Complementary MOSFET

ELM34608AA-N

■General Description

ELM34608AA-N uses advanced trench technology to provide excellent Rds(on) and low gate charge.

■Features

N-channel	P-channel
• Vds=60V	Vds=-60V
• Id=4.5A	Id=-3.5A
• Rds(on) < 58mΩ(Vgs=10V)	Rds(on) < 90mΩ(Vgs=-10V)
• Rds(on) < 85mΩ(Vgs=4.5V)	Rds(on) < 135mΩ(Vgs=-4.5V)

■Maximum Absolute Ratings

Parameter		Symbol	N-ch (Max.)	P-ch (Max.)	Unit	Note
Drain-source voltage		Vds	60	-60	V	
Gate-source voltage		Vgs	±20	±20	V	
Continuous drain current	Ta=25℃	Id	4.5	-3.5	A	
	Ta=70℃		4.0	-3.0		
Pulsed drain current		Idm	20	-20	A	1
Power dissipation	Ta=25℃	Pd	2.0	2.0	W	
	Ta=70℃		1.3	1.3		
Junction and storage temperature range		Tj,Tstg	-55 to 150	-55 to 150	℃	

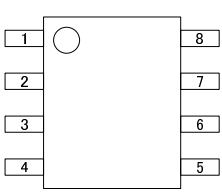
■Thermal Characteristics

Parameter		Symbol	Device	Typ.	Max.	Unit	Note
Maximum junction-to-ambient		Rθja	N-ch		62.5	℃/W	
Maximum junction-to-ambient		Rθja	P-ch		62.5	℃/W	

1. Pulse width limited by maximum junction temperature.
2. Duty cycle ≤ 1%.

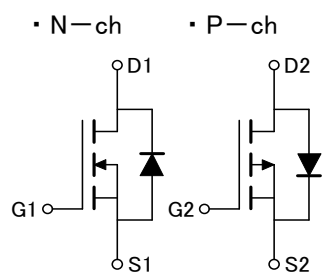
■Pin Configuration

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)

Ta=25℃

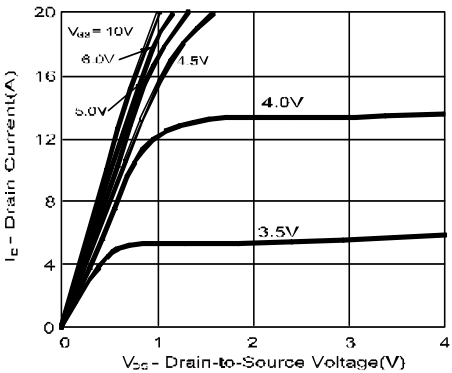
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit	Note
STATIC PARAMETERS							
Drain-source breakdown voltage	BVdss	Id=250μA, Vgs=0V	60			V	
Zero gate voltage drain current	Idss	Vds=48V, Vgs=0V			1	μA	
		Vds=40V, Vgs=0V, Tj=55℃			10		
Gate-body leakage current	Igss	Vds=0V, Vgs=±20V			±100	nA	
Gate threshold voltage	Vgs(th)	Vds=Vgs, Id=250μA	1.0	1.5	2.5	V	
On state drain current	Id(on)	Vgs=10V, Vds=5V	20			A	1
Static drain-source on-resistance	Rds(on)	Vgs=10V, Id=4.5A		42	58	mΩ	1
		Vgs=4.5V, Id=4A		55	85		
Forward transconductance	Gfs	Vds=10V, Id=4.5A		14		S	1
Diode forward voltage	Vsd	If=Is=1.3A, Vgs=0V			1	V	1
Max.body-diode continuous current	Is				1.3	A	
Pulsed current	Ism				2.6	A	3
DYNAMIC PARAMETERS							
Input capacitance	Ciss	Vgs=0V, Vds=25V, f=1MHz		650		pF	
Output capacitance	Coss			80		pF	
Reverse transfer capacitance	Crss			35		pF	
SWITCHING PARAMETERS							
Total gate charge	Qg	Vgs=10V, Vds=30V, Id=4.5A		12.0	16.0	nC	2
Gate-source charge	Qgs			2.4		nC	2
Gate-drain charge	Qgd			2.6		nC	2
Turn-on delay time	td(on)	Vgs=10V, Vds=30V, Id ≅ 1A Rgen=6Ω		11	20	ns	2
Turn-on rise time	tr			8	18	ns	2
Turn-off delay time	td(off)			19	35	ns	2
Turn-off fall time	tf			6	15	ns	2

NOTE :

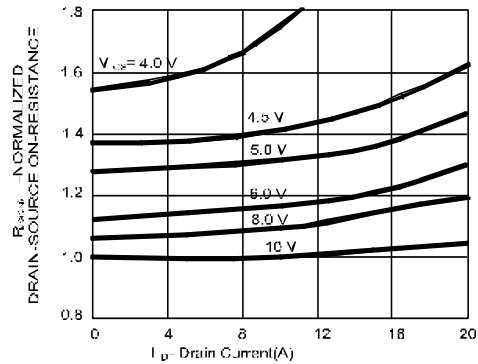
1. Pulse test : Pulse width ≤ 300μsec, duty cycle ≤ 2%.
2. Independent of operating temperature.
3. Pulse width limited by maximum junction temperature.

