Complementary MOSFET

ELM4C3901FAA-N

■General Description

ELM4C3901FAA-N uses advanced trench technology to provide excellent Rds(on) and low gate charge.

■Features

N-channel	P-channel
• Vds=30V	Vds=-30V
• Id=6.0A (Vgs=10V)	Id=--5.7A (Vgs=-10V)
• Rds(on) = 27mΩ(Vgs=10V)	Rds(on) = 32mΩ(Vgs=-10V)
• Rds(on) = 40mΩ(Vgs=4.5V)	Rds(on) = 56mΩ(Vgs=-4.5V)

■Maximum Absolute Ratings

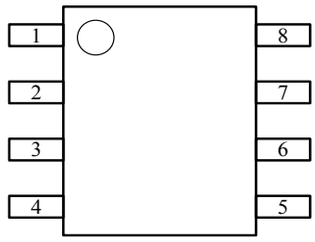
Parameter		Symbol	N-ch (Max.)	P-ch (Max.)	Unit	Note
Drain-source voltage		Vds	30	-30	V	
Gate-source voltage		Vgs	±20	±20	V	
Continuous drain current (Vgs=10V)(Vgs=-10V)	Ta=25°C	Id	6.0	-5.7	A	1
	Ta=70°C		4.8	-4.5		
Pulsed drain current		Idm	24	-24	A	2
Single pulse avalanche energy		EAS	8.1	45.0	mJ	3
Avalanche current		Ias	12.7	-30.0	A	
Total power dissipation	Ta=25°C	Pd	1.5	1.5	W	4
Storage temperature range		Tstg	-55 to 150	-55 to 150	°C	
Operating junction temperature range		Tj	-55 to 150	-55 to 150	°C	

■Thermal Characteristics

Parameter	Symbol	Typ.	Max.	Unit	Note
Thermal resistance junction-ambient	Rθja		85	°C/W	1
Thermal resistance junction-case	Rθjc		60	°C/W	1

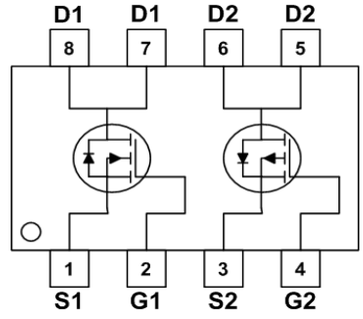
■Pin configuration

SOP-8(TOP VIEW)



Pin No.	Pin name
1	SOURCE1
2	GATE1
3	SOURCE2
4	GATE2
5	DRAIN2
6	DRAIN2
7	DRAIN1
8	DRAIN1

■Circuit



■Electrical Characteristics (N-ch)

Tj=25°C. Unless otherwise noted.

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit	Note
STATIC PARAMETERS							
Drain-source breakdown voltage	BVdss	Vgs=0V, Id=250μA	30	-	-	V	
BVdss Temperature coefficient	$\frac{\Delta BVdss}{\Delta Tj}$	Reference to 25°C, Id=1mA	-	0.023	-	V/°C	
Static drain-source on-resistance	Rds(on)	Vgs=10V, Id=6A	-	-	27	mΩ	2
		Vgs=4.5V, Id=4A	-	-	40		
Gate threshold voltage	Vgs(th)	Vgs=Vds, Id=250μA	1.0	-	2.5	V	
Vgs(th) Temperature coefficient	ΔVgs(th)		-	4.2	-	mV/°C	
Drain-source leakage current	Idss	Vds=24V, Vgs=0V	-	-	1	μA	
		Vds=24V, Vgs=0V, Tj=55°C	-	-	5		
Gate-source leakage current	Igss	Vgs=±20V, Vds=0V	-	-	±100	nA	
Forward transconductance	Gfs	Vds=5V, Id=6A	-	12.8	-	S	
Continuous source current	Is	Vgs=Vds=0V, Force current	-	-	6	A	1, 5
Pulsed source current	Ism		-	-	24	A	2, 5
Diode forward voltage	Vsd	Vgs=0V, Is=1A	-	-	1.2	V	2
DYNAMIC PARAMETERS							
Input capacitance	Ciss	Vds=15V, Vgs=0V, f=1MHz	-	416	-	pF	
Output capacitance	Coss		-	62	-	pF	
Reverse transfer capacitance	Crss		-	51	-	pF	
Gate resistance	Rg	Vds=0V, Vgs=0V, f=1MHz	-	2.3	-	Ω	
SWITCHING PARAMETERS							
Total gate charge (4.5V)	Qg	Vds=20V, Vgs=4.5V, Id=6A	-	5.00	-	nC	
Gate-source charge	Qgs		-	1.11	-	nC	
Gate-drain charge	Qgd		-	2.61	-	nC	
Turn-on delay time	td(on)	Vds=12V, Vgs=10V Rgen=3.3Ω, Id=6A	-	7.7	-	ns	
Turn-on rise time	tr		-	46.0	-	ns	
Turn-off delay time	td(off)		-	11.0	-	ns	
Turn-off fall time	tf		-	3.6	-	ns	

