

# Single P-channel MOSFET

## ELM321504A-S

### ■ General description

ELM321504A-S uses advanced trench technology to provide excellent  $R_{ds(on)}$ , low gate charge and low gate resistance.

### ■ Features

- $V_{ds} = -40V$
- $I_d = -45A$
- $R_{ds(on)} < 15m\Omega$  ( $V_{gs} = -10V$ )
- $R_{ds(on)} < 29m\Omega$  ( $V_{gs} = -4.5V$ )

### ■ Maximum absolute ratings

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

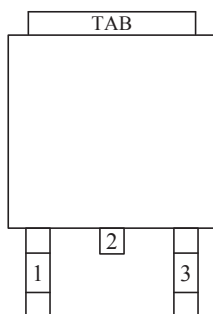
Parameter	Symbol	Limit	Unit	Note	
Drain-source voltage	$V_{ds}$	-40	V		
Gate-source voltage	$V_{gs}$	$\pm 20$	V		
Continuous drain current	$I_d$	$T_a = 25^\circ C$	-45	A	
		$T_a = 70^\circ C$	-36		
Pulsed drain current	$I_{dm}$	-150	A	3	
Avalanche current	$I_{as}$	-45	A		
Avalanche energy	$L = 0.1mH$	Eas	102	mJ	4
Power dissipation	$P_d$	$T_c = 25^\circ C$	50	W	
		$T_c = 70^\circ C$	32		
Junction and storage temperature range	$T_j, T_{stg}$	-55 to 150	$^\circ C$		

### ■ Thermal characteristics

Parameter	Symbol	Typ.	Max.	Unit	Note
Maximum junction-to-case	$R_{\theta jc}$		2.5	$^\circ C/W$	
Maximum junction-to-ambient	$R_{\theta ja}$		75.0	$^\circ C/W$	

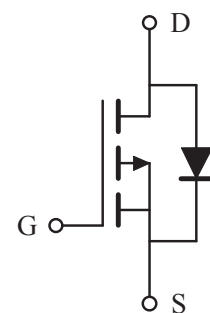
### ■ Pin configuration

TO-252-3(TOP VIEW)



Pin No.	Pin name
1	GATE
2	DRAIN
3	SOURCE

### ■ Circuit



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### ■ Electrical characteristics

Ta=25°C. Unless otherwise noted.

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit	Note
<b>STATIC PARAMETERS</b>							
Drain-source breakdown voltage	BVdss	Id=-250μA, Vgs=0V	-40			V	
Zero gate voltage drain current	Idss	Vds=-32V, Vgs=0V			-1	μA	
		Vds=-30V, Vgs=0V, Ta=55°C			-10		
Gate-body leakage current	Igss	Vds=0V, Vgs=±20V			±100	nA	
Gate threshold voltage	Vgs(th)	Vds=Vgs, Id=-250μA	-1.7	-2.2	-3.0	V	
On state drain current	Id(on)	Vds=-5V, Vgs=-10V	-150			A	1
Static drain-source on-resistance	Rds(on)	Vgs=-10V, Id=-25A		13	15	mΩ	1
		Vgs=-4.5V, Id=-15A		19	29	mΩ	
Forward transconductance	Gfs	Vds=-5V, Id=-25A		24		S	1
Diode forward voltage	Vsd	If=Is, Vgs=0V		-0.7	-1.3	V	1
Max. body-diode continuous current	Is				-25	A	
<b>DYNAMIC PARAMETERS</b>							
Input capacitance	Ciss	Vgs=0V, Vds=-15V f=1MHz		2700	2950	pF	
Output capacitance	Coss			400	430	pF	
Reverse transfer capacitance	Crss			230	250	pF	
Gate resistance	Rg	Vgs=-15mV, Vds=0V, f=1MHz		3.5	4.5	Ω	
<b>SWITCHING PARAMETERS</b>							
Total gate charge	Qg	Vgs=-10V, Vds=-20V Id=-25A		40	45	nC	2
Gate-source charge	Qgs			10	13	nC	2
Gate-drain charge	Qgd			5	8	nC	2
Turn-on delay time	td(on)	Vgs=-10V, Vds=-20V Id=-1A, RL=0.75Ω Rgen=6Ω		11		ns	2
Turn-on rise time	tr			75		ns	2
Turn-off delay time	td(off)			89		ns	2
Turn-off fall time	tf		35		ns	2	
Body diode reverse recovery time	trr	If=-25A, dIf/dt=100A/μs		28		ns	
Body diode reverse recovery charge	Qrr			26		nC	

