

# Complementary MOSFET (common drain)

## ELM55616CA-S

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

### ■ General description

ELM55616CA-S uses advanced trench technology to provide excellent  $R_{ds(on)}$ , low gate charge and low gate threshold voltage.

### ■ Features

- |   |  |
|---|--|
| N-channel                               | P-channel                                |
| • $V_{ds}=60V$                          | • $V_{ds}=-60V$                          |
| • $I_d=7.0A$                            | • $I_d=-7.0A$                            |
| • $R_{ds(on)} = 34m\Omega(V_{gs}=10V)$  | • $R_{ds(on)} = 56m\Omega(V_{gs}=-10V)$  |
| • $R_{ds(on)} = 40m\Omega(V_{gs}=4.5V)$ | • $R_{ds(on)} = 68m\Omega(V_{gs}=-4.5V)$ |

### ■ Maximum absolute ratings

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

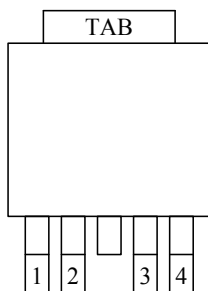
Parameter	Symbol	N-ch (Max.)	P-ch (Max.)	Unit	
Drain-source voltage	$V_{ds}$	60	-60	V	
Gate-source voltage	$V_{gs}$	$\pm 20$	$\pm 20$	V	
Continuous drain current( $T_j=150^\circ C$ )	$I_d$	$T_a=25^\circ C$	7.0	-7.0	A
		$T_a=70^\circ C$	6.0	-6.0	
Pulsed drain current	$I_{dm}$	30	-30	A	
Power dissipation	$P_d$	$T_c=25^\circ C$	2.8	2.8	W
		$T_c=70^\circ C$	1.8	1.8	
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
Thermal resistance junction-to-ambient	$R_{\theta ja}$	N-ch		62.5	$^\circ C/W$
Thermal resistance junction-to-ambient	$R_{\theta ja}$	P-ch		62.5	$^\circ C/W$

### ■ Pin configuration

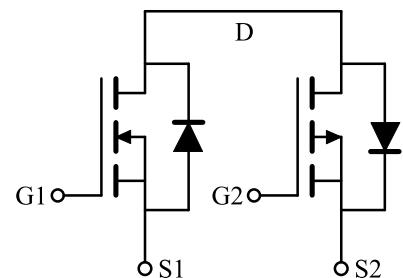
TO-252-4(TOP VIEW)



Pin No.	Pin name
1	SOURCE1
2	GATE1
3	SOURCE2
4	GATE2
TAB	DRAIN1/DRAIN2

### ■ Circuit

- N-ch
- P-ch



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### ■Electrical characteristics (N-ch)

Ta=25°C. Unless otherwise noted.

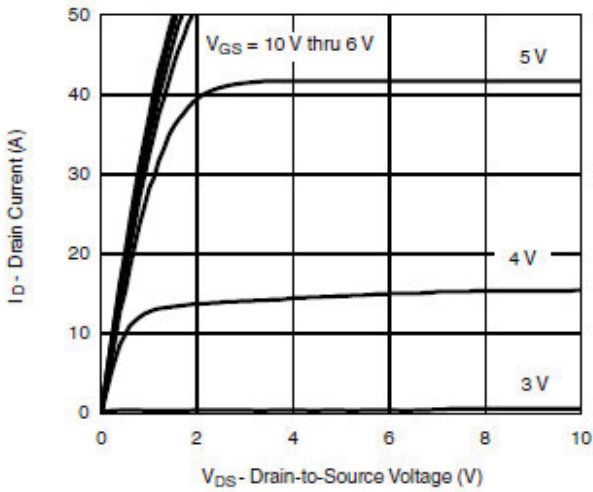
Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
<b>STATIC PARAMETERS</b>						
Drain-source breakdown voltage	BVdss	Id=250μA, Vgs=0V	60			V
Zero gate voltage drain current	Idss	Vds=60V, Vgs=0V Ta=85°C			1	μA
					5	
Gate-body leakage current	Igss	Vds=0V, Vgs=±20V			±100	nA
Gate threshold voltage	Vgs(th)	Vds=Vgs, Id=250μA	1.0		2.5	V
On state drain current	Id(on)	Vgs=4.5V, Vds≥5V	30			A
Static drain-source on-resistance	Rds(on)	Vgs=10V, Id=7.0A		25	34	mΩ
		Vgs=4.5V, Id=6.0A		30	40	
Forward transconductance	Gfs	Vds=15V, Id=5.3A		24		S
Diode forward voltage	Vsd	Is=2A, 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		700		pF
Output capacitance	Coss			150		pF
Reverse transfer capacitance	Crss			70		pF
<b>SWITCHING PARAMETERS</b>						
Total gate charge	Qg	Vgs=4.5V, Vds=30V Id≐23.0A		7.0	15.0	nC
Gate-source charge	Qgs			3.2		nC
Gate-drain charge	Qgd			3.2		nC
Turn-on delay time	td(on)	Vgs=10V, Vds=30V RL=1.3Ω, Id≐23.0A Rgen=1.0Ω		10	20	ns
Turn-on rise time	tr			15	30	ns
Turn-off delay time	td(off)			30	65	ns
Turn-off fall time	tf			25	50	ns

