Single N-channel MOSFET

ELM13416CA-S

■General description

ELM13416CA-S uses advanced trench technology to provide excellent Rds(on), low gate charge and operation with gate voltages as low as 1.8V and internal ESD protection is included.

■Features

- Vds=20V
- Id=6.5A (Vgs=4.5V)
- Rds(on) < 22mΩ (Vgs=4.5V)
- Rds(on) < 26mΩ (Vgs=2.5V)
- Rds(on) < 34mΩ (Vgs=1.8V)
- ESD protected

■Maximum absolute ratings

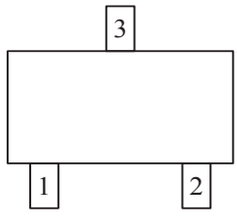
Parameter		Symbol	Limit	Unit	Note
Drain-source voltage		Vds	20	V	
Gate-source voltage		Vgs	±8	V	
Continuous drain current	Ta=25°C	Id	6.5	A	
	Ta=70°C		5.2		
Pulsed drain current		Idm	30	A	3
Power dissipation	Ta=25°C	Pd	1.4	W	2
	Ta=70°C		0.9		
Junction and storage temperature range		Tj, Tstg	-55 to 150	°C	

■Thermal characteristics

Parameter		Symbol	Typ.	Max.	Unit	Note
Maximum junction-to-ambient	t≤10s	Rθja	70	90	°C/W	1
Maximum junction-to-ambient	Steady-state		100	125	°C/W	1, 4
Maximum junction-to-lead	Steady-state	Rθjl	63	80	°C/W	

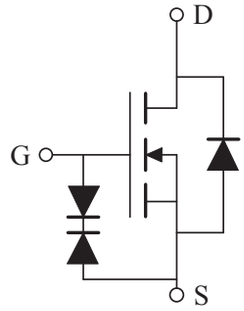
■Pin configuration

SOT-23(TOP VIEW)



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=250μA, Vgs=0V		20			V
Zero gate voltage drain current	Idss	Vds=20V, Vgs=0V				1	μA
			Tj=55°C			5	
Gate-body leakage current	Igss	Vds=0V, Vgs=±8V				±10	μA
Gate threshold voltage	Vgs(th)	Vds=Vgs, Id=250μA		0.4	0.7	1.1	V
On state drain current	Id(on)	Vgs=4.5V, Vds=5V		30			A
Static drain-source on-resistance	Rds(on)	Vgs=4.5V, Id=6.5A			16	22	mΩ
			Tj=125°C		22	30	
		Vgs=2.5V, Id=5.5A			18	26	
		Vgs=1.8V, Id=5A			21	34	
Forward transconductance	Gfs	Vds=5V, Id=6.5A			50		S
Diode forward voltage	Vsd	Is=1A, Vgs=0V			0.62	1.00	V
Max. body-diode continuous current	Is					2	A
DYNAMIC PARAMETERS							
Input capacitance	Ciss	Vgs=0V, Vds=10V, f=1MHz			1295	1650	pF
Output capacitance	Coss				160		pF
Reverse transfer capacitance	Crss				87		pF
Gate resistance	Rg	Vgs=0V, Vds=0V, f=1MHz			1.8		kΩ
SWITCHING PARAMETERS							
Total gate charge	Qg	Vgs=4.5V, Vds=10V, Id=6.5A			10.0		nC
Gate-source charge	Qgs				4.2		nC
Gate-drain charge	Qgd				2.6		nC
Turn-on delay time	td(on)	Vgs=4.5V, Vds=10V Rl=1.54Ω, Rgen=3Ω			280.00		ns
Turn-on rise time	tr				328.00		ns
Turn-off delay time	td(off)				3.76		ns
Turn-off fall time	tf				2.24		ns
Body diode reverse recovery time	trr	If=6.5A, dl/dt=100A/μs			31	41	ns
Body diode reverse recovery charge	Qrr	If=6.5A, dl/dt=100A/μs			6.8		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 application depends on the user's specific board design.
2. The power dissipation Pd is based on Tj(Max)=150°C, using 10s junction-to-ambient thermal resistance.
3. Repetitive rating, pulse width limited by junction temperature Tj(Max)=150°C. Ratings are based on low frequency and duty cycles to keep initial Tj=25°C.
4. The Rθja is the sum of the thermal impedence from junction to lead Rθjl and lead to ambient.
5. The static characteristics in Figures 1 to 6 are obtained using <300μs pulses, duty cycle 0.5% max.
6. These curves are based on the junction-to-ambient thermal impedence which is measured with the device mounted on 1in2 FR-4 board with 2oz.Copper, assuming a maximum junction temperature of Tj(Max)=150°C. The SOA curve provides a single pulse rating.

