

Single N-channel MOSFET

ELM13400CA-S

General description

ELM13400CA-S uses advanced trench technology to provide excellent $R_{ds(on)}$, low gate charge and low gate resistance.

Features

- $V_{ds}=30V$
- $I_d=5.8A$ ($V_{gs}=10V$)
- $R_{ds(on)} < 28m\Omega$ ($V_{gs}=10V$)
- $R_{ds(on)} < 33m\Omega$ ($V_{gs}=4.5V$)
- $R_{ds(on)} < 52m\Omega$ ($V_{gs}=2.5V$)

Maximum absolute ratings

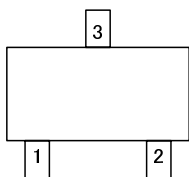
Parameter	Symbol	Limit	Unit	Note	
Drain-source voltage	V_{ds}	30	V		
Gate-source voltage	V_{gs}	± 12	V		
Continuous drain current	I_d	$T_a=25^\circ C$	5.8	A	1
		$T_a=70^\circ C$	4.9		
Pulsed drain current	I_{dm}	30	A	2	
Power dissipation	P_d	$T_a=25^\circ C$	1.4	W	1
		$T_a=70^\circ C$	1.0		
Junction and storage temperature range	T_j, T_{stg}	-55 to 150	$^\circ C$		

Thermal characteristics

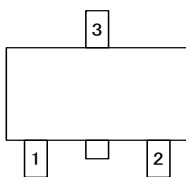
Parameter		Symbol	Typ.	Max.	Unit	Note
Maximum junction-to-ambient	$t \leq 10s$	$R\theta_{ja}$	65	90	$^\circ C/W$	1
Maximum junction-to-ambient	Steady-state		85	125	$^\circ C/W$	
Maximum junction-to-lead	Steady-state	$R\theta_{jl}$	43	60	$^\circ C/W$	3

Pin configuration

SOT-23 (TOP VIEW)



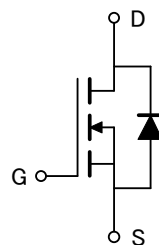
(Without extra bar)



(With extra bar)

Pin No.	Pin name
1	GATE
2	SOURCE
3	DRAIN

Circuit



Single N-channel MOSFET

ELM13400CA-S

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	0.7	1.1	1.4	V
On state drain current	I _{d(on)}	V _{gs} =4.5V, V _{ds} =5V	30			A
Static drain-source on-resistance	R _{ds(on)}	V _{gs} =10V		22.8	28.0	mΩ
		I _d =5.8A	T _j =125°C	32.0	39.0	
		V _{gs} =4.5V, I _d =5A		27.3	33.0	mΩ
		V _{gs} =2.5V, I _d =4A		43.3	52.0	mΩ
Forward transconductance	G _{fs}	V _{ds} =5V, I _d =5A	10	15		S
Diode forward voltage	V _{sd}	I _s =1A, V _{gs} =0V		0.71	1.00	V
Max. body-diode continuous current	I _s				2.5	A
DYNAMIC PARAMETERS						
Input capacitance	C _{iss}			823	1030	pF
Output capacitance	C _{oss}	V _{gs} =0V, V _{ds} =15V, f=1MHz		99		pF
Reverse transfer capacitance	C _{rss}			77		pF
Gate resistance	R _g	V _{gs} =0V, V _{ds} =0V, f=1MHz		1.2	3.6	Ω
SWITCHING PARAMETERS						
Total gate charge	Q _g			9.7	12.0	nC
Gate-source charge	Q _{gs}	V _{gs} =4.5V, V _{ds} =15V, I _d =5.8A		1.6		nC
Gate-drain charge	Q _{gd}			3.1		nC
Turn-on delay time	t _{d(on)}			3.3	5.0	ns
Turn-on rise time	t _r	V _{gs} =10V, V _{ds} =15V		4.8	7.0	ns
Turn-off delay time	t _{d(off)}	R _l =2.7 Ω, R _{gen} =3 Ω		26.3	40.0	ns
Turn-off fall time	t _f			4.1	6.0	ns
Body diode reverse recovery time	t _{rr}	I _f =5A, dI/dt=100A/μs		16.0	20.0	ns
Body diode reverse recovery charge	Q _{rr}	I _f =5A, dI/dt=100A/μs		8.9	12.0	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.

