

Single P-channel MOSFET

ELM17413FA-S

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

■ General description

ELM17413FA-S uses advanced trench technology to provide excellent $R_{ds(on)}$, low gate charge and operation with gate voltages as low as 2.5V and internal ESD protection.

■ Features

- $V_{ds} = -20V$
- $I_d = -1.4A$ ($V_{gs} = -10V$)
- $R_{ds(on)} < 113m\Omega$ ($V_{gs} = -10V$)
- $R_{ds(on)} < 135m\Omega$ ($V_{gs} = -4.5V$)
- $R_{ds(on)} < 180m\Omega$ ($V_{gs} = -2.5V$)
- ESD Rating : 2000V HBM

■ Maximum absolute ratings

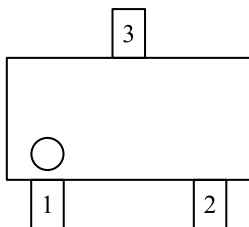
Parameter	Symbol	Limit	Unit	Note	
Drain-source voltage	V_{ds}	-20	V		
Gate-source voltage	V_{gs}	± 12	V		
Continuous drain current	I_d	$T_a = 25^\circ C$	-1.4	A	
		$T_a = 70^\circ C$	-1.2		
Pulsed drain current	I_{dm}	-13	A	3	
Power dissipation	P_d	$T_c = 25^\circ C$	0.35	W	2
		$T_c = 70^\circ C$	0.22		
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	$R_{\theta ja}$	$t \leq 10s$	300	$^\circ C/W$	1
Maximum junction-to-ambient		Steady-state	350	$^\circ C/W$	1, 4
Maximum junction-to-lead	$R_{\theta jl}$	280	320	$^\circ C/W$	

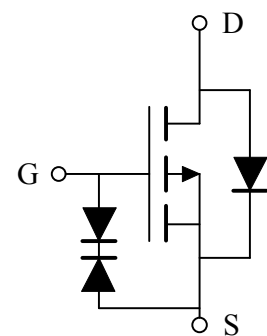
■ Pin configuration

SC-70(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
		Ta=55°C			-5	
Gate-body leakage current	Igss	Vds=0V, Vgs=±12V			±10	μA
Gate threshold voltage	Vgs(th)	Vds=Vgs, Id=-250μA	-0.50	-0.85	-1.20	V
On state drain current	Id(on)	Vgs=-4.5V, Vds=-5V	-13			A
Static drain-source on-resistance	Rds(on)	Vgs=-10V		94	113	mΩ
		Id=-1.4A	Ta=125°C	130	160	
		Vgs=-4.5V, Id=-1.3A		111	135	
		Vgs=-2.5V, Id=-1.1A		150	180	
Forward transconductance	Gfs	Vds=-5V, Id=-1.4A		5		S
Diode forward voltage	Vsd	Is=-1A, Vgs=0V		-0.76	-1.00	V
Max. body-diode continuous current	Is				-1	A
DYNAMIC PARAMETERS						
Input capacitance	Ciss		250	325	400	pF
Output capacitance	Coss	Vgs=0V, Vds=-10V, f=1MHz	40	63	85	pF
Reverse transfer capacitance	Crss		22	37	52	pF
Gate resistance	Rg	Vgs=0V, Vds=0V, f=1MHz		11.2	17.0	Ω
SWITCHING PARAMETERS						
Total gate charge	Qg	Vgs=-4.5V, Vds=-10V Id=-1.4A		3.2	4.5	nC
Gate-source charge	Qgs			0.6		nC
Gate-drain charge	Qgd			0.9		nC
Turn-on delay time	td(on)			11.0		ns
Turn-on rise time	tr	Vgs=-10V, Vds=-10V		5.5		ns
Turn-off delay time	td(off)	RL=7.1Ω, Rgen=3Ω		22.0		ns
Turn-off fall time	tf			8.0		ns
Body diode reverse recovery time	trr	If=-1.4A, dl/dt=100A/μs		6.1		ns
Body diode reverse recovery charge	Qrr	If=-1.4A, dl/dt=100A/μs		1.4		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 applications 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 cycle to keep initial Tj=25°C.
4. The Rθja is the sum of the thermal impedance 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 impedance which is measured with the device mounted on 1in² FR-4 board with 2oz. Copper, assuming a maximum junction temperature Tj(Max.)=150°C. The SOA curve provides a single pulse rating.

