Single N-channel MOSFET

ELM17410FA-S

■General description

 ELM17410FA-S uses advanced trench technology to provide excellent Rds(on), low gate charge and operation with gate voltages as low as 2.5V.

■Features

- Vds=30V
- Id=1.6A (Vgs=10V)
- Rds(on) < 90mΩ (Vgs=10V)
- Rds(on) < 100mΩ (Vgs=4.5V)
- Rds(on) < 175mΩ (Vgs=2.5V)

■Maximum absolute ratings

Parameter		Symbol	Limit	Unit	Note
Drain-source voltage		Vds	30	V	
Gate-source voltage		Vgs	±12	V	
Continuous drain current	Ta=25℃	Id	1.6	A	1
	Ta=70℃		1.3		
Pulsed drain current		Idm	10	A	2
Power dissipation	Ta=25℃	Pd	0.35	W	1
	Ta=70℃		0.22		
Junction and storage temperature range		Tj, Tstg	−55 to 150	℃	

■Thermal characteristics

Parameter		Symbol	Typ.	Max.	Unit	Note
Maximum junction-to-ambient	t≤10s	Rθja	300	360	℃/W	1
Maximum junction-to-ambient	Steady-state		340	425	℃/W	
Maximum junction-to-lead	Steady-state	Rθjl	280	320	℃/W	3

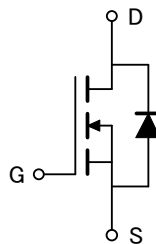### ■Pin configuration

■Circuit

SC-70 (TOP VIEW)
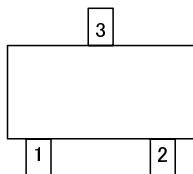
Pin No.	Pin name
1	GATE
2	SOURCE
3	DRAIN

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■Electrical characteristics

Ta=25℃

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			0.001	1.000	μA
		Vgs=0V	Tj=55℃			5.000	
Gate-body leakage current	Igss	Vds=0V, Vgs=±12V				100	nA
Gate threshold voltage	Vgs(th)	Vds=Vgs, Id=250μA		1.0	1.4	1.8	V
On state drain current	Id(on)	Vgs=4.5V, Vds=5V		10			A
Static drain-source on-resistance	Rds(on)	Vgs=10V			75	90	mΩ
		Id=1.6A	Tj=125℃		105	130	
		Vgs=4.5V, Id=1.5A			82	100	mΩ
		Vgs=2.5V, Id=1A			120	175	mΩ
Forward transconductance	Gfs	Vds=5V, Id=3.8A			4.5		S
Diode forward voltage	Vsd	Is=1A, Vgs=0V			0.84	1.00	V
Max. body-diode continuous current	Is					2.5	A
DYNAMIC PARAMETERS							
Input capacitance	Ciss				226	270	pF
Output capacitance	Coss	Vgs=0V, Vds=15V, f=1MHz			39		pF
Reverse transfer capacitance	Crss				29		pF
Gate resistance	Rg	Vgs=0V, Vds=0V, f=1MHz			1.4	1.7	Ω
SWITCHING PARAMETERS							
Total gate charge	Qg				3.0	3.6	nC
Gate-source charge	Qgs	Vgs=4.5V, Vds=15V, Id=1.6A			0.4		nC
Gate-drain charge	Qgd				1.2		nC
Turn-on delay time	td(on)				2.8	4.0	ns
Turn-on rise time	tr	Vgs=10V, Vds=15V			2.1	3.0	ns
Turn-off delay time	td(off)	Rl=9.4Ω, Rgen=6Ω			17.4	21.0	ns
Turn-off fall time	tf				2.1	3.0	ns
Body diode reverse recovery time	trr	If=1.6A, dl/dt=100A/μs			9.1	11.0	ns
Body diode reverse recovery charge	Qrr	If=1.6A, dl/dt=100A/μs			3.4	4.0	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℃. The value in any given applications depends on the user's specific board design, The current rating is based on the t ≤ 10s themal resistance rating.
2. Repetitive rating, pulse width limited by junction temperature.
3. The Rθja is the sum of the thermal impedance from junction to lead Rθjl 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℃. The SOA curve provides a single pulse rating.

