

Single P-channel MOSFET

ELM13405CA-S

■General description

ELM13405CA-S uses advanced trench technology to provide excellent $R_{ds(on)}$, low gate charge and low gate resistance.

■Features

- $V_{ds} = -30V$
- $I_d = -2.6A$ ($V_{gs} = -10V$)
- $R_{ds(on)} < 130m\Omega$ ($V_{gs} = -10V$)
- $R_{ds(on)} < 180m\Omega$ ($V_{gs} = -4.5V$)

■Maximum absolute ratings

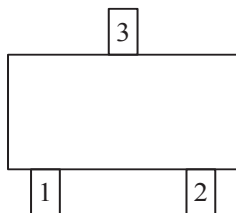
Parameter		Symbol	Limit	Unit	Note
Drain-source voltage		V_{ds}	-30	V	
Gate-source voltage		V_{gs}	± 12	V	
Continuous drain current	$T_a = 25^\circ C$	I_d	-2.6	A	1
	$T_a = 70^\circ C$		-2.2		
Pulsed drain current		I_{dm}	-30	A	2
Power dissipation	$T_a = 25^\circ C$	P_d	1.4	W	1
	$T_a = 70^\circ C$		1.0		
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

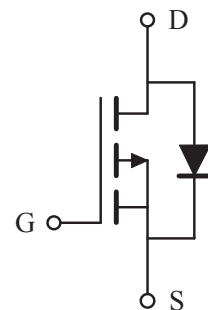
■Pin configuration

SOT-23(TOP VIEW)



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	BV _{dss}	I _d =-250μA, V _{gs} =0V	-30			V
Zero gate voltage drain current	I _{dss}	V _{ds} =-24V V _{gs} =0V			-1	μA
		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 =-250μA	-1.3	-1.8	-2.3	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 I _d =-2.6A		102	130	mΩ
		T _j =125°C				
		V _{gs} =-4.5V, I _d =-2A		137	180	mΩ
Forward transconductance	G _{fs}	V _{ds} =-5V, I _d =-2.5A	7	11		S
Diode forward voltage	V _{sd}	I _s =-1A, V _{gs} =0V		-0.83	-1.00	V
Max. body-diode continuous current	I _s				-2.2	A
DYNAMIC PARAMETERS						
Input capacitance	C _{iss}	V _{gs} =0V, V _{ds} =-15V, f=1MHz		481		pF
Output capacitance	C _{oss}			54		pF
Reverse transfer capacitance	C _{rss}			34		pF
Gate resistance	R _g	V _{gs} =0V, V _{ds} =0V, f=1MHz		12		Ω
SWITCHING PARAMETERS						
Total gate charge	Q _g	V _{gs} =-4.5V, V _{ds} =-15V I _d =-2.5A		1.25		nC
Gate-source charge	Q _{gs}			1.75		nC
Gate-drain charge	Q _{gd}			4.35		nC
Turn-on delay time	t _{d(on)}	V _{gs} =-10V, V _{ds} =-15V R _l =6Ω, R _{gen} =6Ω		8.9		ns
Turn-on rise time	t _r			8.8		ns
Turn-off delay time	t _{d(off)}			23.0		ns
Turn-off fall time	t _f			6.9		ns
Body diode reverse recovery time	t _{rr}			26.0		ns
Body diode reverse recovery charge	Q _{rr}	I _f =-2.5A, dI/dt=100A/μs		15.6		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 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 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 Ta=25°C. The SOA curve provides a single pulse rating.