# Complementary MOSFET (common drain)

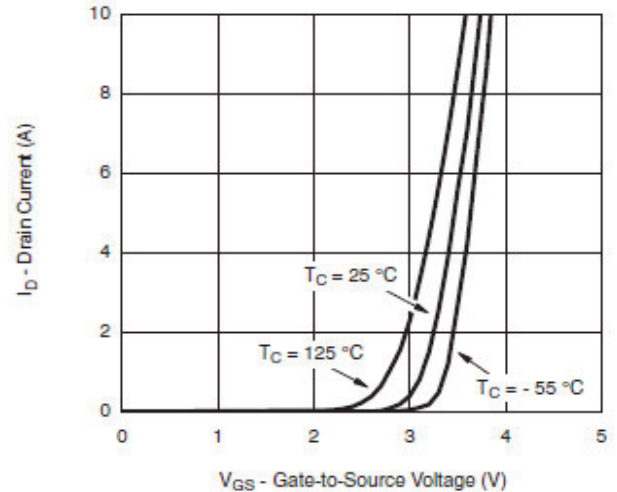
ELM55616CA-S

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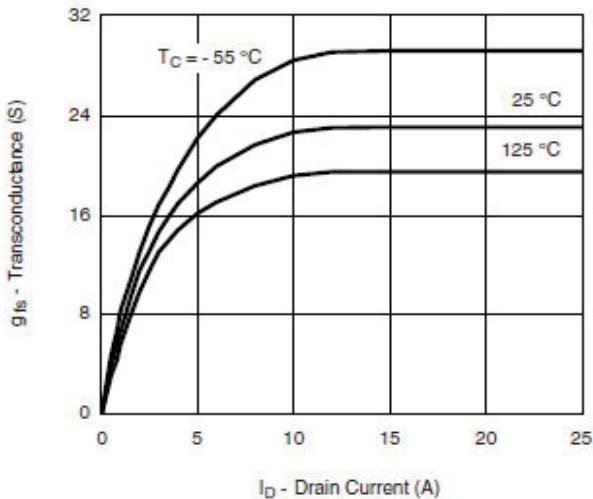
## ■ Typical electrical and thermal characteristics (N-ch)



