-ch)

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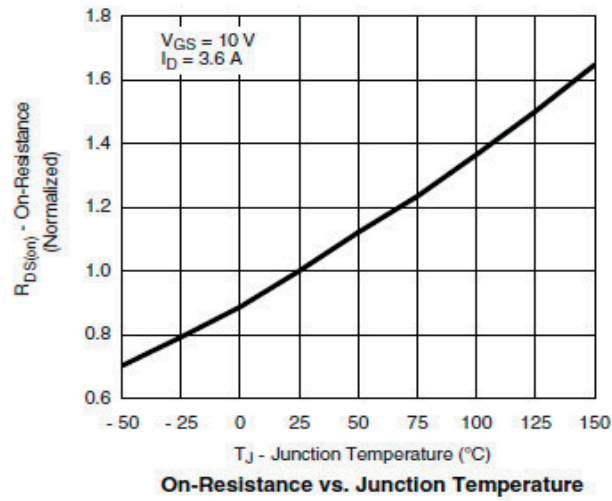
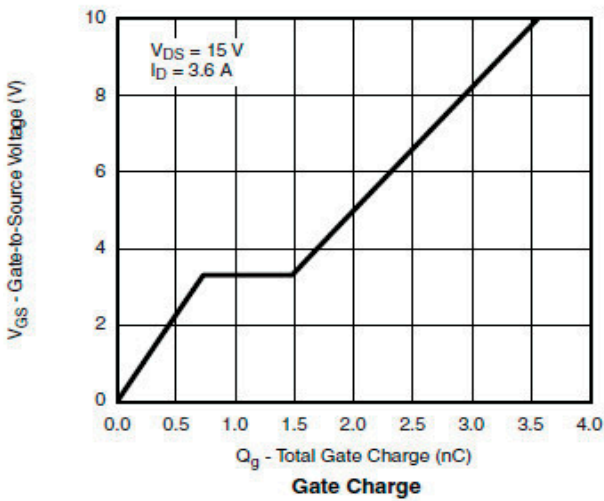
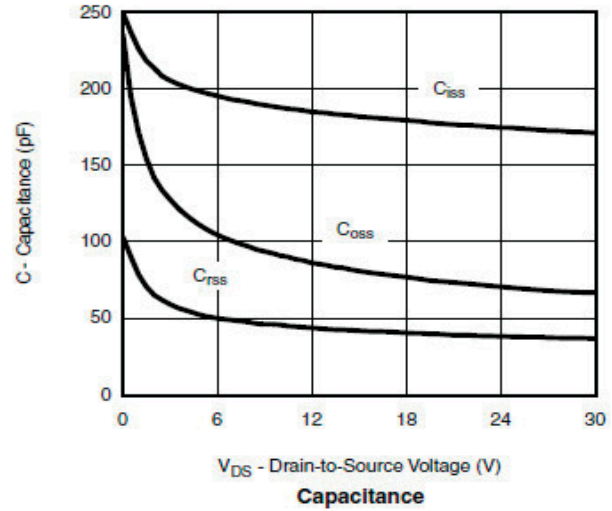
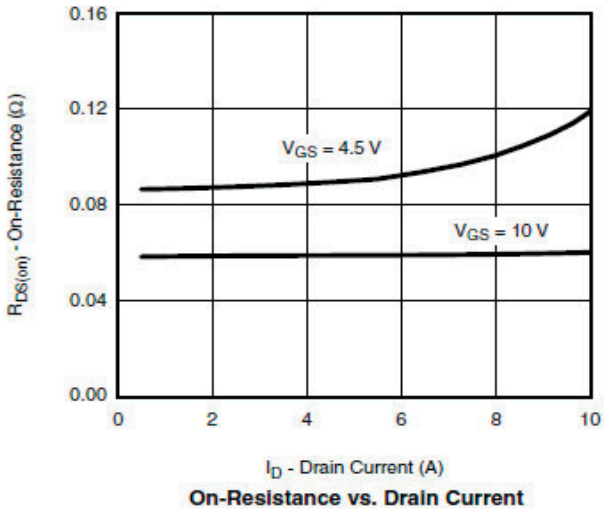
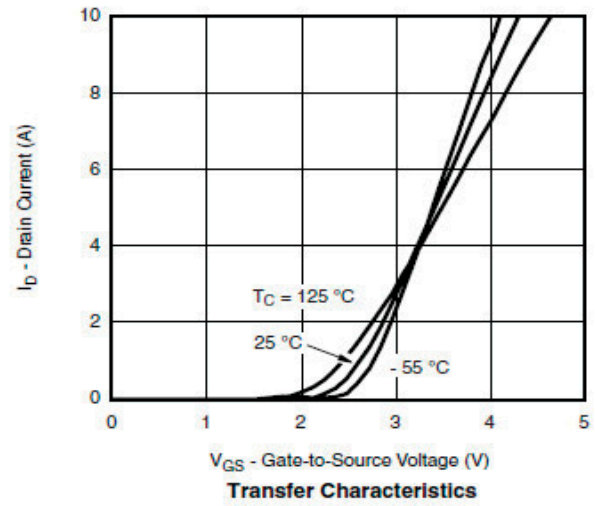
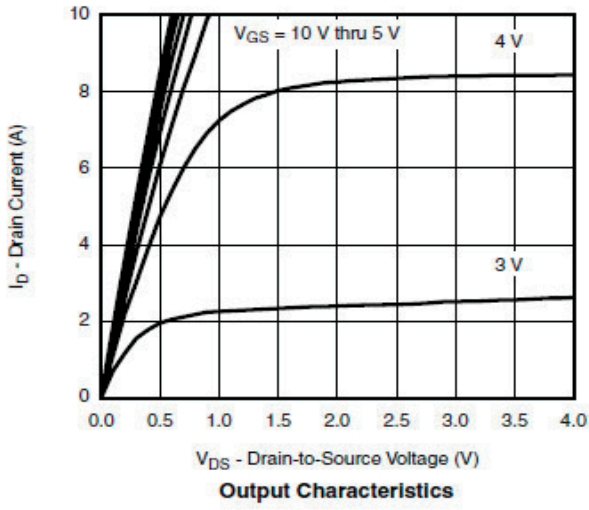
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
<b>STATIC PARAMETERS</b>						
