

Single P-channel MOSFET

ELM13401CA-S

<http://www.elm-tech.com>

■ General description

ELM13401CA-S uses advanced trench technology to provide excellent $R_{ds(on)}$, low gate charge and low gate resistance.

■ Features

- $V_{ds} = -30V$
- $I_d = -4.2A$ ($V_{gs} = -10V$)
- $R_{ds(on)} < 50m\Omega$ ($V_{gs} = -10V$)
- $R_{ds(on)} < 65m\Omega$ ($V_{gs} = -4.5V$)
- $R_{ds(on)} < 120m\Omega$ ($V_{gs} = -2.5V$)

■ Maximum absolute ratings

$T_a = 25^\circ C$. Unless otherwise noted.

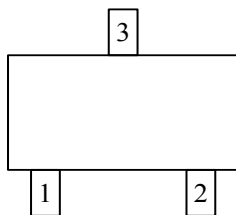
Parameter	Symbol	Limit	Unit	Note	
Drain-source voltage	V_{ds}	-30	V		
Gate-source voltage	V_{gs}	± 12	V		
Continuous drain current	I_d	$T_a = 25^\circ C$	-4.2	A	1
		$T_a = 70^\circ C$	-3.5		
Pulsed drain current	I_{dm}	-30	A	2	
Power dissipation	P_d	$T_c = 25^\circ C$	1.4	W	1
		$T_c = 70^\circ C$	1.0		
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	$R_{\theta ja}$	$t \leq 10s$	65	$^\circ C/W$	1
Maximum junction-to-ambient		Steady-state	85	$^\circ C/W$	
Maximum junction-to-lead	$R_{\theta jl}$	43	60	$^\circ C/W$	3

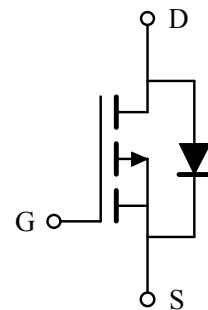
■ Pin configuration

SOT-23(TOP VIEW)



Pin No.	Pin name
1	GATE
2	SOURCE
3	DRAIN

■ Circuit



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■ Electrical characteristics

Ta=25°C. Unless otherwise noted.

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit	
STATIC PARAMETERS							
Drain-source breakdown voltage	BVdss	Id=-250μA, Vgs=0V	-30			V	
Zero gate voltage drain current	Idss	Vds=-24V			-1	μA	
		Vgs=0V		Ta=55°C	-5		
Gate-body leakage current	Igss	Vds=0V, Vgs=±12V			±100	nA	
Gate threshold voltage	Vgs(th)	Vds=Vgs, Id=-250μA	-0.7	-1.0	-1.3	V	
On state drain current	Id(on)	Vgs=-4.5V, Vds=-5V	-25			A	
Static drain-source on-resistance	Rds(on)	Vgs=-10V		42	50	mΩ	
		Id=-4.2A			75		
			Ta=125°C				
		Vgs=-4.5V, Id=-4A			53	65	mΩ
		Vgs=-2.5V, Id=-1A			80	120	mΩ
Forward transconductance	Gfs	Vds=-5V, Id=-5A	7	11		S	
Diode forward voltage	Vsd	Is=-1A, Vgs=0V		-0.75	-1.00	V	
Max. body-diode continuous current	Is				-2.2	A	
DYNAMIC PARAMETERS							
Input capacitance	Ciss			954		pF	
Output capacitance	Coss	Vgs=0V, Vds=-15V, f=1MHz		115		pF	
Reverse transfer capacitance	Crss			77		pF	
Gate resistance	Rg	Vgs=0V, Vds=0V, f=1MHz		6		Ω	
SWITCHING PARAMETERS							
Total gate charge	Qg	Vgs=-4.5V, Vds=-15V Id=-4A		9.4		nC	
Gate-source charge	Qgs			2.0		nC	
Gate-drain charge	Qgd			3.0		nC	
Turn-on delay time	td(on)	Vgs=-10V, Vds=-15V RL=3.6Ω, Rgen=6Ω		6.3		ns	
Turn-on rise time	tr			3.2		ns	
Turn-off delay time	td(off)			38.2		ns	
Turn-off fall time	tf			12.0		ns	
Body diode reverse recovery time	trr	If=-4A, dIf/dt=100A/μs		20.2		ns	
Body diode reverse recovery charge	Qrr	If=-4A, dIf/dt=100A/μs		11.2		nC	

NOTE :

- 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 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 Rθja is the sum of the thermal impedance from junction to lead Rθjl 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 Ta=25°C. The SOA curve provides a single pulse rating.

