

# Single N-channel MOSFET

## ELM14440AA-N

### ■ General description

ELM14440AA-N uses advanced trench technology to provide excellent  $R_{ds(on)}$ , low gate charge and low gate resistance.

### ■ Features

- $V_{ds}=60V$
- $I_d=5A$  ( $V_{gs}=10V$ )
- $R_{ds(on)} < 55m\Omega$  ( $V_{gs}=10V$ )
- $R_{ds(on)} < 75m\Omega$  ( $V_{gs}=4.5V$ )

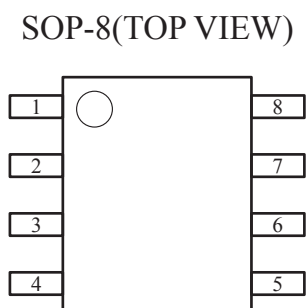
### ■ Maximum absolute ratings

Parameter	Symbol	Limit	Unit	Note	
Drain-source voltage	$V_{ds}$	60	V		
Gate-source voltage	$V_{gs}$	$\pm 20$	V		
Continuous drain current	$I_d$	$T_a=25^\circ C$	5	A	1
		$T_a=70^\circ C$	4		
Pulsed drain current	$I_{dm}$	20	A	2	
Power dissipation	$P_d$	$T_a=25^\circ C$	2.5	W	
		$T_a=70^\circ C$	1.6		
Junction and storage temperature range	$T_j, T_{stg}$	-55 to 150	$^\circ C$		

### ■ Thermal characteristics

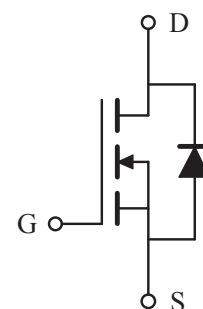
Parameter		Symbol	Typ.	Max.	Unit	Note
Maximum junction-to-ambient	$t \leq 10s$	$R_{\theta ja}$	38	50	$^\circ C/W$	1
Maximum junction-to-ambient	Steady-state		69	80	$^\circ C/W$	
Maximum junction-to-lead	Steady-state	$R_{\theta jl}$	24	30	$^\circ C/W$	3

### ■ Pin configuration



Pin No.	Pin name
1	SOURCE
2	SOURCE
3	SOURCE
4	GATE
5	DRAIN
6	DRAIN
7	DRAIN
8	DRAIN

### ■ Circuit



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### ■Electrical characteristics

Ta=25°C

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
<b>STATIC PARAMETERS</b>						
Drain-source breakdown voltage	BV <sub>dss</sub>	I <sub>d</sub> =250μA, V <sub>gs</sub> =0V	60			V
Zero gate voltage drain current	I <sub>dss</sub>	V <sub>ds</sub> =48V V <sub>gs</sub> =0V			1	μA
		T <sub>j</sub> =55°C			5	
Gate-body leakage current	I <sub>gss</sub>	V <sub>ds</sub> =0V, V <sub>gs</sub> =±20V			100	nA
Gate threshold voltage	V <sub>gs(th)</sub>	V <sub>ds</sub> =V <sub>gs</sub> , I <sub>d</sub> =250μA	1.0	2.3	3.0	V
On state drain current	I <sub>d(on)</sub>	V <sub>gs</sub> =10V, V <sub>ds</sub> =5V	20			A
Static drain-source on-resistance	R <sub>ds(on)</sub>	V <sub>gs</sub> =10V I <sub>d</sub> =5A		42	55	mΩ
		T <sub>j</sub> =125°C		75		
		V <sub>gs</sub> =4.5V, I <sub>d</sub> =4A		54	75	mΩ
Forward transconductance	G <sub>fs</sub>	V <sub>ds</sub> =5V, I <sub>d</sub> =5A		11		S
Diode forward voltage	V <sub>sd</sub>	I <sub>s</sub> =1A, V <sub>gs</sub> =0V		0.78	1.00	V
Max. body-diode continuous current	I <sub>s</sub>				4	A
<b>DYNAMIC PARAMETERS</b>						
Input capacitance	C <sub>iss</sub>			450	540	pF
Output capacitance	C <sub>oss</sub>	V <sub>gs</sub> =0V, V <sub>ds</sub> =30V, f=1MHz		60		pF
Reverse transfer capacitance	C <sub>rss</sub>			25		pF
Gate resistance	R <sub>g</sub>	V <sub>gs</sub> =0V, V <sub>ds</sub> =0V, f=1MHz		1.65	2.00	Ω
<b>SWITCHING PARAMETERS</b>						
Total gate charge (10V)	Q <sub>g</sub>	V <sub>gs</sub> =10V, V <sub>ds</sub> =30V, I <sub>d</sub> =5A		8.5	10.5	nC
Total gate charge (4.5V)	Q <sub>g</sub>			4.3	5.5	nC
Gate-source charge	Q <sub>gs</sub>			1.6		nC
Gate-drain charge	Q <sub>gd</sub>			2.2		nC
Turn-on delay time	t <sub>d(on)</sub>	V <sub>gs</sub> =10V, V <sub>ds</sub> =30V R <sub>l</sub> =6Ω, R <sub>gen</sub> =3Ω		5.1	7.0	ns
Turn-on rise time	t <sub>r</sub>			2.6	4.0	ns
Turn-off delay time	t <sub>d(off)</sub>			15.9	20.0	ns
Turn-off fall time	t <sub>f</sub>			2.0	3.0	ns
Body diode reverse recovery time	t <sub>rr</sub>		I <sub>f</sub> =5A, dI/dt=100A/μs		25.1	35.0
Body diode reverse recovery charge	Q <sub>rr</sub>	I <sub>f</sub> =5A, dI/dt=100A/μs		28.7		nC