NOTE :

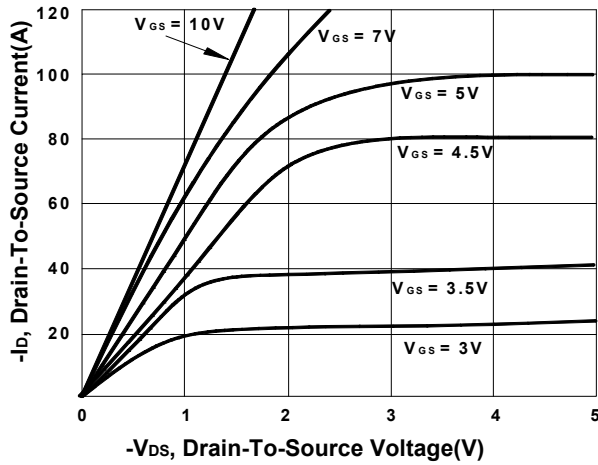
1. Pulse test : Pulsed width ≤ 300μsec and Duty cycle ≤ 2%.
2. Independent of operating temperature.
3. Pulsed width limited by maximum junction temperature.
4. Vdd = -20V, Starting Tj = 25°C.

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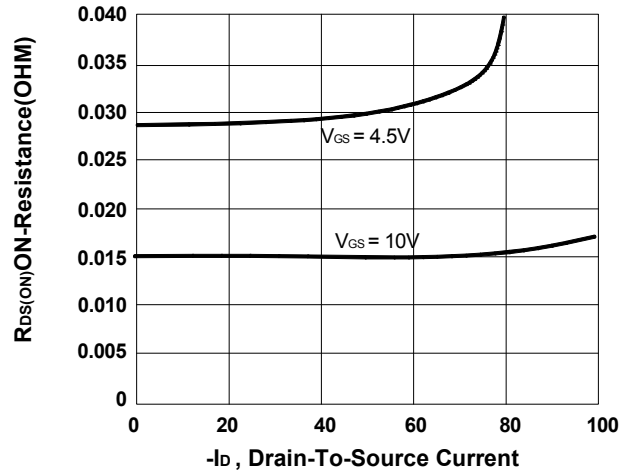
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## ■ Typical electrical and thermal characteristics