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■ Typical electrical and thermal characteristics

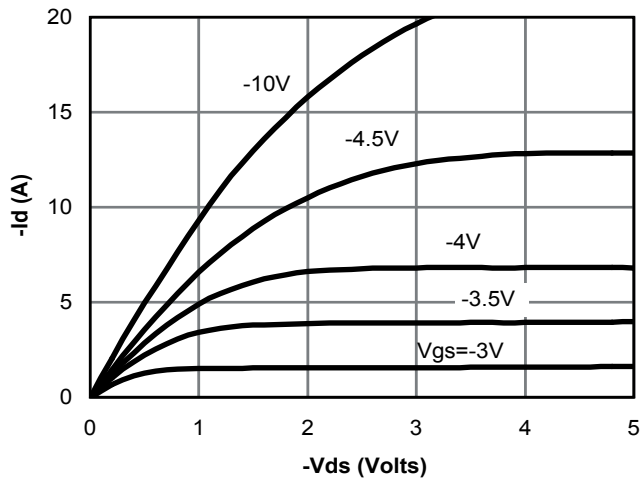


Fig 1: On-Region Characteristics

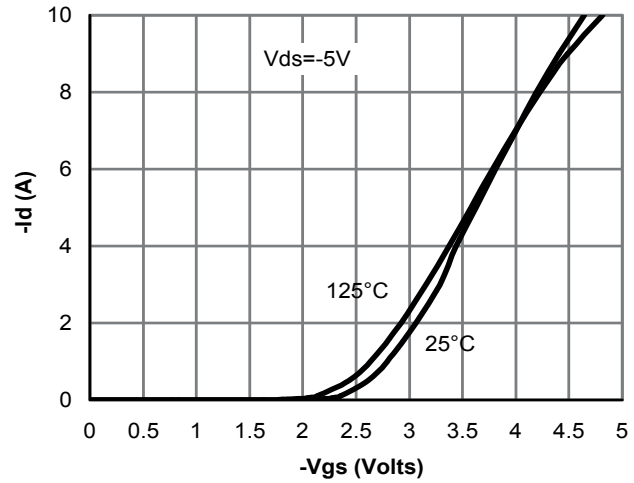


Figure 2: Transfer Characteristics

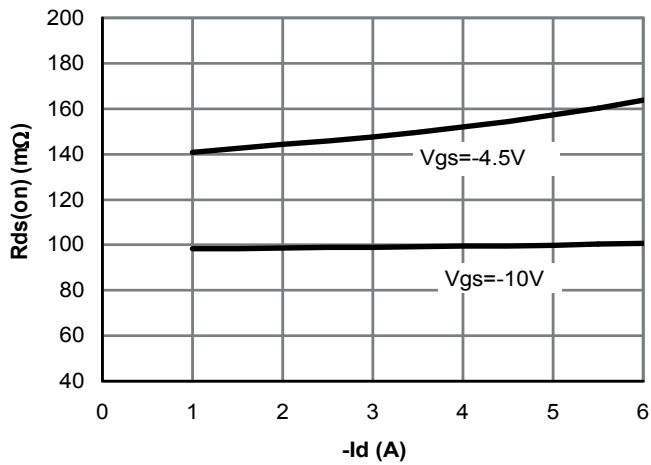


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

