

Single P-channel MOSFET

ELM16409EA-S

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

■ 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

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

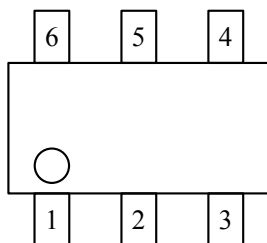
Parameter	Symbol	Limit	Unit	Note	
Drain-source voltage	V_{ds}	-20	V		
Gate-source voltage	V_{gs}	± 8	V		
Continuous drain current	I_d	$T_a = 25^\circ C$	-5.0	A	1
		$T_a = 70^\circ C$	-4.2		
Pulsed drain current	I_{dm}	-30	A	2	
Power dissipation	P_d	$T_c = 25^\circ C$	2.00	W	1
		$T_c = 70^\circ C$	1.28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

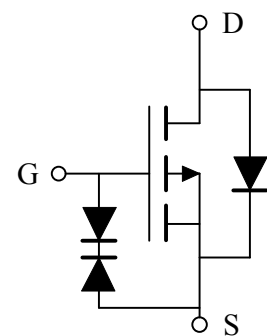
■ Pin configuration

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. Unless otherwise noted.

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit	
STATIC PARAMETERS							
Drain-source breakdown voltage	BV _{dss}	I _d =-250μA, V _{gs} =0V	-20			V	
Zero gate voltage drain current	I _{dss}	V _{ds} =-16V, V _{gs} =0V			-1	μA	
		Ta=55°C			-5		
Gate-body leakage current	I _{gss}	V _{ds} =0V, V _{gs} =±4.5V			±1	μA	
		V _{ds} =0V, V _{gs} =±8V			±10	μA	
Gate threshold voltage	V _{gs(th)}	V _{ds} =V _{gs} , I _d =-250μA	-0.30	-0.55	-1.00	V	
On state drain current	I _{d(on)}	V _{gs} =-4.5V, V _{ds} =-5V	-25			A	
Static drain-source on-resistance	R _{ds(on)}	V _{gs} =-4.5V, I _d =-5A	Ta=125°C		37	45	mΩ
					48	60	
		V _{gs} =-2.5V, I _d =-4A		46	56		
		V _{gs} =-1.8V, I _d =-2A		57	75		
Forward transconductance	G _{fs}	V _{ds} =-5V, I _d =-5A	8	16		S	
Diode forward voltage	V _{sd}	I _s =-1A, V _{gs} =0V		-0.78	-1.00	V	
Max. body-diode continuous current	I _s				-2.2	A	
DYNAMIC PARAMETERS							
Input capacitance	C _{iss}			1450		pF	
Output capacitance	C _{oss}	V _{gs} =0V, V _{ds} =-10V, f=1MHz		205		pF	
Reverse transfer capacitance	C _{rss}			160		pF	
Gate resistance	R _g	V _{gs} =0V, V _{ds} =0V, f=1MHz		6.5		Ω	
SWITCHING PARAMETERS							
Total gate charge	Q _g	V _{gs} =-4.5V, V _{ds} =-10V I _d =-5A		17.2		nC	
Gate-source charge	Q _{gs}			1.3		nC	
Gate-drain charge	Q _{gd}			4.5		nC	
Turn-on delay time	t _{d(on)}	V _{gs} =-4.5V, V _{ds} =-10V R _L =2Ω, R _{gen} =3Ω		9		ns	
Turn-on rise time	t _r			14		ns	
Turn-off delay time	t _{d(off)}			91		ns	
Turn-off fall time	t _f			31		ns	
Body diode reverse recovery time	t _{rr}	I _f =-5A, dI _f /dt=100A/μs		33		ns	
Body diode reverse recovery charge	Q _{rr}	I _f =-5A, dI _f /dt=100A/μs		14		nC	

NOTE :

1. The value of R_{θja} 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 ≤ 10s thermal resistance rating.
2. Repetitive rating, pulse width limited by junction temperature.
3. The R_{θja} is the sum of the thermal impedance from junction to lead R_{θjl} and lead to ambient.
4. The static characteristics in Figures 1 to 6 are obtained using 80μs 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