Drain-source breakdown voltage	BVdss	Id=250μA, Vgs=0V	30			V
Zero gate voltage drain current	Idss	Vds=30V, Vgs=0V Ta=85°C			1	μA
					30	
Gate-body leakage current	Igss	Vds=0V, Vgs=±20V			±100	nA
Gate threshold voltage	Vgs(th)	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
<b>DYNAMIC PARAMETERS</b>						
Input capacitance	Ciss	Vgs=0V, Vds=15V, f=1MHz		230		pF
Output capacitance	Coss			50		pF
Reverse transfer capacitance	Crss			20		pF
<b>SWITCHING PARAMETERS</b>						
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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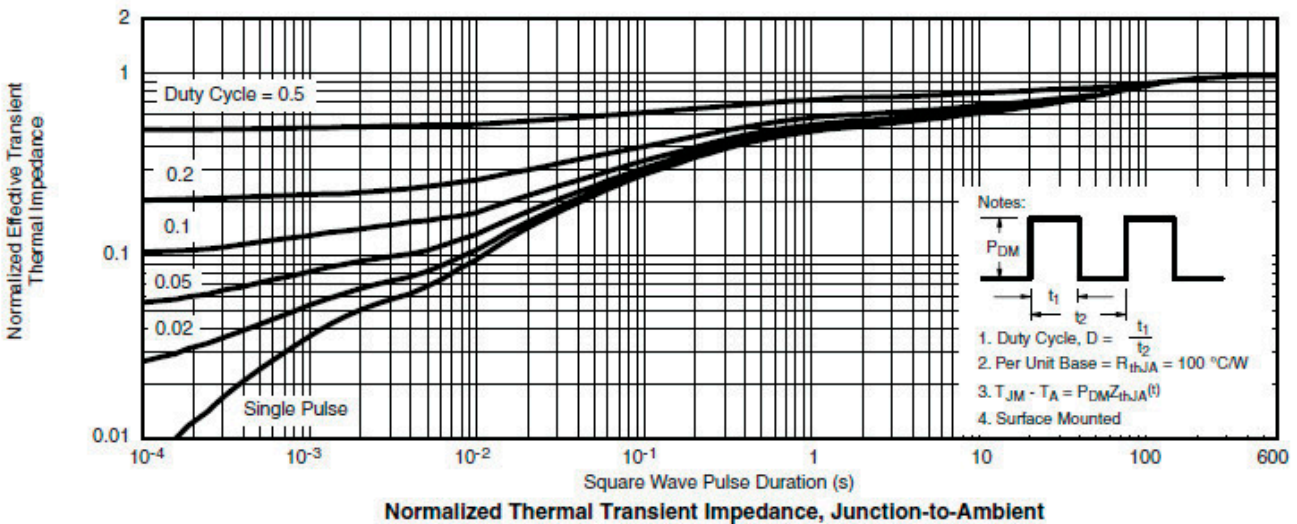
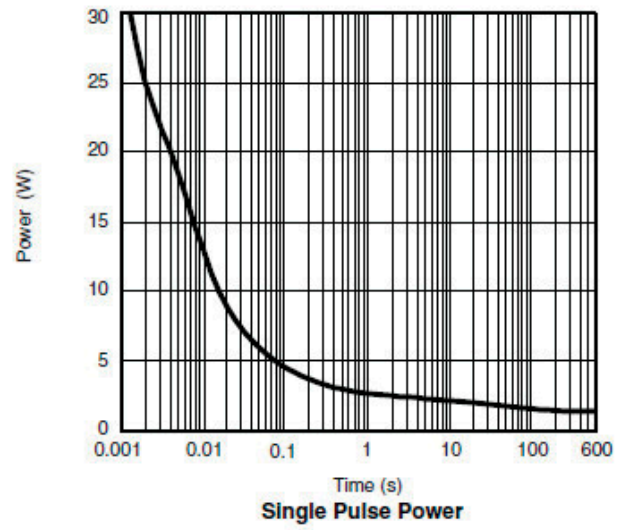
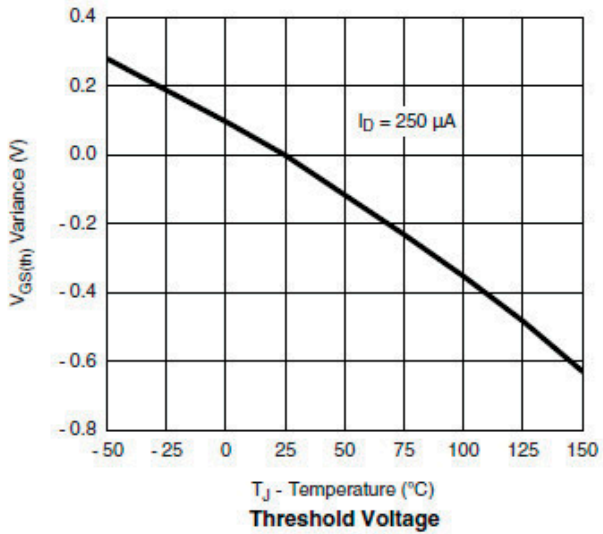
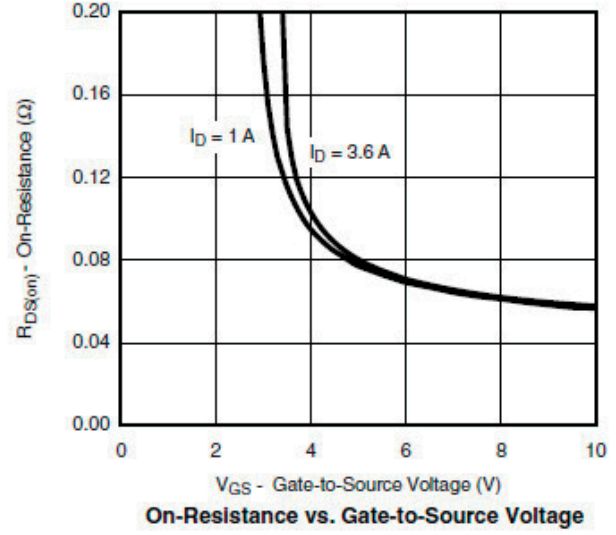
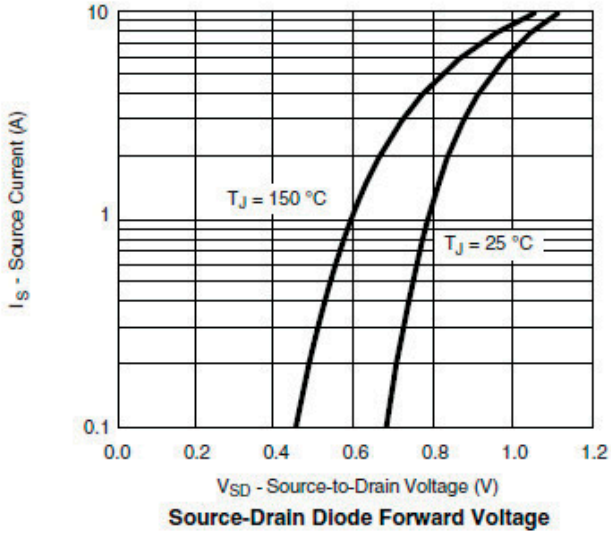