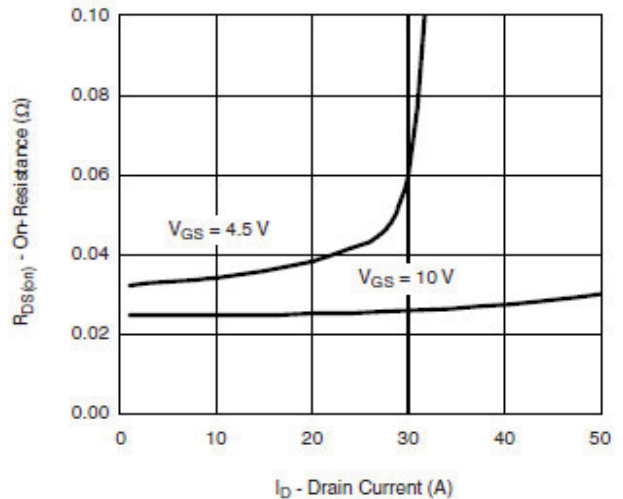
Output Characteristics



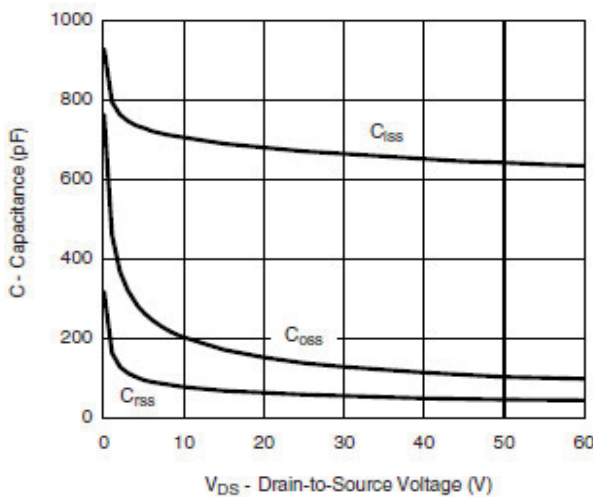
Transfer Characteristics



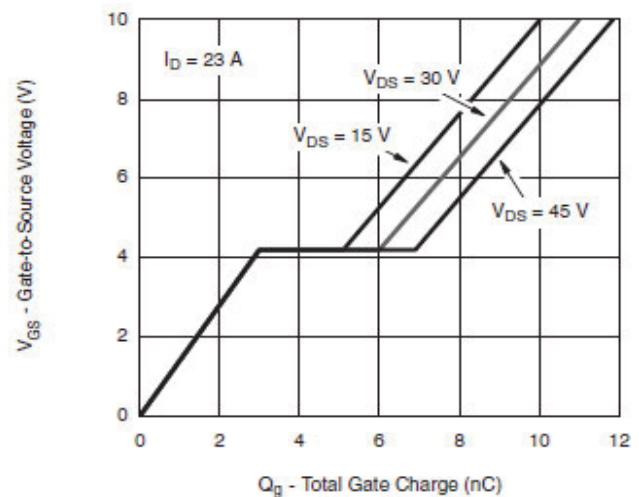
Transconductance



On-Resistance vs. Drain Current



Capacitance

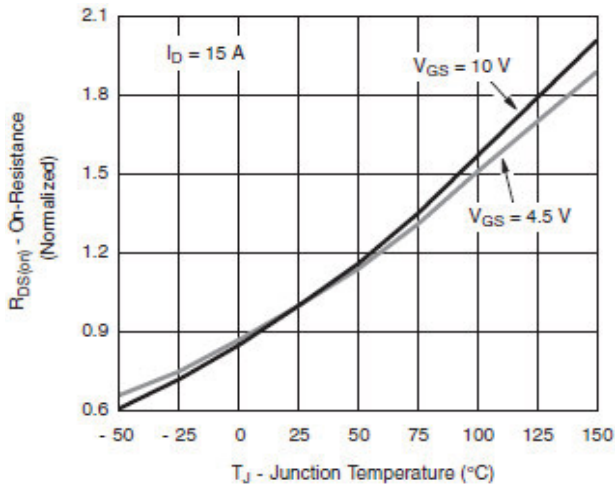


Gate Charge

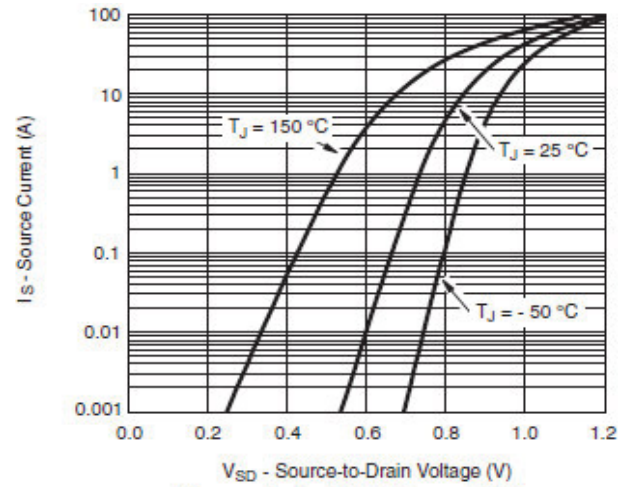
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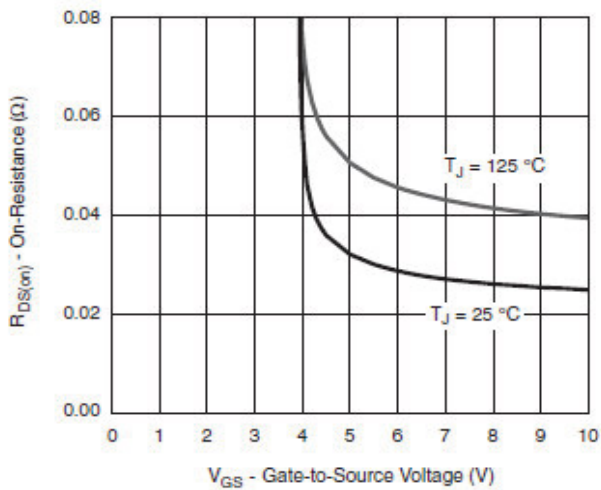
<http://www.elm-tech.com>