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Typical electrical and thermal characteristics

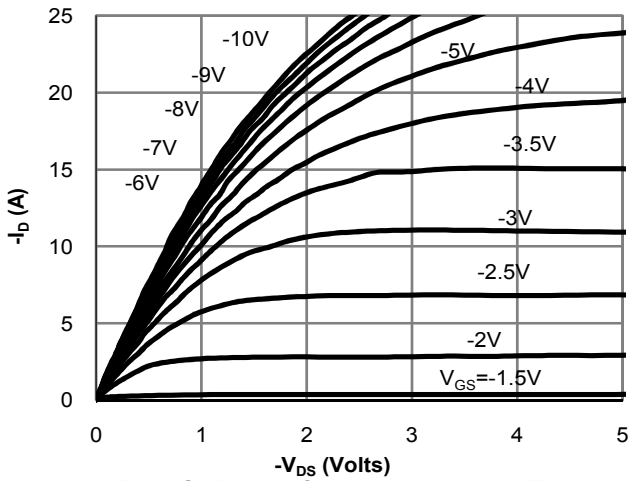


Figure 1: On-Region Characteristics (Note E)

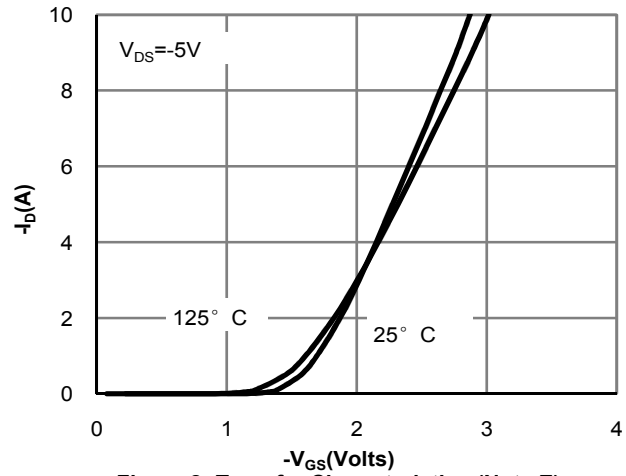


Figure 2: Transfer Characteristics (Note E)

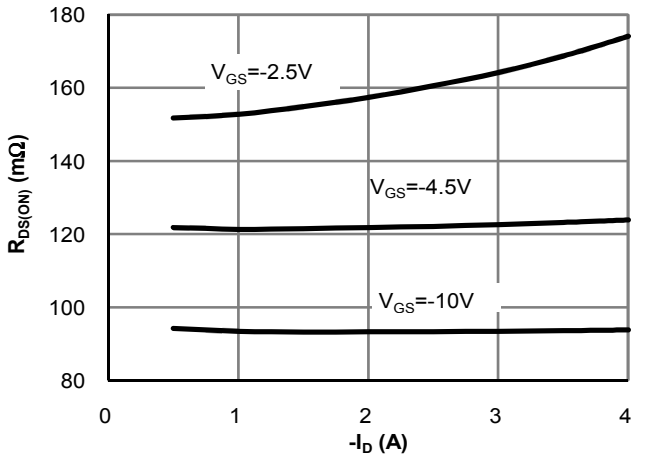


Figure 3: On-Resistance vs. Drain Current and Gate Voltage (Note E)