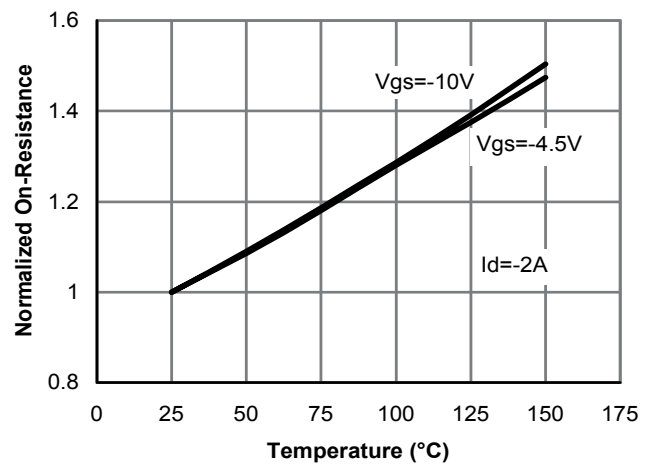


Figure 4: On-Resistance vs. Junction Temperature

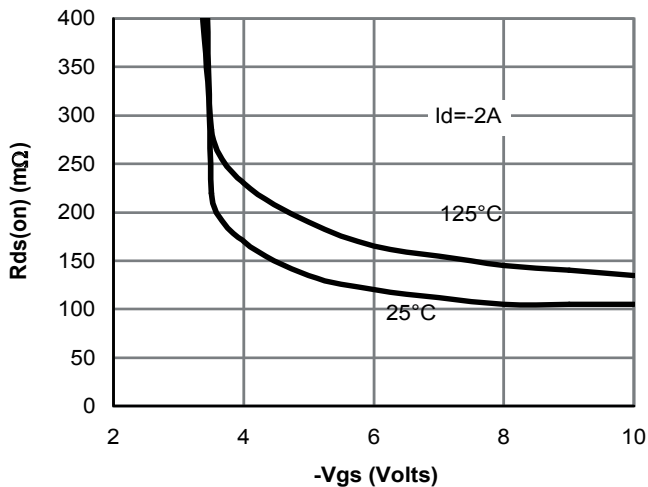


Figure 5: On-Resistance vs. Gate-Source Voltage

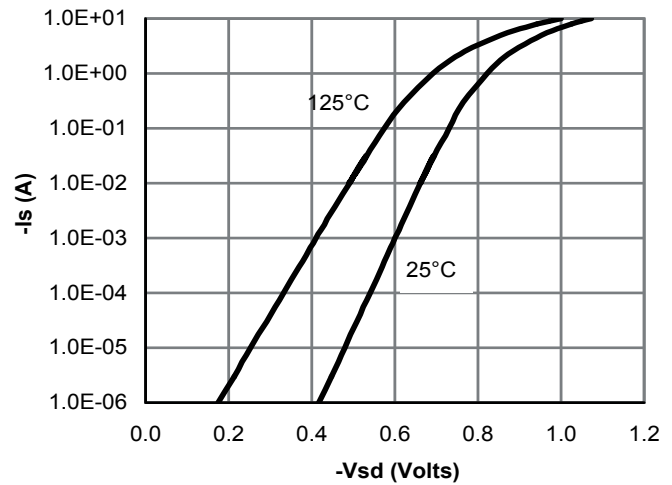


Figure 6: Body-Diode Characteristics

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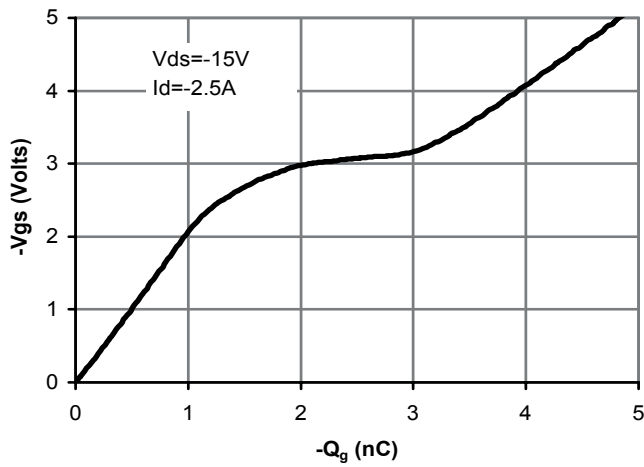


