

# Complementary MOSFET

## ELM54569CWSA-N

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

### General Description

ELM54569CWSA-N uses advanced trench technology to provide excellent Rds(on) and low gate charge.

### Features

- |                          |                           |
|--------------------------|---------------------------|
| N-channel                | P-channel                 |
| • Vds=60V                | • Vds=-60V                |
| • Id=8.0A                | • Id=-8.0A                |
| • Rds(on)=36mΩ(Vgs=10V)  | • Rds(on)=60mΩ(Vgs=-10V)  |
| • Rds(on)=40mΩ(Vgs=4.5V) | • Rds(on)=72mΩ(Vgs=-4.5V) |

### Maximum Absolute Ratings

Ta=25°C. Unless otherwise noted.

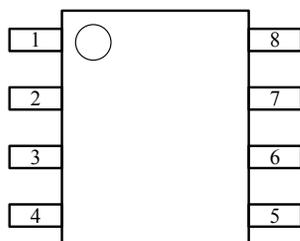
Parameter	Symbol	N-ch (Max.)	P-ch (Max.)	Unit	
Drain-source voltage	Vds	60	-60	V	
Gate-source voltage	Vgs	±20	±20	V	
Continuous drain current(Tj=150°C)	Id	Ta=25°C	8.0	-8.0	A
		Ta=70°C	6.0	-6.0	
Pulsed drain current	Idm	20	-20	A	
Power dissipation	Pd	Tc=25°C	2.8	2.8	W
		Tc=70°C	1.8	1.8	
Operating junction temperature	Tj	150	150	°C	
Storage temperature range	Tstg	-55 to 150	-55 to 150	°C	

### Thermal Characteristics

Parameter	Symbol	Device	Typ.	Max.	Unit
Thermal resistance junction-to-ambient	Rθja	N-ch		62.5	°C/W
Thermal resistance junction-to-ambient	Rθja	P-ch		62.5	°C/W

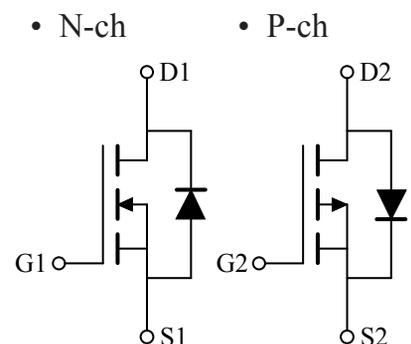
### Pin configuration

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)

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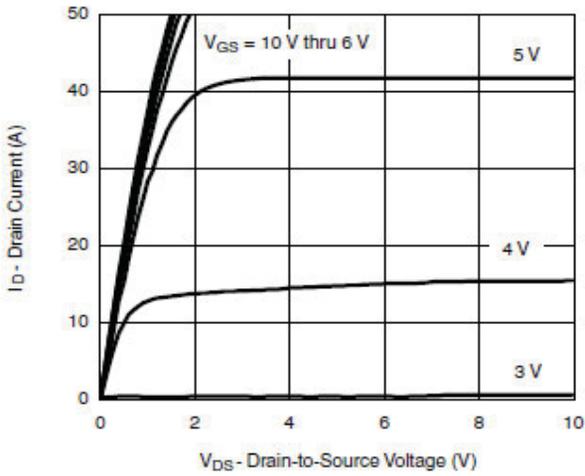
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
<b>STATIC PARAMETERS</b>						
Drain-source breakdown voltage	BVdss	Id=250μA, Vgs=0V	60			V
Zero gate voltage drain current	Idss	Vds=48V, Vgs=0V Ta=85°C			1	μA
					5	
Gate-body leakage current	Igss	Vds=0V, Vgs=±20V			±100	nA
Gate threshold voltage	Vgs(th)	Vds=Vgs, Id=250μA	1.0		2.0	V
On state drain current	Id(on)	Vgs=10V, Vds≥5V	20			A
Static drain-source on-resistance	Rds(on)	Vgs=10V, Id=8.0A		28	36	mΩ
		Vgs=4.5V, Id=6.0A		32	40	
Forward transconductance	Gfs	Vds=15V, Id=15A		20		S
Diode forward voltage	Vsd	Is=2.0A, 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=25V, f=1MHz		680		pF
Output capacitance	Coss			150		pF
Reverse transfer capacitance	Crss			60		pF
<b>SWITCHING PARAMETERS</b>						
Total gate charge	Qg	Vgs=4.5V, Vds=30V, Id=8A		6.5	13.0	nC
Gate-source charge	Qgs			3.0		nC
Gate-drain charge	Qgd			3.0		nC
Turn-on delay time	td(on)	Vgs=10V, Vds=30V, Id=8A RL=1.3Ω, Rgen=6.0Ω		8	15	ns
Turn-on rise time	tr			15	30	ns
Turn-off delay time	td(off)			30	60	ns
Turn-off fall time	tf			25	50	ns

