

# Single P-channel MOSFET

## ELM53415EAA-S

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

### ■ General description

ELM53415EAA-S uses advanced trench technology to provide excellent  $R_{ds(on)}$ , low gate charge and low gate threshold voltage.

### ■ Features

- $V_{ds} = -20V$
- $I_d = -4.5A$
- $R_{ds(on)} = 41m\Omega$  ( $V_{gs} = -4.5V$ )
- $R_{ds(on)} = 54m\Omega$  ( $V_{gs} = -2.5V$ )
- $R_{ds(on)} = 70m\Omega$  ( $V_{gs} = -1.8V$ )
- ESD protected

### ■ Maximum absolute ratings

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

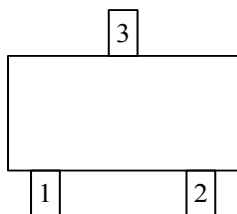
Parameter	Symbol	Limit	Unit
Drain-source voltage	$V_{ds}$	-20	V
Gate-source voltage	$V_{gs}$	$\pm 12$	V
Continuous drain current ( $T_j = 150^\circ C$ )	$I_d$	$T_a = 25^\circ C$	-4.5
		$T_a = 70^\circ C$	-3.9
Pulsed drain current	$I_{dm}$	-10	A
Power dissipation	$P_d$	$T_c = 25^\circ C$	1.25
		$T_c = 70^\circ C$	0.80
Junction and storage temperature range	$T_j, T_{stg}$	-55 to 150	$^\circ C$

### ■ Thermal characteristics

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

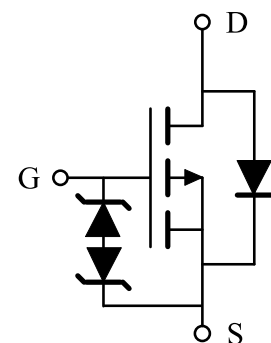
### ■ Pin configuration

SOT-23(TOP VIEW)



Pin No.	Pin name
1	GATE
2	SOURCE
3	DRAIN

### ■ Circuit



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### ■Electrical characteristics

Ta=25°C. Unless otherwise noted.

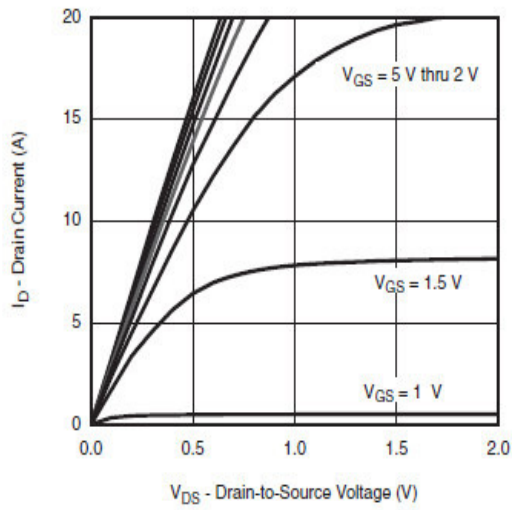
Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
<b>STATIC PARAMETERS</b>						
Drain-source breakdown voltage	BVdss	Vgs=0V, Id=-250μA	-20			V
Zero gate voltage drain current	Idss	Vds=-16V, Vgs=0V			-1	μA
		Vds=-16V, Vgs=0V, Ta=85°C			-10	
Gate-body leakage current	Igss	Vds=0V, Vgs=±8V			±10	μA
Gate threshold voltage	Vgs(th)	Vds=Vgs, Id=-250μA	-0.4	-0.6	-0.9	V
On state drain current	Id(on)	Vgs=-4.5V, Vds≥-5V	-6			A
		Vgs=-2.5V, Vds≥-5V	-4			
Static drain-source on-resistance	Rds(on)	Vgs=-4.5V, Id=-4.5A		35	41	mΩ
		Vgs=-2.5V, Id=-3.4A		45	54	
		Vgs=-1.8V, Id=-2.2A		60	70	
Forward transconductance	Gfs	Vds=-5V, Id=-3.6A		10		S
Diode forward voltage	Vsd	Is=-1.25A, Vgs=0V		-0.85	-1.20	V
Max. body-diode continuous current	Is				-1.6	A
<b>DYNAMIC PARAMETERS</b>						
Input capacitance	Ciss			1050		pF
Output capacitance	Coss	Vgs=0V, Vds=-10V, f=1MHz		165		pF
Reverse transfer capacitance	Crss			135		pF
<b>SWITCHING PARAMETERS</b>						
Total gate charge	Qg	Vgs=-2.5V, Vds=-10V Id=-4.0A		10.0	18.0	nC
Gate-source charge	Qgs			2.5		nC
Gate-drain charge	Qgd			3.5		nC
Turn-on delay time	td(on)	Vgs=-4.5V, Vds=-10V Id=-3.7A RL=2.7Ω, Rgen=1Ω		15	25	ns
Turn-on rise time	tr			25	40	ns
Turn-off delay time	td(off)			40	65	ns
Turn-off fall time	tf			15	25	ns

