

# Complementary MOSFET

ELM36600EA-S

## General Description

ELM36600EA-S uses advanced trench technology to provide excellent  $R_{ds(on)}$  and low gate charge.

## Features

- |  |  |
|--|--|
| N-channel                                | P-channel                                |
| • $V_{ds}=30V$                           | $V_{ds}=-30V$                            |
| • $I_d=3.5A$                             | $I_d=-2A$                                |
| • $R_{ds(on)} < 68m\Omega (V_{gs}=10V)$  | $R_{ds(on)} < 145m\Omega (V_{gs}=-10V)$  |
| • $R_{ds(on)} < 98m\Omega (V_{gs}=4.5V)$ | $R_{ds(on)} < 245m\Omega (V_{gs}=-4.5V)$ |

## Maximum Absolute Ratings

Parameter	Symbol	N-ch (Max.)	P-ch (Max.)	Unit	Note
Drain-source voltage	$V_{ds}$	30	-30	V	
Gate-source voltage	$V_{gs}$	$\pm 20$	$\pm 20$	V	
Continuous drain current	$I_d$	$T_a=25^\circ C$	3.5	-2.3	A
		$T_a=70^\circ C$	2.8	-1.8	
Pulsed drain current	$I_{dm}$	10	-10	A	1
Power dissipation	$P_d$	$T_a=25^\circ C$	1.15	1.15	W
		$T_a=70^\circ C$	0.73	0.73	
Junction and storage temperature range	$T_j, T_{stg}$	-55 to 150	-55 to 150	$^\circ C$	

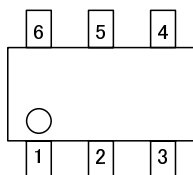
## Thermal Characteristics

Parameter	Symbol	Device	Typ.	Max.	Unit	Note
Maximum junction-to-ambient	$R_{\theta ja}$	N-ch		110	$^\circ C/W$	
Maximum junction-to-ambient			Steady-state	150		
Maximum junction-to-lead	$R_{\theta jl}$			80		
Maximum junction-to-ambient	$R_{\theta ja}$	P-ch		110	$^\circ C/W$	
Maximum junction-to-ambient			Steady-state	150		
Maximum junction-to-lead	$R_{\theta jl}$			80		

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

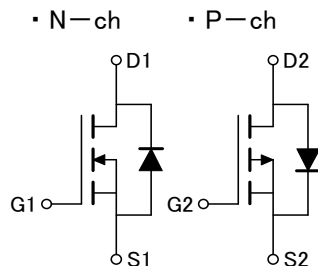
## Pin Configuration

SOT-26 (TOP VIEW)



Pin No.	Pin name
1	GATE1
2	SOURCE2
3	GATE2
4	DRAIN2
5	SOURCE1
6	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	30			V		
Zero gate voltage drain current	I <sub>dss</sub>	V <sub>ds</sub> =24V, V <sub>gs</sub> =0V			1	μA		
		V <sub>ds</sub> =20V, 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	8			A	1	
Static drain-source on-resistance	R <sub>ds(on)</sub>	V <sub>gs</sub> =10V, I <sub>d</sub> =3.5A		55	68	mΩ	1	
		V <sub>gs</sub> =4.5V, I <sub>d</sub> =2A		75	98			
Forward transconductance	G <sub>fs</sub>	V <sub>ds</sub> =5V, I <sub>d</sub> =2.5A		4.5		S	1	
Diode forward voltage	V <sub>sd</sub>	I <sub>f</sub> =0.8A, V <sub>gs</sub> =0V			1.2	V	1	
<b>DYNAMIC PARAMETERS</b>								
Input capacitance	C <sub>iss</sub>	V <sub>gs</sub> =0V, V <sub>ds</sub> =15V, f=1MHz		200		pF		
Output capacitance	C <sub>oss</sub>			40		pF		
Reverse transfer capacitance	C <sub>rss</sub>			20		pF		
<b>SWITCHING PARAMETERS</b>								
Total gate charge	Q <sub>g</sub>	V <sub>gs</sub> =10V, V <sub>ds</sub> =15V, I <sub>d</sub> =2.5A		6.5	8.5	nC	2	
Gate-source charge	Q <sub>gs</sub>			1.2		nC	2	
Gate-drain charge	Q <sub>gd</sub>			1.6		nC	2	
Turn-on delay time	t <sub>d(on)</sub>	V <sub>gs</sub> =10V, V <sub>ds</sub> =15V, I <sub>d</sub> ≅1A		7	11	ns	2	
Turn-on rise time	t <sub>r</sub>			12	18	ns	2	
Turn-off delay time	t <sub>d(off)</sub>		R <sub>l</sub> =15 Ω, R <sub>gen</sub> =6 Ω		12	18	ns	2
Turn-off fall time	t <sub>f</sub>				7	11	ns	2
Body-diode reverse recovery time	t <sub>rr</sub>	I <sub>f</sub> =0.8A, di/dt=100A/μs		40	80	ns		

#### NOTE :

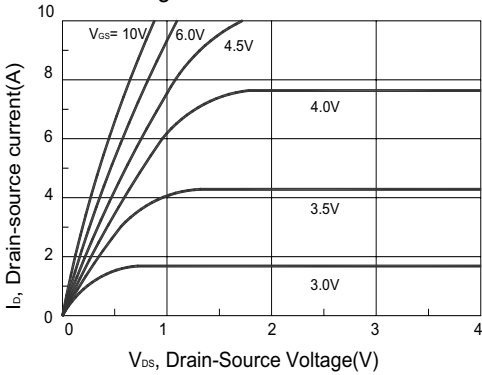
1. Pulse test : Pulse width ≤ 300 μsec, duty cycle ≤ 2%.
2. Independent of operating temperature.
3. Pulse width limited by maximum junction temperature.

# Complementary MOSFET

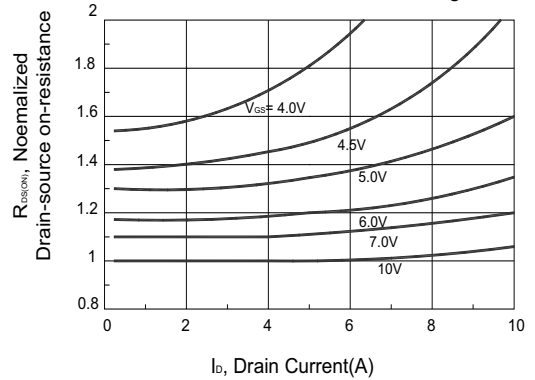
ELM36600EA-S

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

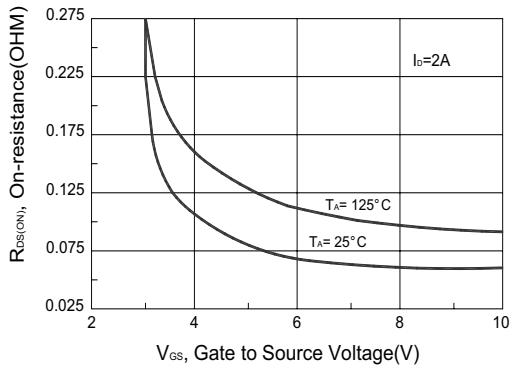
On-Region Characteristics.



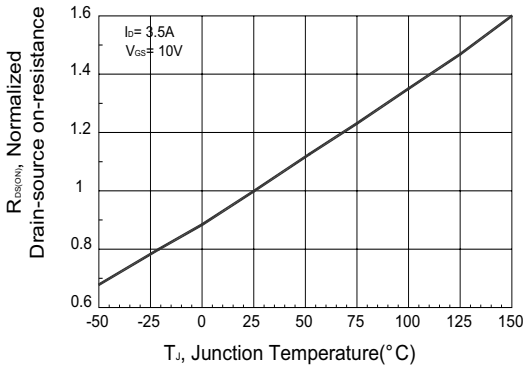
On-Resistance Variation with Drain Current and Gate Voltage.



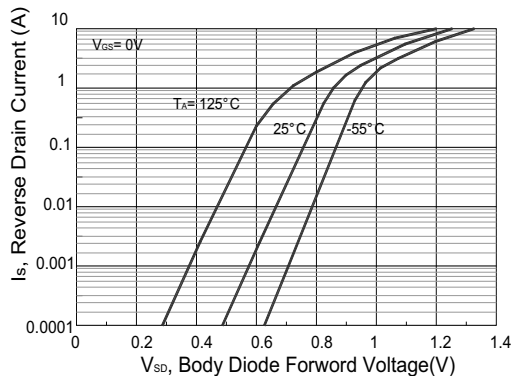
On-Resistance Variation with Gate-to-Source Voltage.



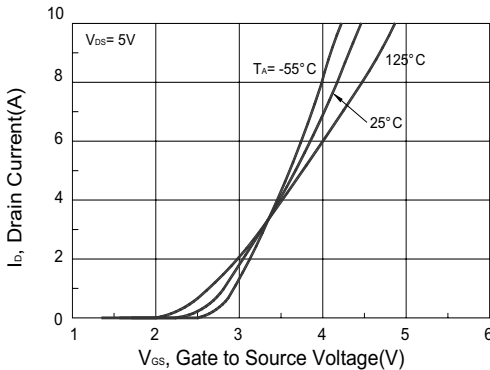
On-Resistance Variation with Temperature.



Body Diode Forward Voltage Variation with Source Current and Temperature.



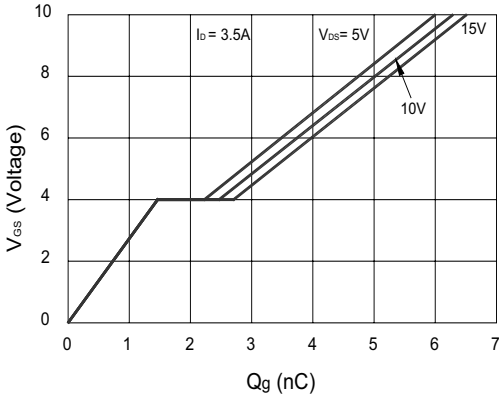
Transfer Characteristics.



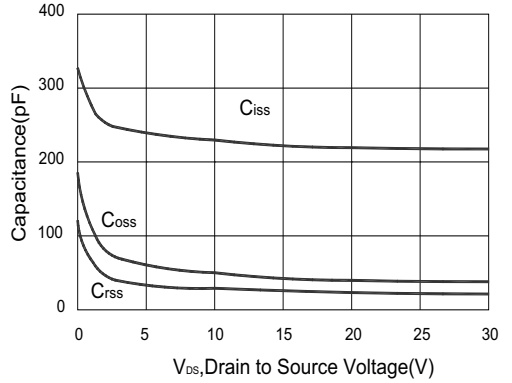
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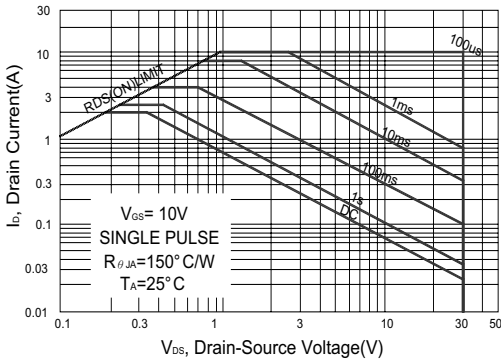
### Gate-Charge Characteristics



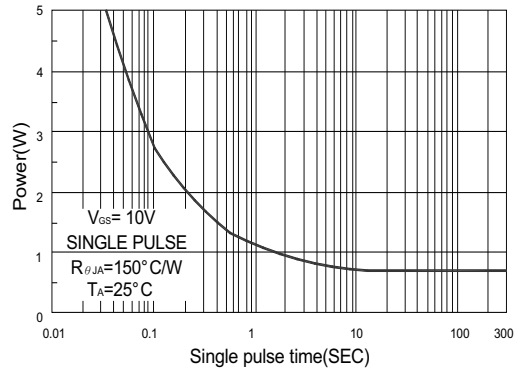
### Capacitance Characteristics



### Maximum Safe Operating Area.



### Single Pulse Maximum Power Dissipation.



# Complementary MOSFET

## ELM36600EA-S

### ■ 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	-30			V	
Zero gate voltage drain current	I <sub>dss</sub>	V <sub>ds</sub> =-24V, V <sub>gs</sub> =0V			-1	μA	
		V <sub>ds</sub> =-20V, 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	-8			A	1
Static drain-source on-resistance	R <sub>ds(on)</sub>	V <sub>gs</sub> =-10V, I <sub>d</sub> =-2.3A		115	145	mΩ	1
		V <sub>gs</sub> =-4.5V, I <sub>d</sub> =-1.5A		185	245		
Forward transconductance	G <sub>fs</sub>	V <sub>ds</sub> =-5V, I <sub>d</sub> =-2A		3		S	1
Diode forward voltage	V <sub>sd</sub>	I <sub>f</sub> =-0.8A, V <sub>gs</sub> =0V			-1.2	V	1
<b>DYNAMIC PARAMETERS</b>							
Input capacitance	C <sub>iss</sub>	V <sub>gs</sub> =0V, V <sub>ds</sub> =-15V, f=1MHz		190		pF	
Output capacitance	C <sub>oss</sub>			60		pF	
Reverse transfer capacitance	C <sub>rss</sub>			30		pF	
<b>SWITCHING PARAMETERS</b>							
Total gate charge	Q <sub>g</sub>	V <sub>gs</sub> =-10V, V <sub>ds</sub> =-15V I <sub>d</sub> =-2A		4.5	6.0	nC	2
Gate-source charge	Q <sub>gs</sub>			1.2		nC	2
Gate-drain charge	Q <sub>gd</sub>			0.9		nC	2
Turn-on delay time	t <sub>d(on)</sub>	V <sub>gs</sub> =-10V, V <sub>ds</sub> =-15V I <sub>d</sub> ≅-1A, R <sub>l</sub> =15Ω R <sub>gen</sub> =6Ω		8	12	ns	2
Turn-on rise time	t <sub>r</sub>			11	18	ns	2
Turn-off delay time	t <sub>d(off)</sub>			14	21	ns	2
Turn-off fall time	t <sub>f</sub>			8	12	ns	2
Body-diode reverse recovery time	t <sub>rr</sub>		I <sub>f</sub> =-0.8A, dI/dt=100A/μs		40	80	ns

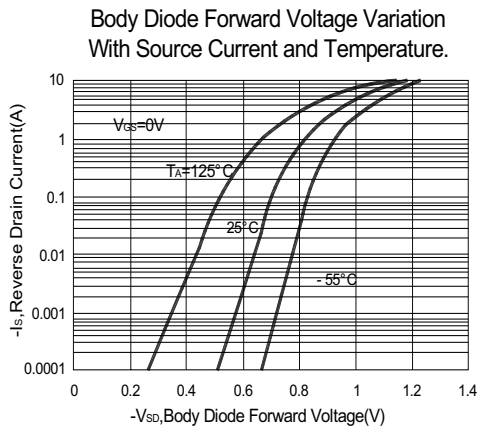
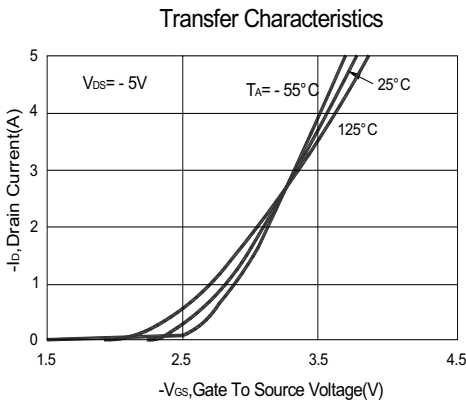
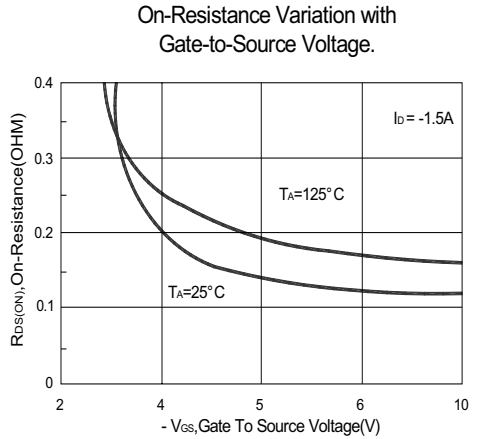
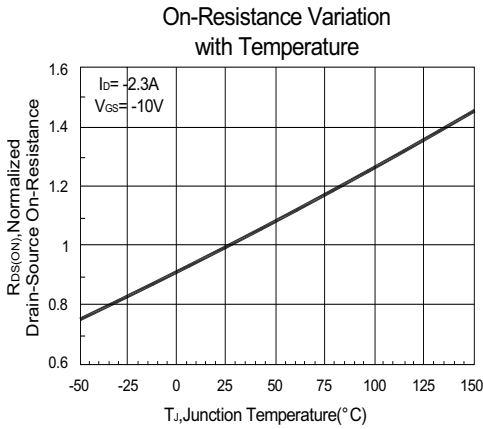
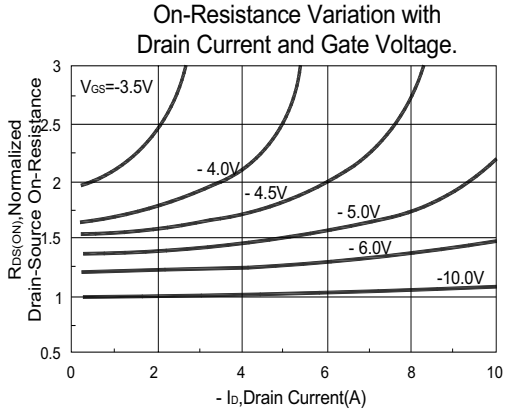
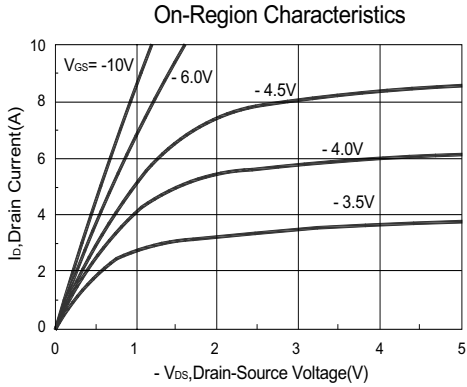
#### NOTE :

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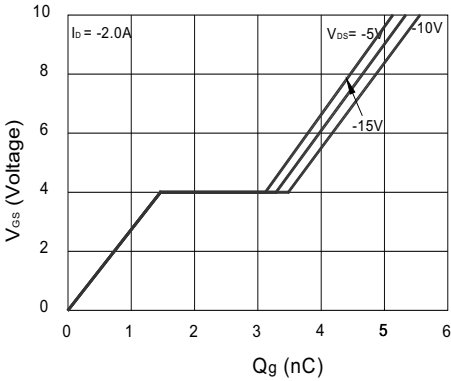
### Typical Electrical and Thermal Characteristics (P-ch)



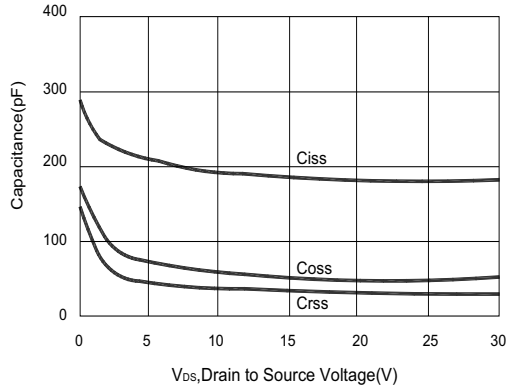
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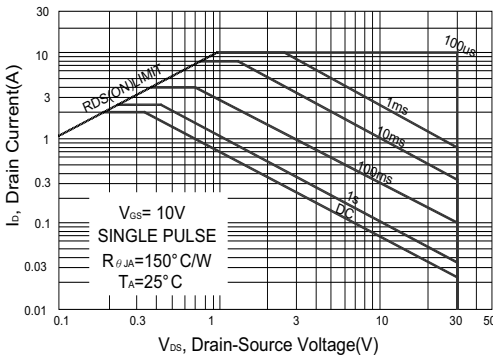
### Gate-Charge Characteristics



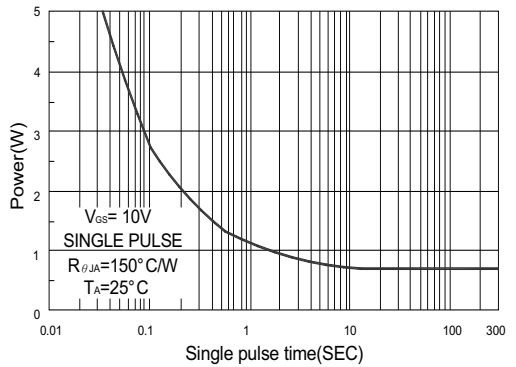
### Capacitance Characteristics



### Maximum Safe Operating Area.



### Single Pulse Maximum Power Dissipation.



### Transient Thermal Response Curve.