Figure 7: Gate-Charge Characteristics

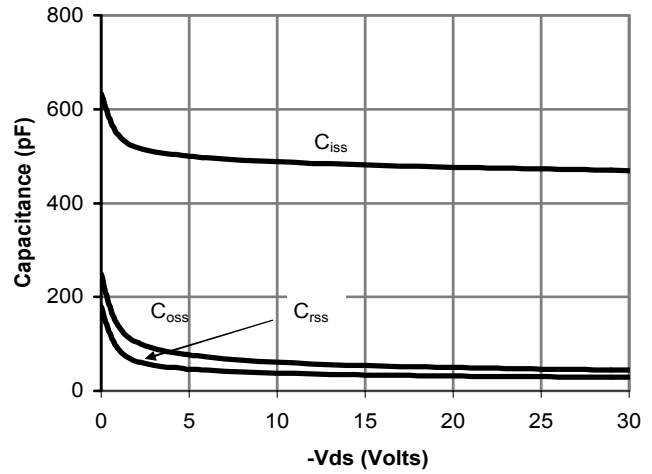


Figure 8: Capacitance Characteristics

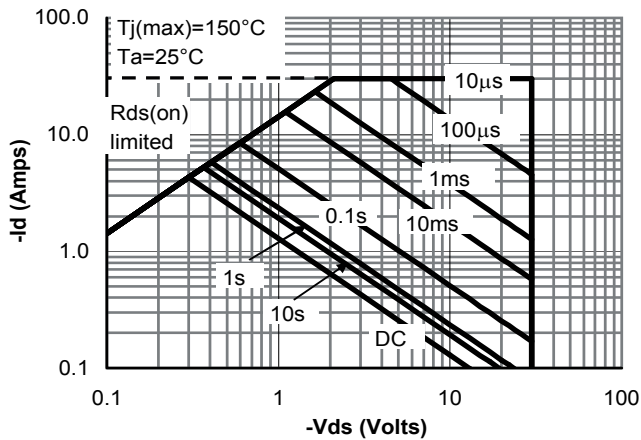


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

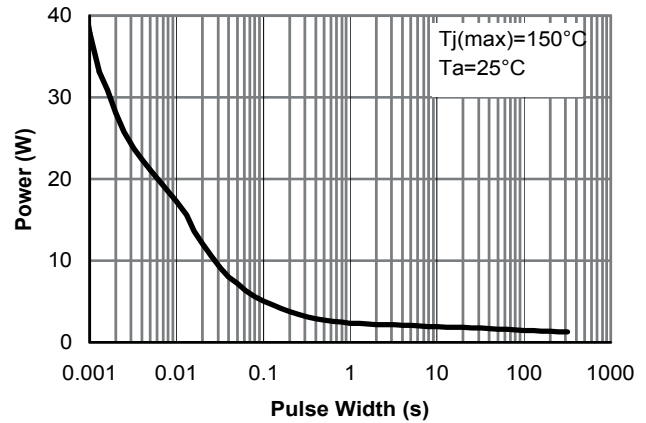


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

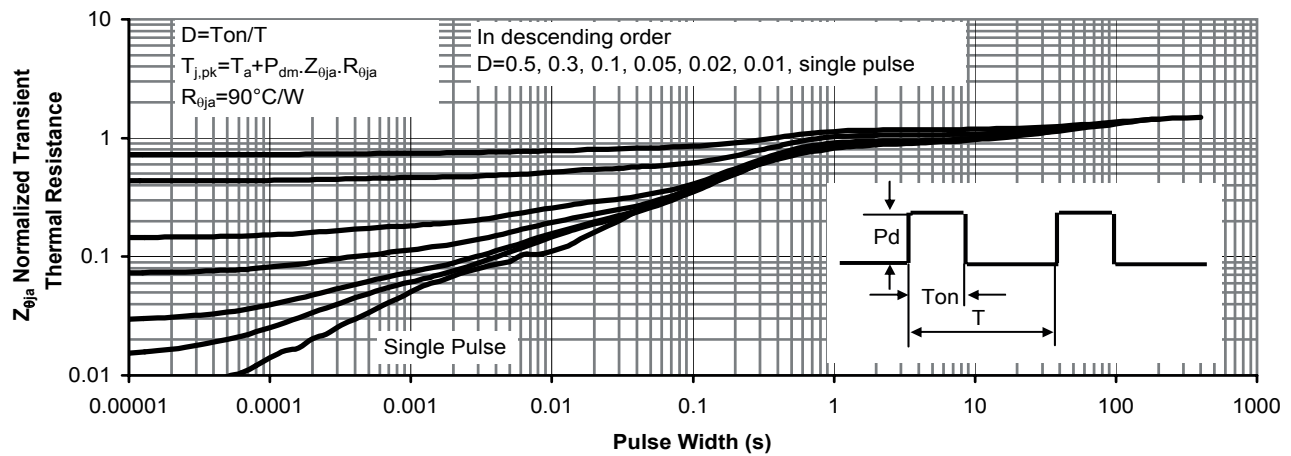


Figure 11: Normalized Maximum Transient Thermal Impedance