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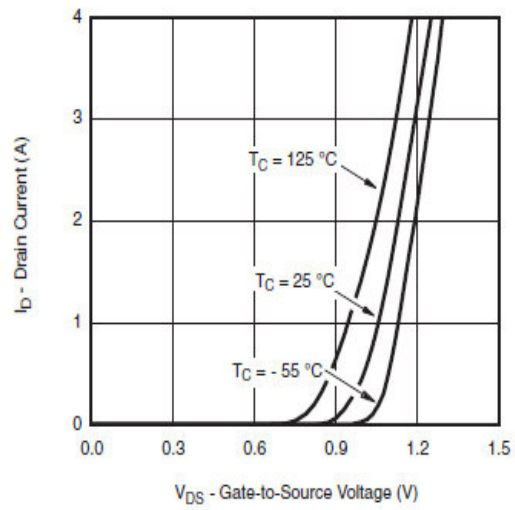
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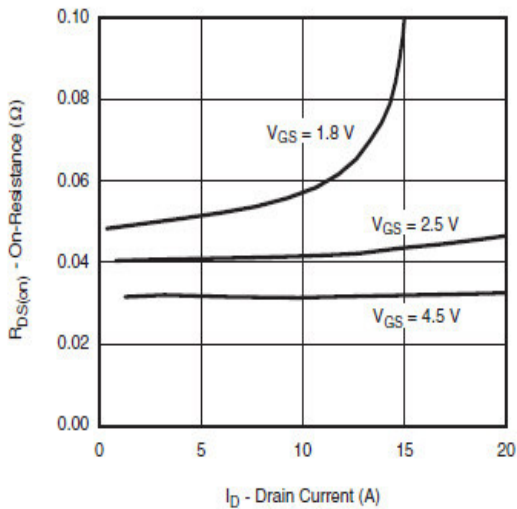
## ■ Typical electrical and thermal characteristics



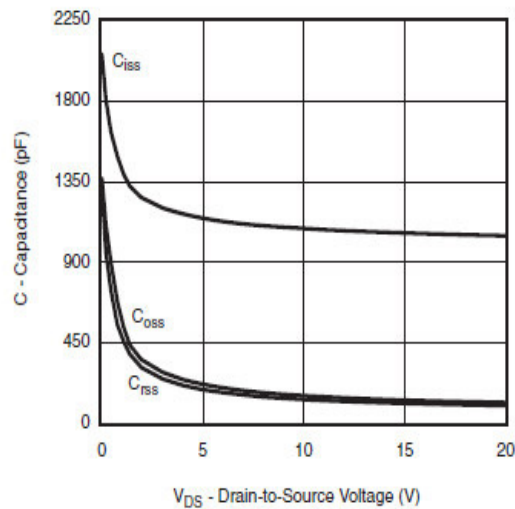
Output Characteristics



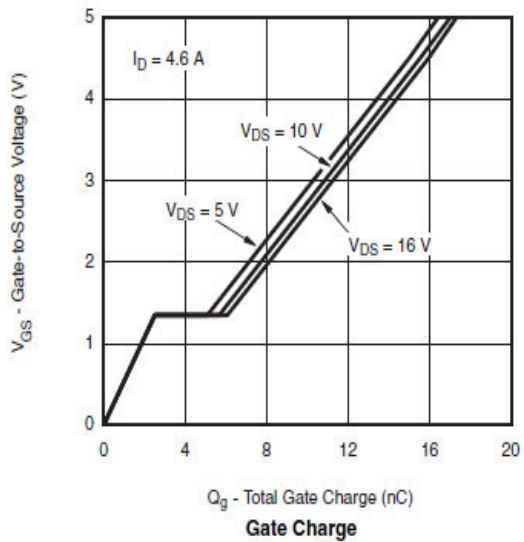
Transfer Characteristics



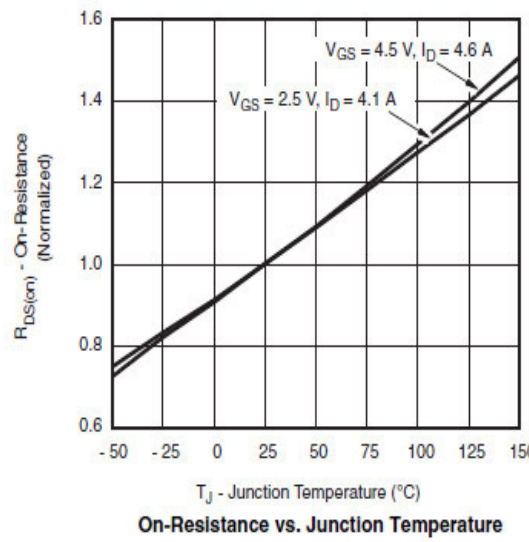
On-Resistance vs. Drain Current and Gate Voltage