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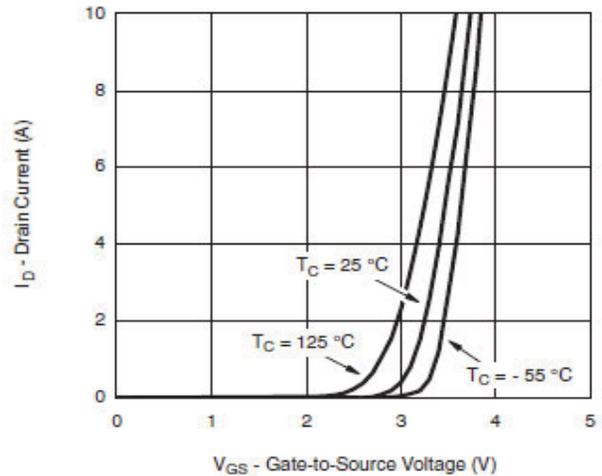
## ELM54569CWSA-N

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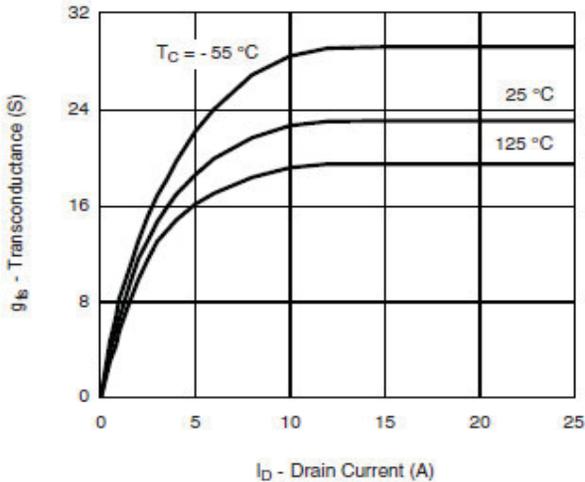
### ■ Typical Electrical and Thermal Characteristics (N-ch)