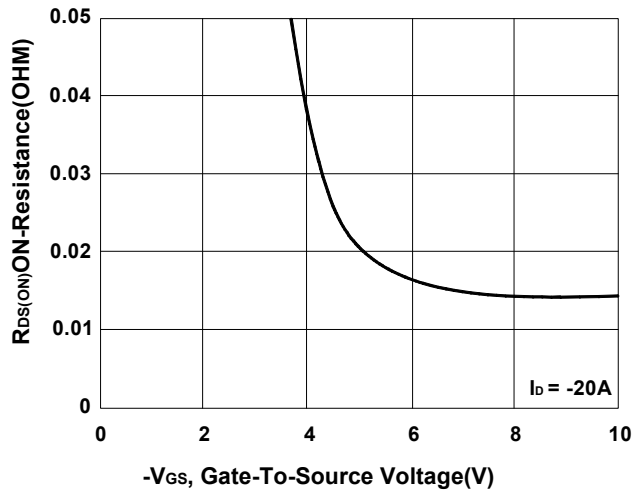
**Output Characteristics**



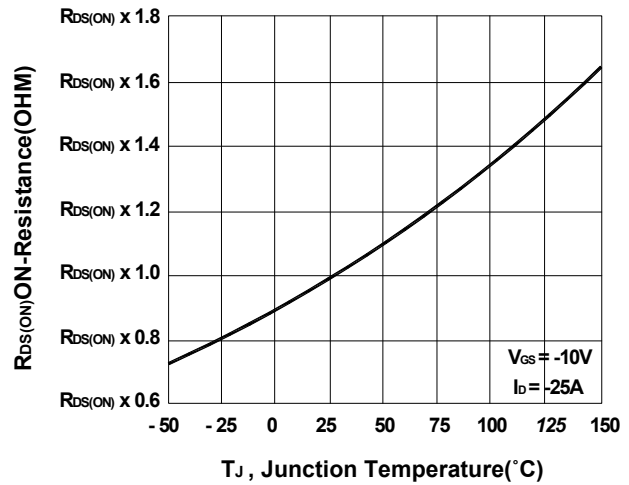
**On-Resistance VS Drain Current**



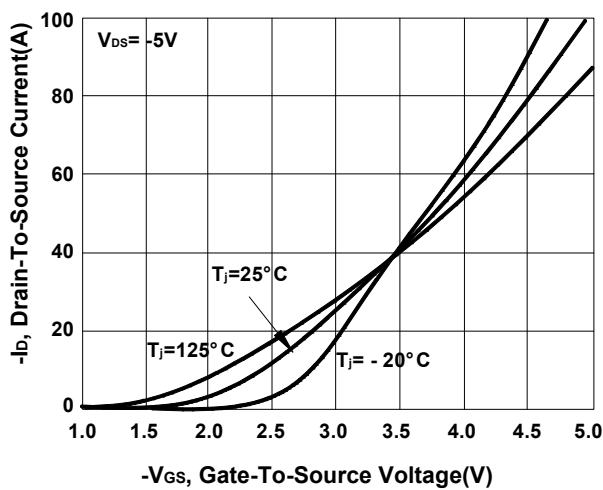
**On-Resistance VS Gate-To-Source**



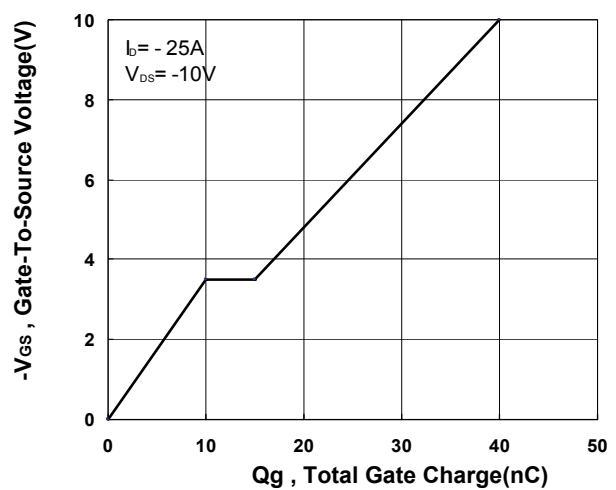
**On-Resistance VS Temperature**



**Transfer Characteristics**



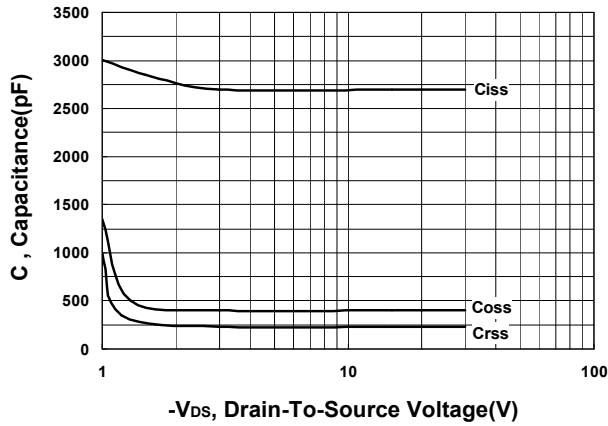