Single N-channel MOSFET

ELM13400CA-S

Typical electrical and thermal characteristics

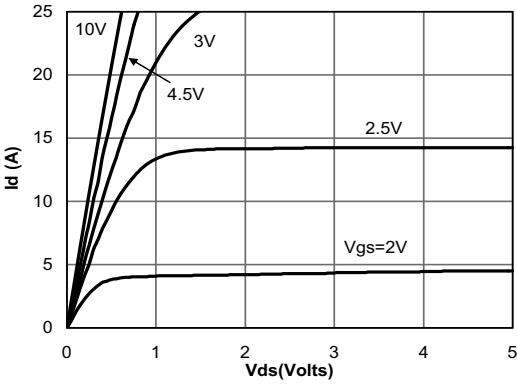


Figure 1: On-Region Characteristics

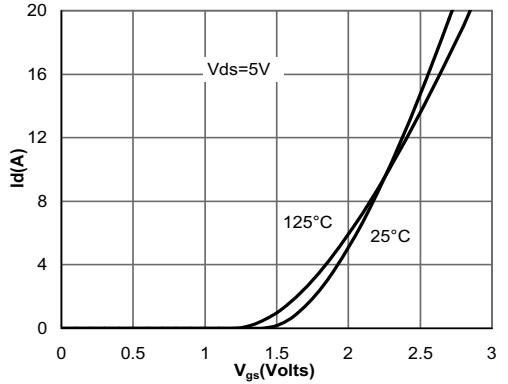


Figure 2: Transfer Characteristics

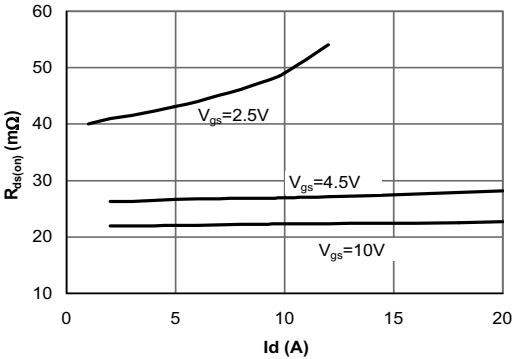


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

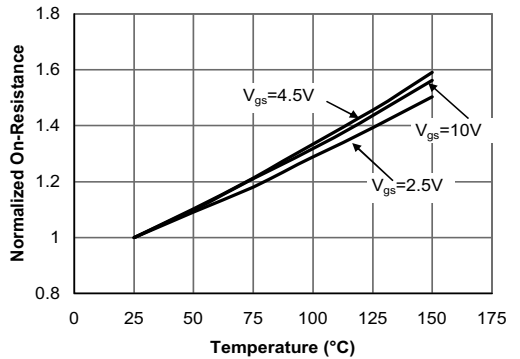


Figure 4: On-Resistance vs. Junction Temperature

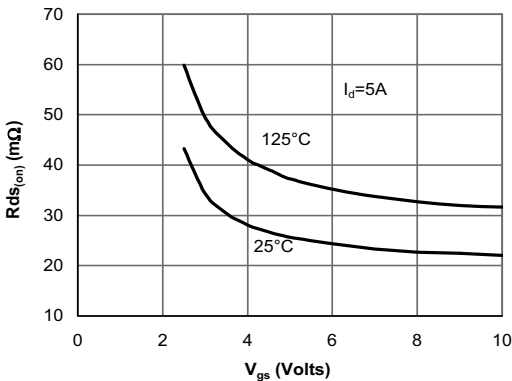


Figure 5: On-Resistance vs. Gate-Source Voltage

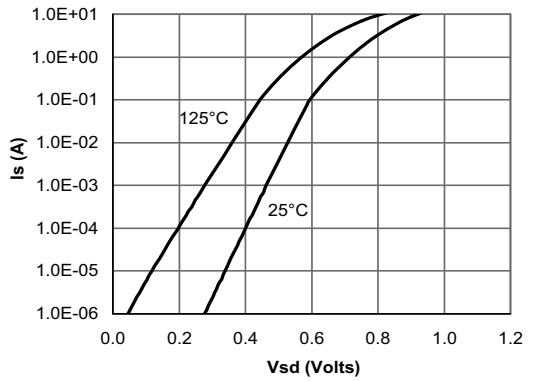