### ■ Typical Electrical and Thermal Characteristics (N-ch)



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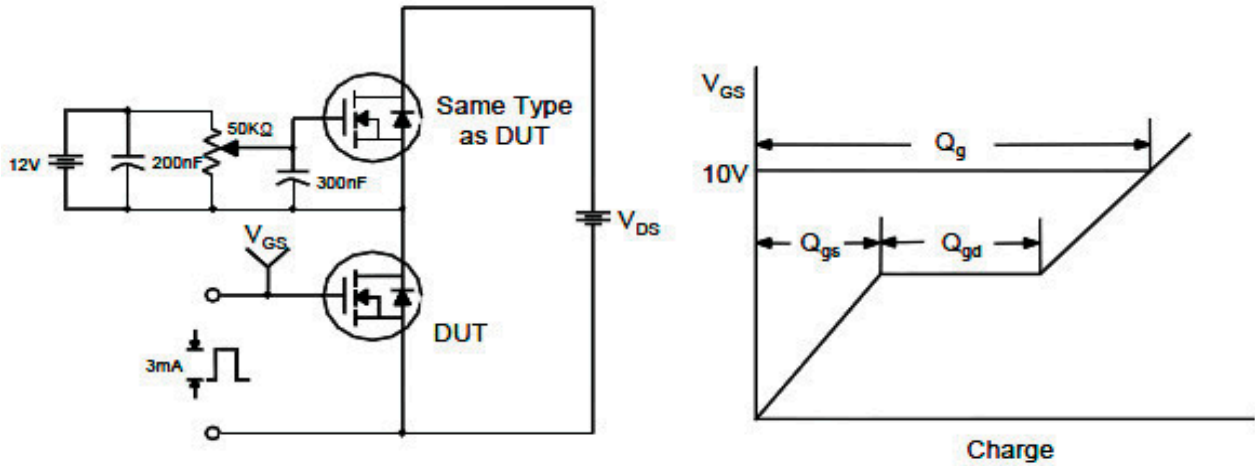
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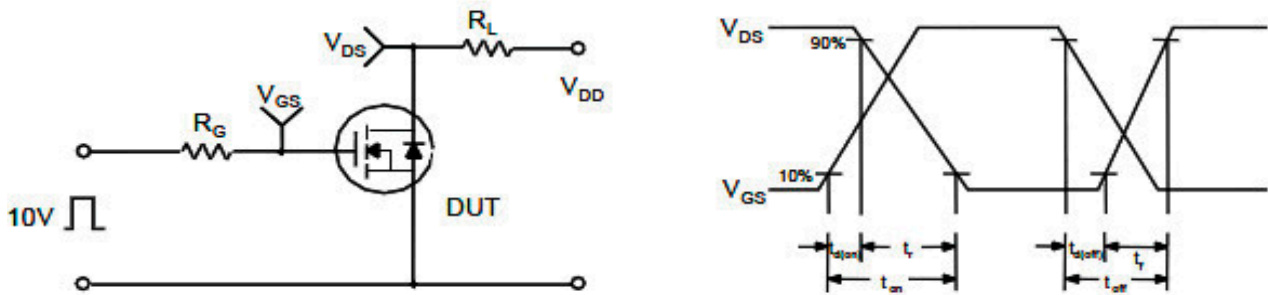
<http://www.elm-tech.com>

## ■ Test circuit and waveform (N-ch)

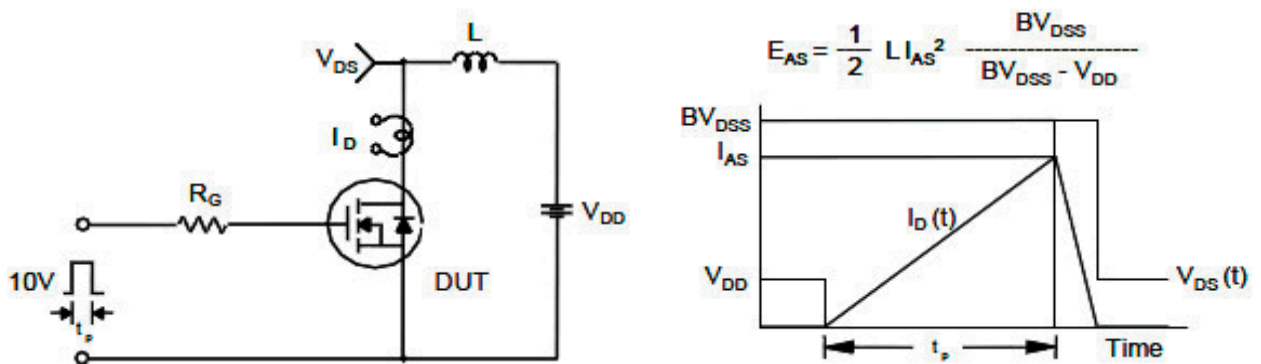
Gate Charge Test Circuit & Waveform



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.