■Typical Electrical and Thermal Characteristics (N-ch)

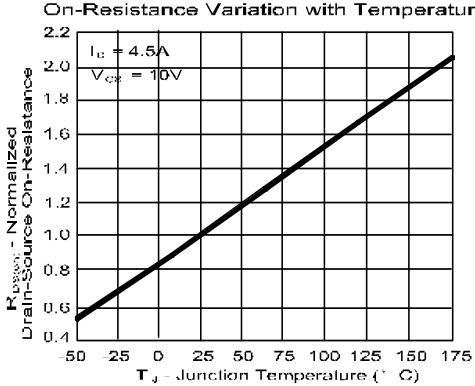
On-Region Characteristics



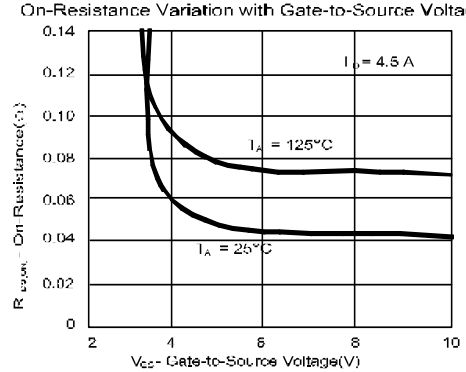
On-Resistance Variation with Drain Current and Gate Voltage



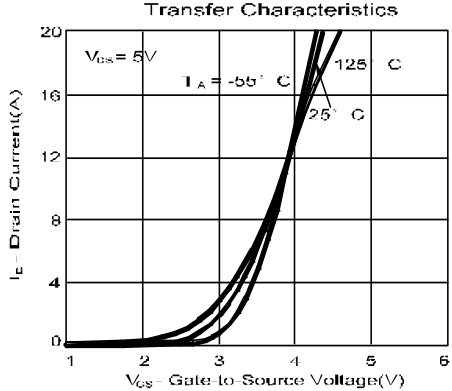
On-Resistance Variation with Temperature



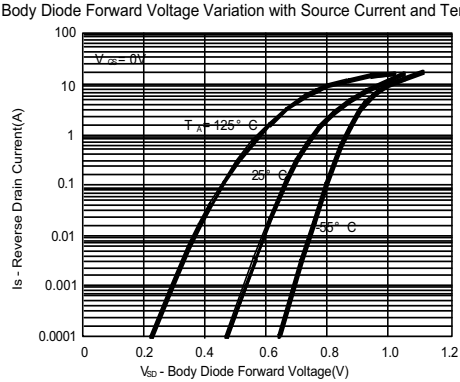
On-Resistance Variation with Gate-to-Source Voltage