■Typical electrical and thermal characteristics

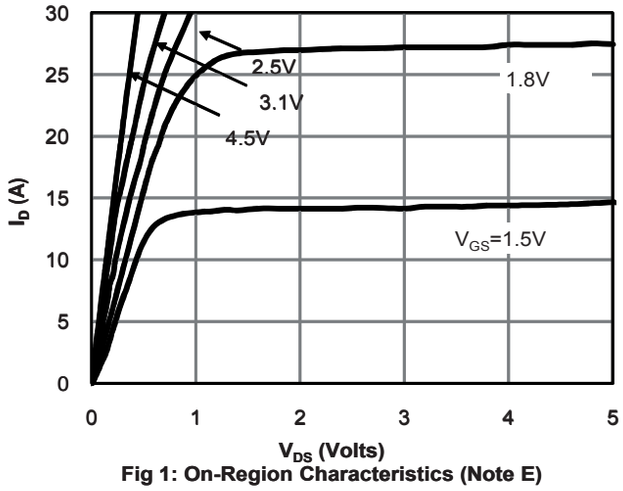


Fig 1: On-Region Characteristics (Note E)

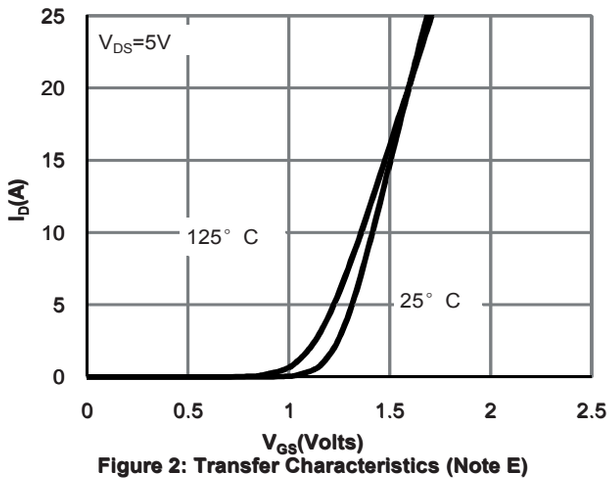


Figure 2: Transfer Characteristics (Note E)

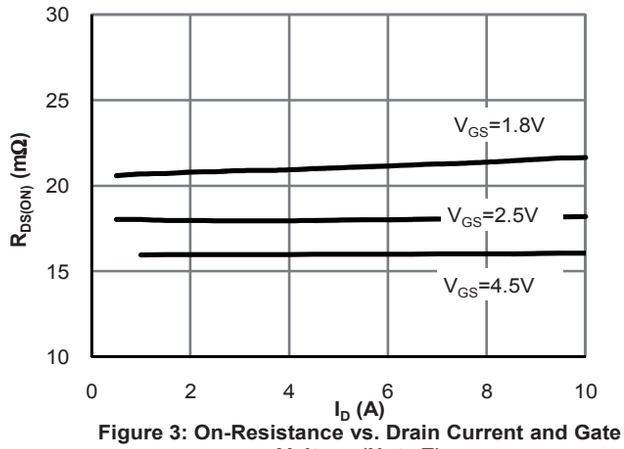


Figure 3: On-Resistance vs. Drain Current and Gate Voltage (Note E)