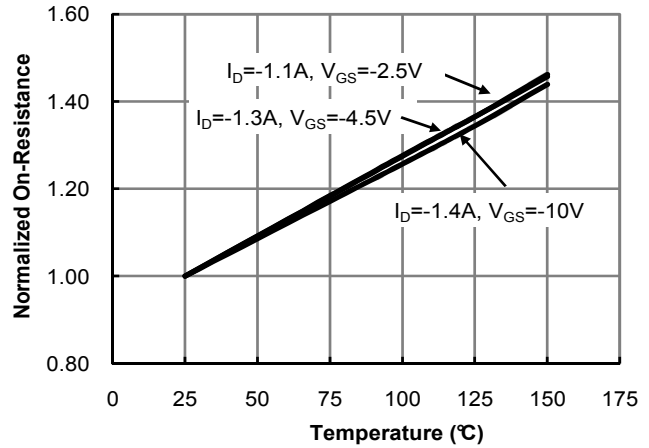


Figure 4: On-Resistance vs. Junction Temperature (Note E)

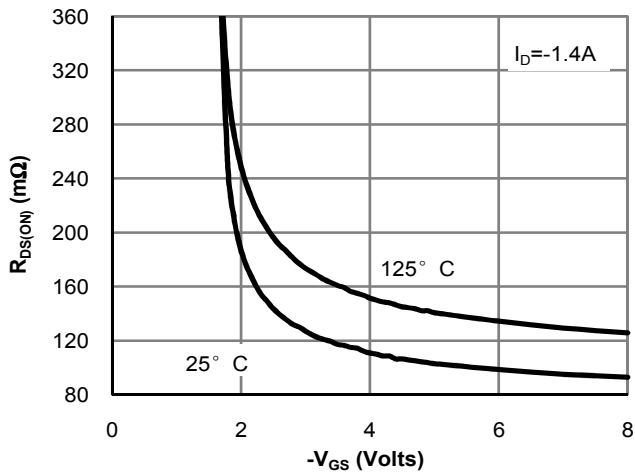


Figure 5: On-Resistance vs. Gate-Source Voltage (Note E)

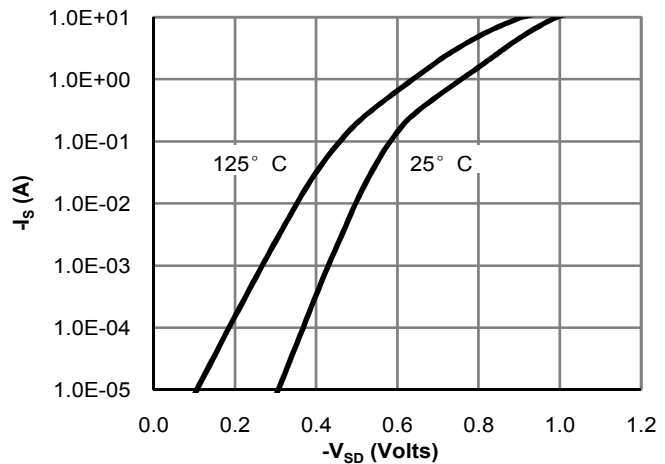


Figure 6: Body-Diode Characteristics (Note E)

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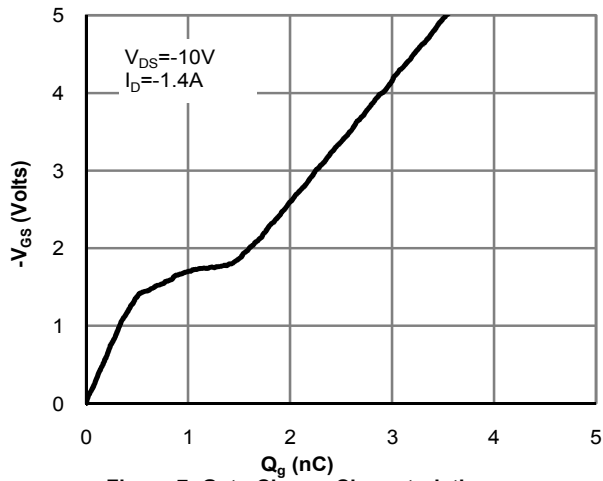