#### NOTE :

1. The value of R<sub>θja</sub> is measured with the device mounted on 1in<sup>2</sup> 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<sub>θja</sub> is the sum of the thermal impedance from junction to lead R<sub>θjl</sub> 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 1in<sup>2</sup> 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

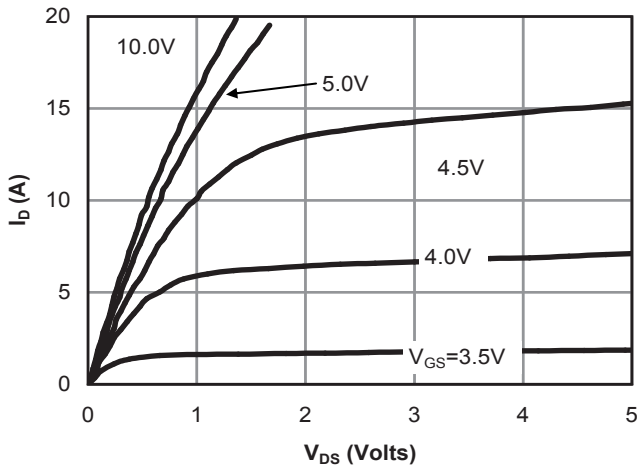


Fig 1: On-Region Characteristics

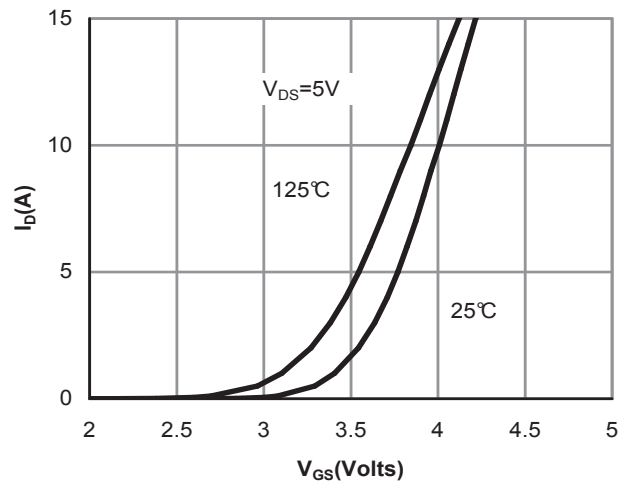


Figure 2: Transfer Characteristics

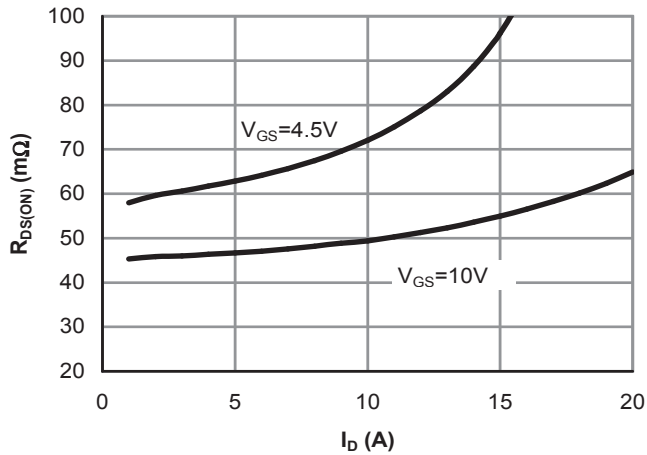


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

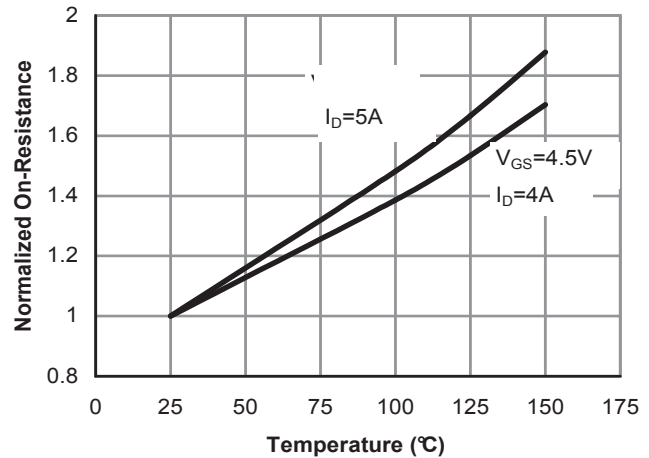


Figure 4: On-Resistance vs. Junction Temperature

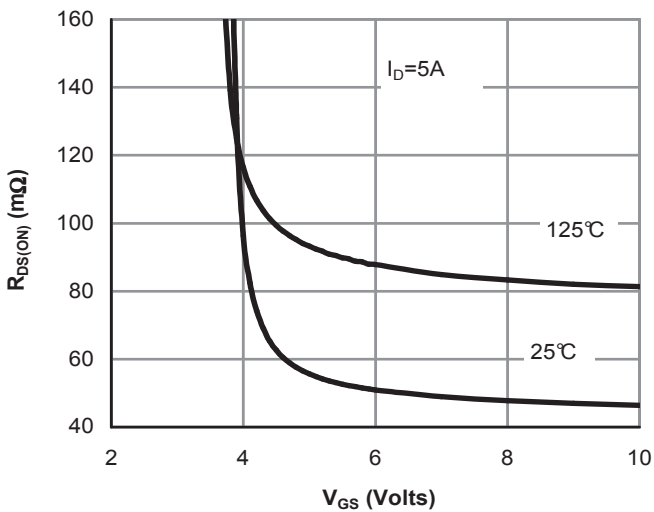


Figure 5: On-Resistance vs. Gate-Source Voltage

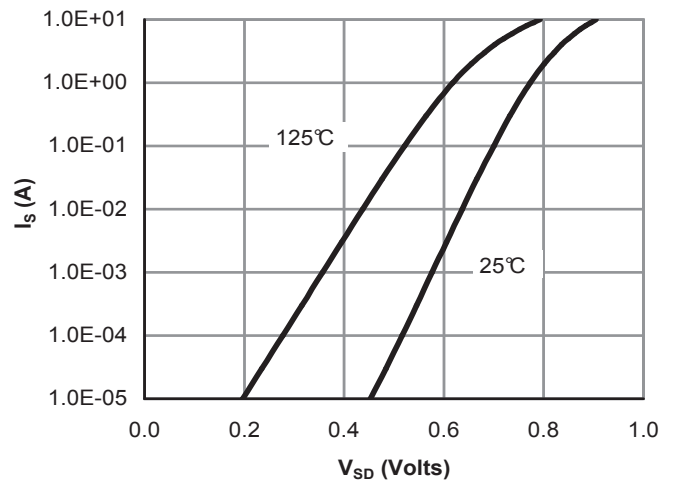


Figure 6: Body-Diode Characteristics

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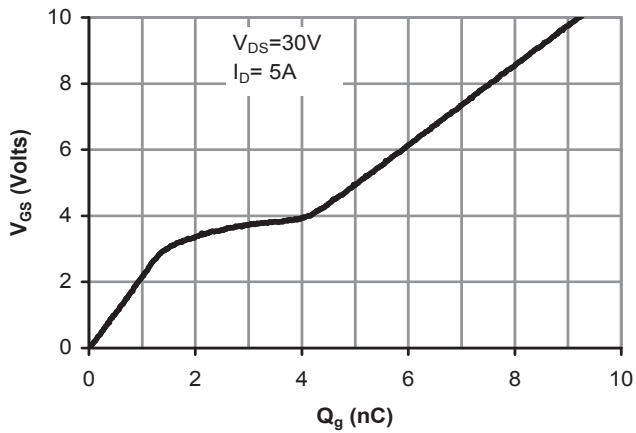


Figure 7: Gate-Charge Characteristics

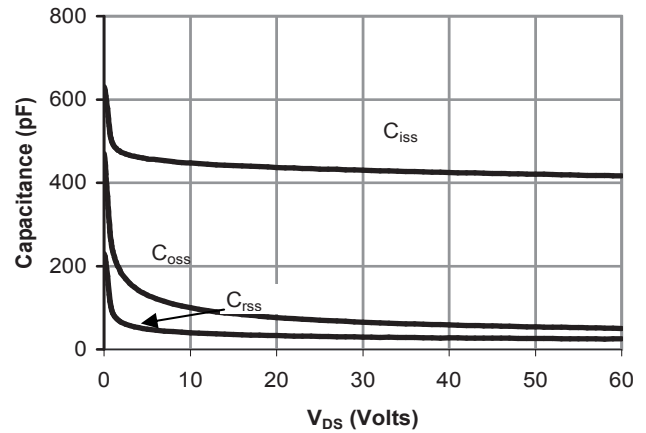


Figure 8: Capacitance Characteristics

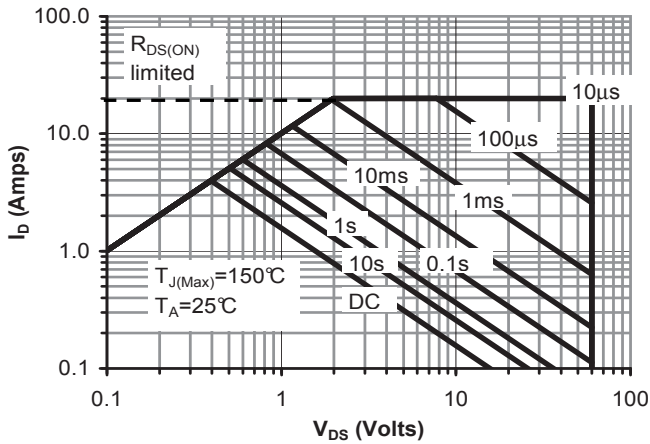


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

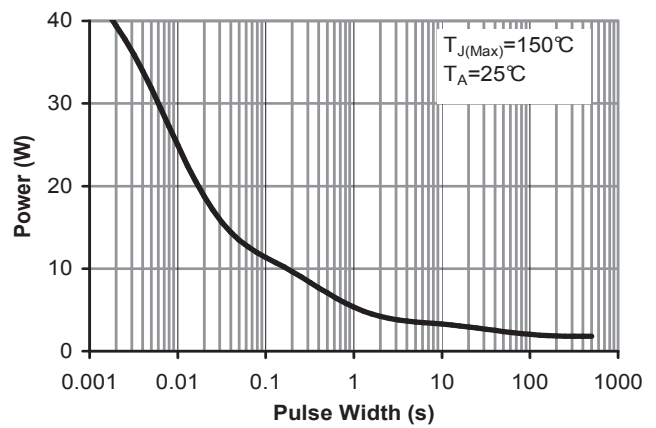


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

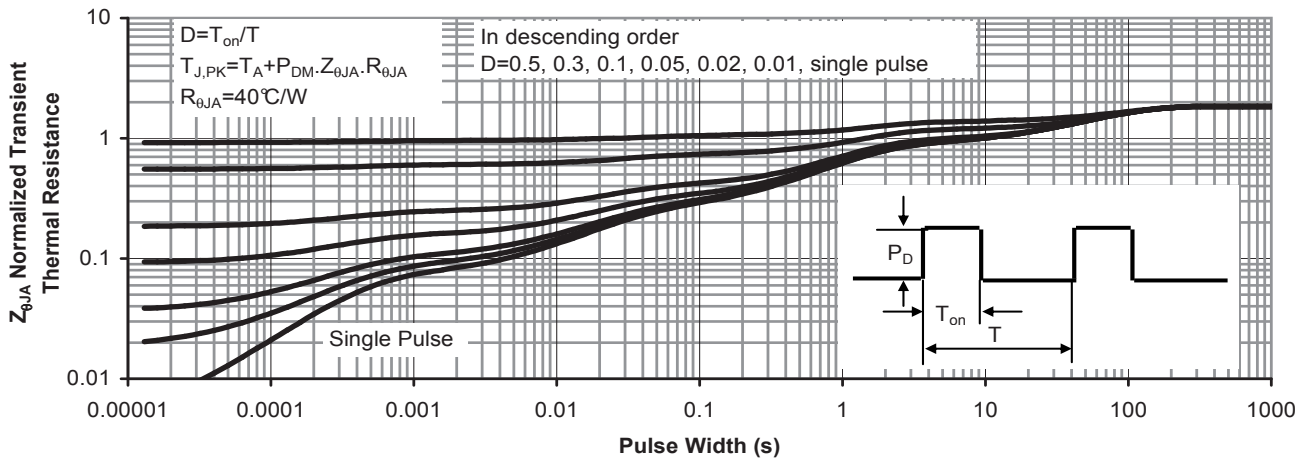


Figure 11: Normalized Maximum Transient Thermal Impedance