Note :

1. The data tested by surface mounted on a 1 inch^2 FR-4 board with 2OZ copper.
2. The data tested by pulsed, pulse width ≤ 300us, duty cycle ≤ 2%.
3. The EAS data shows Max. rating . The test condition is Vdd=25V, Vgs=10V, L=0.1mH, Ias=12.7A.
4. The power dissipation is limited by 150°C junction temperature.
5. The data is theoretically the same as Id and Idm, in real applications, should be limited by total power dissipation.

■Typical Electrical and Thermal Characteristics (N-ch)

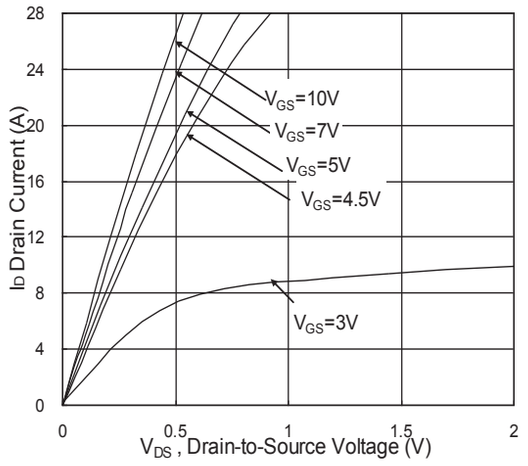


Fig.1 Typical Output Characteristics

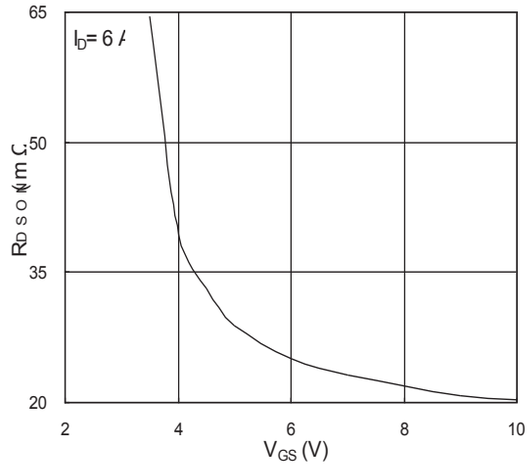


Fig.2 On-Resistance vs. Gate-Source

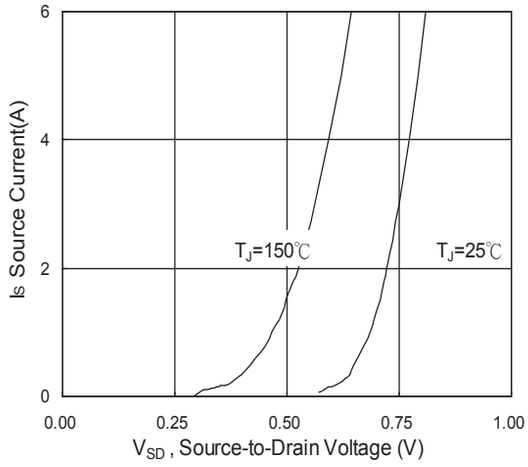


Fig.3 Forward Characteristics Of Reverse

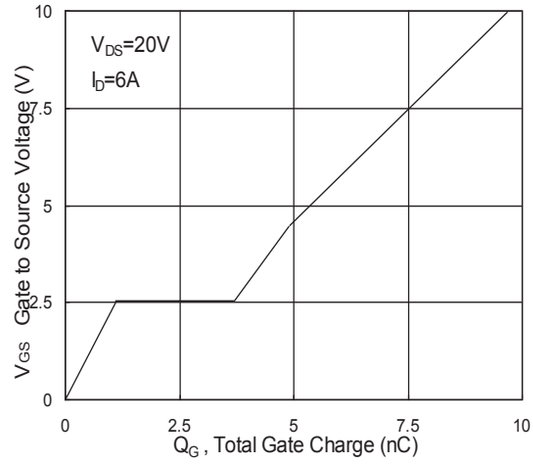


Fig.4 Gate-Charge Characteristics

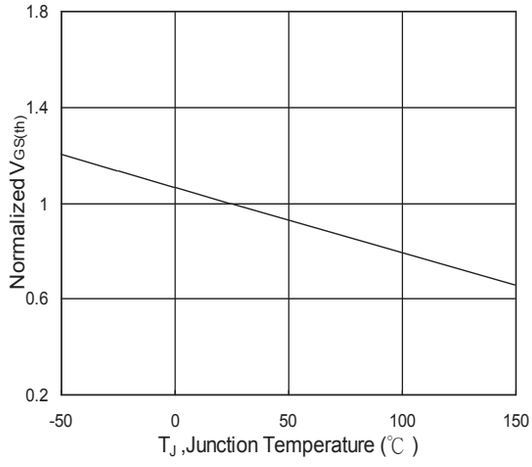


Fig.5 Normalized $V_{GS(th)}$ vs. T_J

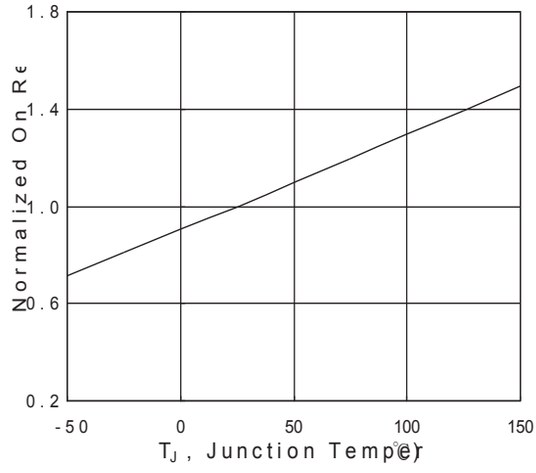