Figure 7: Gate-Charge Characteristics

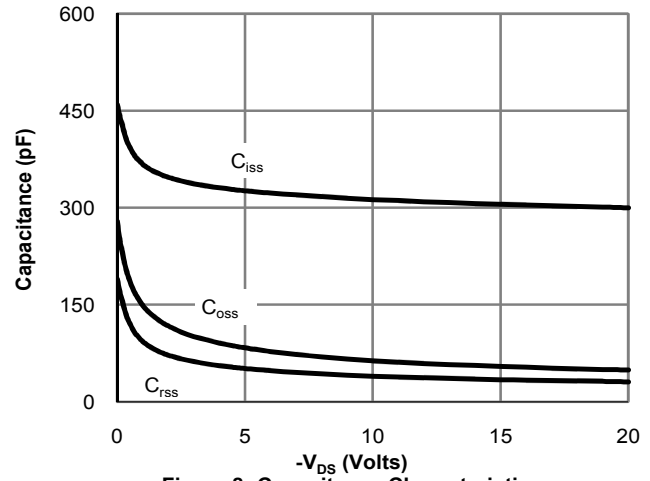


Figure 8: Capacitance Characteristics

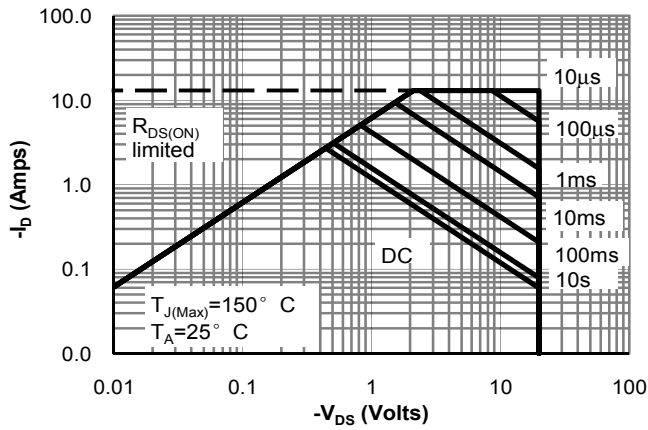


Figure 9: Maximum Forward Biased Safe Operating Area (Note F)

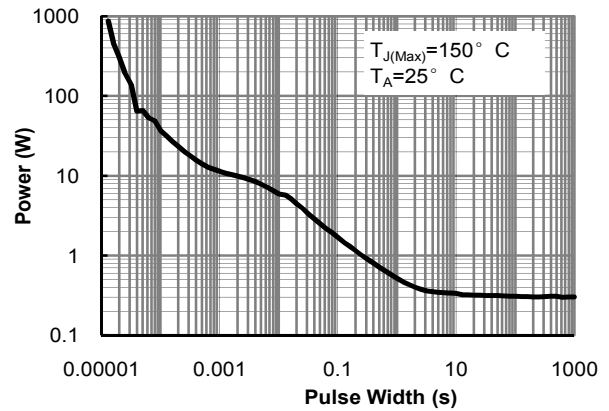


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note F)