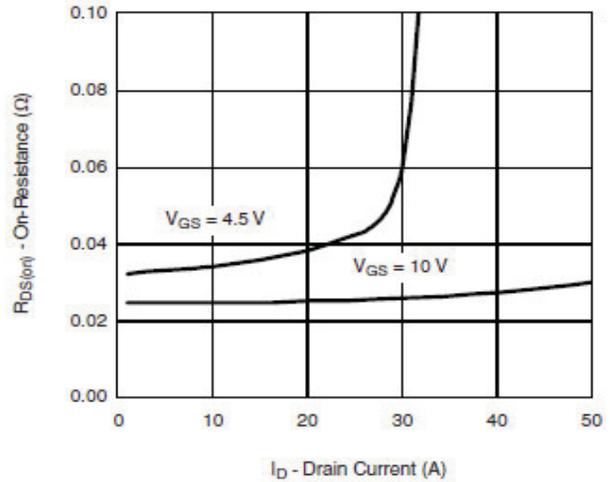
Output Characteristics



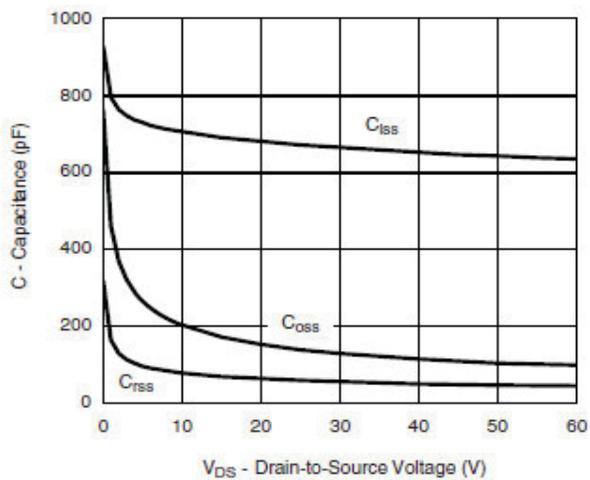
Transfer Characteristics



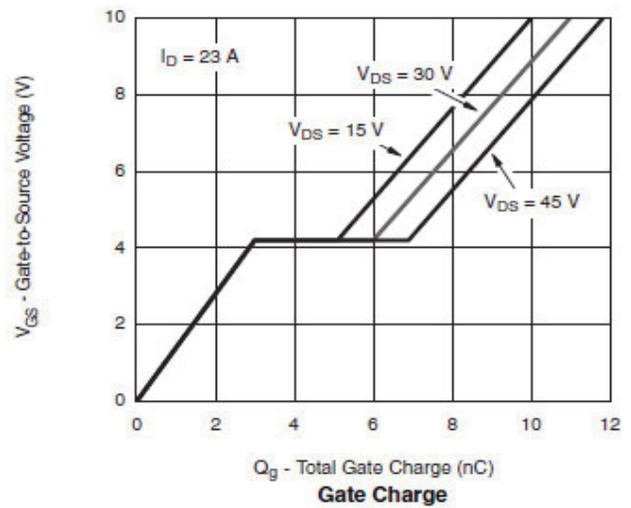
Transconductance



On-Resistance vs. Drain Current



Capacitance

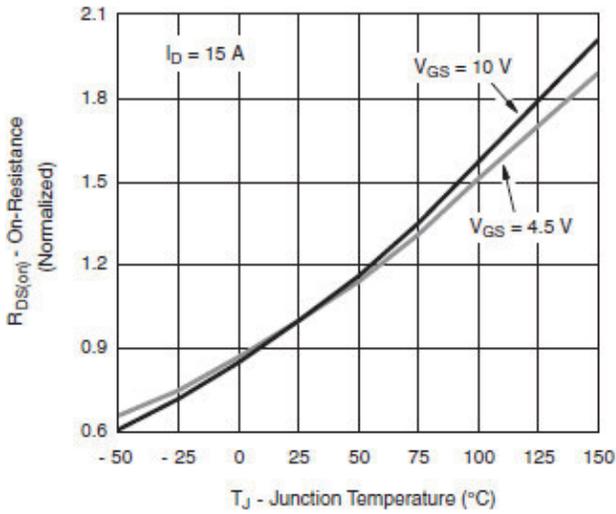


Gate Charge

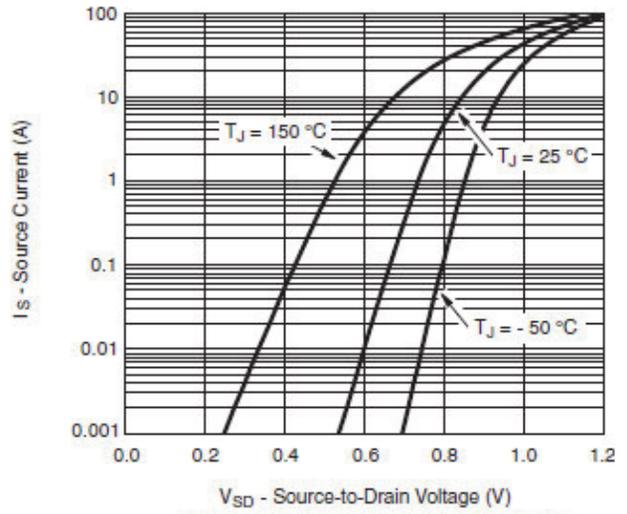
# Complementary MOSFET

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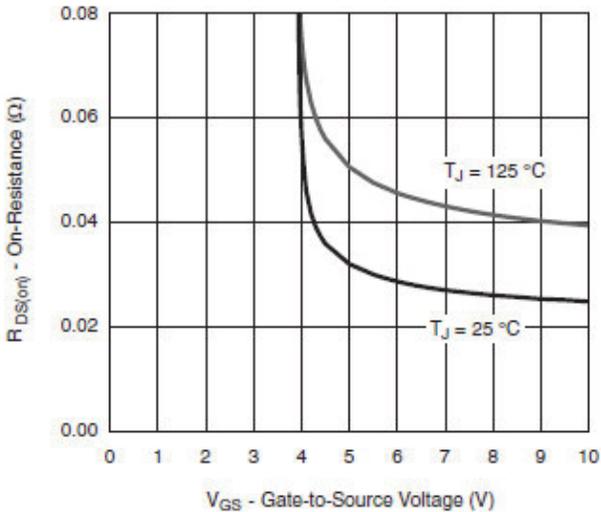
<http://www.elm-tech.com>