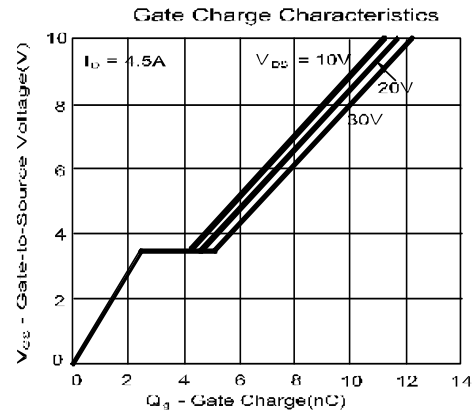


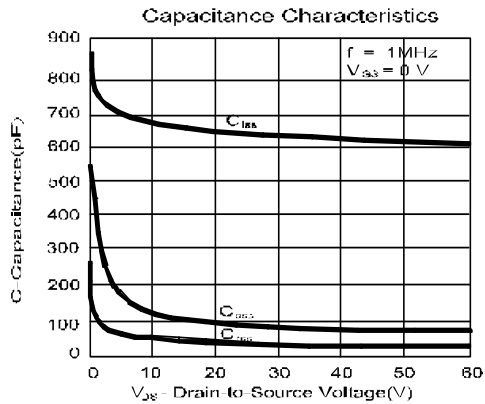
Transfer Characteristics

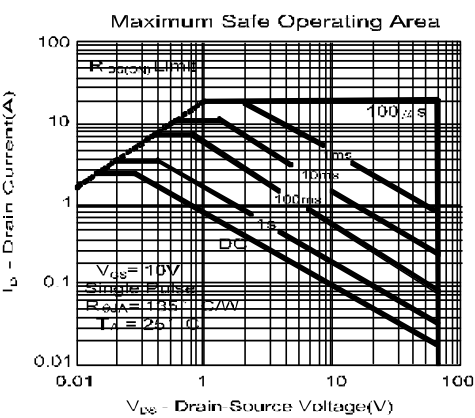


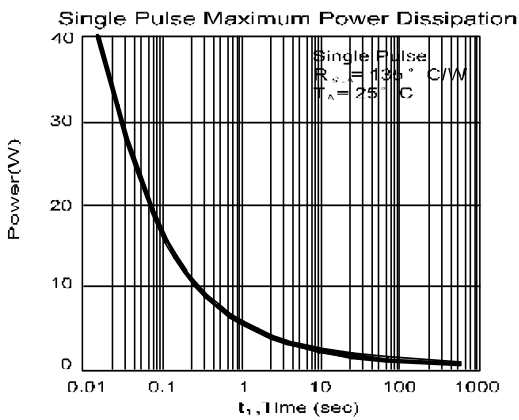
Body Diode Forward Voltage Variation with Source Current and Temperature




Gate Charge Characteristics
I_D = 1.5A
V_{DS} = 10V
20V
30V
V_{GS} - Gate-to-Source Voltage(V)
Q_g - Gate Charge(nC)


Capacitance Characteristics
f = 1MHz
V_{GS} = 0 V
C_{iss}
C_{oss}
C_{rss}
C-Capacitance(pF)
V_{DS} - Drain-to-Source Voltage(V)


Maximum Safe Operating Area
$R_{DS(on)}$ Limit
100μs
1ms
10ms
100ms
1s
DC
V_{GS}= 10V
Single Pulse
$R_{\theta JA}$= 135°C/W
T_A = 25°C
I_D - Drain Current(A)
V_{DS} - Drain-Source Voltage(V)


Single Pulse Maximum Power Dissipation
Single Pulse
$R_{\theta JA}$ = 135° C/W
T_A = 25° C
Power(W)
t_1 , Time (sec)

■Electrical Characteristics (P-ch)

Ta=25℃

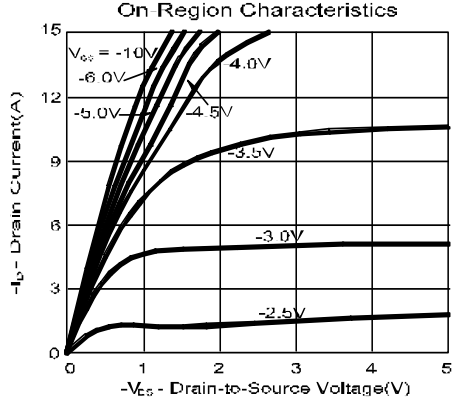
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit	Note
STATIC PARAMETERS							
Drain-source breakdown voltage	BVdss	Id=-250μA, Vgs=0V	-60			V	
Zero gate voltage drain current	Idss	Vds=-48V, Vgs=0V			-1	μA	
		Vds=-40V, Vgs=0V, Tj=55℃			-10		
Gate-body leakage current	Igss	Vds=0V, Vgs=±20V			±100	nA	
Gate threshold voltage	Vgs(th)	Vds=Vgs, Id=-250μA	-1.0	-1.5	-2.5	V	
On state drain current	Id(on)	Vgs=-10V, Vds=-5V	-20			A	1
Static drain-source on-resistance	Rds(on)	Vgs=-10V, Id=-3.5A		70	90	mΩ	1
		Vgs=-4.5V, Id=-3A		100	135		
Forward transconductance	Gfs	Vds=-5V, Id=-3.5A		9		S	1
Diode forward voltage	Vsd	If=Is=-1.3A, Vgs=0V			-1	V	1
Max.body-diode continuous current	Is				-1.3	A	
Pulsed current	Ism				-2.6	A	3
DYNAMIC PARAMETERS							
Input capacitance	Ciss	Vgs=0V, Vds=-30V, f=1MHz		630		pF	
Output capacitance	Coss			81		pF	
Reverse transfer capacitance	Crss			33		pF	
SWITCHING PARAMETERS							
Total gate charge	Qg	Vgs=-10V, Vds=-30V Id=-3.5A		11.0	15.0	nC	2
Gate-source charge	Qgs			2.1		nC	2
Gate-drain charge	Qgd			2.5		nC	2
Turn-on delay time	td(on)	Vgs=-10V, Vds=-30V Id ≅ -1A, Rgen=6Ω		6	13	ns	2
Turn-on rise time	tr			8	18	ns	2
Turn-off delay time	td(off)			17	31	ns	2
Turn-off fall time	tf			11	20	ns	2

NOTE :

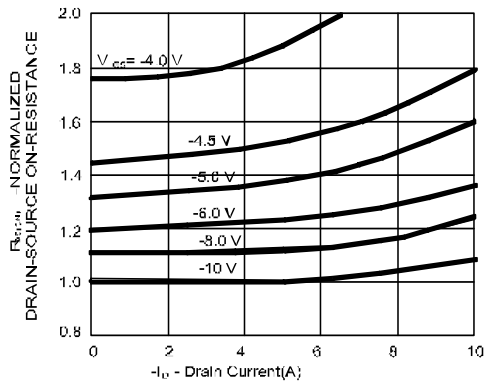
1. Pulse test : Pulse width ≤ 300μsec, duty cycle ≤ 2%.
2. Independent of operating temperature.
3. Pulse width limited by maximum junction temperature.

■Typical Electrical and Thermal Characteristics (P-ch)

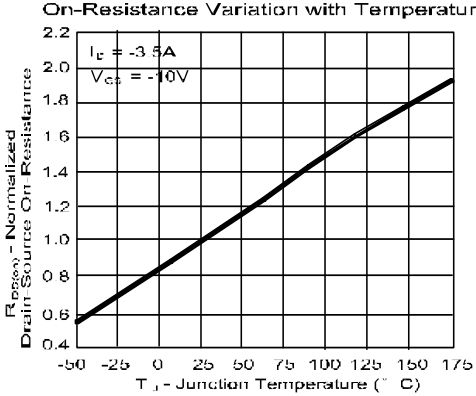
On-Region Characteristics



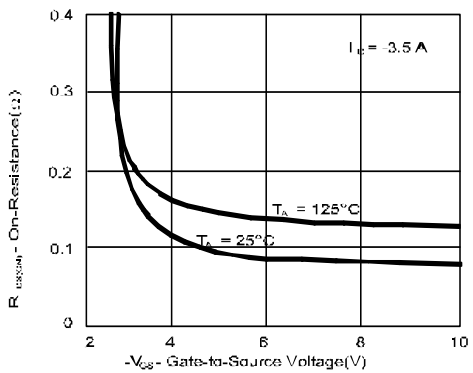
On-Resistance Variation with Drain Current and Gate Voltage



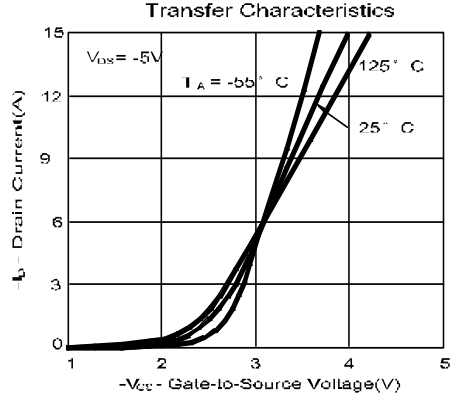
On-Resistance Variation with Temperature



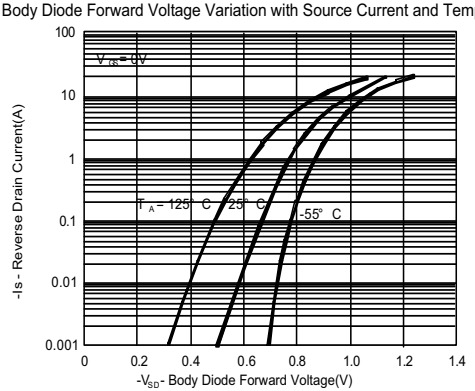
On-Resistance Variation with Gate-to-Source Voltage