**Gate charge Characteristics**



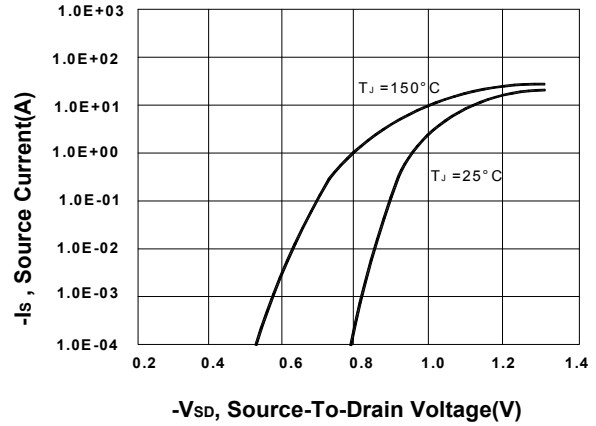
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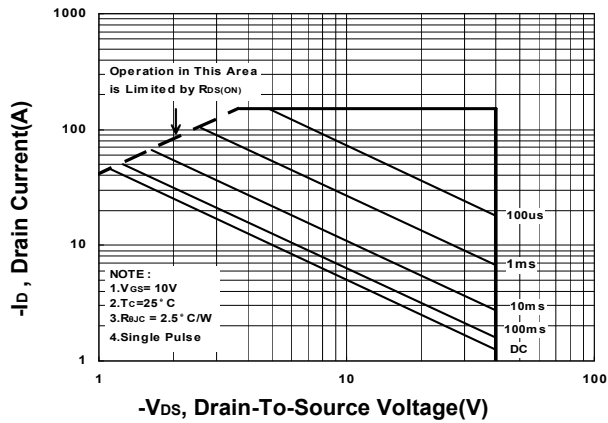
### Capacitance Characteristic



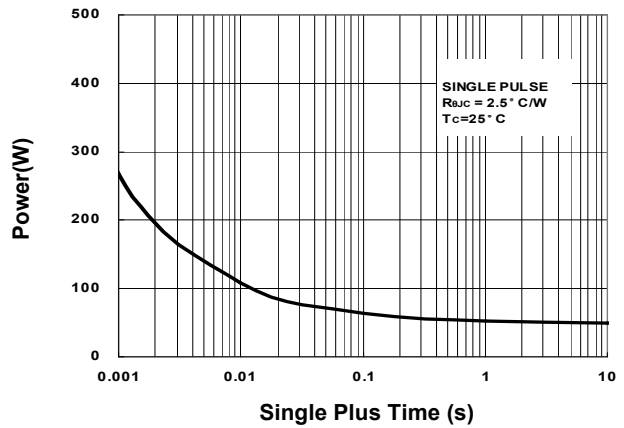
### Body Diode Forward Voltage VS Source current