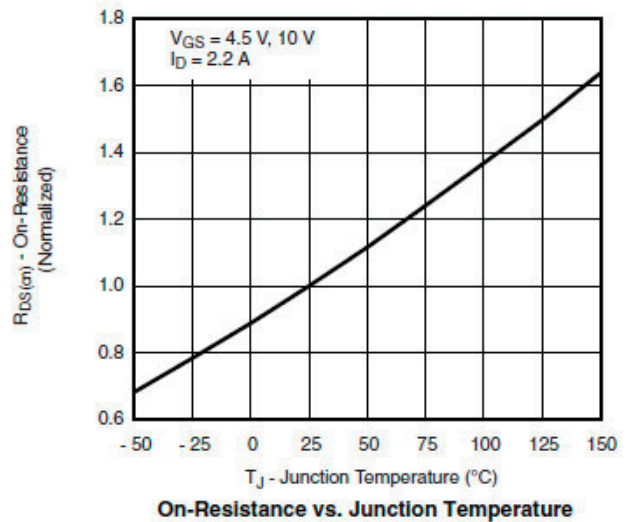
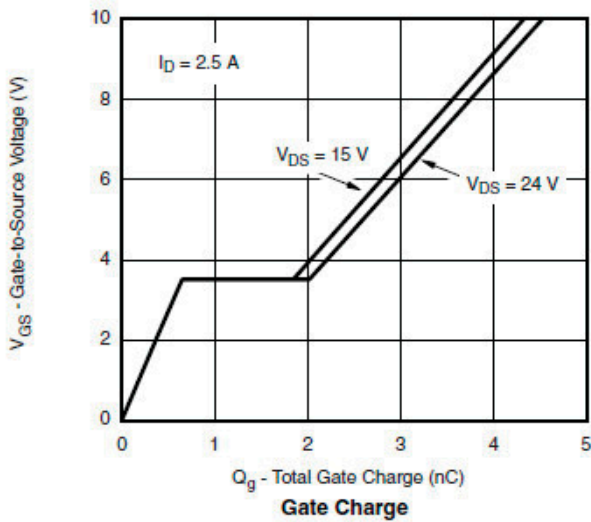
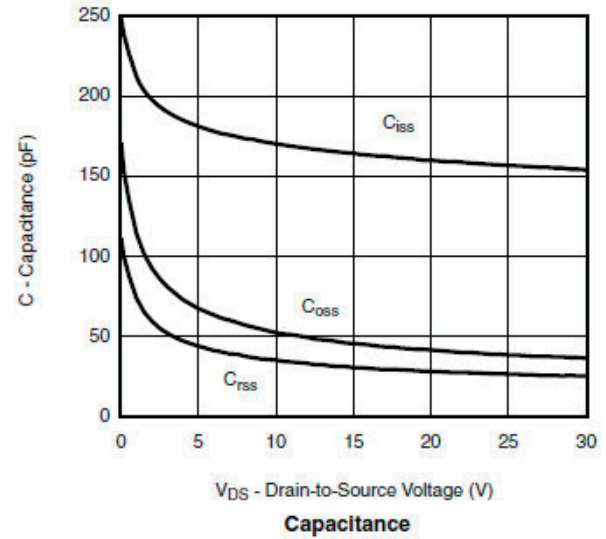
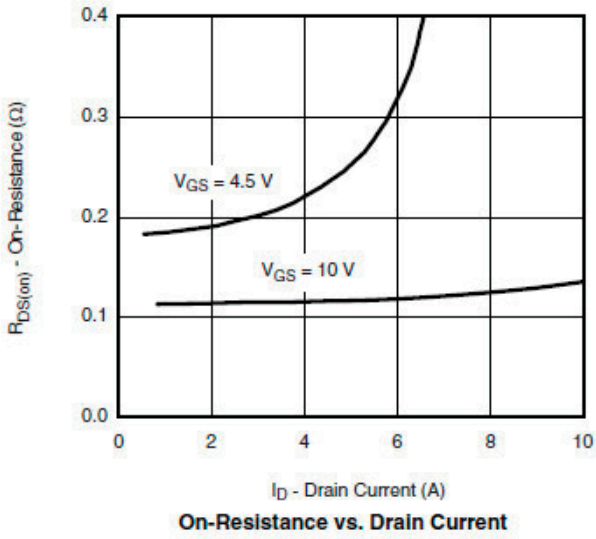
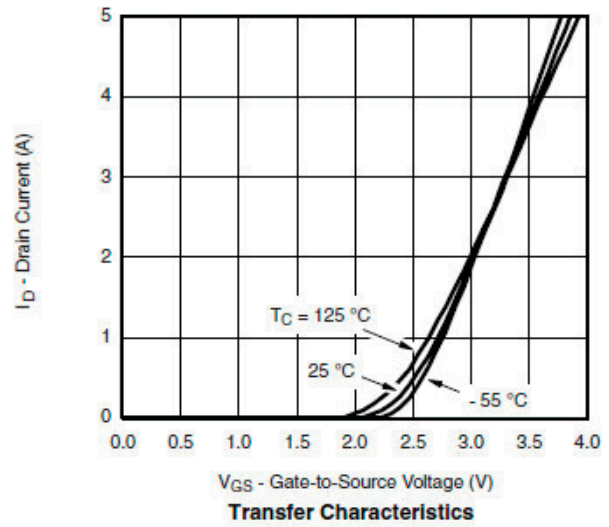
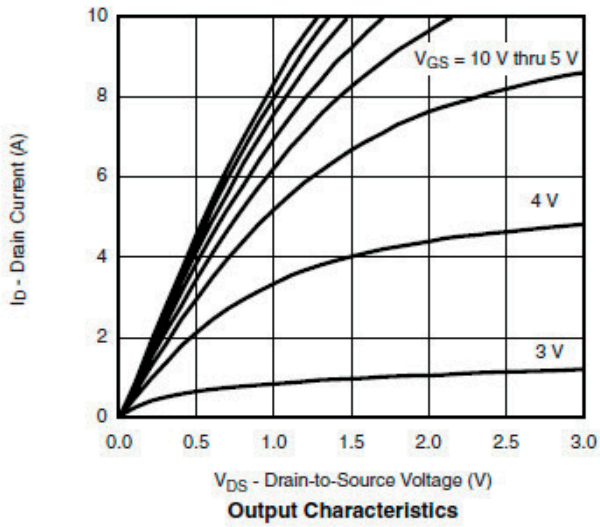
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
<b>STATIC PARAMETERS</b>						
Drain-source breakdown voltage	BVdss	Id=-250μA, Vgs=0V	-30			V