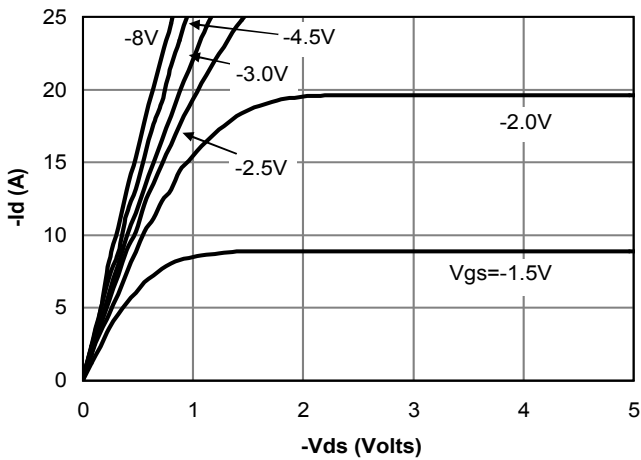


Fig 1: On-Region Characteristics

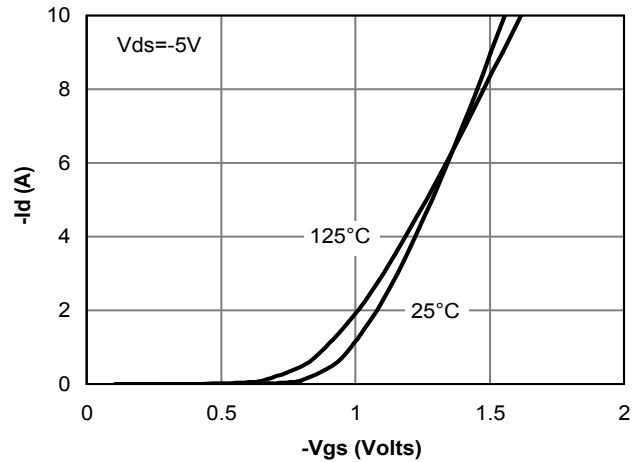


Figure 2: Transfer Characteristics

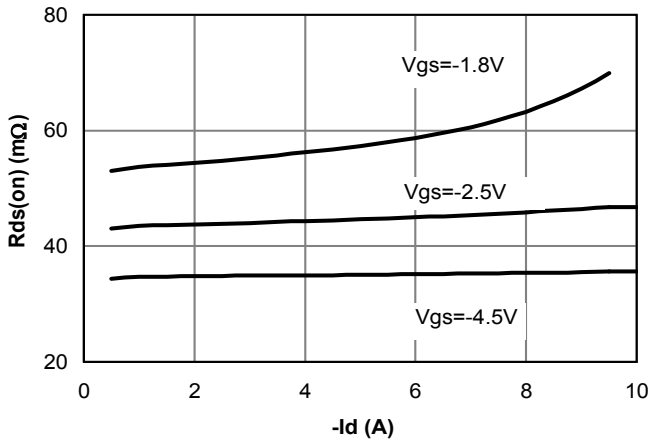


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

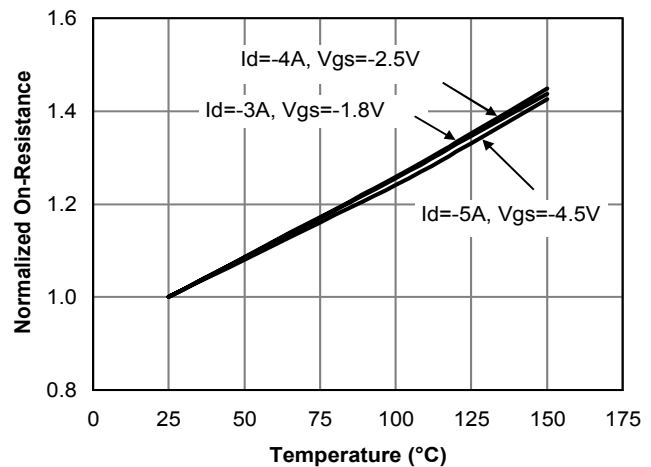