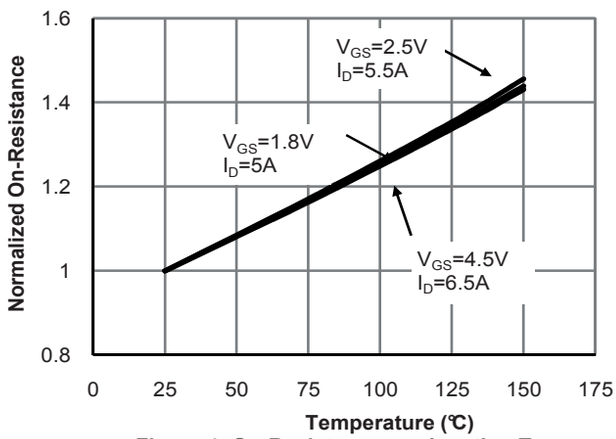


Figure 4: On-Resistance vs. Junction Temperature (Note E)

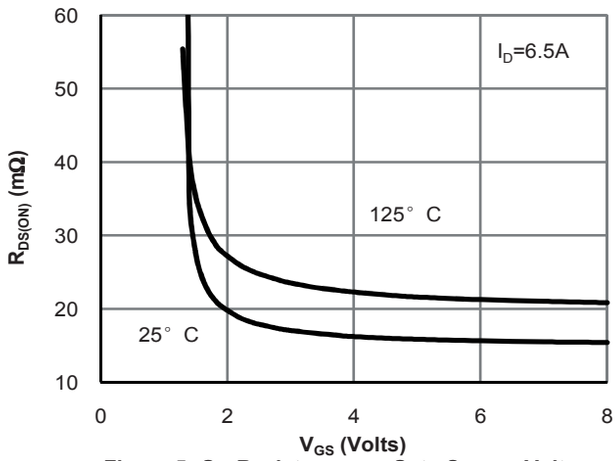


Figure 5: On-Resistance vs. Gate-Source Voltage (Note E)

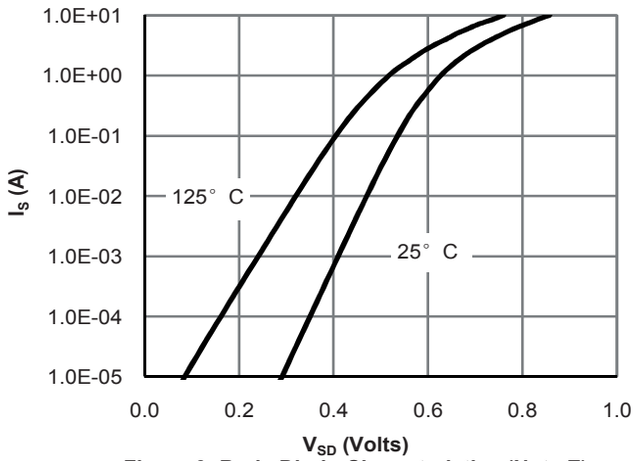


Figure 6: Body-Diode Characteristics (Note E)

