

Single P-channel MOSFET

ELM13415CA-S

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

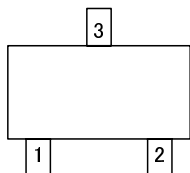
Parameter	Symbol	Limit	Unit	Note	
Drain-source voltage	V_{ds}	-20	V		
Gate-source voltage	V_{gs}	± 8	V		
Continuous drain current	I_d	$T_a = 25^\circ C$	-4.0	A	1
		$T_a = 70^\circ C$	-3.5		
Pulsed drain current	I_{dm}	-30	A	2	
Power dissipation	P_d	$T_a = 25^\circ C$	1.4	W	1
		$T_a = 70^\circ C$	0.9		
Junction and storage temperature range	T_j, T_{stg}	-55 to 150	$^\circ C$		

Thermal characteristics

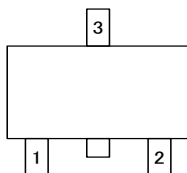
Parameter		Symbol	Typ.	Max.	Unit	Note
Maximum junction-to-ambient	$t \leq 10s$	$R\theta_{ja}$	65	90	$^\circ C/W$	1
Maximum junction-to-ambient	Steady-state		85	125	$^\circ C/W$	
Maximum junction-to-lead	Steady-state	$R\theta_{jl}$	43	60	$^\circ C/W$	3

Pin configuration

SOT-23 (TOP VIEW)



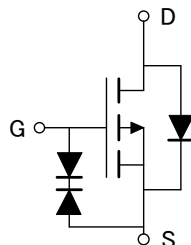
(Without extra bar)



(With extra bar)

Pin No.	Pin name
1	GATE
2	SOURCE
3	DRAIN

Circuit



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Electrical characteristics

T_a=25°C

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
STATIC PARAMETERS						
Drain-source breakdown voltage	BV _{dss}	I _d =-250 μA, V _{gs} =0V	-20			V
Zero gate voltage drain current	I _{dss}	V _{ds} =-16V			-1	μA
		V _{gs} =0V	T _j =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 =-250 μA	-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		35	43	mΩ
		I _d =-4A	T _j =125°C	48	60	
		V _{gs} =-2.5V, I _d =-4A		45	54	mΩ
		V _{gs} =-1.8V, I _d =-2A		56	73	mΩ
Forward transconductance	G _{fs}	V _{ds} =-5V, I _d =-4A	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 =-4A		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)}			9.5		ns
Turn-on rise time	t _r	V _{gs} =-4.5V, V _{ds} =-10V		17.0		ns
Turn-off delay time	t _{d(off)}	R _l =2.5 Ω, R _{gen} =3 Ω		94.0		ns
Turn-off fall time	t _f			35.0		ns
Body diode reverse recovery time	t _{rr}	I _f =-4A, dI/dt=100A/μs		31.0		ns
Body diode reverse recovery charge	Q _{rr}	I _f =-4A, dI/dt=100A/μs		13.8		nC

NOTE :

- The value of R_{θja} is measured with the device mounted on 1in² FR-4 board of 2oz. Copper, in still air environment with T_a=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.
- Repetitive rating, pulse width limited by junction temperature.
- The R_{θja} is the sum of the thermal impedance from junction to lead R_{θjl} and lead to ambient.
- The static characteristics in Figures 1 to 6 are obtained using 80μs pulses, duty cycle 0.5%max.
- These tests are performed with the device mounted on 1in² FR-4 board with 2oz. Copper, in a still air environment with T_a=25°C. The SOA curve provides a single pulse rating.