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■ Typical electrical and thermal characteristics

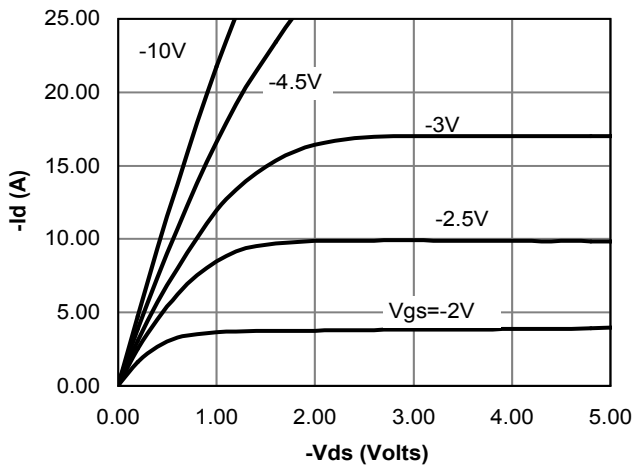


Fig 1: On-Region Characteristics

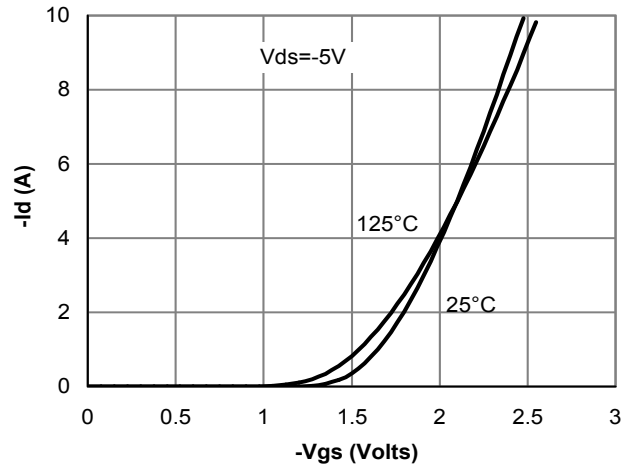


Figure 2: Transfer Characteristics

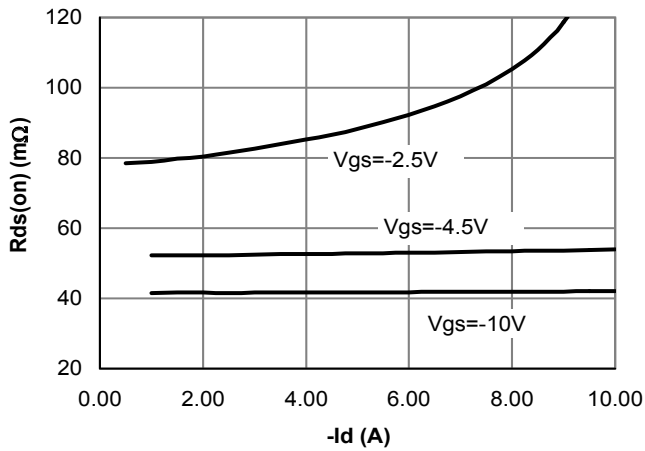


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