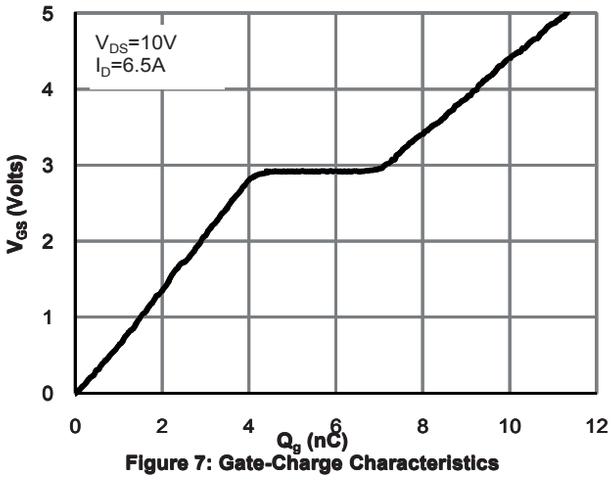


Figure 7: Gate-Charge Characteristics

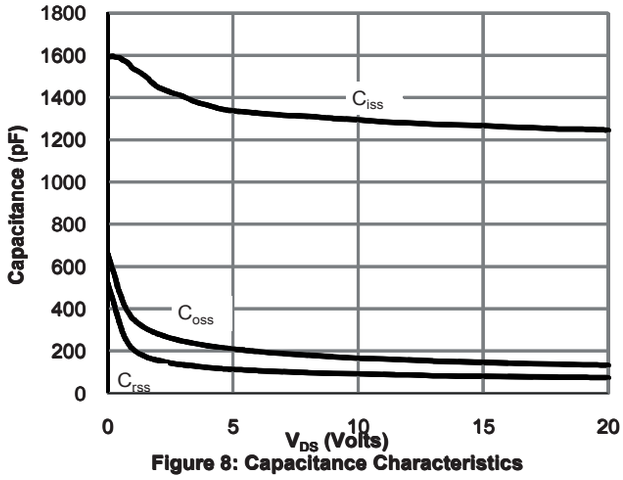


Figure 8: Capacitance Characteristics

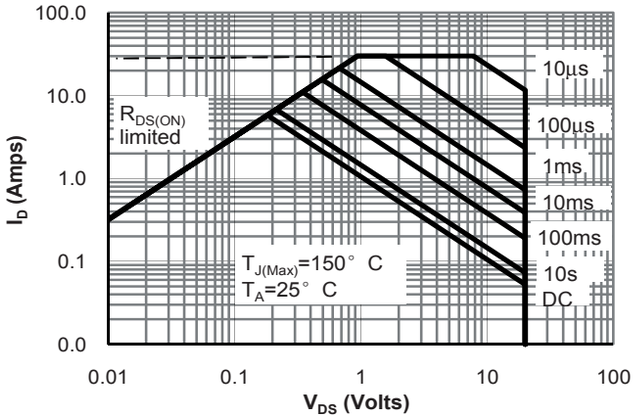


Figure 9: Maximum Forward Biased Safe Operating Area (Note F)

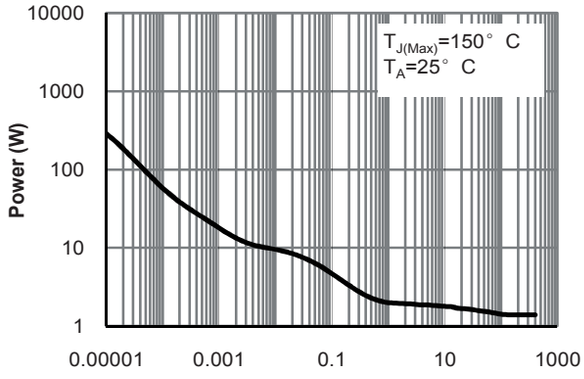


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note F)