Figure 4: On-Resistance vs. Junction Temperature

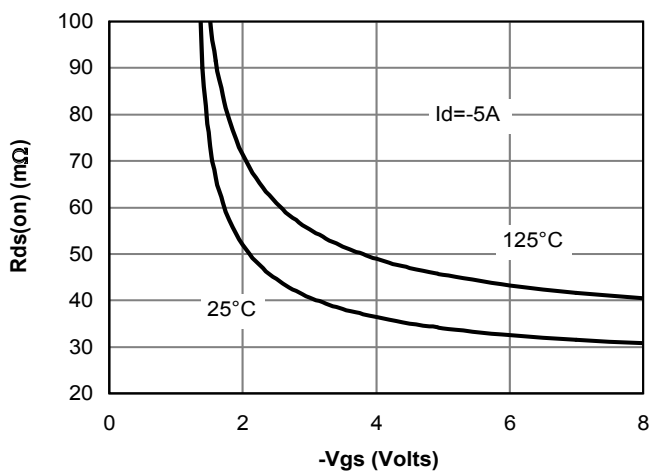


Figure 5: On-Resistance vs. Gate-Source Voltage

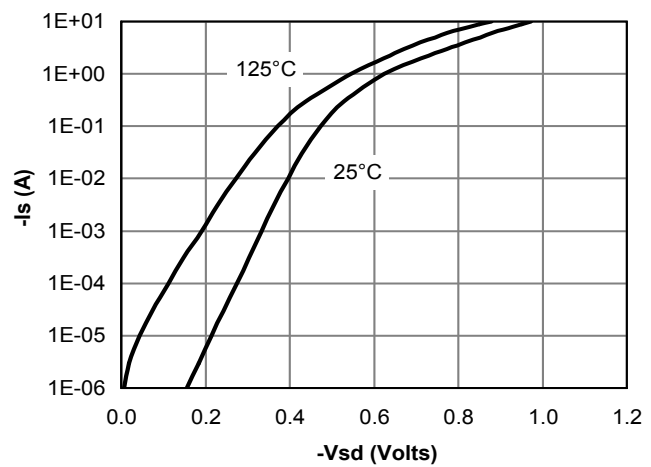


Figure 6: Body-Diode Characteristics

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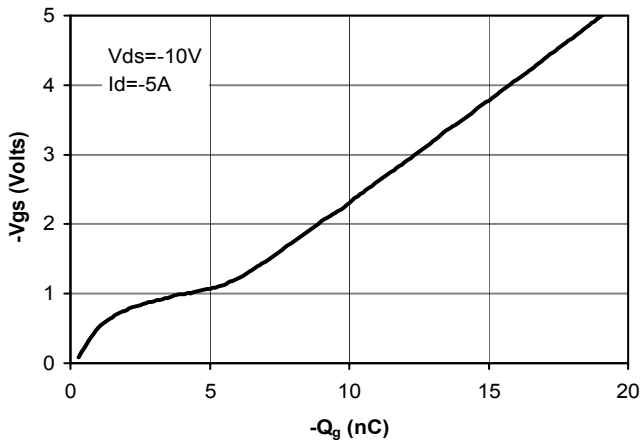


Figure 7: Gate-Charge Characteristics

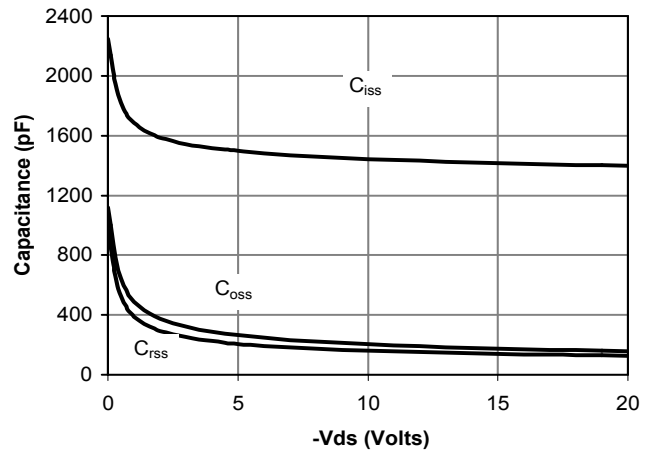


Figure 8: Capacitance Characteristics

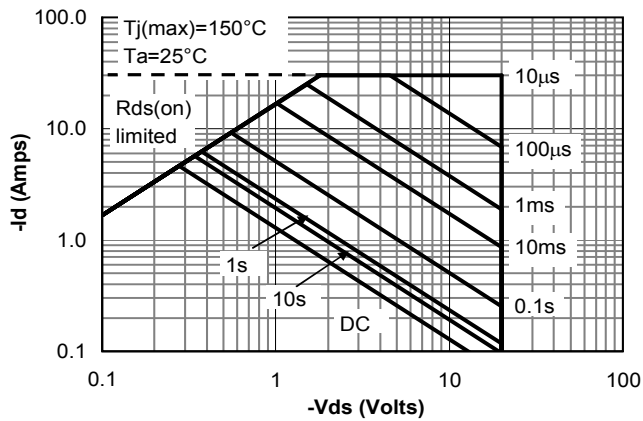


Figure 9: Maximum Forward Biased Safe Operating Area (Note 5)

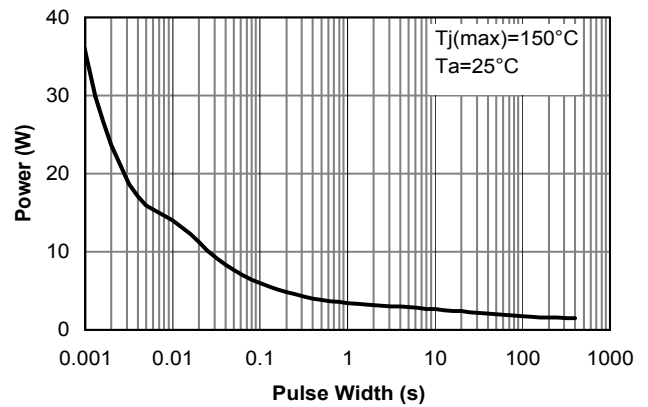


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note 5)

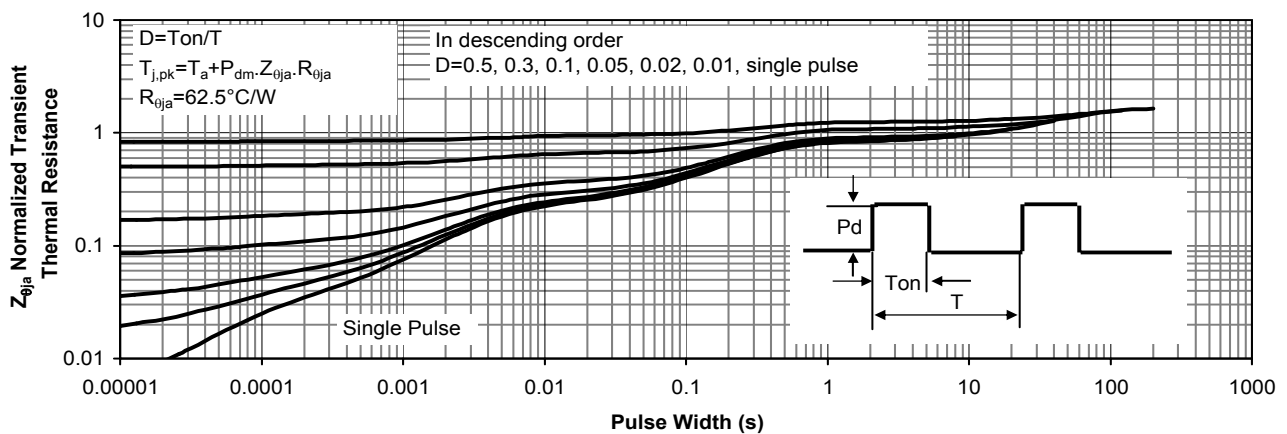


Figure 11: Normalized Maximum Transient Thermal Impedance