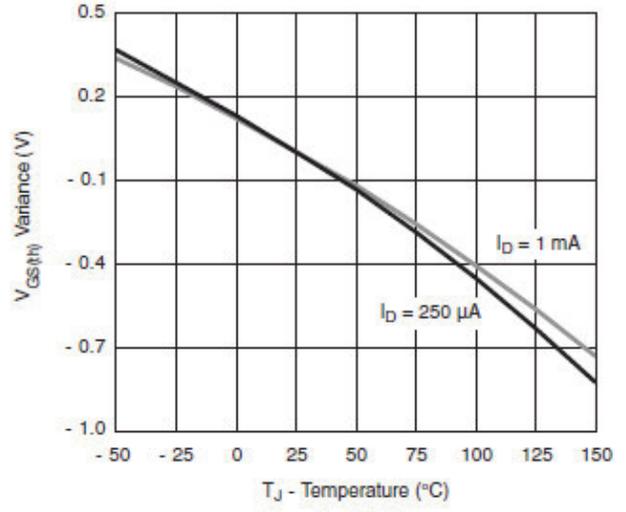
**On-Resistance vs. Junction Temperature**



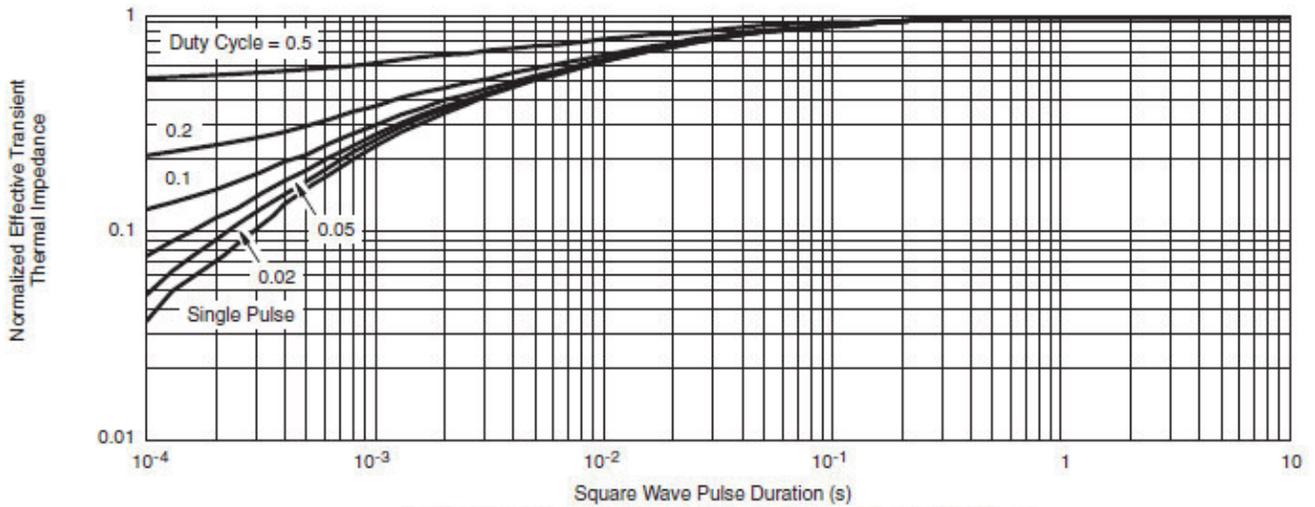
**Source-Drain Diode Forward Voltage**



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



**Threshold Voltage**



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

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### ■Electrical Characteristics (P-ch)