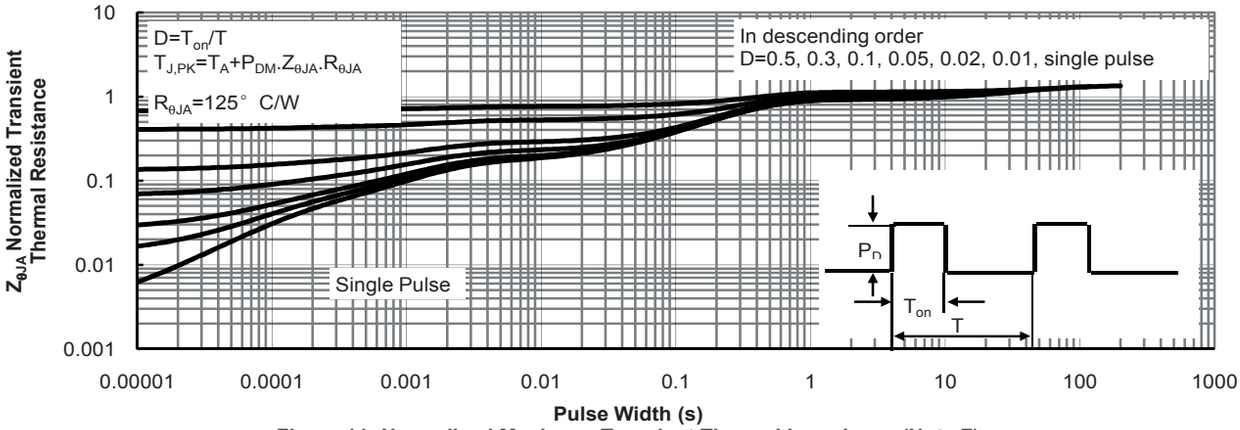
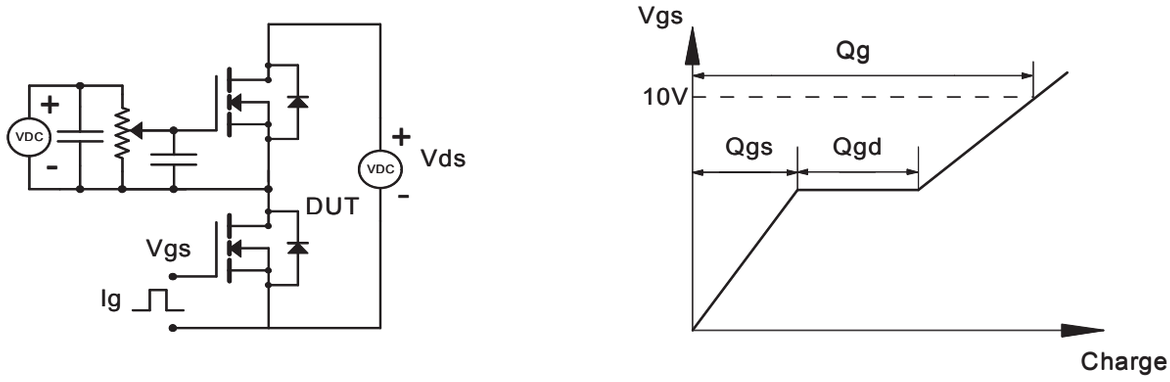


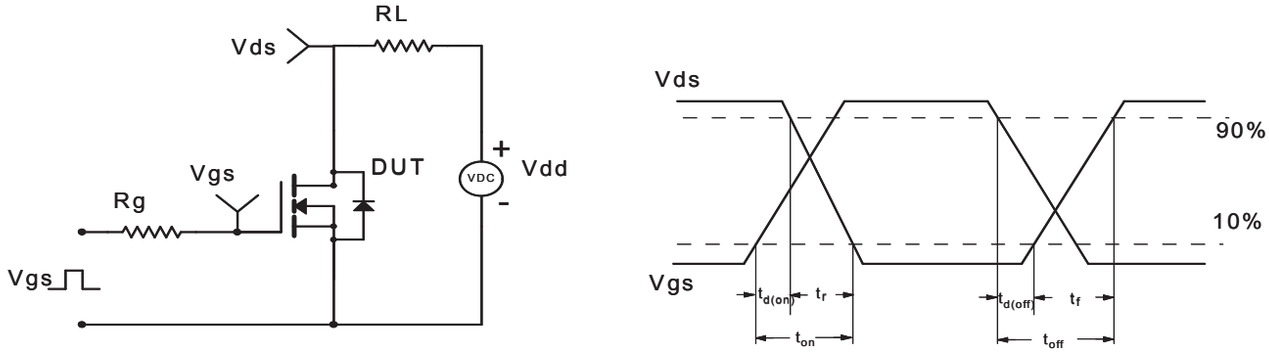
Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)

■Test circuit & waveform

Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms