

Single P-channel MOSFET

ELM13415CA-S

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General description

ELM13415CA-S uses advanced trench technology to provide excellent $R_{ds(on)}$, low gate charge and low gate resistance. Internal ESD protection is included.

Features

- $V_{ds} = -20V$
- $I_d = -4A$ ($V_{gs} = -4.5V$)
- $R_{ds(on)} < 43m\Omega$ ($V_{gs} = -4.5V$)
- $R_{ds(on)} < 54m\Omega$ ($V_{gs} = -2.5V$)
- $R_{ds(on)} < 73m\Omega$ ($V_{gs} = -1.8V$)
- 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	I_d	$T_a = 25^\circ C$	-4.0	A	1
		$T_a = 70^\circ C$	-3.5		
Pulsed drain current	I_{dm}	-30	A	2	
Power dissipation	P_d	$T_a = 25^\circ C$	1.4	W	1
		$T_a = 70^\circ C$	0.9		
Junction and storage temperature range	T_j, T_{stg}	-55 to 150	$^\circ C$		

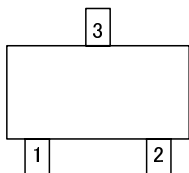
Thermal characteristics

Parameter		Symbol	Typ.	Max.	Unit	Note
Maximum junction-to-ambient	$t \leq 10s$	$R\theta_{ja}$	65	90	$^\circ C/W$	1
Maximum junction-to-ambient	Steady-state		85	125	$^\circ C/W$	
Maximum junction-to-lead	Steady-state	$R\theta_{jl}$	43	60	$^\circ C/W$	3

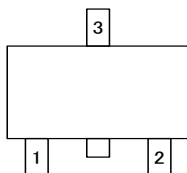
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Pin configuration

SOT-23 (TOP VIEW)



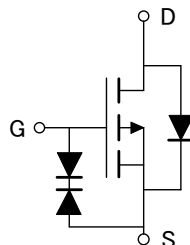
(Without extra bar)



(With extra bar)

Pin No.	Pin name
1	GATE
2	SOURCE
3	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 μA, Vgs=0V	-20			V
Zero gate voltage drain current	Idss	Vds=-16V			-1	μA
		Vgs=0V		Tj=55°C	-5	
Gate-body leakage current	Igss	Vds=0V, Vgs=±4.5V			±1	μA
		Vds=0V, Vgs=±8V			±10	μA
Gate threshold voltage	Vgs(th)	Vds=Vgs, Id=-250 μA	-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		35	43	mΩ
		Id=-4A	Tj=125°C	48	60	
		Vgs=-2.5V, Id=-4A		45	54	mΩ
		Vgs=-1.8V, Id=-2A		56	73	mΩ
Forward transconductance	Gfs	Vds=-5V, Id=-4A	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			1450		pF
Output capacitance	Coss	Vgs=0V, Vds=-10V, f=1MHz		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		17.2		nC
Gate-source charge	Qgs	Id=-4A		1.3		nC
Gate-drain charge	Qgd		4.5		nC	
Turn-on delay time	td(on)			9.5		ns
Turn-on rise time	tr	Vgs=-4.5V, Vds=-10V		17.0		ns
Turn-off delay time	td(off)	RI=2.5 Ω, Rgen=3 Ω		94.0		ns
Turn-off fall time	tf			35.0		ns
Body diode reverse recovery time	trr	If=-4A, di/dt=100A/μs		31.0		ns
Body diode reverse recovery charge	Qrr	If=-4A, di/dt=100A/μs		13.8		nC

NOTE :

1. The value of Rθja 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 Rθja is the sum of the thermal impedance from junction to lead Rθjl 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.

Typical electrical and thermal characteristics

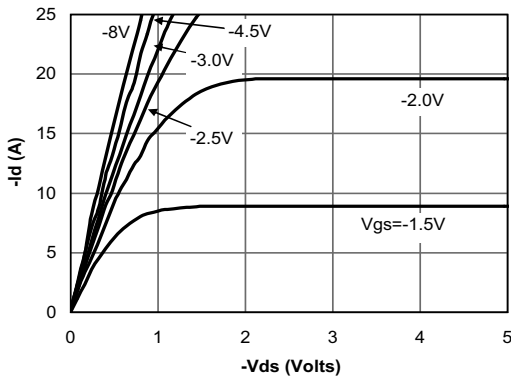


Fig 1: On-Region Characteristics

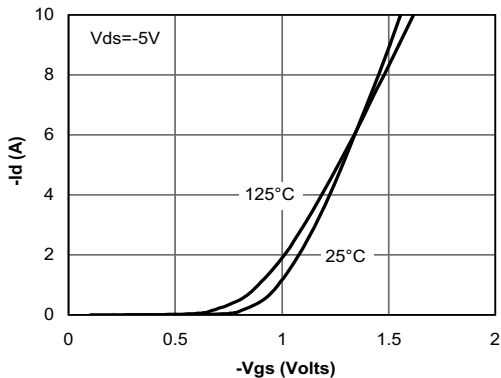


Figure 2: Transfer Characteristics

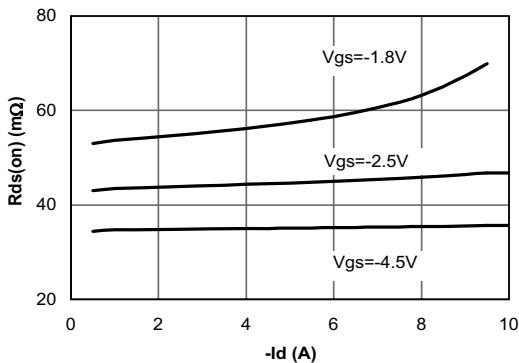


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

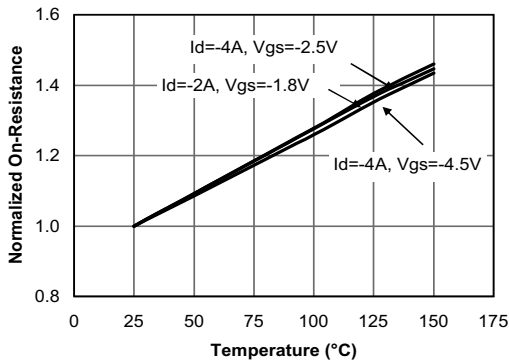


Figure 4: On-Resistance vs. Junction Temperature

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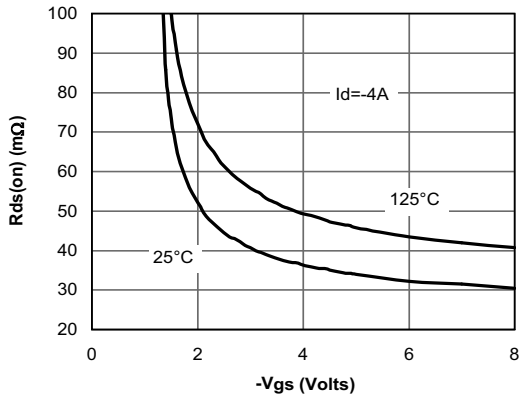


Figure 5: On-Resistance vs. Gate-Source Voltage

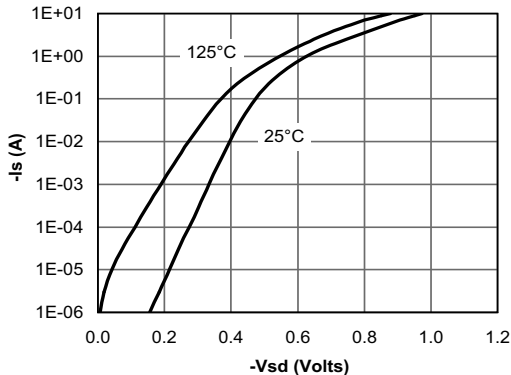


Figure 6: Body-Diode Characteristics

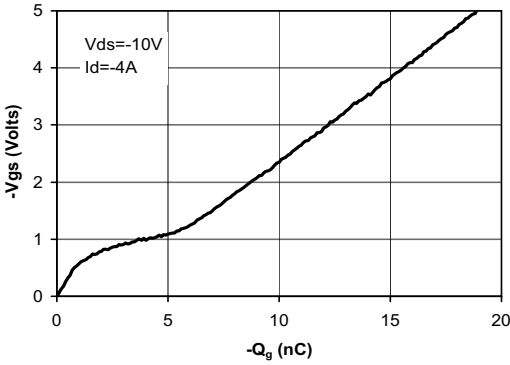


Figure 7: Gate-Charge Characteristics

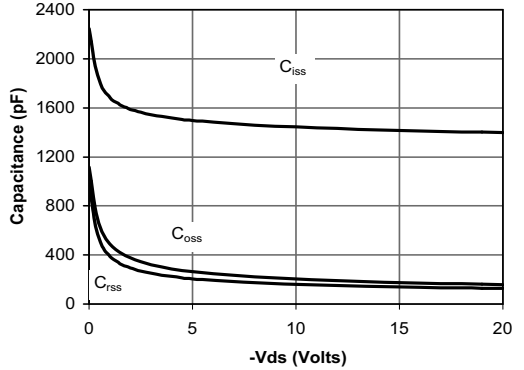


Figure 8: Capacitance Characteristics

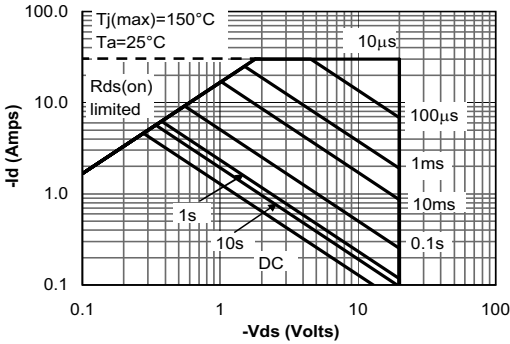


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

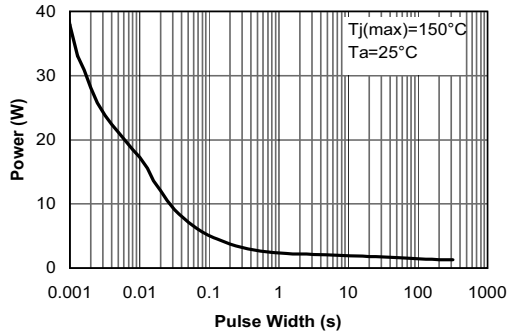


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

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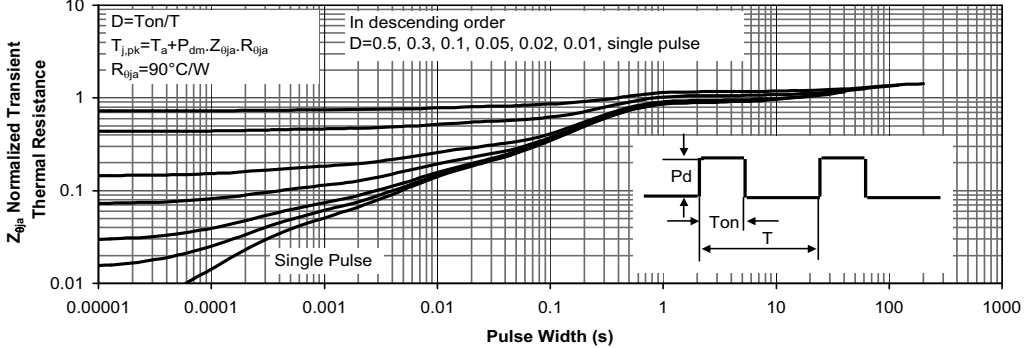


Figure 11: Normalized Maximum Transient Thermal Impedance