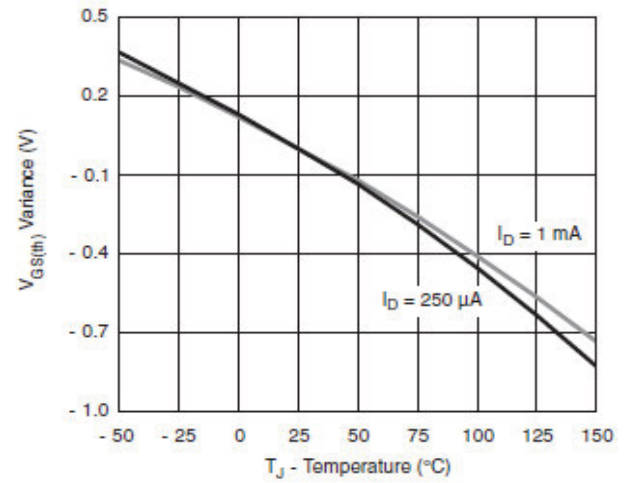
**On-Resistance vs. Junction Temperature**



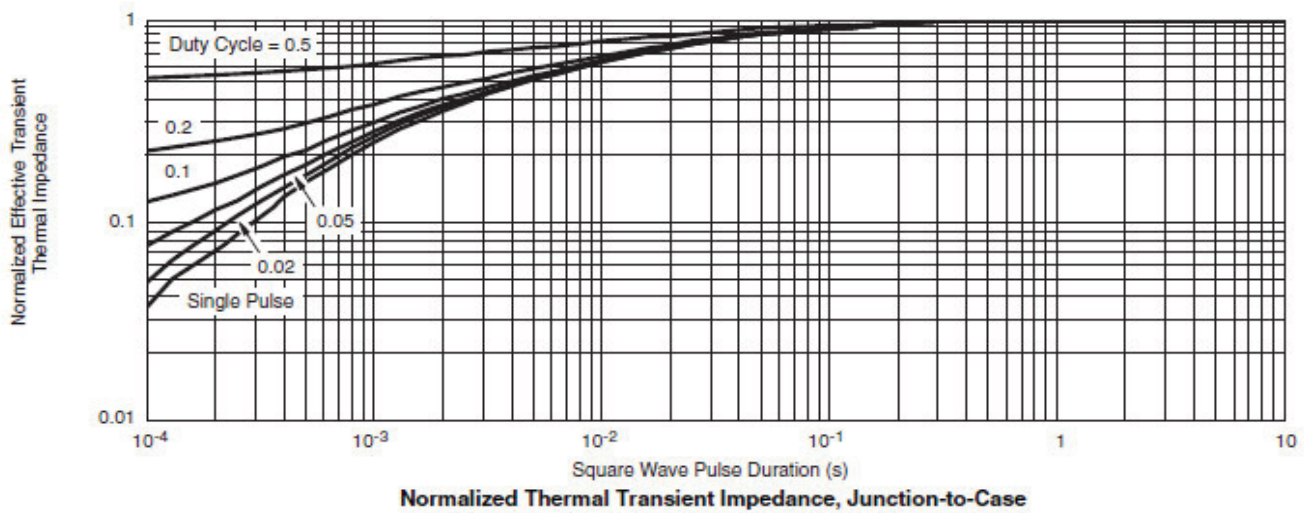
**Source-Drain Diode Forward Voltage**



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



**Threshold Voltage**



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

# Complementary MOSFET (common drain)

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### ■Electrical Characteristics (P-ch)

Ta=25°C. Unless otherwise noted.