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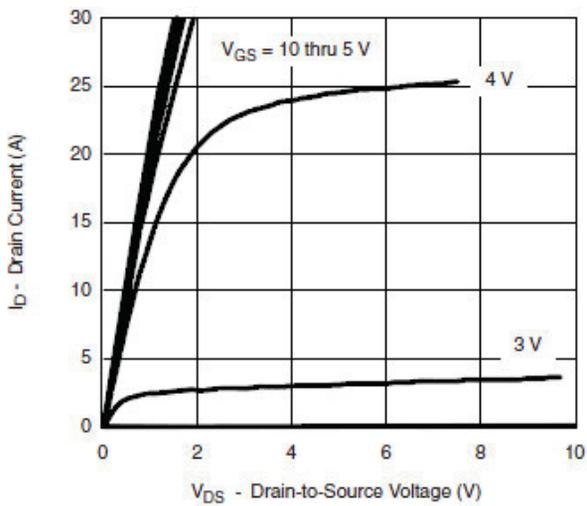
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
<b>STATIC PARAMETERS</b>						
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Zero gate voltage drain current	Idss	Vds=-48V, Vgs=0V Ta=85°C			-1	μA
					-20	
Gate-body leakage current	Igss	Vds=0V, Vgs=±20V			±100	nA
Gate threshold voltage	Vgs(th)	Vds=Vgs, Id=-250μA	-1.0		-2.5	V
On state drain current	Id(on)	Vgs=-10V, Vds≥-5V	-20			A
Static drain-source on-resistance	Rds(on)	Vgs=-10V, Id=-8.0A		52	60	mΩ
		Vgs=-4.5V, Id=-6.0A		61	72	
Forward transconductance	Gfs	Vds=-15V, Id=-3.2A		12		S
Diode forward voltage	Vsd	Is=-3.0A, 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=-25V, f=1MHz		1200	2000	pF
Output capacitance	Coss			140		pF
Reverse transfer capacitance	Crss			90		pF
<b>SWITCHING PARAMETERS</b>						
Total gate charge	Qg	Vgs=-10V, Vds=-30V Id≐-8.0A		25	40	nC
Gate-source charge	Qgs			5		nC
Gate-drain charge	Qgd			8		nC
Turn-on delay time	td(on)	Vgs=-10V, Vds=-30V Id≐-8.0A, RL=3Ω, Rgen=2.5Ω		10	20	ns
Turn-on rise time	tr			10	20	ns
Turn-off delay time	td(off)			45	80	ns
Turn-off fall time	tf			25	40	ns

# Complementary MOSFET

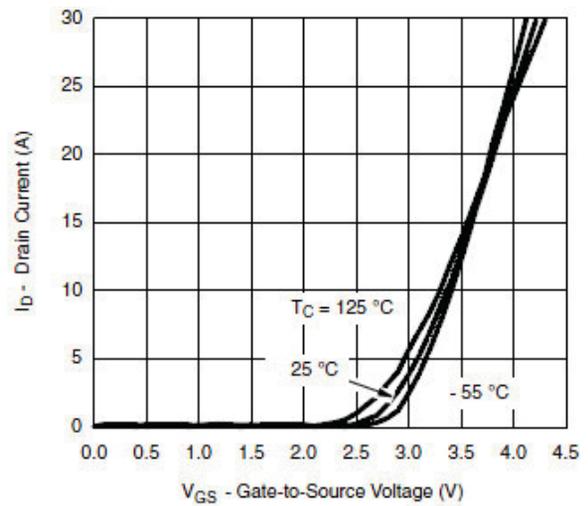
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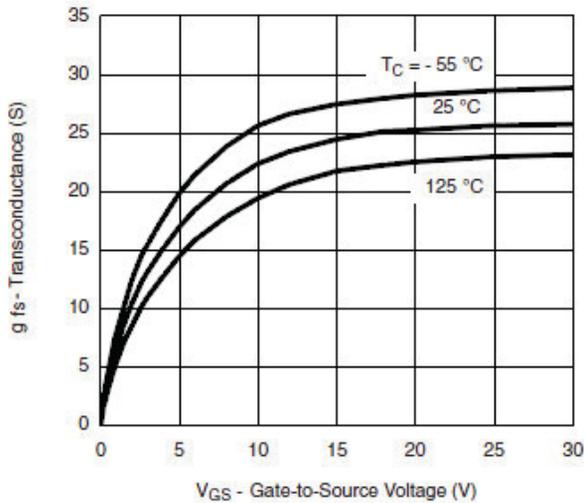
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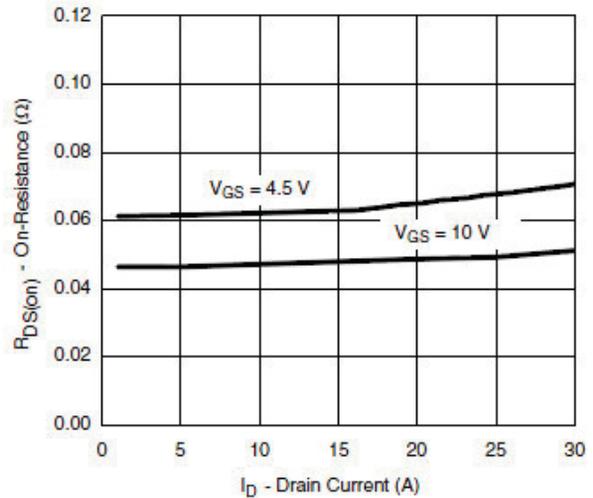
**Output Characteristics**



