Single P-channel MOSFET

ELM33415CA-S

■General description

ELM33415CA-S uses advanced trench technology to provide excellent Rds(on), low gate charge and low gate resistance.

■Features

• Vds=-20V
• Id=-3.5A
• Rds(on) < 51mΩ (Vgs=-4.5V)
• Rds(on) < 61mΩ (Vgs=-2.5V)
• Rds(on) < 71mΩ (Vgs=-1.8V)

■Maximum absolute ratings

Parameter		Symbol	Limit	Unit	Note
Drain-source voltage		Vds	-20	V	
Gate-source voltage		Vgs	±8	V	
Continuous drain current	Ta=25°C	Id	-3.5	A	
	Ta=70°C		-2.8		
Pulsed drain current		Idm	-21	A	3
Power dissipation	Ta=25°C	Pd	1.0	W	
	Ta=70°C		0.6		
Junction and storage temperature range		Tj, Tstg	-55 to 150	°C	

■Thermal characteristics

Parameter		Symbol	Typ.	Max.	Unit	Note
Maximum junction-to-ambient		Rθja		120	°C/W	

■Pin configuration

SOT-23(TOP VIEW)
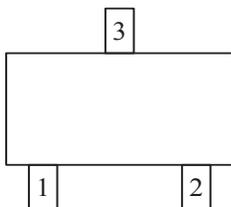
Pin No.	Pin name
1	GATE
2	SOURCE
3	DRAIN

■Circuit

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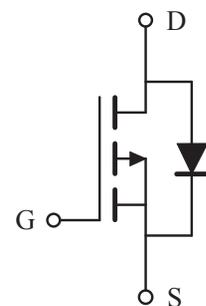
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■Electrical characteristics

| Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit	Note
STATIC PARAMETERS							
Drain-source breakdown voltage	BVdss	Vgs=0V, Id=-250μA	-20			V	
Zero gate voltage drain current	Idss	Vds=-16V, Vgs=0V			-1	μA	
		Vds=-10V, Vgs=0V, Tj=70°C			-10		
Gate-body leakage current	Igss	Vds=0V, Vgs=±8V			±100	nA	
Gate threshold voltage	Vgs(th)	Vds=Vgs, Id=-250μA	-0.45	-0.60	-0.90	V	
On state drain current	Id(on)	Vgs=-4.5V, Vds=-5V	-21			A	1
Static drain-source on-resistance	Rds(on)	Vgs=-4.5V, Id=-3.5A		40	51	mΩ	1
		Vgs=-2.5V, Id=-3.5A		48	61	mΩ	
		Vgs=-1.8V, Id=-2.0A		60	71	mΩ	
Forward transconductance	Gfs	Vds=-5V, Id=-3.5A		17		S	1
Diode forward voltage	Vsd	If=-3.5A, Vgs=0V			-1.3	V	1
Max. body-diode continuous current	Is				-3.5	A	
DYNAMIC PARAMETERS							
Input capacitance	Ciss	Vgs=0V, Vds=-10V, f=1MHz		1180		pF	
Output capacitance	Coss			185		pF	
Reverse transfer capacitance	Crss			117		pF	
SWITCHING PARAMETERS							
Total gate charge	Qg	Vgs=-4.5V, Vds=-10V Id=-3.5A		16.7		nC	2
Gate-source charge	Qgs			1.8		nC	2
Gate-drain charge	Qgd			4.6		nC	2
Turn-on delay time	td(on)	Vgs=-4.5V, Vds=-10V Id≈-3.5A, Rgen=3.3Ω		20		ns	2
Turn-on rise time	tr			36		ns	2
Turn-off delay time	td(off)			45		ns	2
Turn-off fall time	tf			62		ns	2
Body diode reverse recovery time	trr	If=-3.5A, dl/dt=100A/μs		30		ns	
Body diode reverse recovery charge	Qrr			14		nC	

NOTE :

1. Pulsed width≤300μsec and Duty cycle≤2%.

2. Independent of operating temperature.

3. Pulsed width limited by maximum junction temperature.

4. Duty cycle ≤ 1%.

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■Typical electrical and thermal characteristics

Output Characteristics

VGS =-4.5V
VGS =-3V
VGS =-2.5V
VGS =-2V
VGS =-1.5V

-I_D, Drain-To-Source Current(A) vs -V_{DS}, Drain-To-Source Voltage(V)
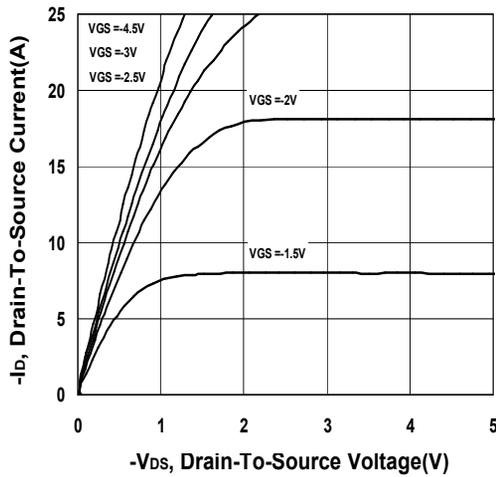
On-Resistance VS Drain Current

VGS =-1.5V
VGS =-2V
VGS =-2.5V
VGS =-3V
VGS =-4.5V

$R_{DS(ON)}$ ON-Resistance(OHM) vs -I_D, Drain-To-Source Current(A)
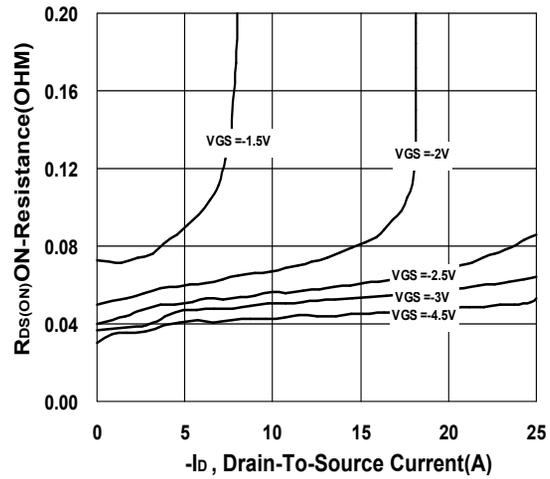
On-Resistance VS Gate-To-Source

ID=-3.5A

$R_{DS(ON)}$ ON-Resistance(OHM) vs -V_{GS}, Gate-To-Source Voltage(V)
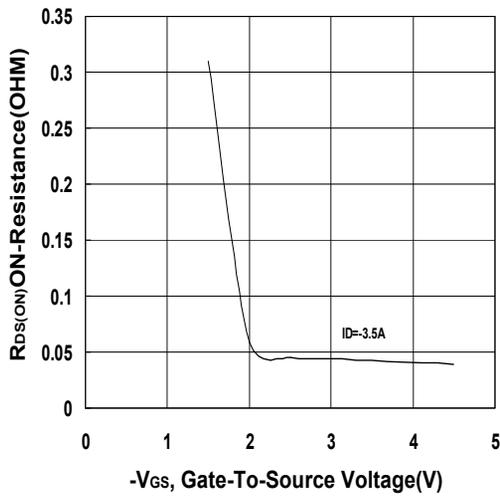
On-Resistance VS Temperature

VGS=-10V
ID=-3.5A

Normalized Drain to Source ON-Resistance vs T_J, Junction Temperature(˚C)
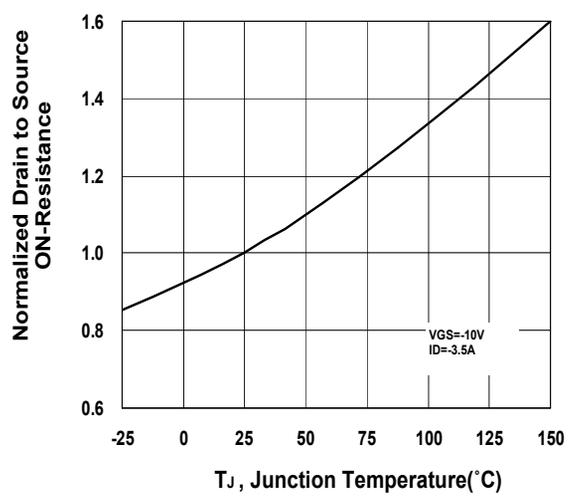
Transfer Characteristics

125℃ 25℃ -20℃

-I_D, Drain-To-Source Current(A) vs -V_{GS}, Gate-To-Source Voltage(V)
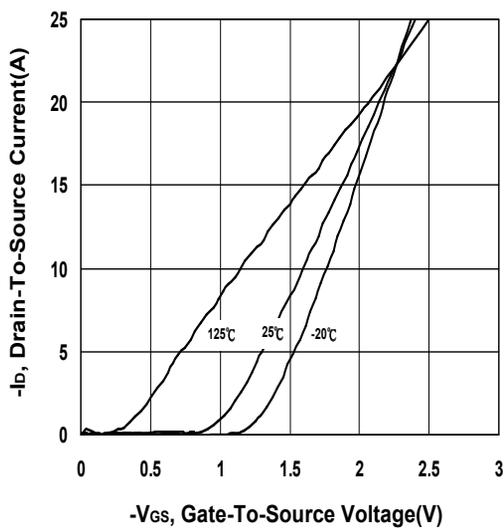
Gate charge Characteristics

I_D=-3.5A
V_{DS}=-10V

-V_{GS}, Gate-To-Source Voltage(V) vs Q_g, Total Gate Charge(nC)

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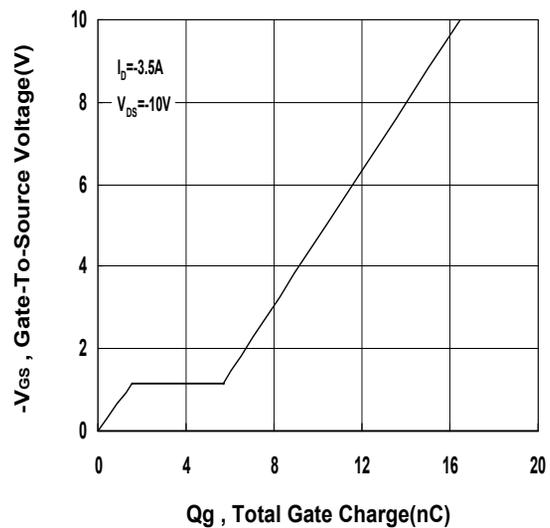
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Capacitance Characteristic

C , Capacitance(pF) vs -V$_{DS}$, Drain-To-Source Voltage(V)

CISS, COSS, CRSS
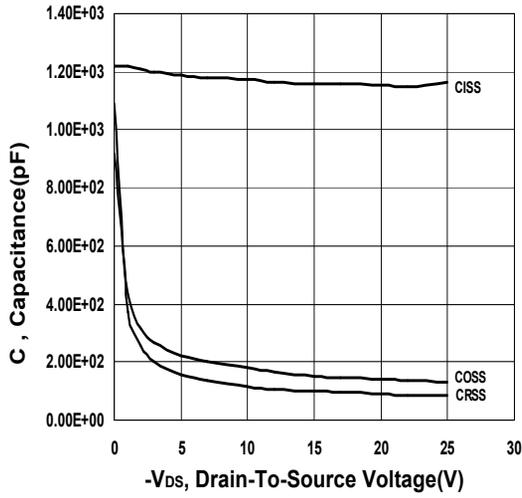
Source-Drain Diode Forward Voltage

-Is , Source Current(A) vs -V$_{SD}$, Source-To-Drain Voltage(V)

150℃   25℃

Safe Operating Area

-I$_D$, Drain Current(A) vs -V$_{DS}$, Drain-To-Source Voltage(V)

1mS
10mS
100mS
10S
DC

NOTE :
1.V$_{GS}$= 10V
2.T$_A$=25℃
3.R$_{θJA}$ = 120℃/W
4.Single Pulse
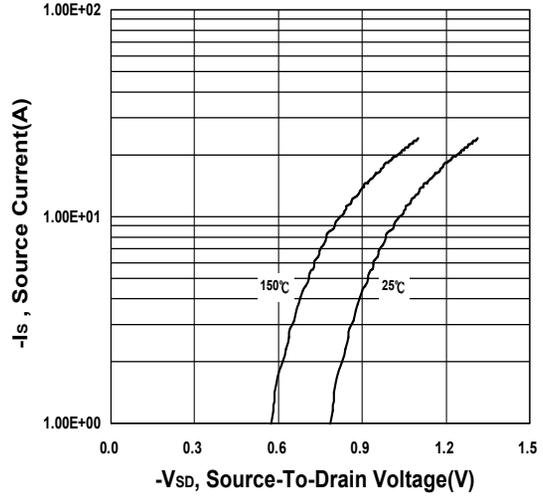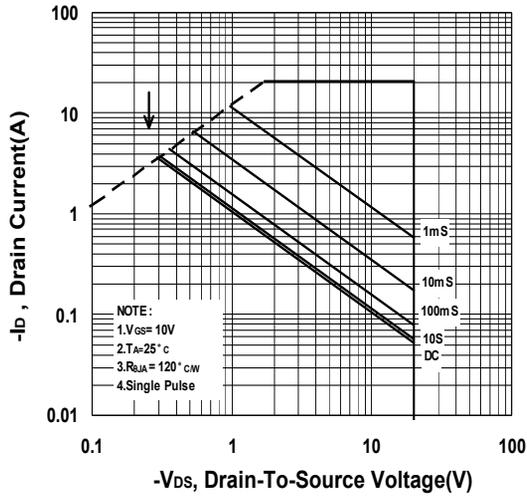
Single Pulse Maximum Power Dissipation

Power(W) vs Single Pulse Time(s)

Single Pulse
R$_{θJA}$ = 120℃/W
T$_A$=25℃
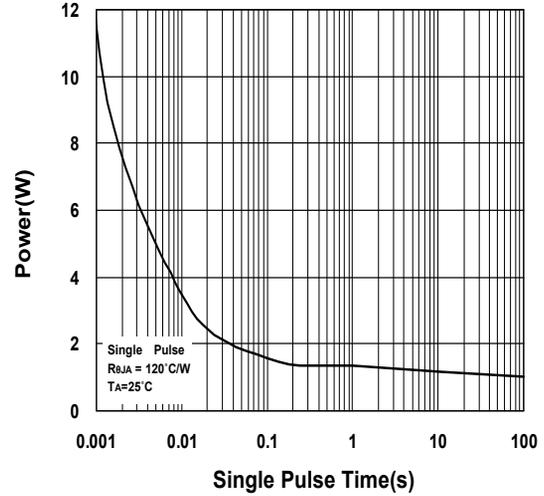
Transient Thermal Response Curve

r(t) , Mormalized Effective Transient Thermal Resistance vs T$_1$, Square Wave Pulse Duration[sec]

Duty cycle=0.5
0.2
0.1
0.05
0.02
0.01
single pulse

Notes

1.Duty cycle, D= t1 / t2
2.RthJA =   120℃/W
3.TJ-TA = P*RthJA(t)
4.RthJA(t) = r(t)*RthJA

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