

Single P-channel MOSFET

ELM16409EA-S

General description

ELM16409EA-S uses advanced trench technology to provide excellent $R_{ds(on)}$, low gate charge and operation with gate voltages as low as 1.8V and internal ESD protection.

Features

- $V_{ds} = -20V$
- $I_d = -5A$ ($V_{gs} = -4.5V$)
- $R_{ds(on)} < 45m\Omega$ ($V_{gs} = -4.5V$)
- $R_{ds(on)} < 56m\Omega$ ($V_{gs} = -2.5V$)
- $R_{ds(on)} < 75m\Omega$ ($V_{gs} = -1.8V$)
- ESD Rating : 3000V HBM

Maximum absolute ratings

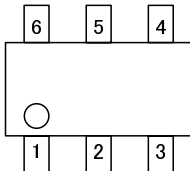
Parameter		Symbol	Limit	Unit	Note
Drain-source voltage		V_{ds}	-20	V	
Gate-source voltage		V_{gs}	± 8	V	
Continuous drain current	$T_a = 25^\circ C$	I_d	-5.0	A	1
	$T_a = 70^\circ C$		-4.2		
Pulsed drain current		I_{dm}	-30	A	2
Power dissipation	$T_a = 25^\circ C$	P_d	2.00	W	1
	$T_a = 70^\circ C$		1.28		
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-ambient	$t \leq 10s$	$R\theta_{ja}$	47.5	62.5	$^\circ C/W$	1
Maximum junction-to-ambient	Steady-state		74.0	110.0	$^\circ C/W$	
Maximum junction-to-lead	Steady-state	$R\theta_{jl}$	37.0	50.0	$^\circ C/W$	3

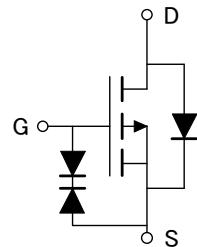
Pin configuration

SOT-26 (TOP VIEW)



Pin No.	Pin name
1	DRAIN
2	DRAIN
3	GATE
4	SOURCE
5	DRAIN
6	DRAIN

Circuit



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■ Electrical characteristics

Ta=25°C

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
STATIC PARAMETERS						
Drain-source breakdown voltage	BVdss	Id=-250 μ A, Vgs=0V	-20			V
Zero gate voltage drain current	Idss	Vds=-16V Vgs=0V			-1	μ A
		Tj=55°C			-5	
Gate-body leakage current	Igss	Vds=0V, Vgs= $\pm$ 4.5V			$\pm$ 1	μ A
		Vds=0V, Vgs= $\pm$ 8V			$\pm$ 10	μ A
Gate threshold voltage	Vgs(th)	Vds=Vgs, Id=-250 μ A	-0.30	-0.55	-1.00	V
On state drain current	Id(on)	Vgs=-4.5V, Vds=-5V	-25			A
Static drain-source on-resistance	Rds(on)	Vgs=-4.5V Id=-5A		37	45	m Ω
		Tj=125°C		48	60	
		Vgs=-2.5V, Id=-4A		46	56	m Ω
		Vgs=-1.8V, Id=-2A		57	75	m Ω
Forward transconductance	Gfs	Vds=-5V, Id=-5A	8	16		S
Diode forward voltage	Vsd	Is=-1A, Vgs=0V		-0.78	-1.00	V
Max. body-diode continuous current	Is				-2.2	A
DYNAMIC PARAMETERS						
Input capacitance	Ciss	Vgs=0V, Vds=-10V, f=1MHz		1450		pF
Output capacitance	Coss			205		pF
Reverse transfer capacitance	Crss			160		pF
Gate resistance	Rg	Vgs=0V, Vds=0V, f=1MHz		6.5		Ω
SWITCHING PARAMETERS						
Total gate charge	Qg	Vgs=-4.5V, Vds=-10V Id=-5A		17.2		nC
Gate-source charge	Qgs			1.3		nC
Gate-drain charge	Qgd			4.5		nC
Turn-on delay time	td(on)	Vgs=-4.5V, Vds=-10V Rl=2 Ω , Rgen=3 Ω		9		ns
Turn-on rise time	tr			14		ns
Turn-off delay time	td(off)			91		ns
Turn-off fall time	tf			31		ns
Body diode reverse recovery time	trr	If=-5A, dI/dt=100A/ μ s		33		ns
Body diode reverse recovery charge	Qrr	If=-5A, dI/dt=100A/ μ s		14		nC

