

# Complementary MOSFET

ELM34608AA-N

## General Description

ELM34608AA-N uses advanced trench technology to provide excellent  $R_{ds(on)}$  and low gate charge.

## Features

- N-channel
- P-channel
- $V_{ds}=60V$
- $V_{ds}=-60V$
- $I_d=4.5A$
- $I_d=-3.5A$
- $R_{ds(on)} < 58m\Omega (V_{gs}=10V)$
- $R_{ds(on)} < 90m\Omega (V_{gs}=-10V)$
- $R_{ds(on)} < 85m\Omega (V_{gs}=4.5V)$
- $R_{ds(on)} < 135m\Omega (V_{gs}=-4.5V)$

## Maximum Absolute Ratings

Parameter	Symbol	N-ch (Max.)	P-ch (Max.)	Unit	Note
Drain-source voltage	$V_{ds}$	60	-60	V	
Gate-source voltage	$V_{gs}$	$\pm 20$	$\pm 20$	V	
Continuous drain current	$I_d$	$T_a=25^\circ C$	4.5	-3.5	A
		$T_a=70^\circ C$	4.0	-3.0	
Pulsed drain current	$I_{dm}$	20	-20	A	1
Power dissipation	$P_d$	$T_a=25^\circ C$	2.0	2.0	W
		$T_a=70^\circ C$	1.3	1.3	
Junction and storage temperature range	$T_j, T_{stg}$	-55 to 150	-55 to 150	$^\circ C$	

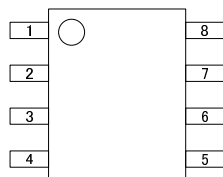
## Thermal Characteristics

Parameter	Symbol	Device	Typ.	Max.	Unit	Note
Maximum junction-to-ambient	$R\theta_{ja}$	N-ch		62.5	$^\circ C/W$	
Maximum junction-to-ambient	$R\theta_{ja}$	P-ch		62.5	$^\circ C/W$	

- Pulse width limited by maximum junction temperature.
- Duty cycle  $\leq 1\%$ .

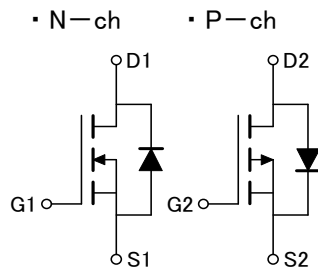
## Pin Configuration

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



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### ■ Electrical Characteristics (N-ch)

T<sub>a</sub>=25°C

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit	Note
<b>STATIC PARAMETERS</b>							
Drain-source breakdown voltage	BV <sub>dss</sub>	I <sub>d</sub> =250 μA, 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	
		V <sub>ds</sub> =40V, V <sub>gs</sub> =0V, T <sub>j</sub> =55°C			10		
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> =250 μA	1.0	1.5	2.5	V	
On state drain current	I <sub>d(on)</sub>	V <sub>gs</sub> =10V, V <sub>ds</sub> =5V	20			A	1
Static drain-source on-resistance	R <sub>ds(on)</sub>	V <sub>gs</sub> =10V, I <sub>d</sub> =4.5A		42	58	mΩ	1
		V <sub>gs</sub> =4.5V, I <sub>d</sub> =4A		55	85		
Forward transconductance	G <sub>fs</sub>	V <sub>ds</sub> =10V, I <sub>d</sub> =4.5A		14		S	1
Diode forward voltage	V <sub>sd</sub>	I <sub>f</sub> =I <sub>s</sub> =1.3A, V <sub>gs</sub> =0V			1	V	1
Max.body-diode continuous current	I <sub>s</sub>				1.3	A	
Pulsed current	I <sub>sm</sub>				2.6	A	3
<b>DYNAMIC PARAMETERS</b>							
Input capacitance	C <sub>iss</sub>	V <sub>gs</sub> =0V, V <sub>ds</sub> =25V, f=1MHz		650		pF	
Output capacitance	C <sub>oss</sub>			80		pF	
Reverse transfer capacitance	C <sub>rss</sub>			35		pF	
<b>SWITCHING PARAMETERS</b>							
Total gate charge	Q <sub>g</sub>	V <sub>gs</sub> =10V, V <sub>ds</sub> =30V, I <sub>d</sub> =4.5A		12.0	16.0	nC	2
Gate-source charge	Q <sub>gs</sub>			2.4		nC	2
Gate-drain charge	Q <sub>gd</sub>			2.6		nC	2
Turn-on delay time	t <sub>d(on)</sub>	V <sub>gs</sub> =10V, V <sub>ds</sub> =30V, I <sub>d</sub> ≈ 1A R <sub>gen</sub> =6 Ω		11	20	ns	2
Turn-on rise time	t <sub>r</sub>			8	18	ns	2
Turn-off delay time	t <sub>d(off)</sub>			19	35	ns	2
Turn-off fall time	t <sub>f</sub>			6	15	ns	2

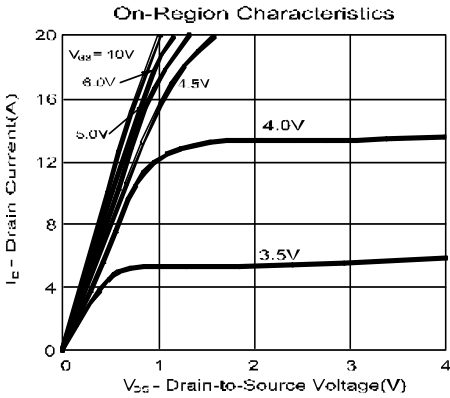
#### NOTE :

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

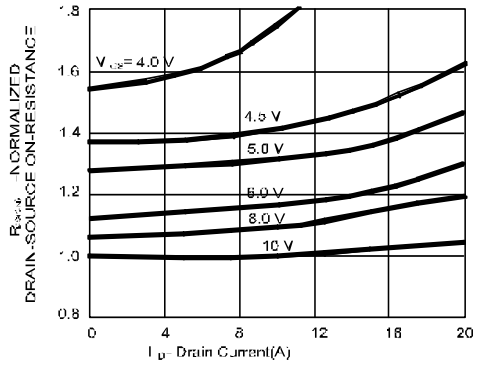
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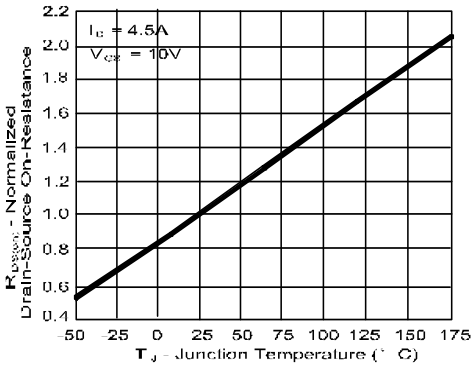
### Typical Electrical and Thermal Characteristics (N-ch)



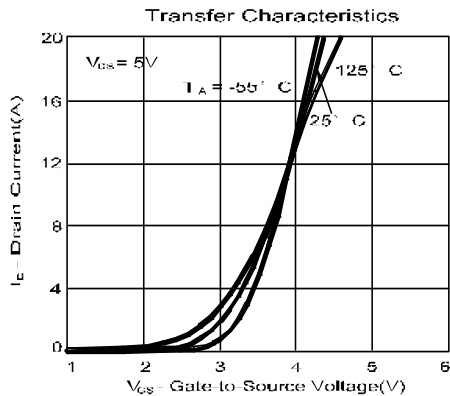
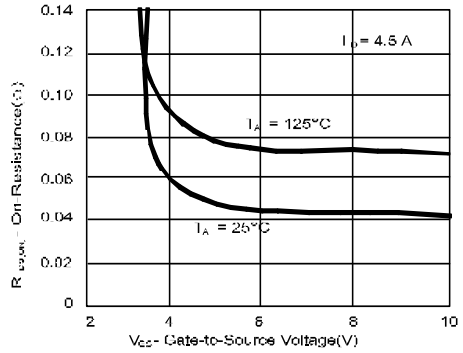
On-Resistance Variation with Drain Current and Gate Voltage



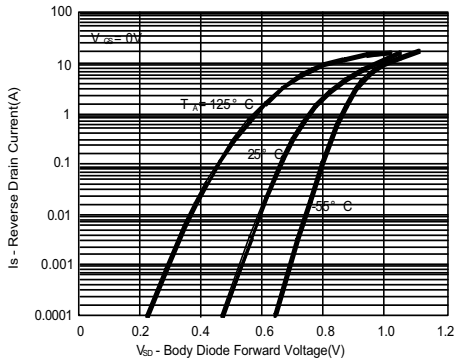
On-Resistance Variation with Temperature



On-Resistance Variation with Gate-to-Source Voltage

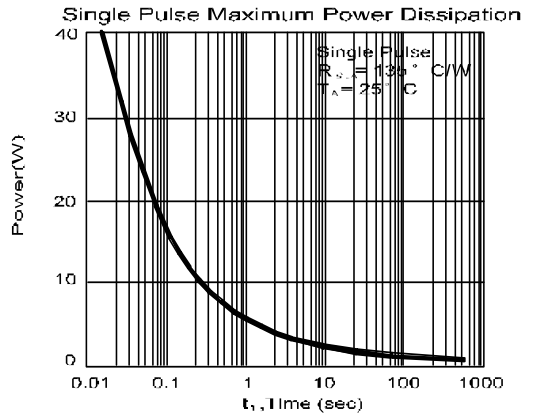
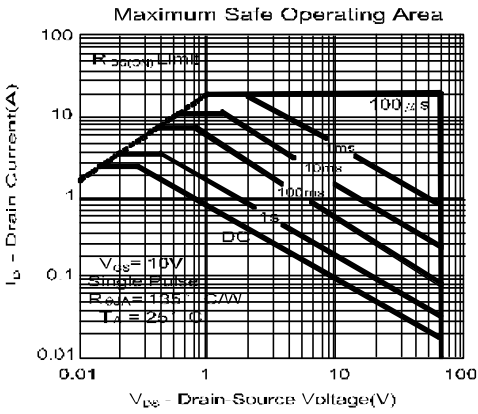
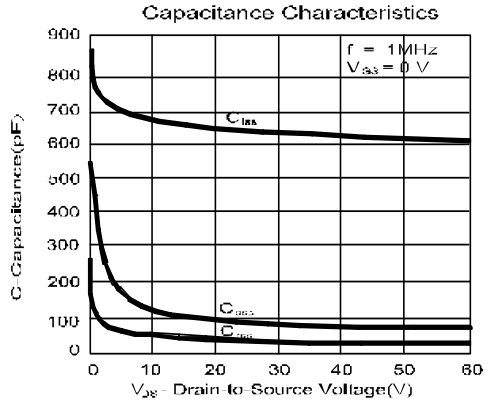
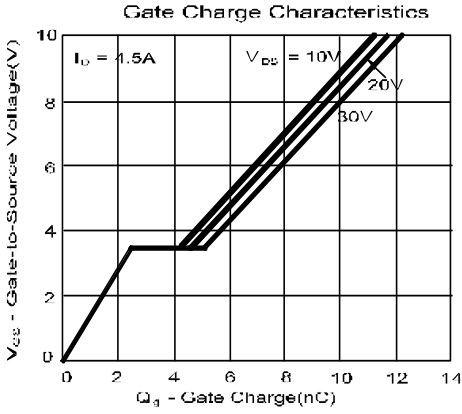


Body Diode Forward Voltage Variation with Source Current and Temperature



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# Complementary MOSFET

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### ■ Electrical Characteristics (P-ch)

T<sub>a</sub>=25°C

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit	Note
<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	
		V <sub>ds</sub> =-40V, V <sub>gs</sub> =0V, T <sub>j</sub> =55°C			-10		
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	-1.5	-2.5	V	
On state drain current	I <sub>d(on)</sub>	V <sub>gs</sub> =-10V, V <sub>ds</sub> =-5V	-20			A	1
Static drain-source on-resistance	R <sub>ds(on)</sub>	V <sub>gs</sub> =-10V, I <sub>d</sub> =-3.5A		70	90	mΩ	1
		V <sub>gs</sub> =-4.5V, I <sub>d</sub> =-3A		100	135		
Forward transconductance	G <sub>fs</sub>	V <sub>ds</sub> =-5V, I <sub>d</sub> =-3.5A		9		S	1
Diode forward voltage	V <sub>sd</sub>	I <sub>f</sub> =I <sub>s</sub> =-1.3A, V <sub>gs</sub> =0V			-1	V	1
Max.body-diode continuous current	I <sub>s</sub>				-1.3	A	
Pulsed current	I <sub>sm</sub>				-2.6	A	3
<b>DYNAMIC PARAMETERS</b>							
Input capacitance	C <sub>iss</sub>	V <sub>gs</sub> =0V, V <sub>ds</sub> =-30V, f=1MHz		630		pF	
Output capacitance	C <sub>oss</sub>			81		pF	
Reverse transfer capacitance	C <sub>rss</sub>			33		pF	
<b>SWITCHING PARAMETERS</b>							
Total gate charge	Q <sub>g</sub>	V <sub>gs</sub> =-10V, V <sub>ds</sub> =-30V I <sub>d</sub> =-3.5A		11.0	15.0	nC	2
Gate-source charge	Q <sub>gs</sub>			2.1		nC	2
Gate-drain charge	Q <sub>gd</sub>			2.5		nC	2
Turn-on delay time	t <sub>d(on)</sub>	V <sub>gs</sub> =-10V, V <sub>ds</sub> =-30V I <sub>d</sub> ≈-1A, R <sub>gen</sub> =6Ω		6	13	ns	2
Turn-on rise time	t <sub>r</sub>			8	18	ns	2
Turn-off delay time	t <sub>d(off)</sub>			17	31	ns	2
Turn-off fall time	t <sub>f</sub>			11	20	ns	2

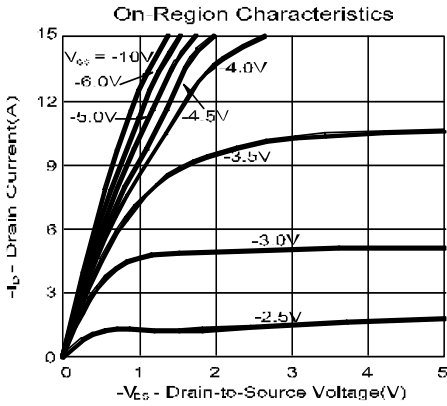
NOTE :

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

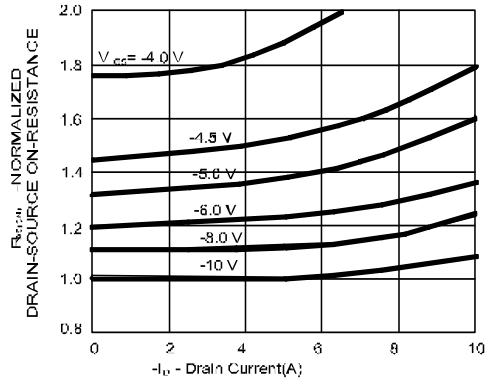
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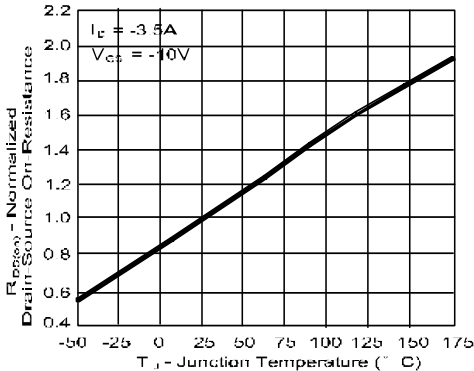
## Typical Electrical and Thermal Characteristics (P-ch)



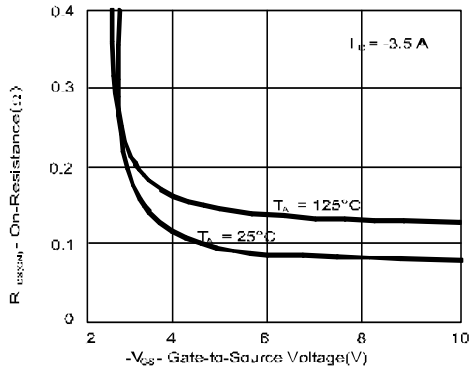
On-Resistance Variation with Drain Current and Gate Voltage



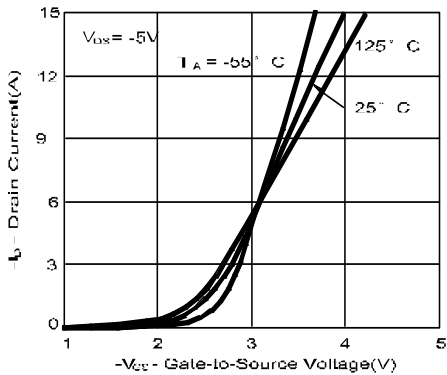
On-Resistance Variation with Temperature



On-Resistance Variation with Gate-to-Source Voltage



Transfer Characteristics



Body Diode Forward Voltage Variation with Source Current and Temperature