Capacitance



Gate Charge

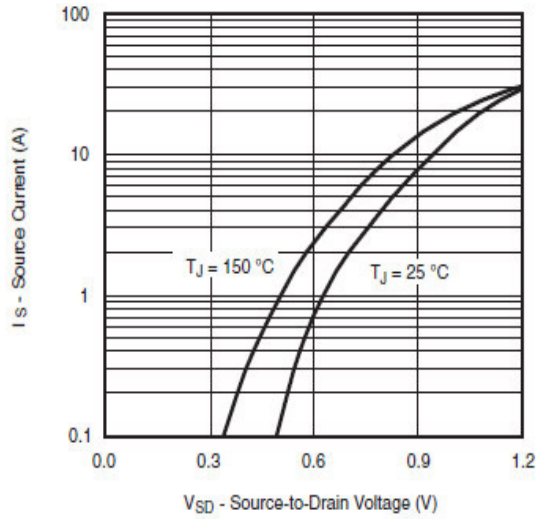


On-Resistance vs. Junction Temperature

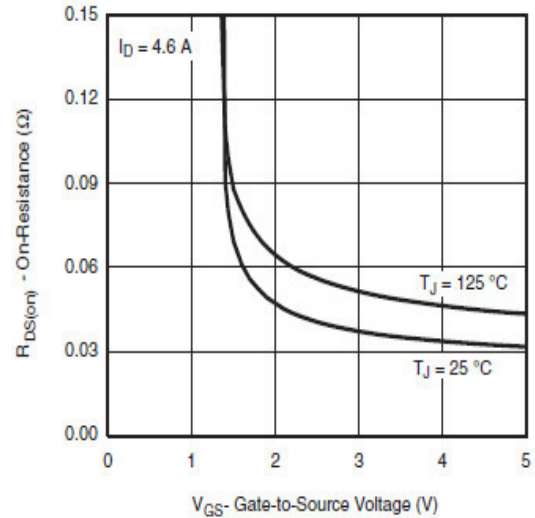
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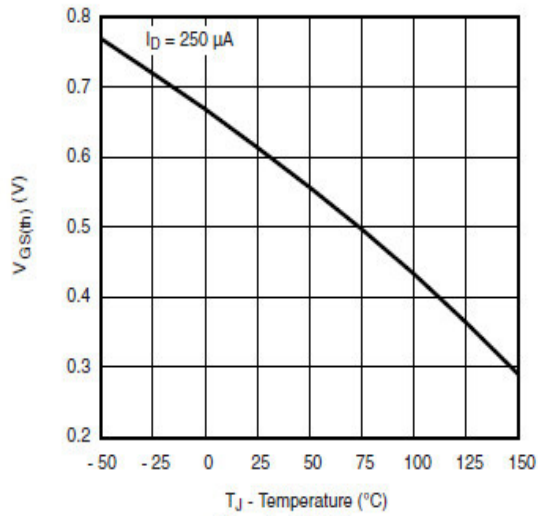
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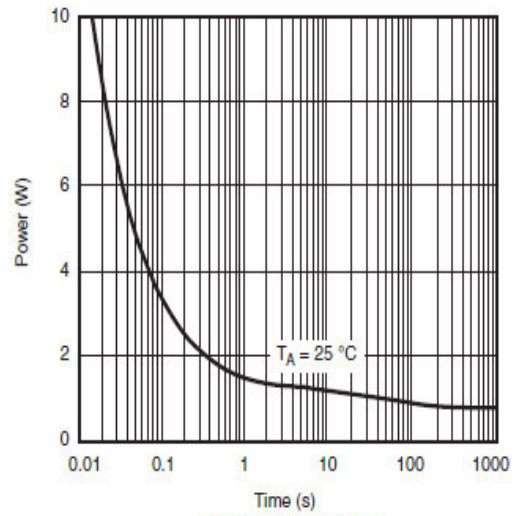
Source-Drain Diode Forward Voltage