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Typical electrical and thermal characteristics

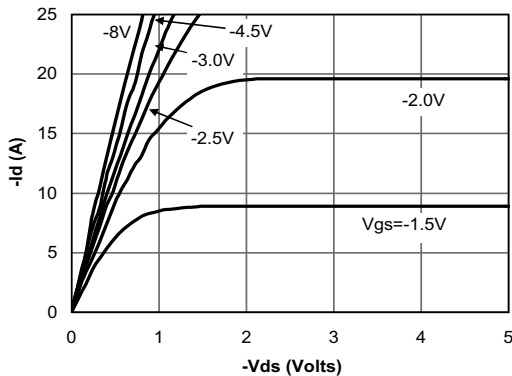


Fig 1: On-Region Characteristics

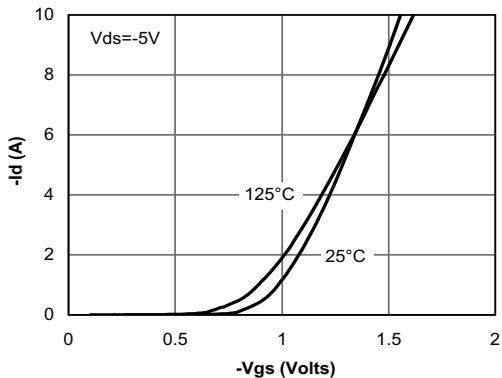


Figure 2: Transfer Characteristics

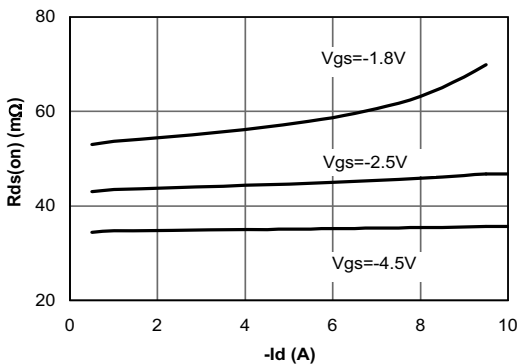


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

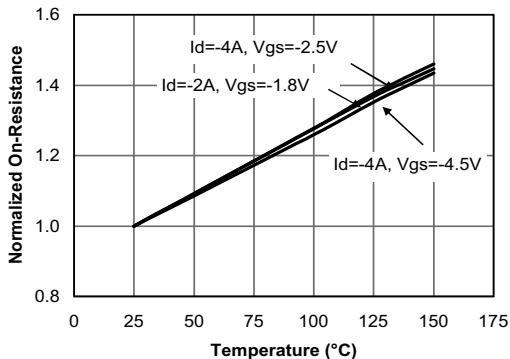


Figure 4: On-Resistance vs. Junction Temperature

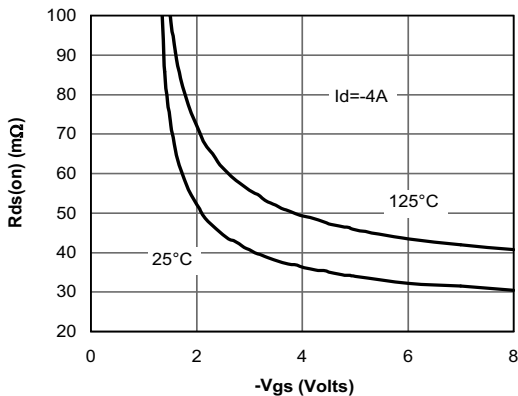


Figure 5: On-Resistance vs. Gate-Source Voltage

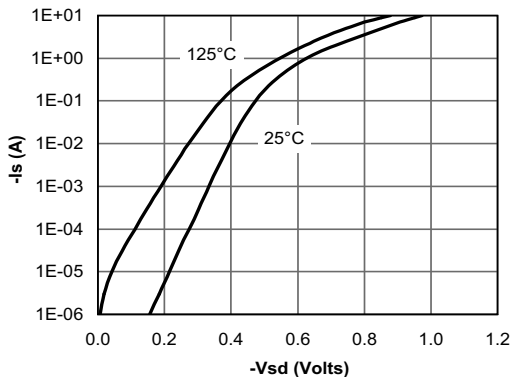