Figure 6: Body-Diode Characteristics

Single N-channel MOSFET

ELM13400CA-S

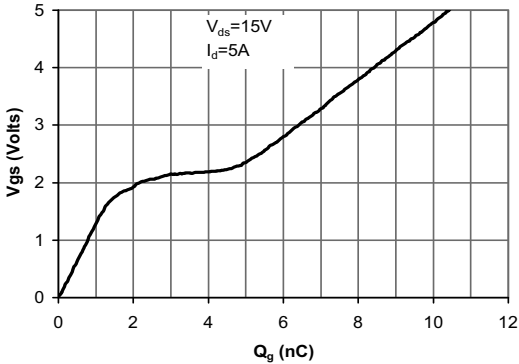


Figure 7: Gate-Charge Characteristics

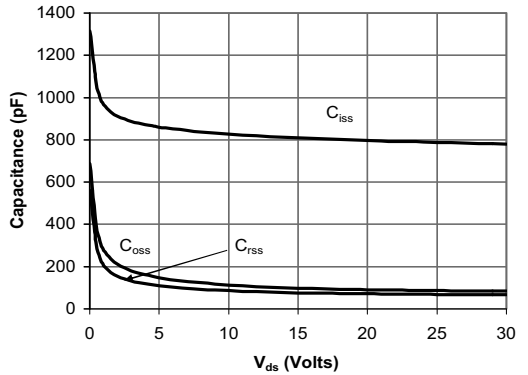


Figure 8: Capacitance Characteristics

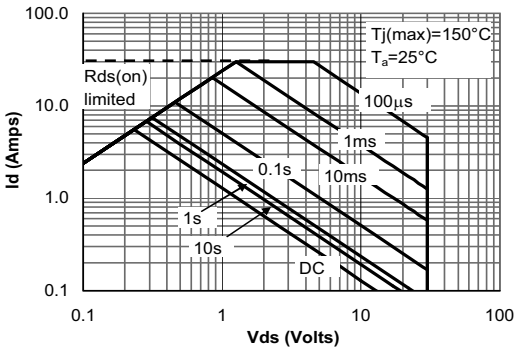


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

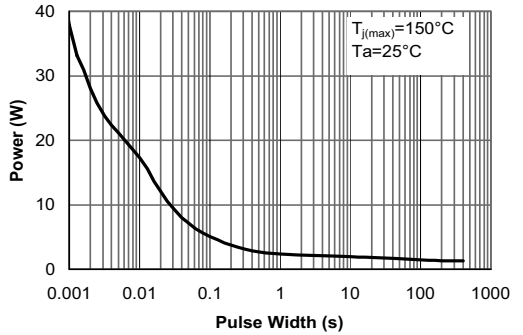


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

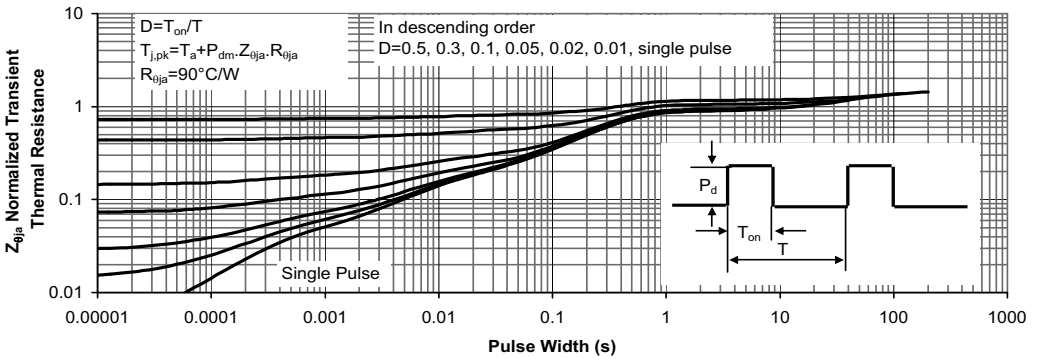


Figure 11: Normalized Maximum Transient Thermal Impedance