

Single N-channel MOSFET

ELM13402CA-S

General description

ELM13402CA-S uses advanced trench technology to provide excellent $R_{ds(on)}$, low gate charge and low gate resistance.

Features

- $V_{ds}=30V$
- $I_d=4A$ ($V_{gs}=10V$)
- $R_{ds(on)} < 55m\Omega$ ($V_{gs}=10V$)
- $R_{ds(on)} < 70m\Omega$ ($V_{gs}=4.5V$)
- $R_{ds(on)} < 110m\Omega$ ($V_{gs}=2.5V$)

Maximum absolute ratings

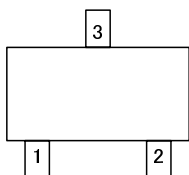
Parameter	Symbol	Limit	Unit	Note	
Drain-source voltage	V_{ds}	30	V		
Gate-source voltage	V_{gs}	± 12	V		
Continuous drain current	I_d	$T_a=25^\circ C$	4.0	A	1
		$T_a=70^\circ C$	3.4		
Pulsed drain current	I_{dm}	15	A	2	
Power dissipation	P_d	$T_a=25^\circ C$	1.4	W	1
		$T_a=70^\circ C$	1.0		
Junction and storage temperature range	T_j, T_{stg}	-55 to 150	$^\circ C$		

Thermal characteristics

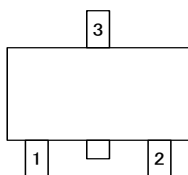
Parameter		Symbol	Typ.	Max.	Unit	Note
Maximum junction-to-ambient	$t \leq 10s$	$R\theta_{ja}$	70	90	$^\circ C/W$	1
Maximum junction-to-ambient	Steady-state		100	125	$^\circ C/W$	
Maximum junction-to-lead	Steady-state	$R\theta_{jl}$	63	80	$^\circ C/W$	3

Pin configuration

SOT-23 (TOP VIEW)



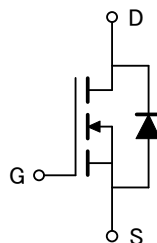
(Without extra bar)



(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	30			V
Zero gate voltage drain current	I _{dss}	V _{ds} =24V			1	μA
		V _{gs} =0V		T _j =55°C	5	
Gate-body leakage current	I _{gss}	V _{ds} =0V, V _{gs} =±12V			100	nA
Gate threshold voltage	V _{gs(th)}	V _{ds} =V _{gs} , I _d =250 μA	0.6	1.0	1.4	V
On state drain current	I _{d(on)}	V _{gs} =4.5V, V _{ds} =5V	10			A
Static drain-source on-resistance	R _{ds(on)}	V _{gs} =10V		45	55	mΩ
		I _d =4A	T _j =125°C	66	80	
		V _{gs} =4.5V, I _d =3A		55	70	mΩ
		V _{gs} =2.5V, I _d =2A		83	110	mΩ
Forward transconductance	G _{fs}	V _{ds} =5V, I _d =4A		8		S
Diode forward voltage	V _{sd}	I _s =1A, V _{gs} =0V		0.8	1.0	V
Max. body-diode continuous current	I _s				2.5	A
DYNAMIC PARAMETERS						
Input capacitance	C _{iss}			390.0		pF
Output capacitance	C _{oss}	V _{gs} =0V, V _{ds} =15V, f=1MHz		54.5		pF
Reverse transfer capacitance	C _{rss}			41.0		pF
Gate resistance	R _g	V _{gs} =0V, V _{ds} =0V, f=1MHz		3		Ω
SWITCHING PARAMETERS						
Total gate charge	Q _g			4.34		nC
Gate-source charge	Q _{gs}	V _{gs} =4.5V, V _{ds} =15V, I _d =4A		0.60		nC
Gate-drain charge	Q _{gd}			1.38		nC
Turn-on delay time	t _{d(on)}			3.3		ns
Turn-on rise time	t _r	V _{gs} =10V, V _{ds} =15V		1.0		ns
Turn-off delay time	t _{d(off)}	R _l =3.75 Ω, R _{gen} =6 Ω		21.7		ns
Turn-off fall time	t _f			2.1		ns
Body diode reverse recovery time	t _{rr}	I _f =4A, dI/dt=100A/μs		12.0		ns
Body diode reverse recovery charge	Q _{rr}	I _f =4A, dI/dt=100A/μs		6.3		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 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.
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 T_a=25°C. The SOA curve provides a single pulse rating.