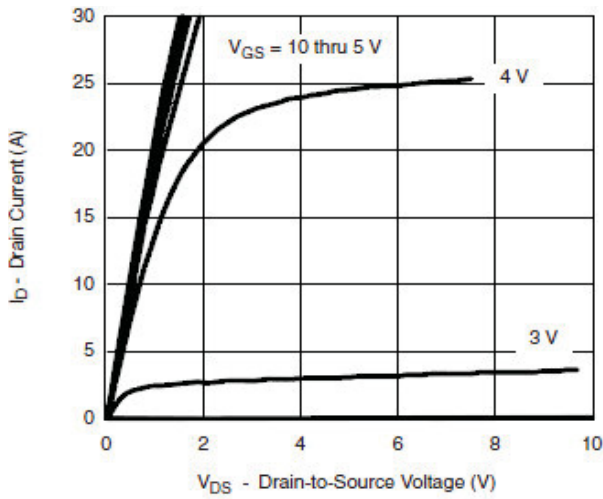
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
<b>STATIC PARAMETERS</b>						
Drain-source breakdown voltage	BVdss	Id=-250μA, Vgs=0V	-60			V
Zero gate voltage drain current	Idss	Vds=-48V, Vgs=0V Ta=85°C			-1	μA
					-20	
Gate-body leakage current	Igss	Vds=0V, Vgs=±20V			±100	nA
Gate threshold voltage	Vgs(th)	Vds=Vgs, Id=-250μA	-1.0		-2.5	V
On state drain current	Id(on)	Vgs=-10V, Vds≥-5V	-30			A
Static drain-source on-resistance	Rds(on)	Vgs=-10V, Id=-7.0A		46	56	mΩ
		Vgs=-4.5V, Id=-6.0A		56	68	
Forward transconductance	Gfs	Vds=-15V, Id=-3.2A		12		S
Diode forward voltage	Vsd	Is=-3A, 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=-10.0A		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=-18.0A, RL=3.0Ω 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

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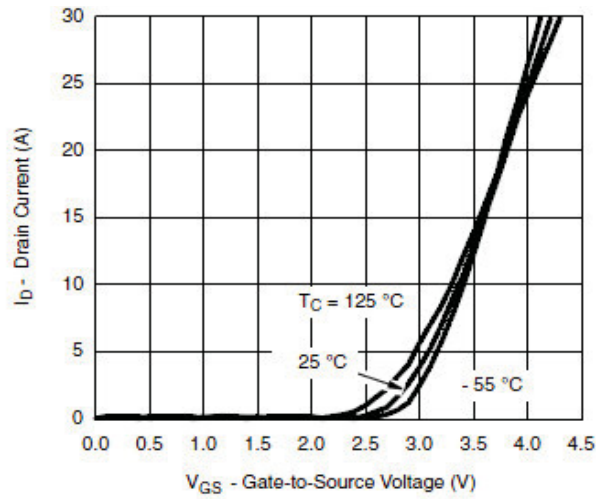
ELM55616CA-S

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

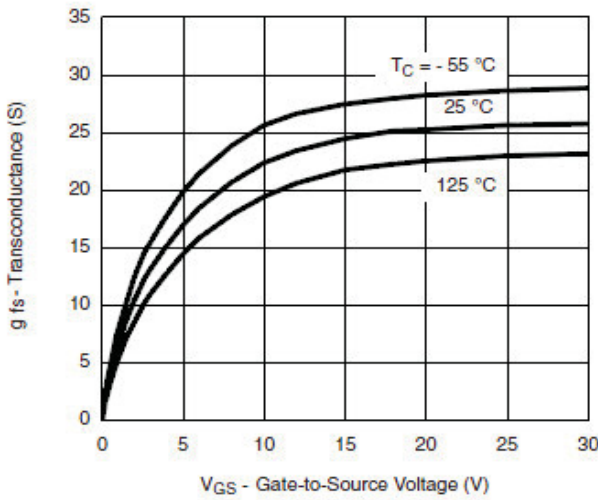
## ■ Typical electrical and thermal characteristics (P-ch)