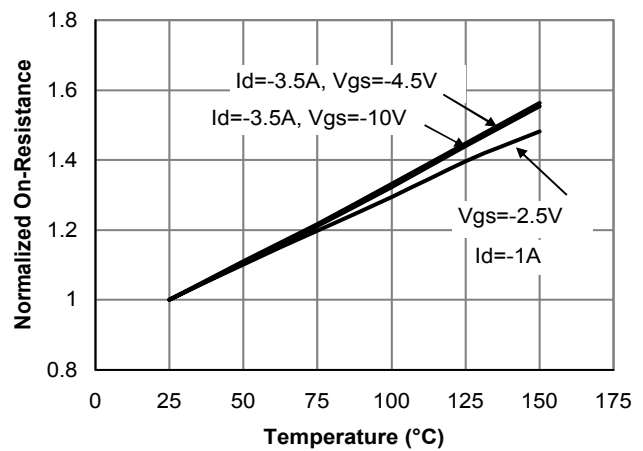


Figure 4: On-Resistance vs. Junction Temperature

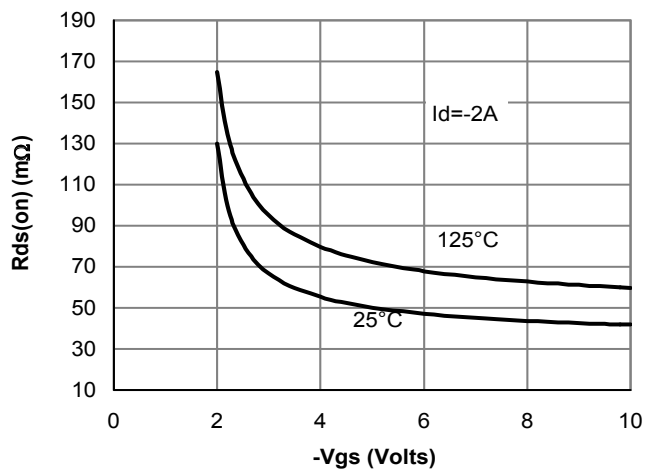


Figure 5: On-Resistance vs. Gate-Source Voltage

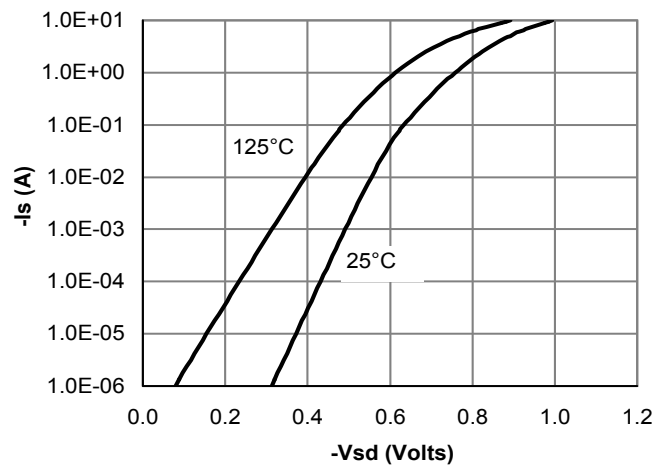


Figure 6: Body-Diode Characteristics

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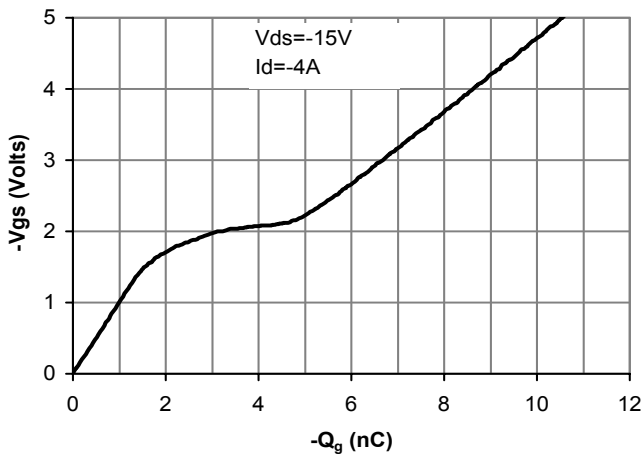