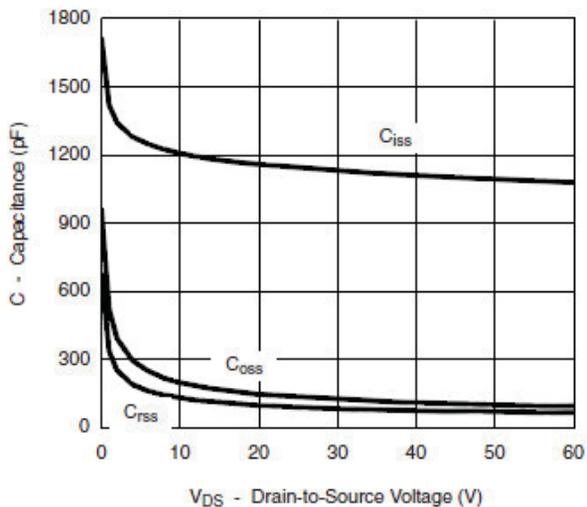
**Transfer Characteristics**



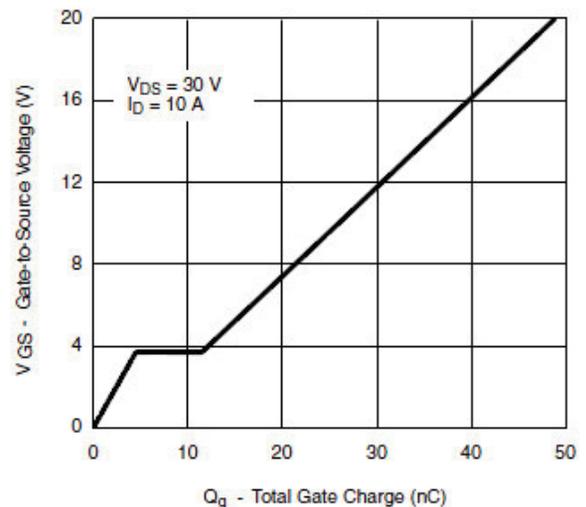
**Transconductance**



**On-Resistance vs. Drain Current**



**Capacitance**

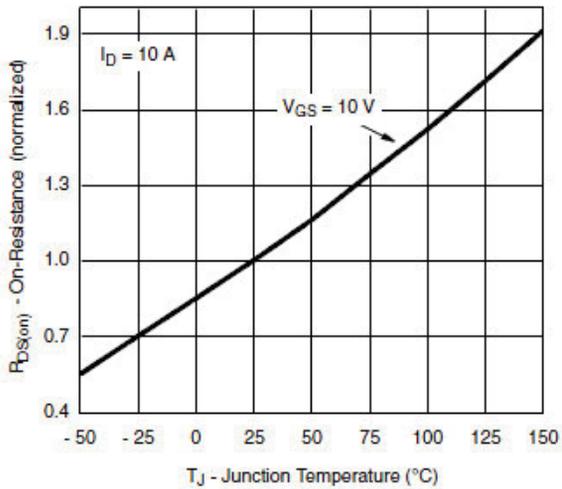


**Gate Charge**

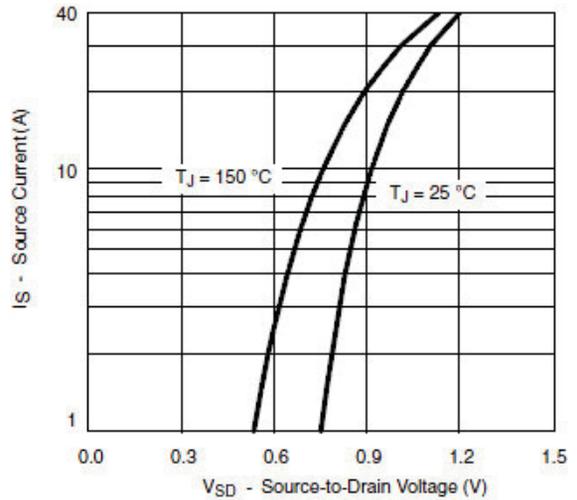
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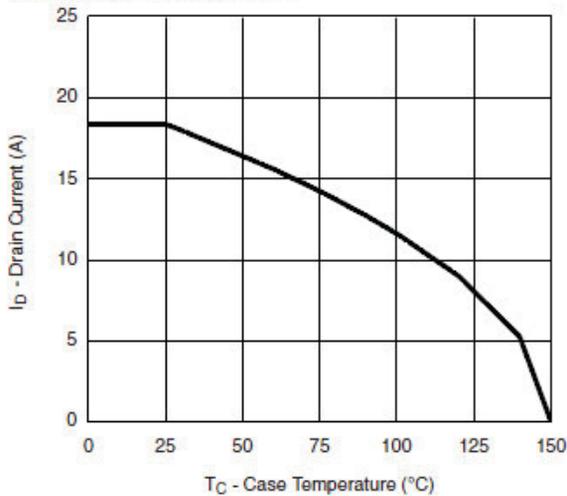