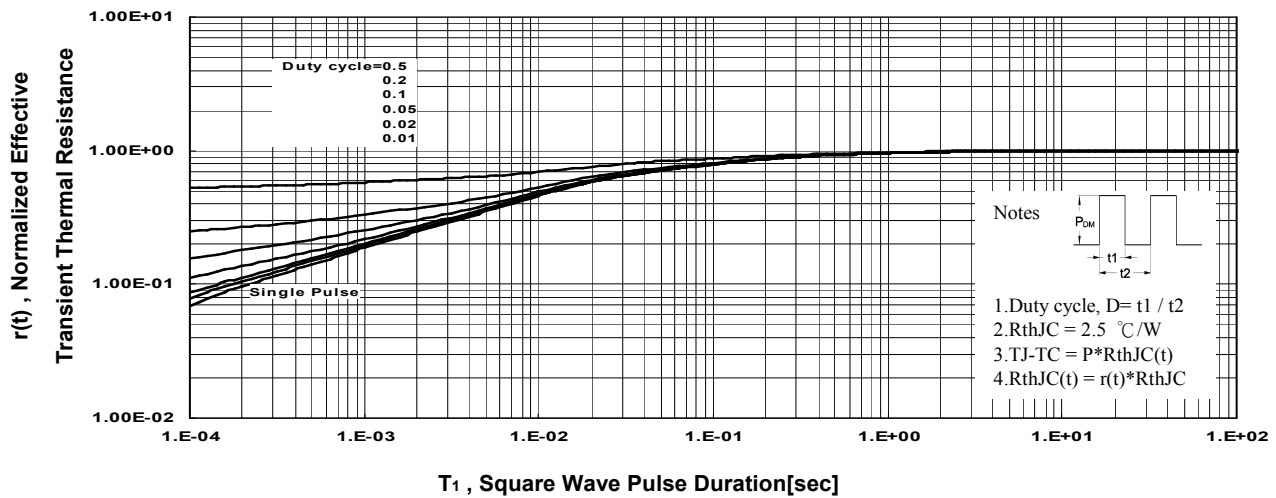
### Safe Operating Area



### Single Pulse Maximum Power Dissipation



### Transient Thermal Response Curve

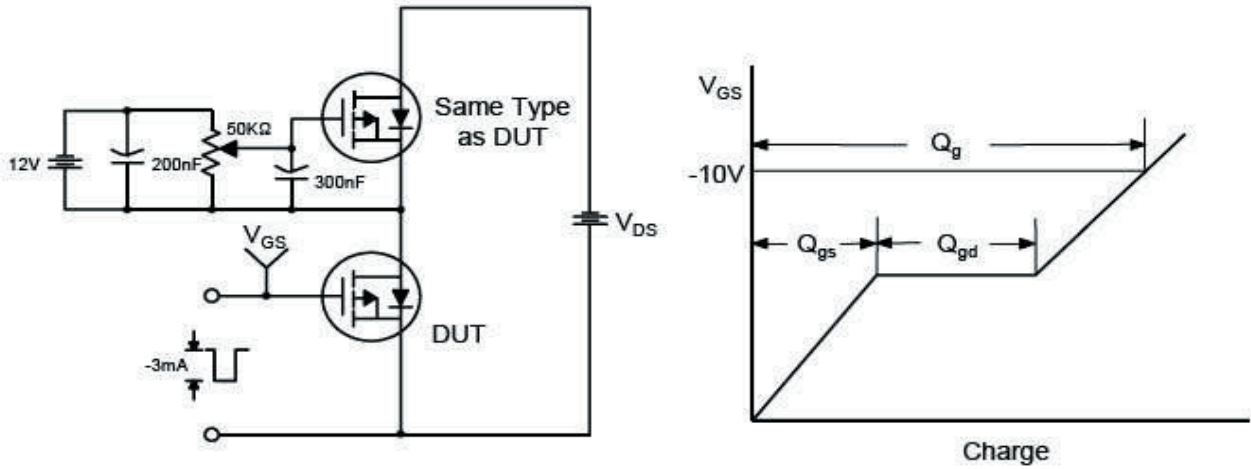


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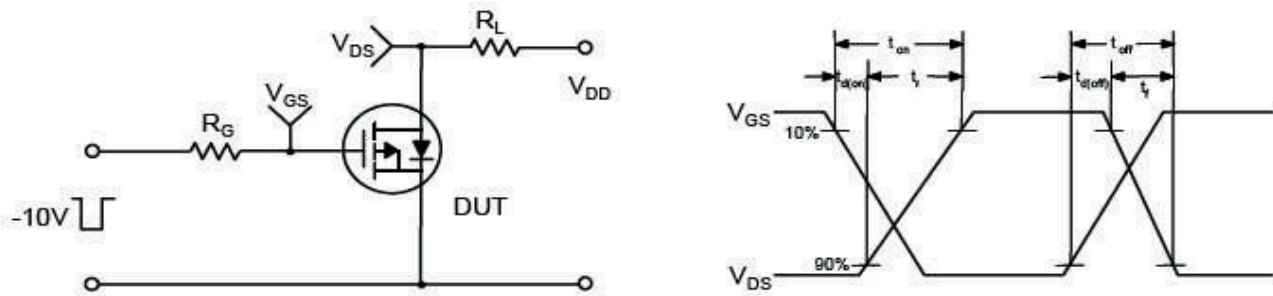
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## ■ Test circuit and waveforms

Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching Test Circuit & Waveforms