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Typical electrical and thermal characteristics

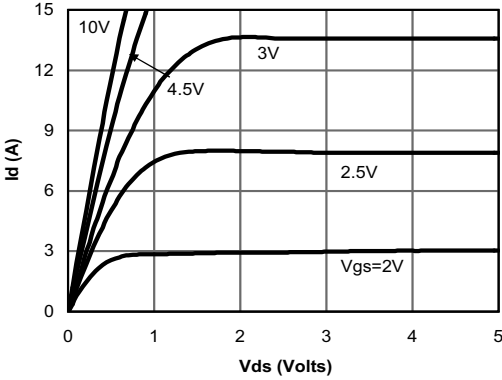


Fig 1: On-Region Characteristics

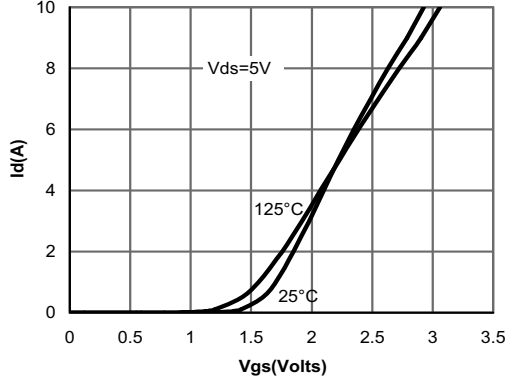


Figure 2: Transfer Characteristics

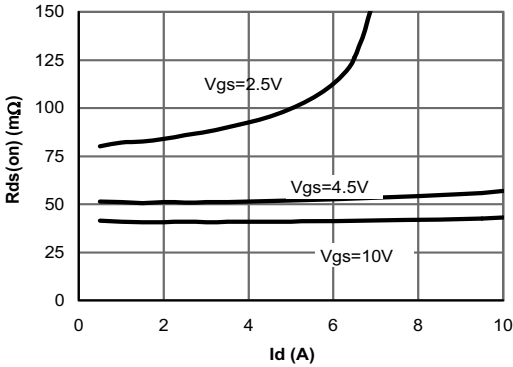


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

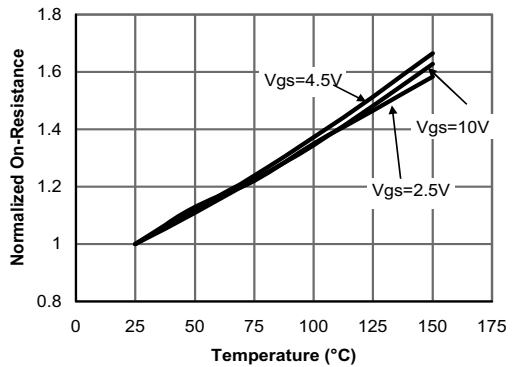


Figure 4: On-Resistance vs. Junction Temperature

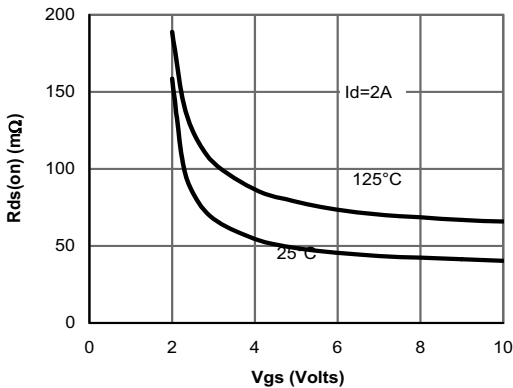


Figure 5: On-Resistance vs. Gate-Source Voltage

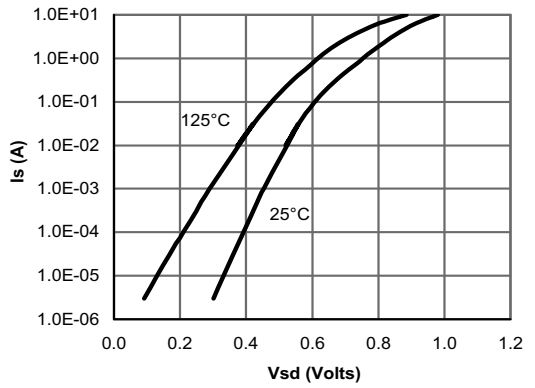