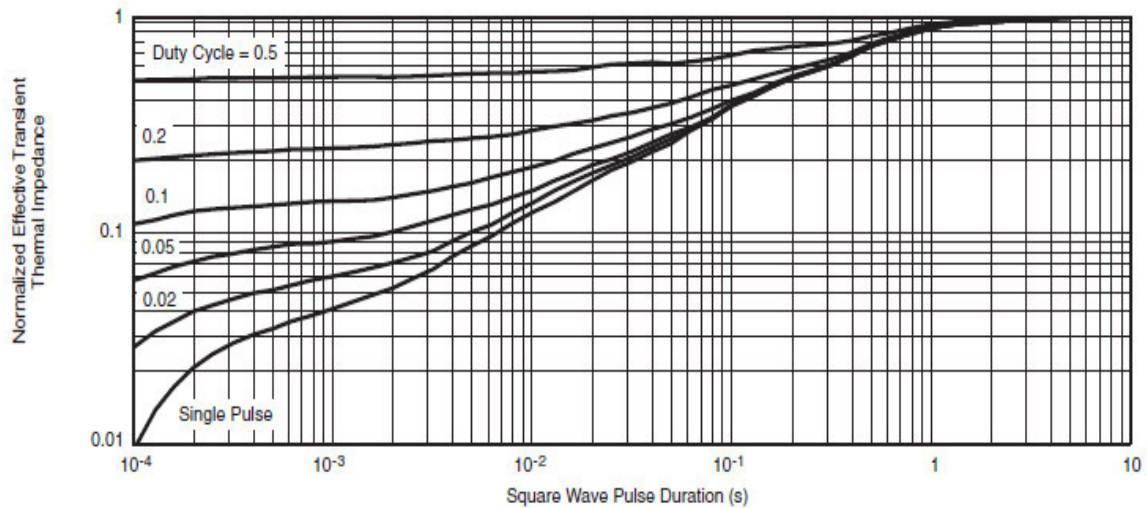
On-Resistance vs. Gate-to-Source Voltage



Threshold Voltage



Single Pulse Power



Normalized Thermal Transient Impedance, Junction-to-Foot

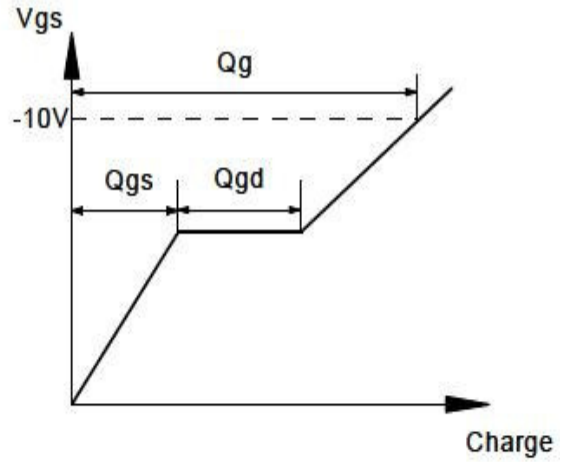
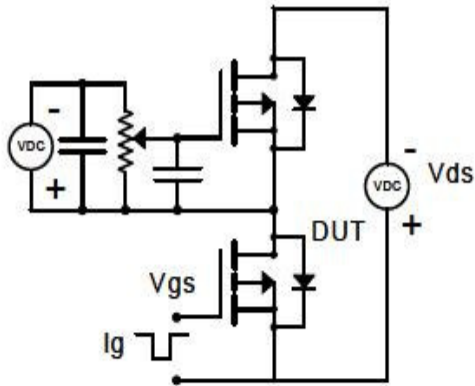
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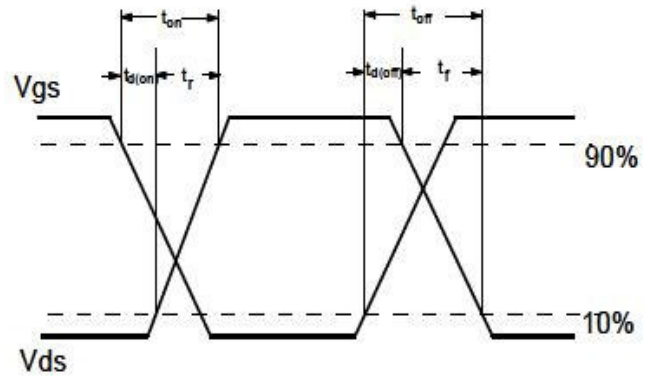
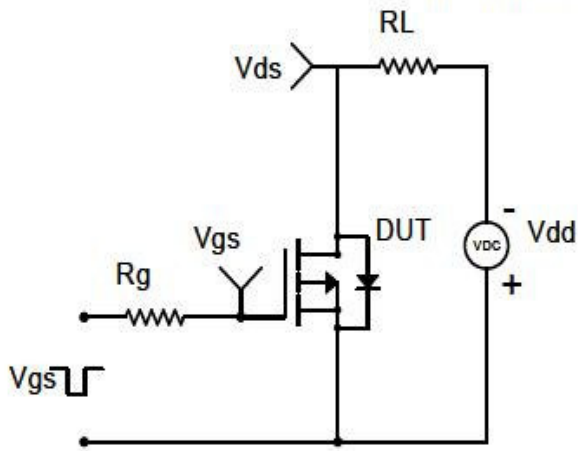
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## ■ Test circuit and waveform

Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms