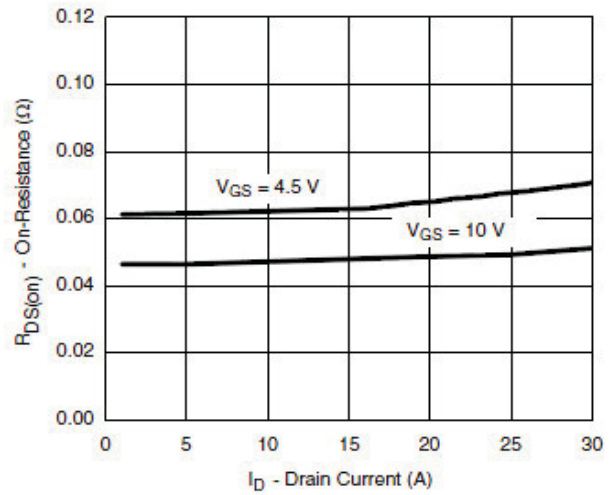
Output Characteristics



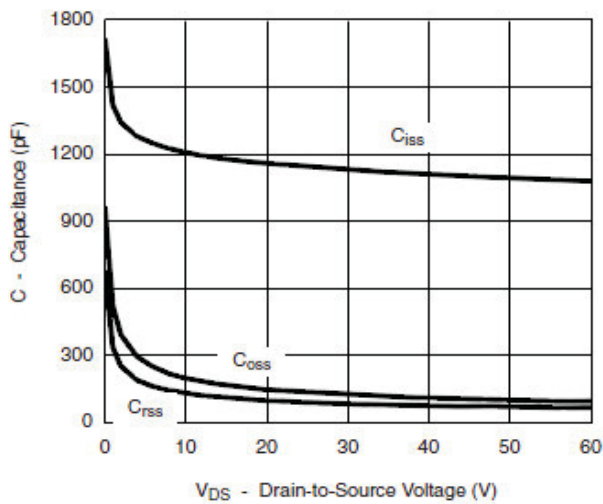
Transfer Characteristics



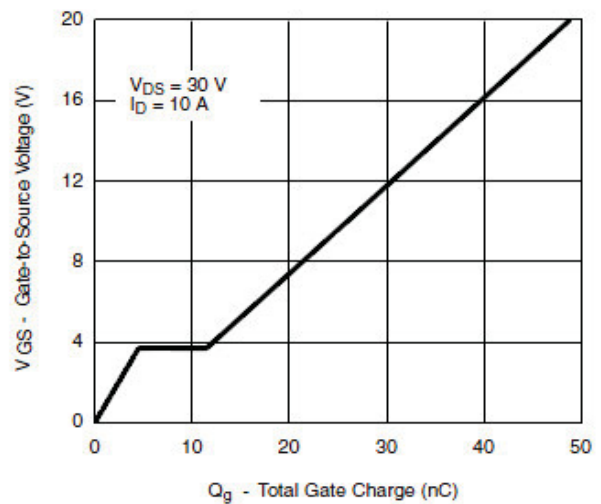
Transconductance



On-Resistance vs. Drain Current



Capacitance



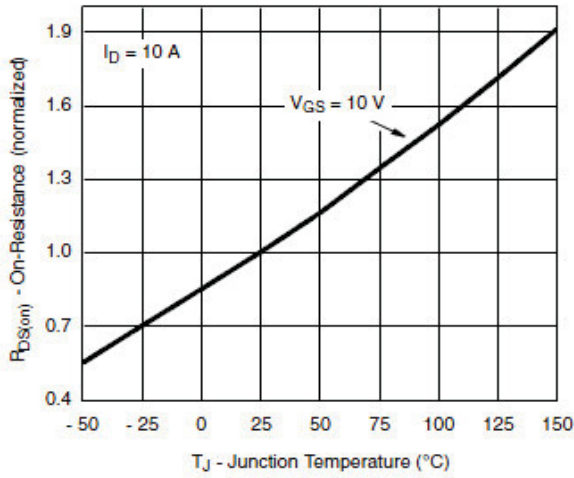
Gate Charge



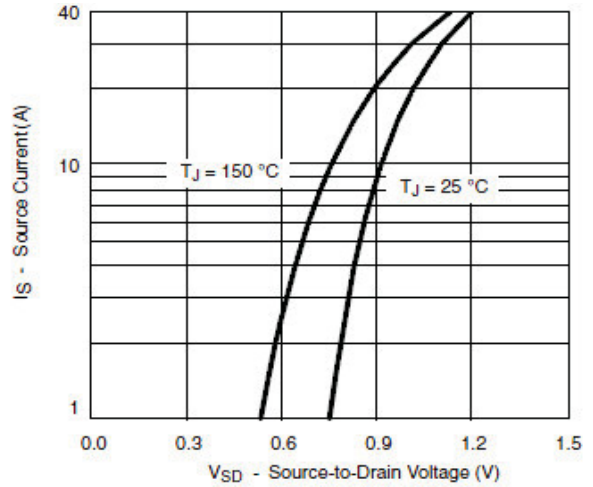
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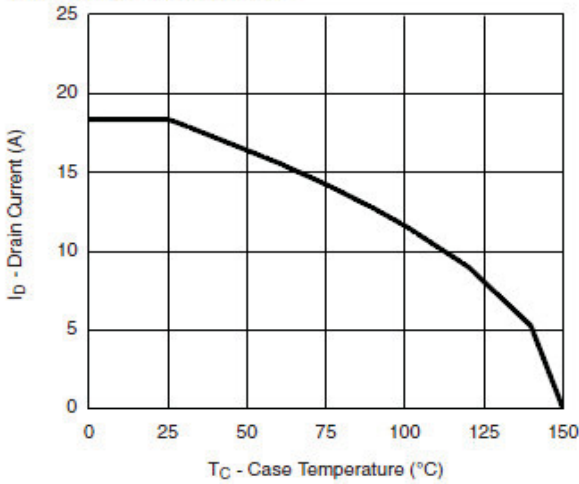


On-Resistance vs. Junction Temperature

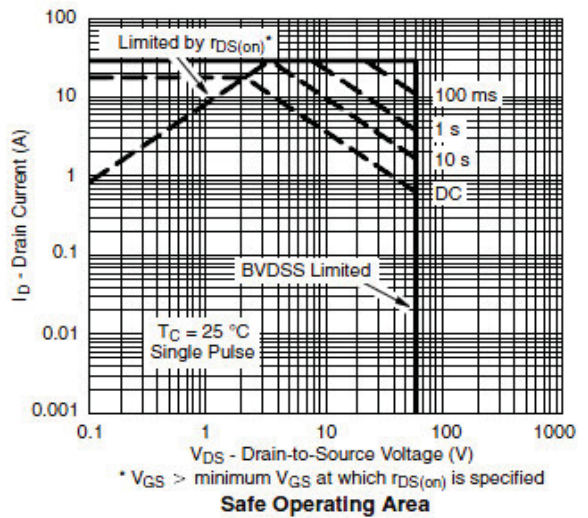


Source-Drain Diode Forward Voltage

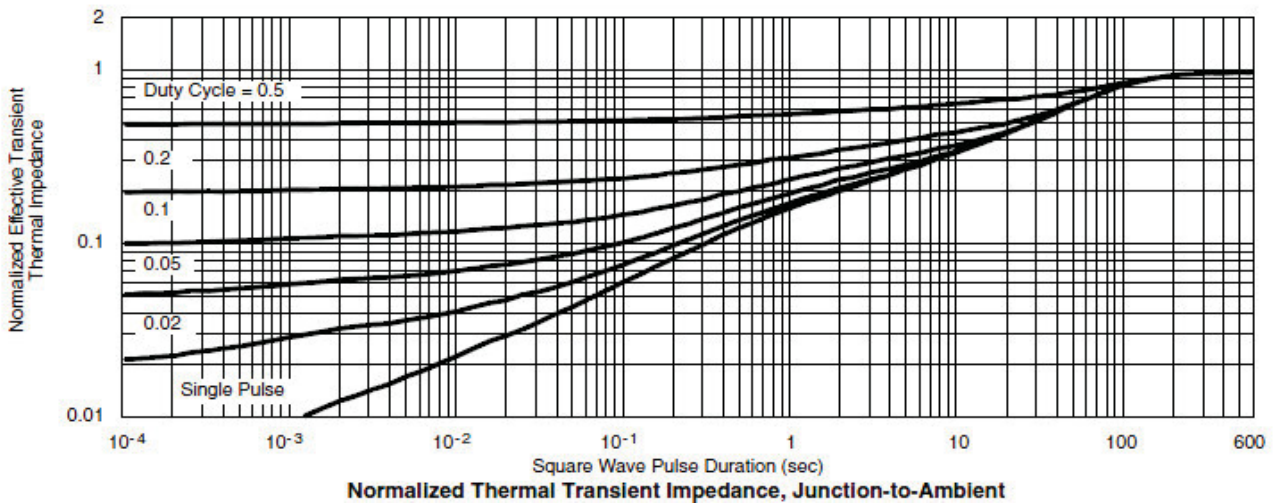
### THERMAL RATINGS



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