Figure 6: Body-Diode Characteristics

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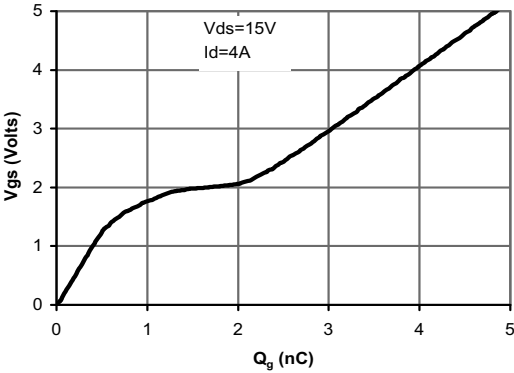


Figure 7: Gate-Charge Characteristics

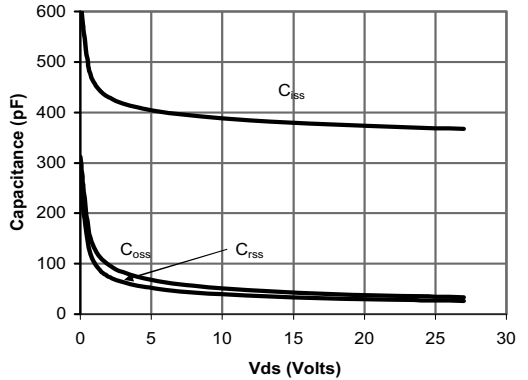


Figure 8: Capacitance Characteristics

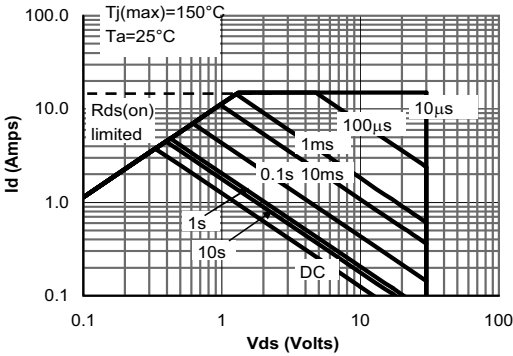


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

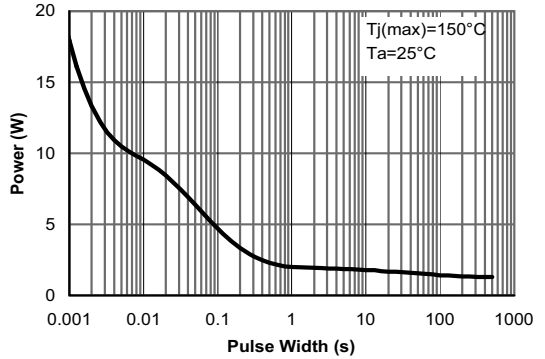


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

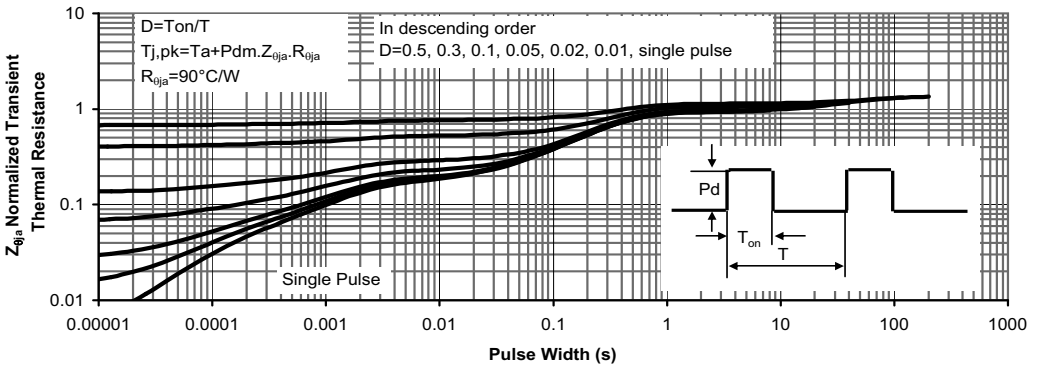


Figure 11: Normalized Maximum Transient Thermal Impedance