Zero gate voltage drain current	Idss	Vds=-24V, Vgs=0V Ta=85°C			-1	μA
					-30	
Gate-body leakage current	Igss	Vds=0V, Vgs=±20V			±100	nA
Gate threshold voltage	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
<b>DYNAMIC PARAMETERS</b>						
Input capacitance	Ciss	Vgs=0V, Vds=-15V, f=1MHz		170		pF
Output capacitance	Coss			50		pF
Reverse transfer capacitance	Crss			30		pF
<b>SWITCHING PARAMETERS</b>						
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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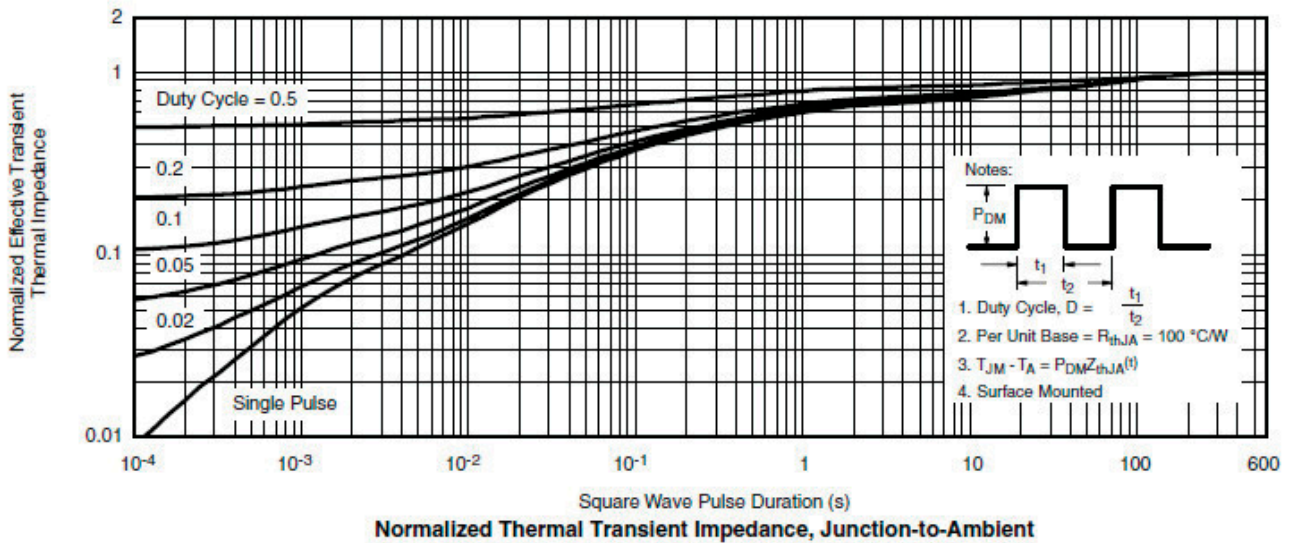
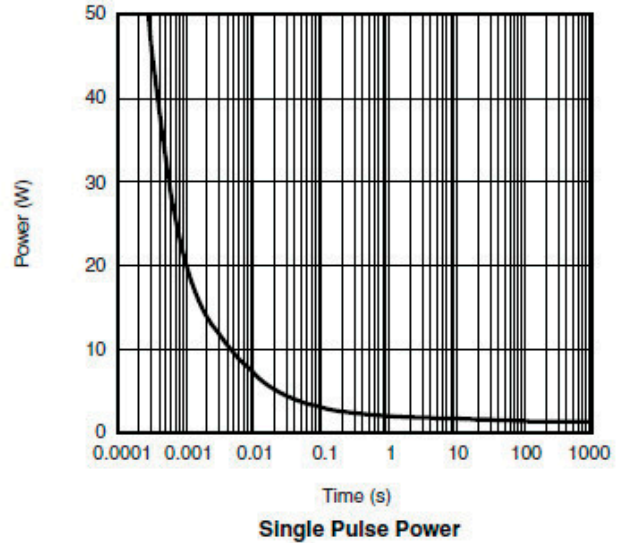
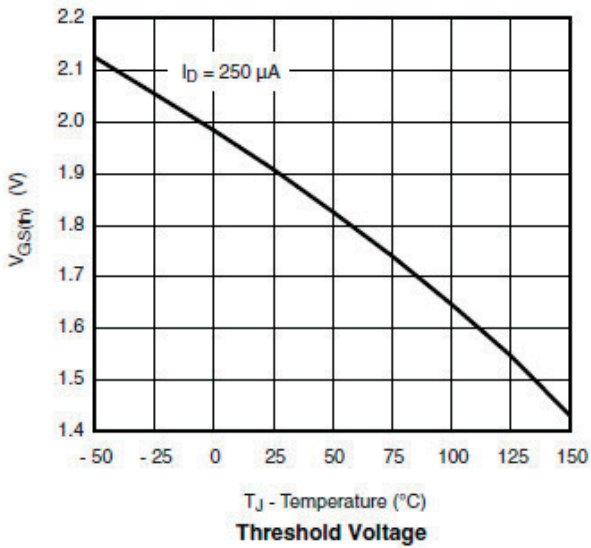
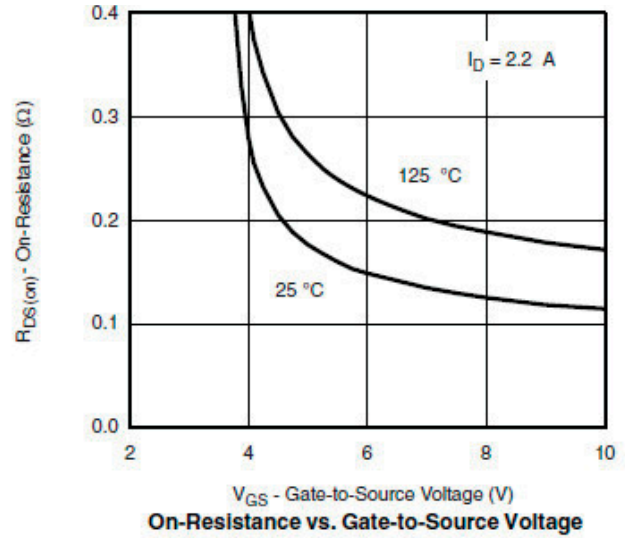
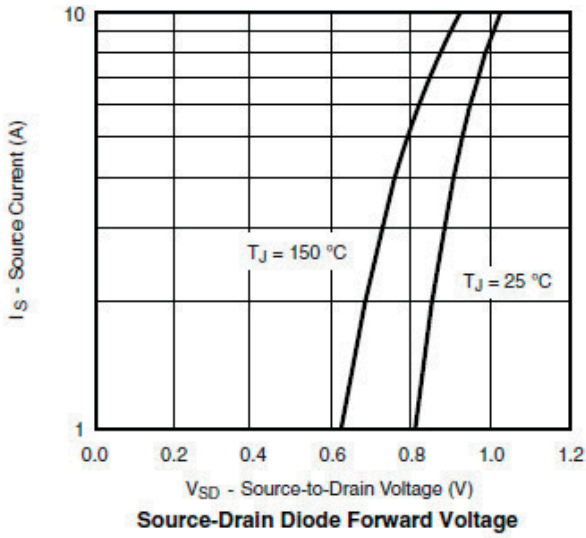