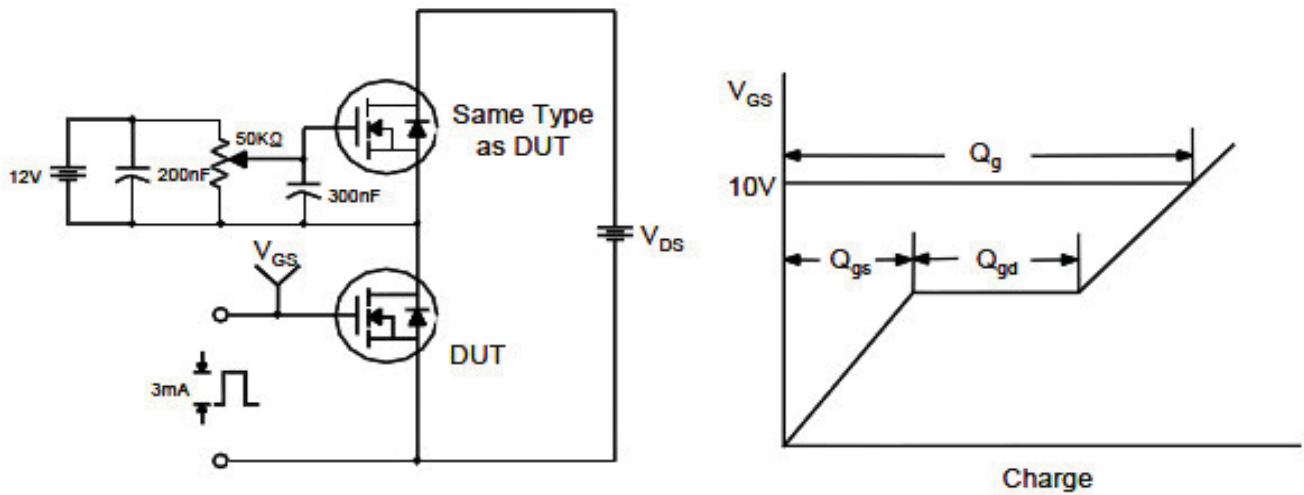
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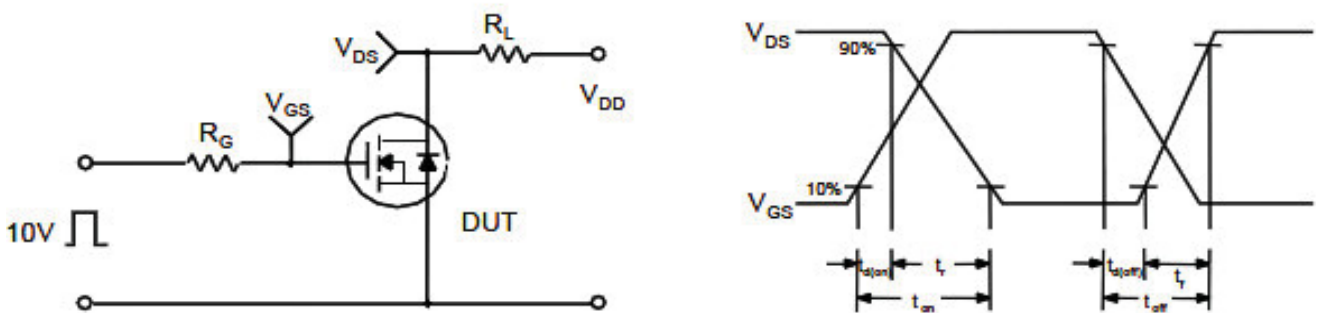
<http://www.elm-tech.com>

## ■ Test circuit and waveform

Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching Test Circuit & Waveforms