Fig.6 Normalized R_{DSON} vs. T_J

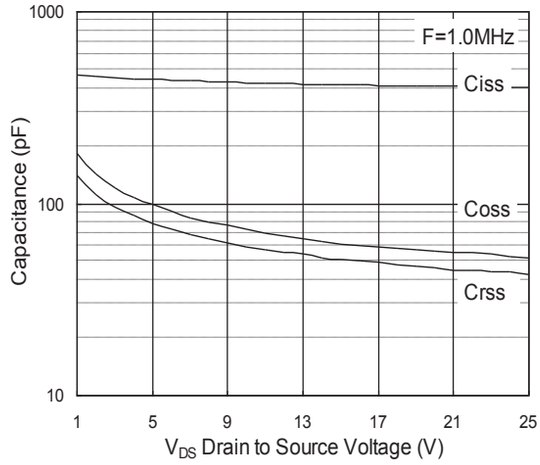


Fig.7 Capacitance

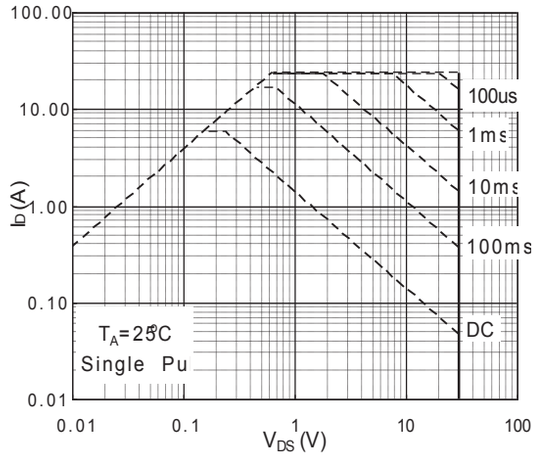


Fig.8 Safe Operating Area

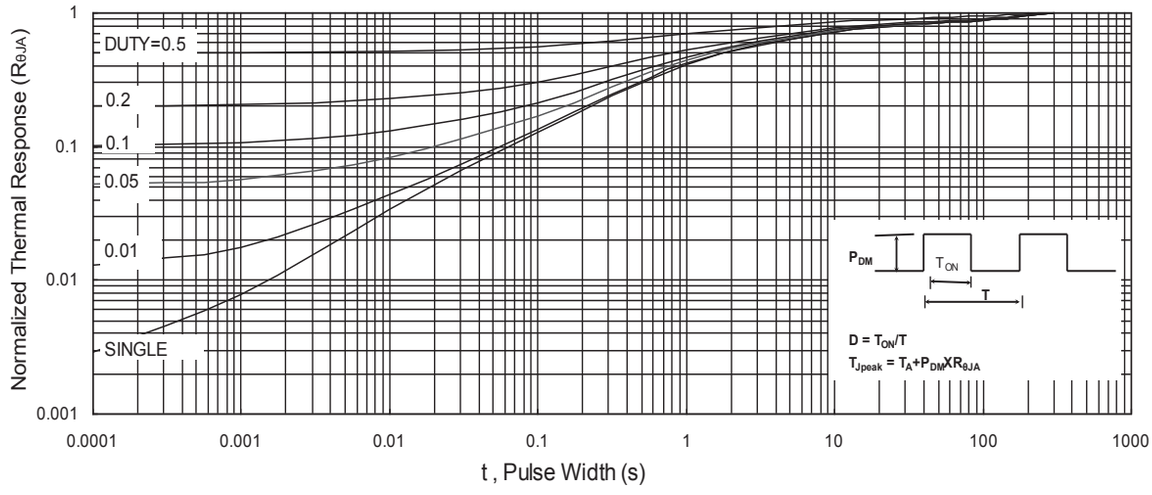


Fig.9 Normalized Maximum Transient Thermal Impedance

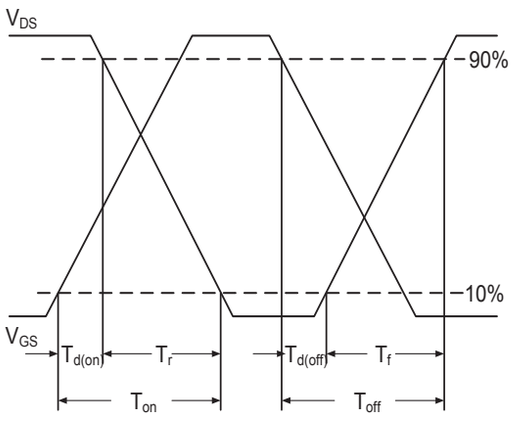


Fig.10 Switching Time Waveform

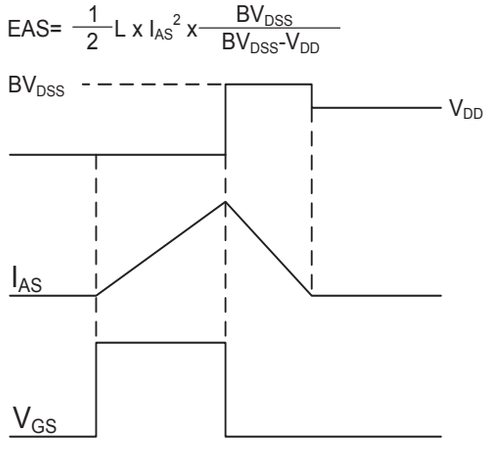


Fig.11 Unclamped Inductive Switching Waveform

■Electrical Characteristics (P-ch)

Tj=25°C. Unless otherwise noted.