NOTE :

1. The value of R θ ja is measured with the device mounted on 1in² FR-4 board of 2oz. Copper, in still air environment with Ta=25°C. The value in any given applications depends on the user's specific board design, The current rating is based on the t $\leq$ 10s thermal resistance rating.
2. Repetitive rating, pulse width limited by junction temperature.
3. The R θ ja is the sum of the thermal impedance from junction to lead R θ jl and lead to ambient.
4. The static characteristics in Figures 1 to 6 are obtained using 80 μ s pulses, duty cycle 0.5%max.
5. These tests are performed with the device mounted on 1in² FR-4 board with 2oz. Copper, in a still air environment with Ta=25°C. The SOA curve provides a single pulse rating.

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Typical electrical and thermal characteristics

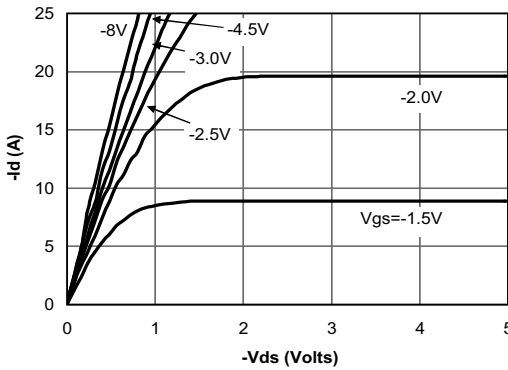


Figure 1: On-Region Characteristics