On-Resistance vs. Junction Temperature

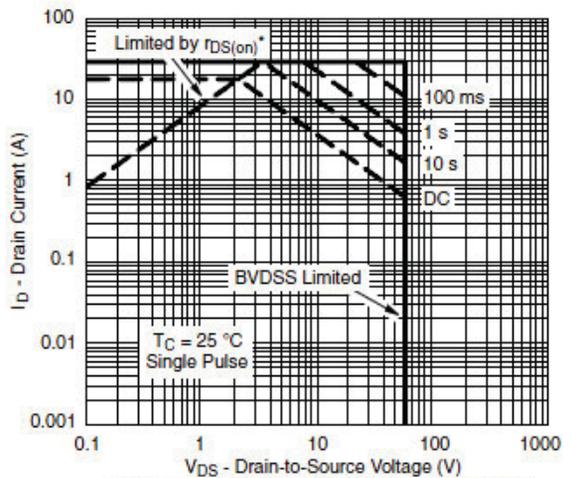


Source-Drain Diode Forward Voltage

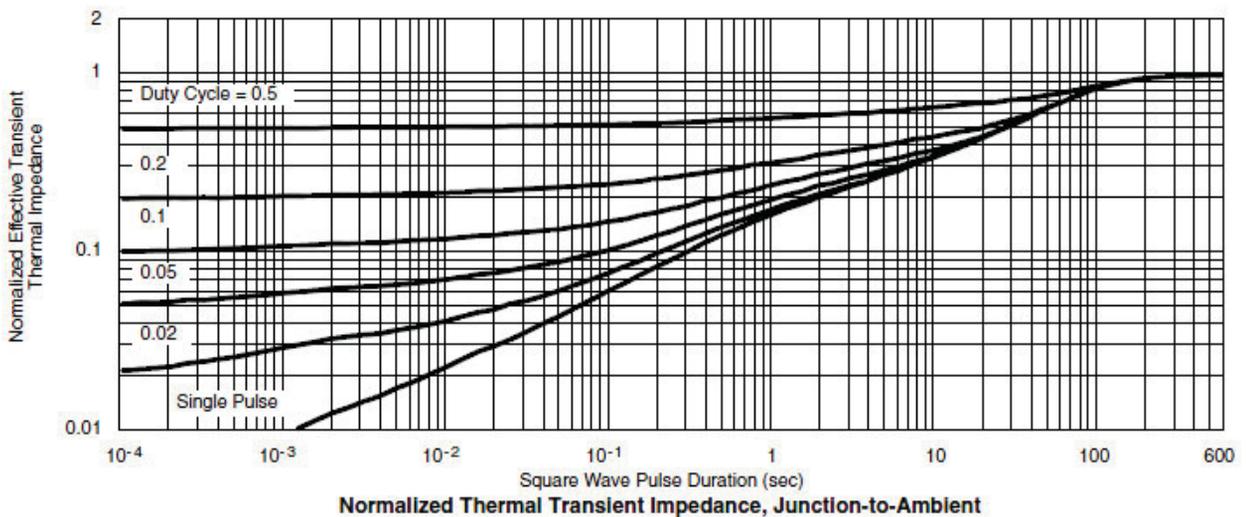
### THERMAL RATINGS



Maximum Drain Current vs. Case Temperature



\*  $V_{GS} >$  minimum  $V_{GS}$  at which  $r_{DS(on)}$  is specified  
Safe Operating Area



Normalized Thermal Transient Impedance, Junction-to-Ambient