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit	Note
STATIC PARAMETERS							
Drain-source breakdown voltage	BVdss	Vgs=0V, Id=-250μA	-30	-	-	V	
BVdss Temperature coefficient	$\frac{\Delta BVdss}{\Delta Tj}$	Reference to 25°C, Id=-1mA	-	-0.021	-	V/°C	
Static drain-source on-resistance	Rds(on)	Vgs=-10V, Id=-6A	-	-	32	mΩ	2
		Vgs=-4.5V, Id=-4A	-	-	56		
Gate threshold voltage	Vgs(th)	Vgs=Vds, Id=-250μA	-1.0	-	-2.5	V	
Vgs(th) Temperature coefficient	ΔVgs(th)		-	-4.2	-	mV/°C	
Drain-source leakage current	Idss	Vds=-24V, Vgs=0V	-	-	-1	μA	
		Vds=-24V, Vgs=0V, Tj=55°C	-	-	-5		
Gate-source leakage current	Igss	Vgs=±20V, Vds=0V	-	-	±100	nA	
Forward transconductance	Gfs	Vds=-5V, Id=-6A	-	12.6	-	S	
Continuous source current	Is	Vgs=Vds=0V, Force Current	-	-	-5.7	A	1, 5
Pulsed source current	Ism		-	-	24.0	A	2, 5
Diode forward voltage	Vsd	Vgs=0V, Is=-1A	-	-	-1.2	V	2
DYNAMIC PARAMETERS							
Input capacitance	Ciss	Vds=-15V, Vgs=0V, f=1MHz	-	930	-	pF	
Output capacitance	Coss		-	148	-	pF	
Reverse transfer capacitance	Crss		-	115	-	pF	
Gate resistance	Rg	Vds=0V, Vgs=0V, f=1MHz	-	15	-	Ω	
SWITCHING PARAMETERS							
Total gate charge (-4.5V)	Qg	Vds=-20V, Vgs=-4.5V Id=-6A	-	9.8	-	nC	
Gate-source charge	Qgs		-	2.2	-	nC	
Gate-drain charge	Qgd		-	3.4	-	nC	
Turn-on delay time	td(on)	Vds=-24V, Vgs=-10V Rgen=3.3Ω, Id=-1A	-	16.4	-	ns	
Turn-on rise time	tr		-	20.2	-	ns	
Turn-off delay time	td(off)		-	55.0	-	ns	
Turn-off fall time	tf		-	10.0	-	ns	

Note :

1. The data tested by surface mounted on a 1 inch^2 FR-4 board with 2OZ copper.
2. The data tested by pulsed, pulse width ≤ 300us, duty cycle ≤ 2%.
3. The EAS data shows Max. rating . The test condition is Vdd=-25V, Vgs=-10V, L=0.1mH, Ias=-30A.
4. The power dissipation is limited by 150°C junction temperature.
5. The data is theoretically the same as Id and Idm, in real applications, should be limited by total power dissipation.

■Typical Electrical and Thermal Characteristics (P-ch)