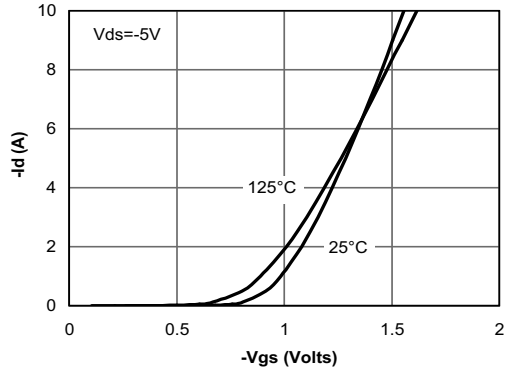


Figure 2: Transfer Characteristics

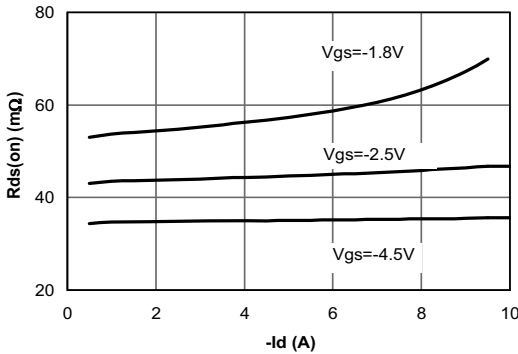


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

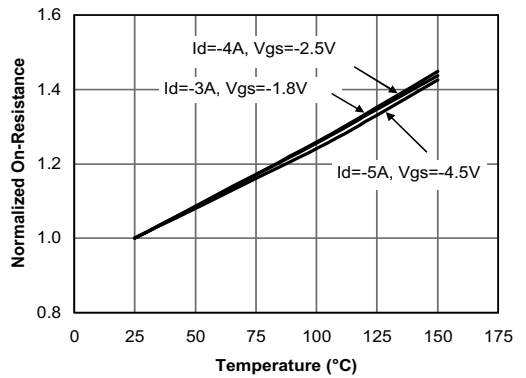


Figure 4: On-Resistance vs. Junction Temperature

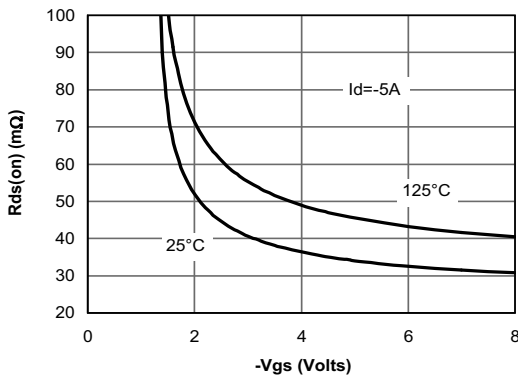


Figure 5: On-Resistance vs. Gate-Source Voltage

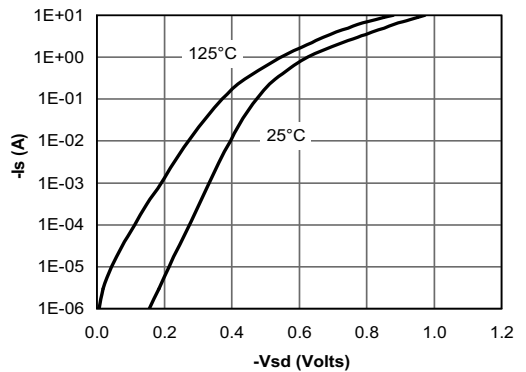


Figure 6: Body-Diode Characteristics

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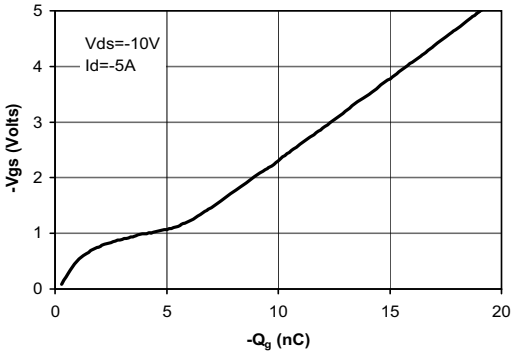


Figure 7: Gate-Charge Characteristics

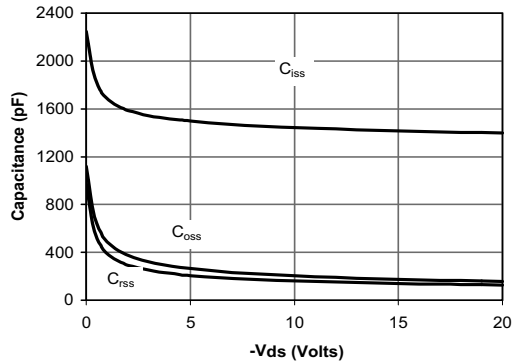


Figure 8: Capacitance Characteristics

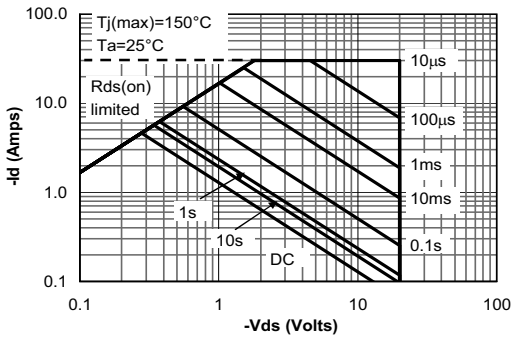


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

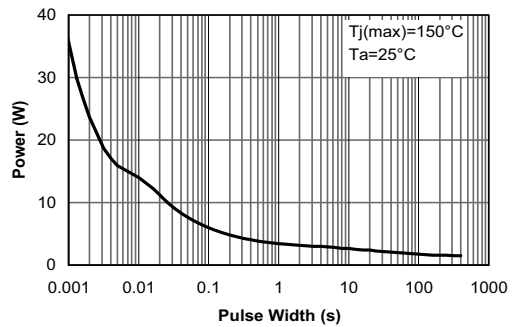


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

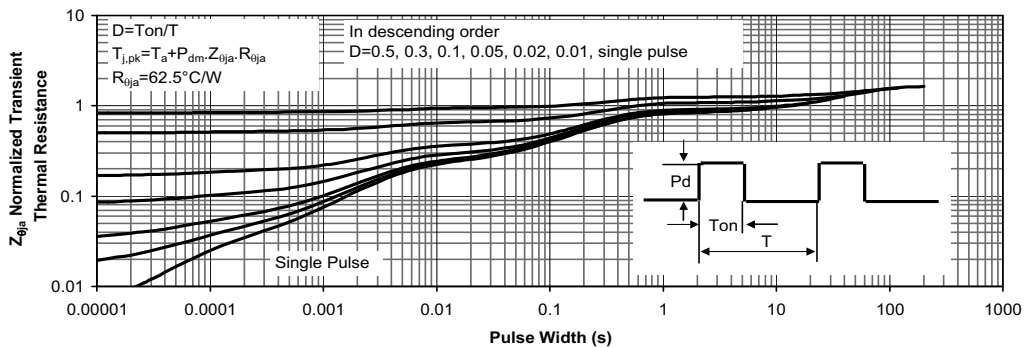


Figure 11: Normalized Maximum Transient Thermal Impedance