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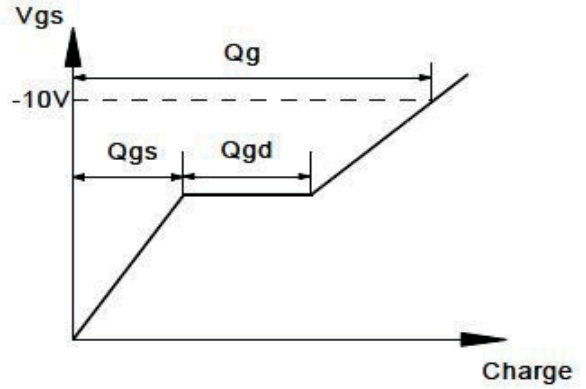
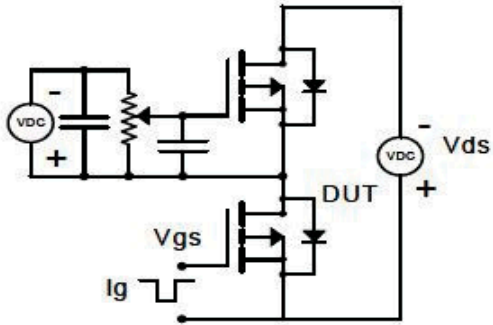
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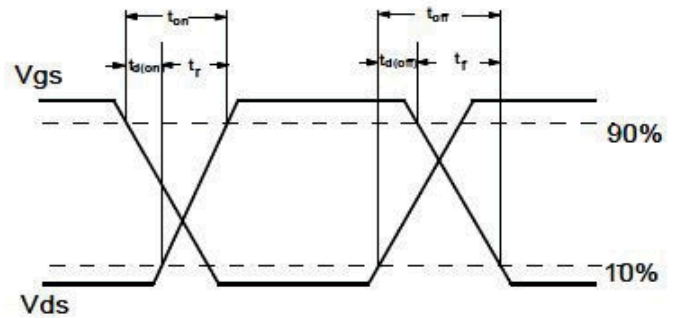
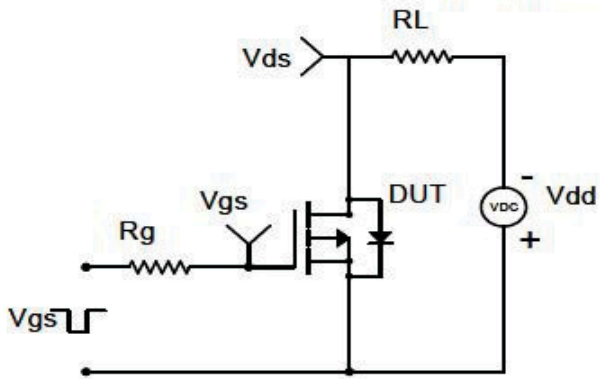
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## ■ Test circuit and waveform (P-ch)

Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms