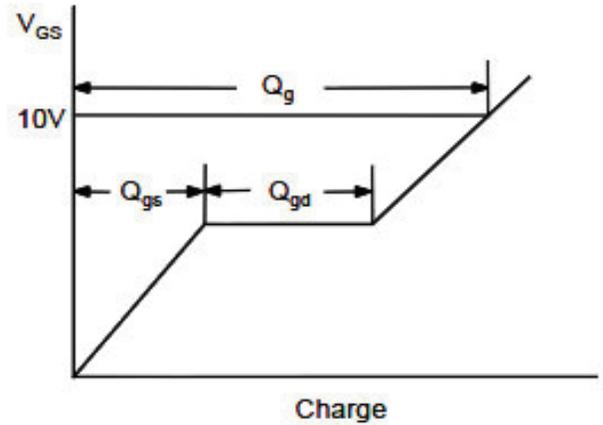
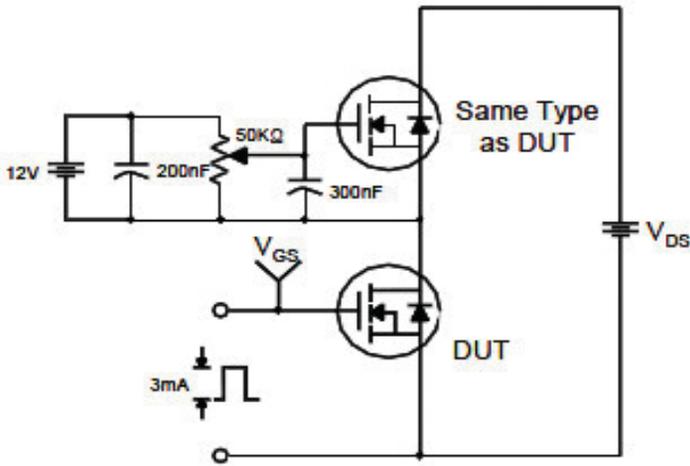
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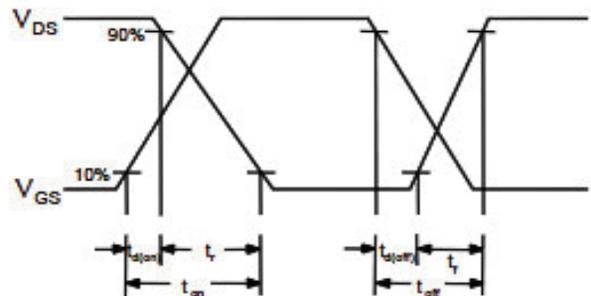
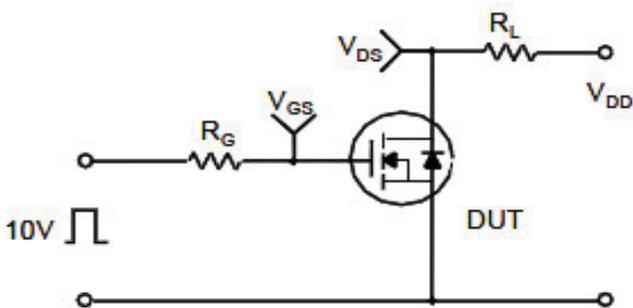
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## ■ Test circuit and waveform

Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching Test Circuit & Waveforms