Figure 7: Gate-Charge Characteristics

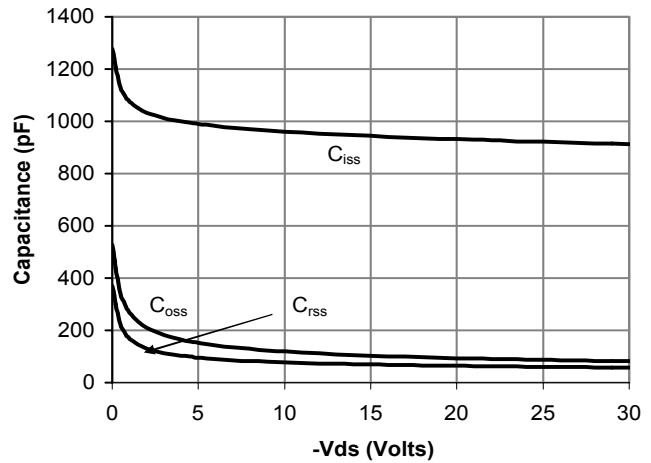


Figure 8: Capacitance Characteristics

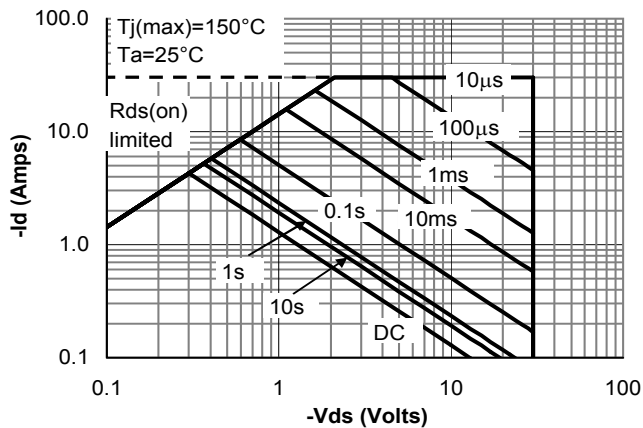


Figure 9: Maximum Forward Biased Safe Operating Area (Note 5)

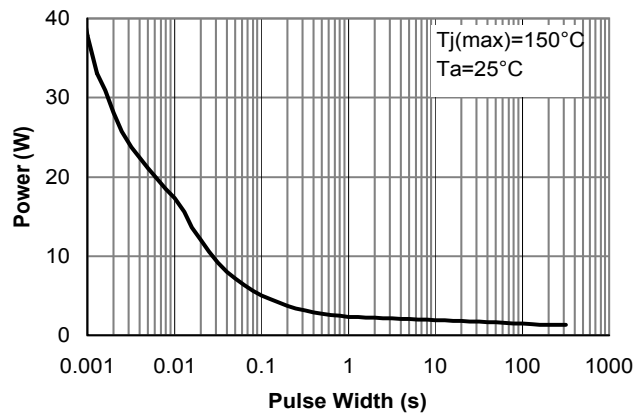


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note 5)

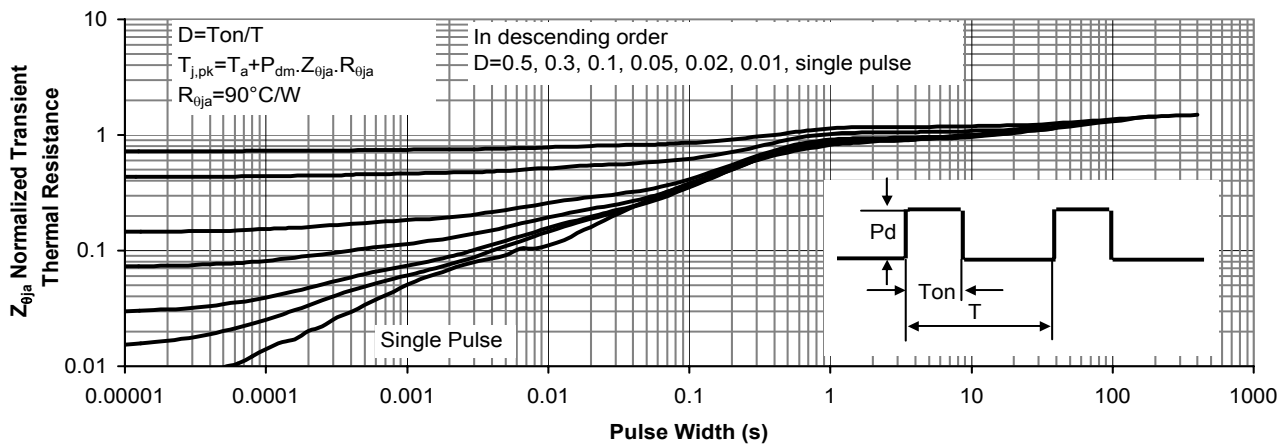


Figure 11: Normalized Maximum Transient Thermal Impedance