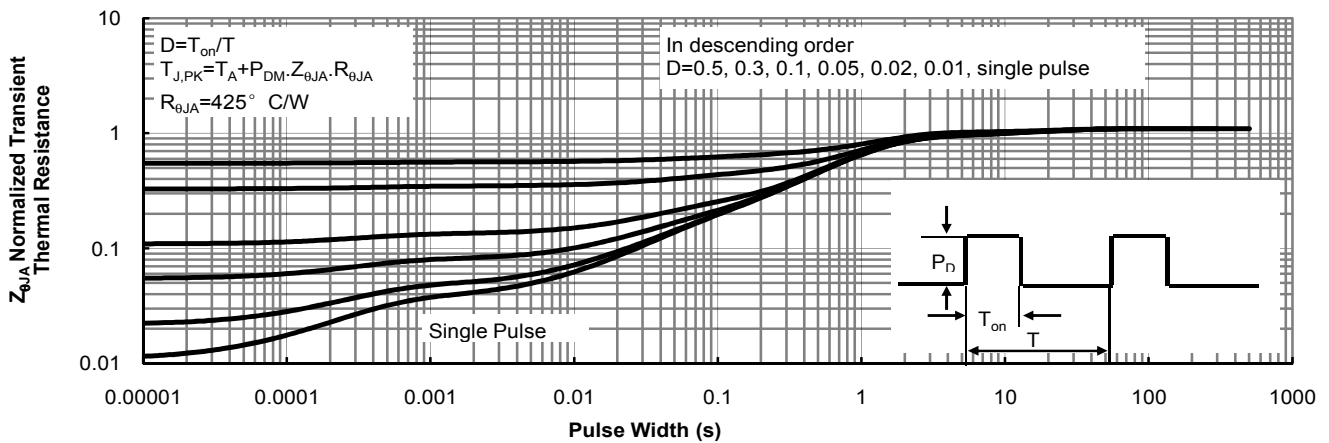


Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)

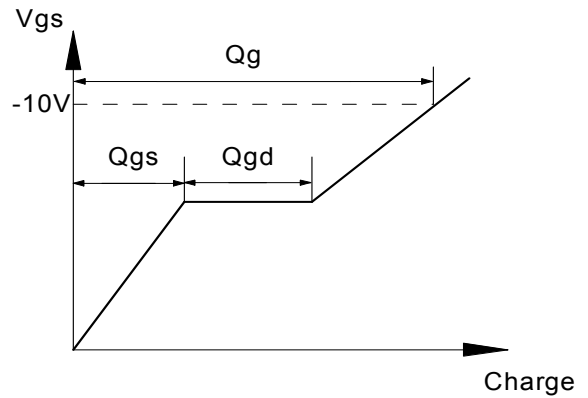
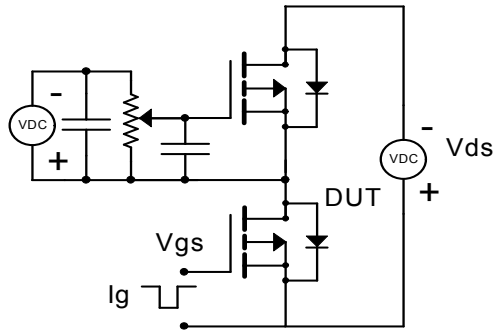
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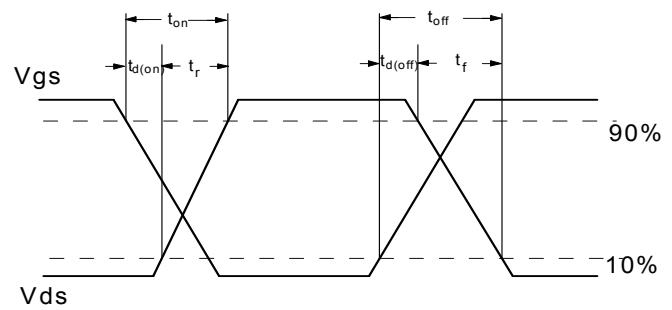
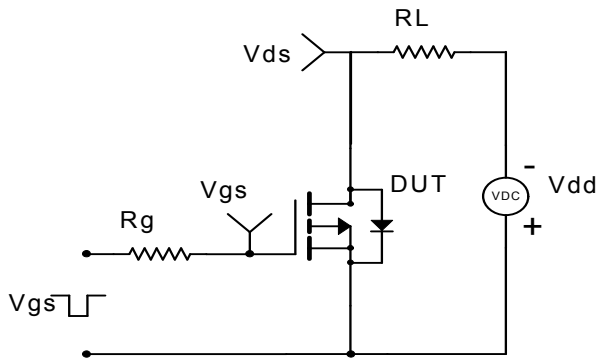
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■ Test circuit and waveform

Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms