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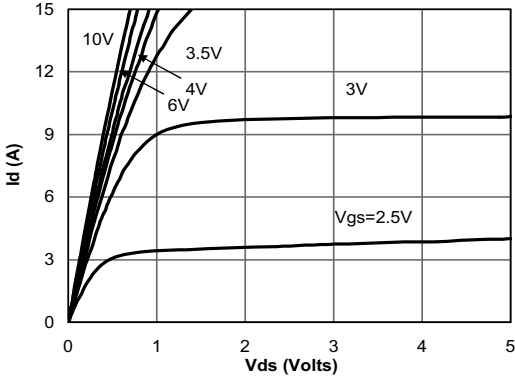■Typical electrical and thermal characteristics
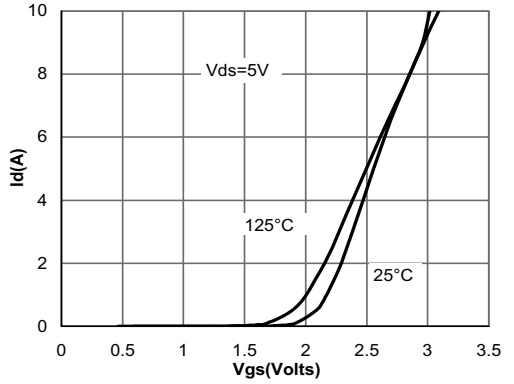
Fig 1: On-Region Characteristics
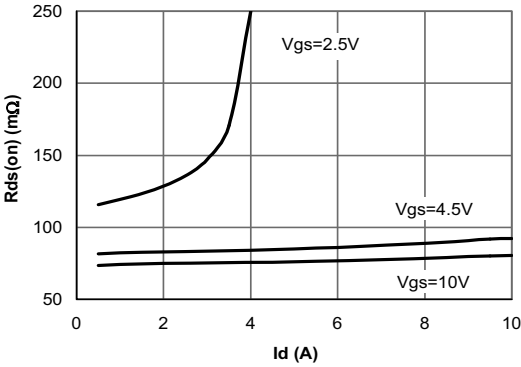
Figure 2: Transfer Characteristics

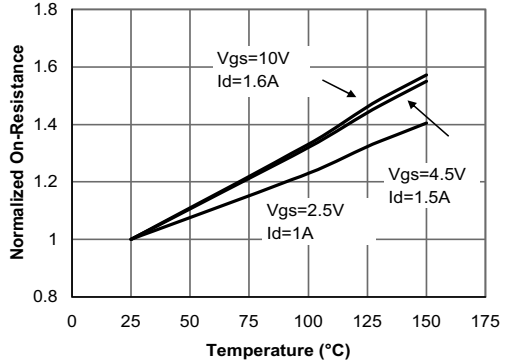**Figure 3: On-Resistance vs. Drain Current and Gate Voltage**
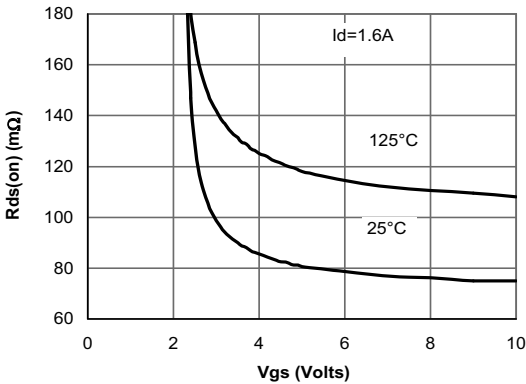
Figure 4: On-Resistance vs. Junction Temperature

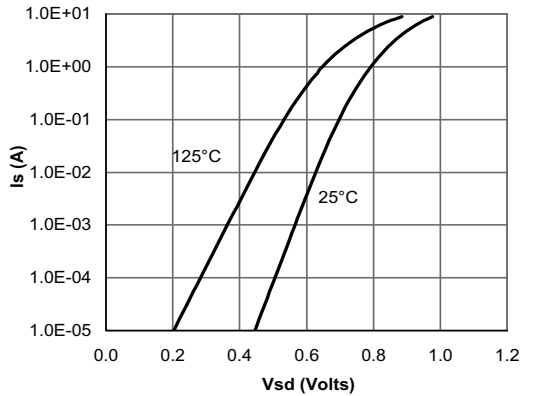**Figure 5: On-Resistance vs. Gate-Source Voltage**

Figure 6: Body-Diode Characteristics
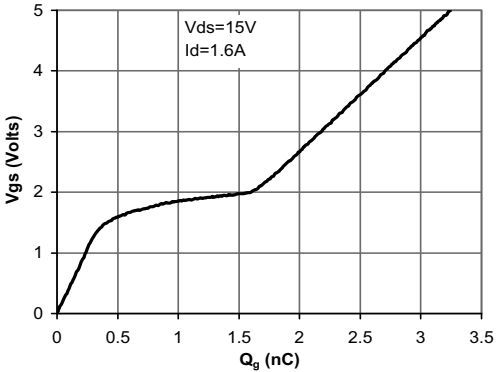
Figure 7: Gate-Charge Characteristics

Vds=15V
Id=1.6A

X-axis: Q_g (nC)
Y-axis: Vgs (Volts)
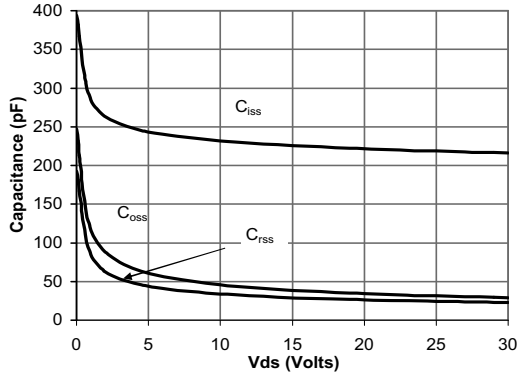
Figure 8: Capacitance Characteristics

C_{iss}
C_{oss}
C_{rss}

X-axis: Vds (Volts)
Y-axis: Capacitance (pF)
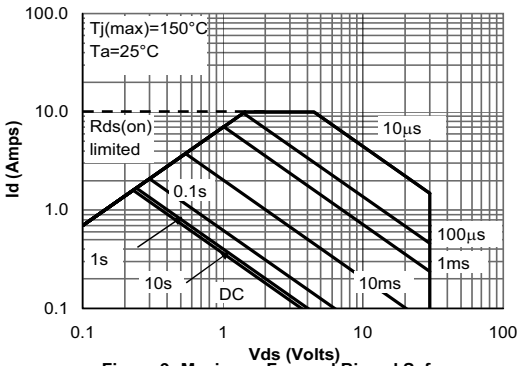
Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

Tj(max)=150°C
Ta=25°C

Rds(on) limited
10μs
0.1s
1s
10s
DC
100μs
1ms
10ms

X-axis: Vds (Volts)
Y-axis: Id (Amps)
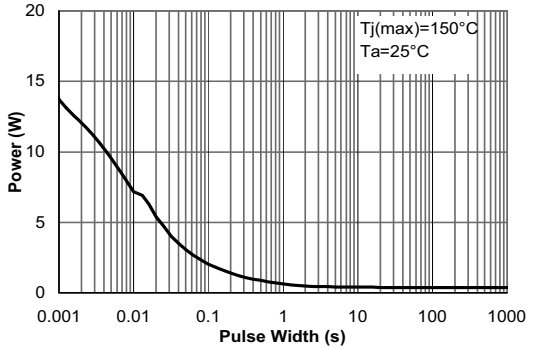
Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

Tj(max)=150°C
Ta=25°C

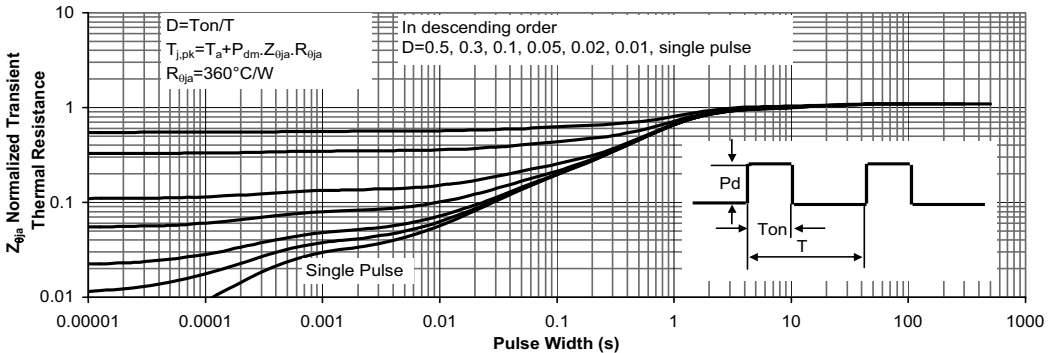X-axis: Pulse Width (s)
Y-axis: Power (W)

Figure 11: Normalized Maximum Transient Thermal Impedance

D=Ton/T
$T_{j,pk}=T_a+P_{dm}.Z_{\theta ja}.R_{\theta ja}$
$R_{\theta ja}$=360°C/W

In descending order
D=0.5, 0.3, 0.1, 0.05, 0.02, 0.01, single pulse

Single Pulse

Pd
Ton
T

X-axis: Pulse Width (s)
Y-axis: $Z_{\theta ja}$ Normalized Transient Thermal Resistance

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