Figure 6: Body-Diode Characteristics

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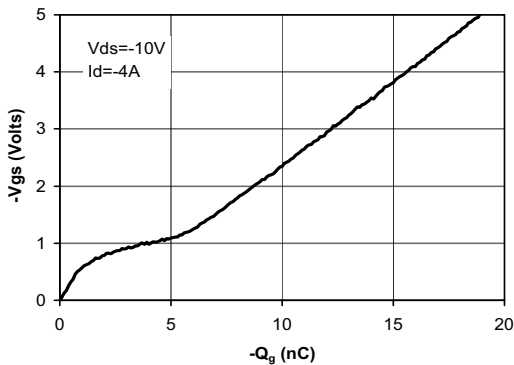


Figure 7: Gate-Charge Characteristics

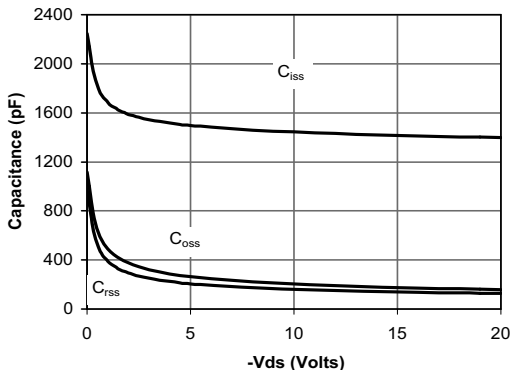


Figure 8: Capacitance Characteristics

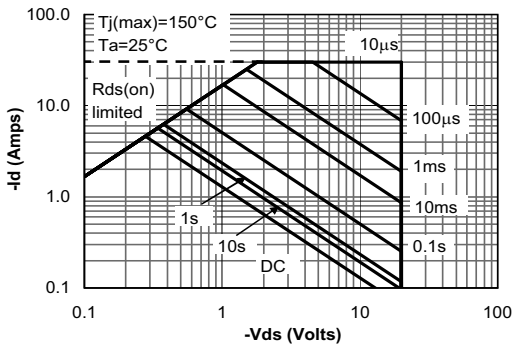


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

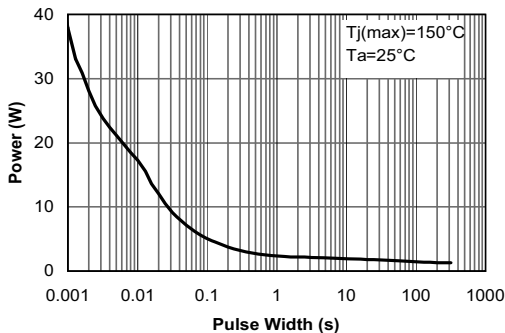


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

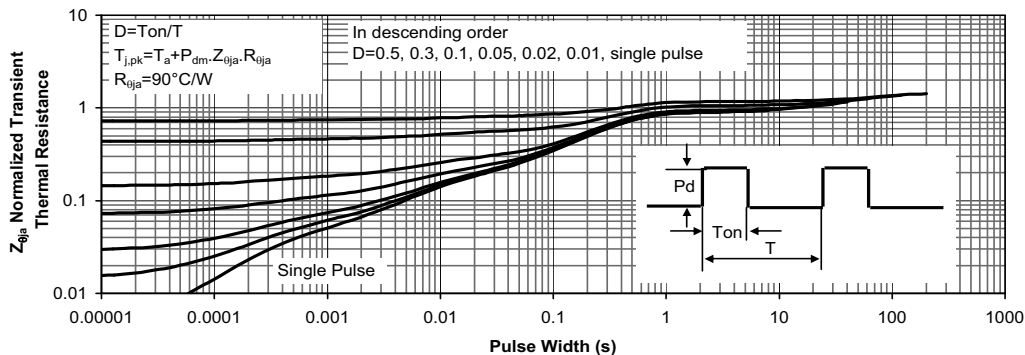


Figure 11: Normalized Maximum Transient Thermal Impedance