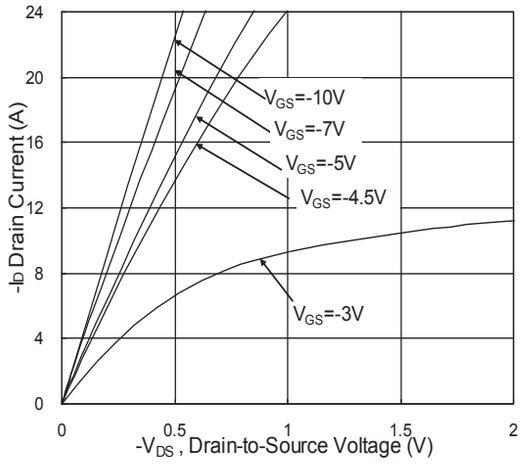


Fig.1 Typical Output Characteristics

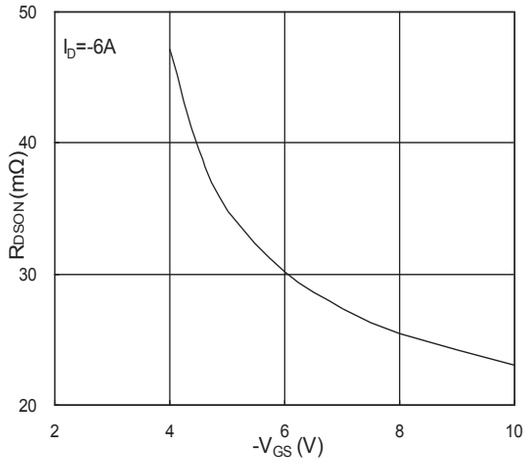


Fig.2 On-Resistance v.s Gate-Source

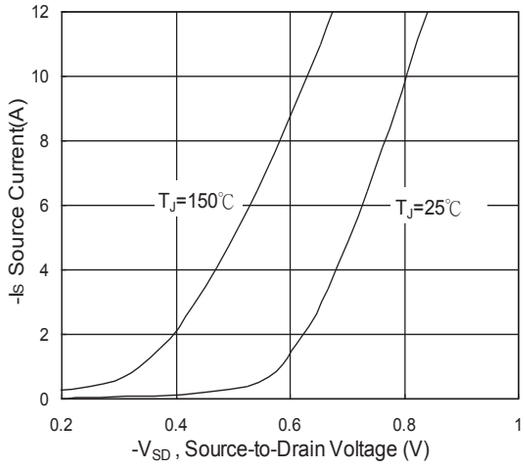


Fig.3 Forward Characteristics Of Reverse

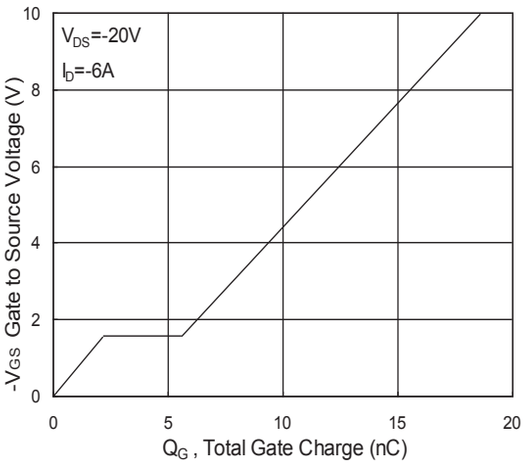


Fig.4 Gate-Charge Characteristics

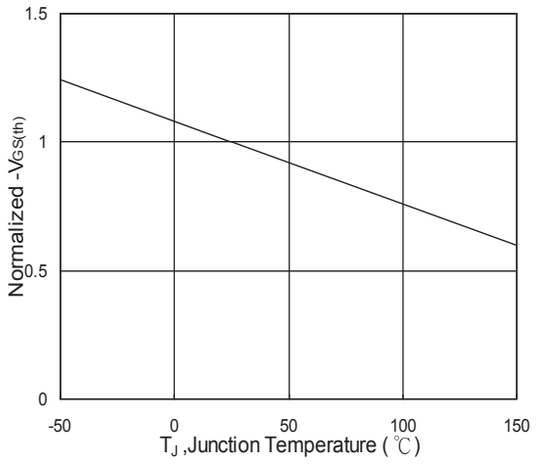


Fig.5 Normalized $V_{GS(th)}$ v.s T_J

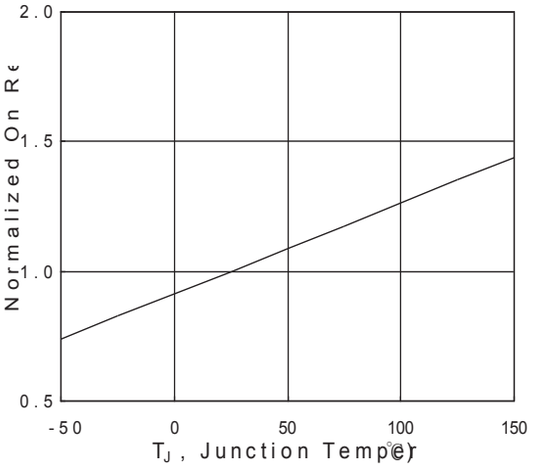


Fig.6 Normalized R_{DSON} v.s T_J

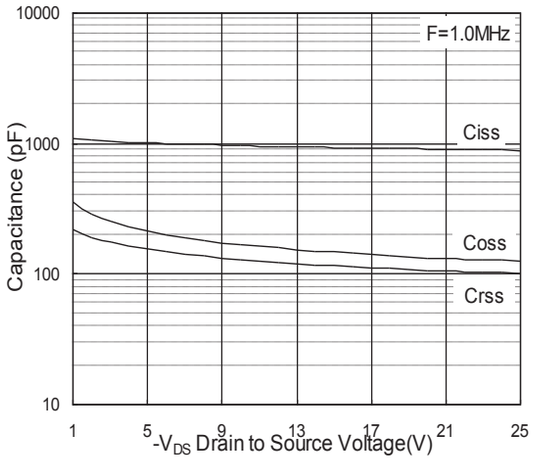


Fig.7 Capacitance

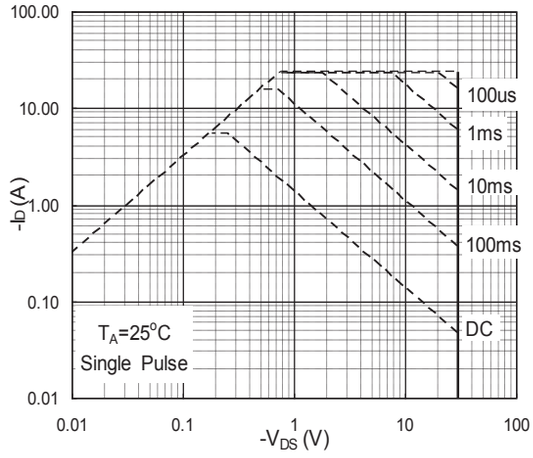


Fig.8 Safe Operating Area

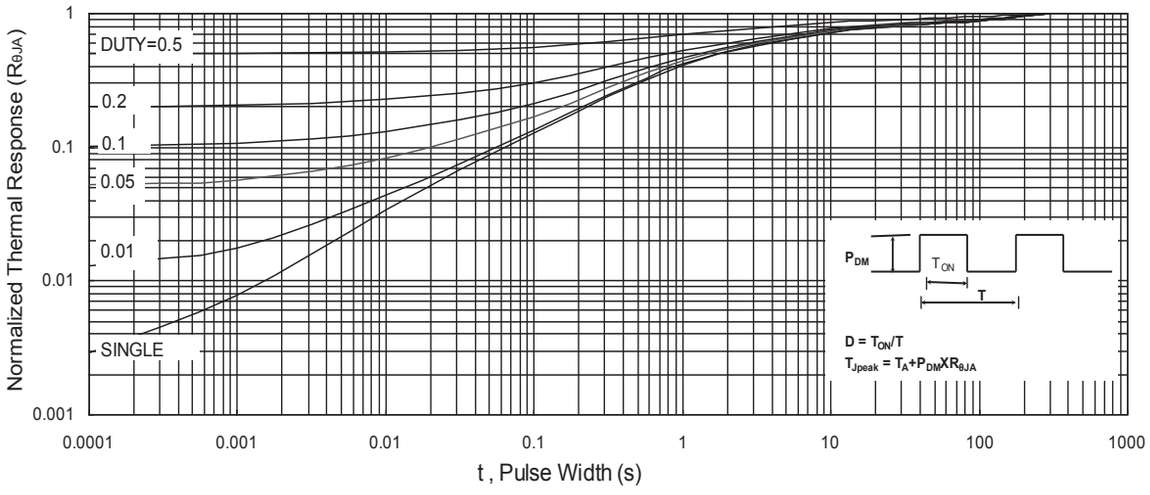
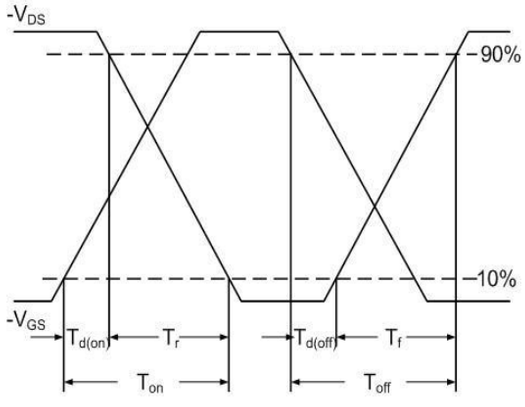


Fig.9 Normalized Maximum Transient Thermal Impedance



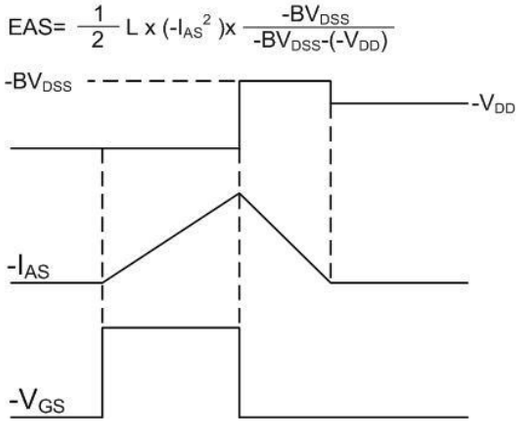
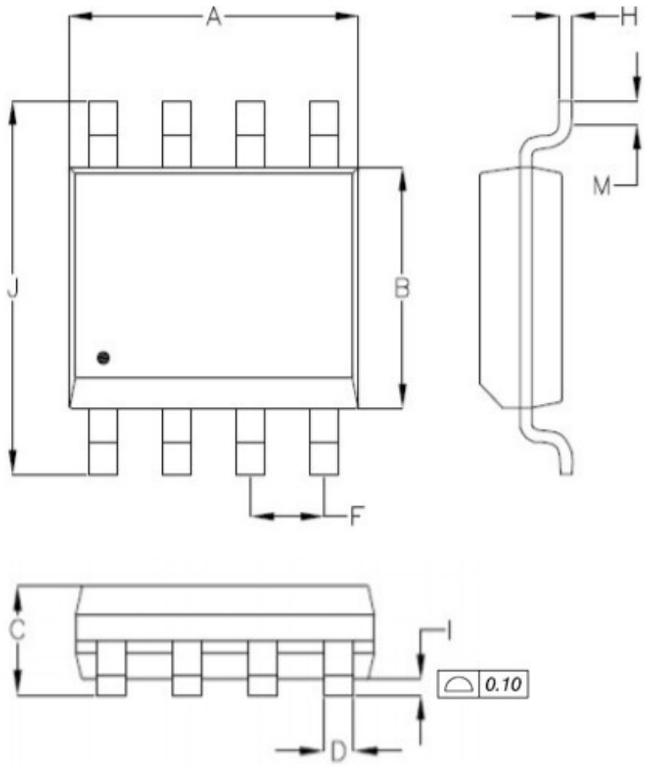


Fig.10 Switching Time Waveform

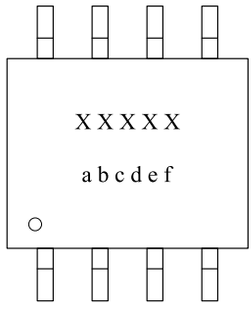
Fig.11 Unclamped Inductive Switching Waveform

■SOP-8 dimension (2,500pcs/reel)



Symbols	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	4.700	5.150	0.185	0.203
B	3.700	4.100	0.146	0.161
C	1.230	1.753	0.048	0.069
D	0.310	0.510	0.012	0.020
F	1.070	1.470	0.042	0.058
H	0.160	0.254	0.006	0.010
I	0.050	0.254	0.002	0.010
J	5.750	6.250	0.226	0.246
M	0.400	1.270	0.016	0.050

■Marking



Symbols	Content
xxxxx	Product code
a	Yearly code: 2019=K, 2020=L, 2021=M, 2022=N...
b, c	Weekly code: 01 to 53
d, e	Sequence: 01 to 99 or 0A to 0Z
f	Assembly code: A to Z (I, O excepted)