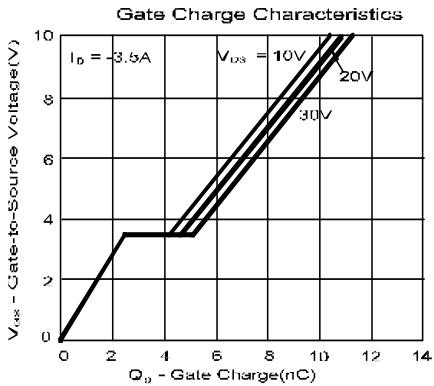


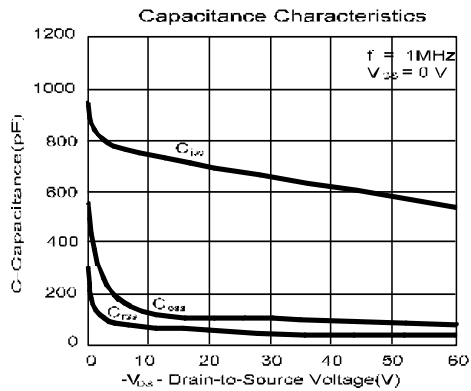
Transfer Characteristics

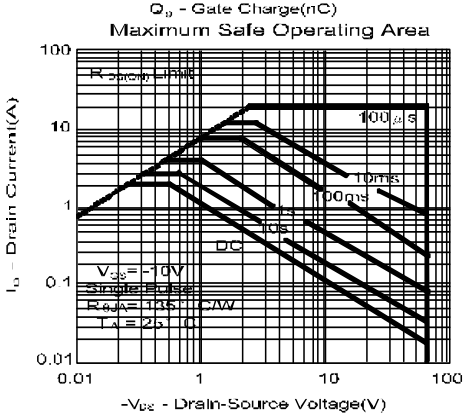


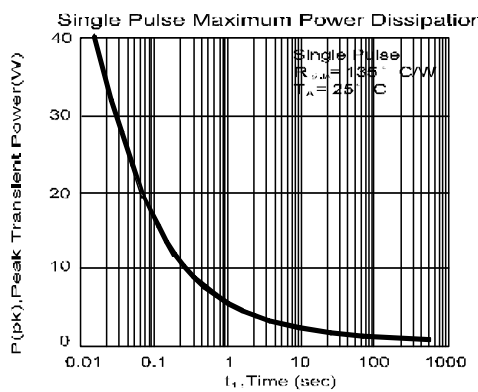
Body Diode Forward Voltage Variation with Source Current and Temperature

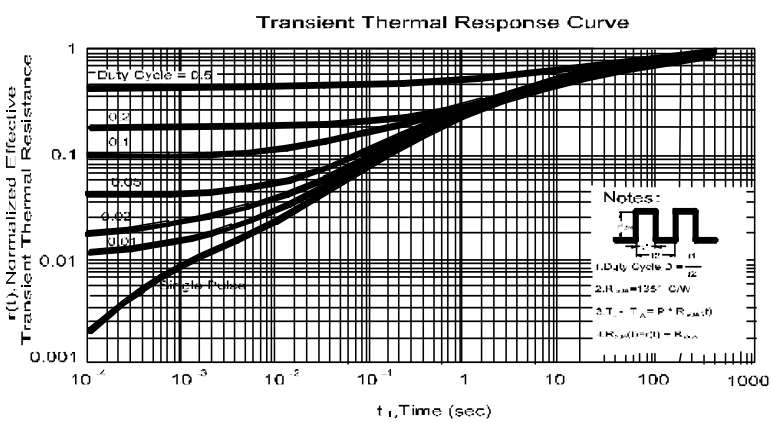



Gate Charge Characteristics
I_D = -3.5A
V_{DS} = 10V
20V
30V
V_{GS} - Gate-to-Source Voltage(V)
Q_g - Gate Charge(nC)


Capacitance Characteristics
f = 1MHz
V_{GS} = 0 V
C_{iss}
C_{oss}
C_{rss}
C-Capacitance(pF)
-V_{DS} - Drain-to-Source Voltage(V)


Maximum Safe Operating Area
$R_{DS(ON)}$ Limit
100μs
1ms
10ms
100ms
1s
DC
V_{GS}=-10V
Single Pulse
$R_{\theta JA}$=135°C/W
T_A=25°C
I_D - Drain Current(A)
-V_{DS} - Drain-Source Voltage(V)


Single Pulse Maximum Power Dissipation
Single Pulse
$R_{\theta JA}$= 135°C/W
T_A= 25°C
P(pK),Peak Transient Power(W)
t_1,Time (sec)


Transient Thermal Response Curve
Duty Cycle = 0.5
0.2
0.1
0.05
0.02
0.01
Single Pulse
Notes:
1.Duty Cycle D = $\frac{t_1}{t_2}$
2.$R_{\theta JA}$=135°C/W
3.T_J - T_A= P * $R_{\theta JA}$(t)
4.$R_{\theta JA}$(t)=r(t) * $R_{\theta JA}$
r(t),Normalized Effective Transient Thermal Resistance
t_1,Time (sec)