

Complementary MOSFET

ELM35603KA-S

General Description

ELM35603KA-S uses advanced trench technology to provide excellent $R_{ds(on)}$ and low gate charge.

Features

- | | |
|---|--|
| N-channel | P-channel |
| • $V_{ds}=40V$ | $V_{ds}=-40V$ |
| • $I_d=10A$ | $I_d=-7A$ |
| • $R_{ds(on)} < 22m\Omega (V_{gs}=10V)$ | $R_{ds(on)} < 33m\Omega (V_{gs}=-10V)$ |
| • $R_{ds(on)} < 33m\Omega (V_{gs}=7V)$ | $R_{ds(on)} < 40m\Omega (V_{gs}=-7V)$ |

Maximum Absolute Ratings

Parameter	Symbol	N-ch (Max.)	P-ch (Max.)	Unit	Note
Drain-source voltage	V_{ds}	40	-40	V	
Gate-source voltage	V_{gs}	± 20	± 20	V	
Continuous drain current	I_d	$T_a=25^\circ C$	10.0	-7.0	A
		$T_a=70^\circ C$	8.5	-6.0	
Pulsed drain current	I_{dm}	50	-50	A	1
Power dissipation	P_d	$T_a=25^\circ C$	3.0	3.0	W
		$T_a=70^\circ C$	2.1	2.1	
Junction and storage temperature range	T_j, T_{stg}	-55 to 150	-55 to 150	$^\circ C$	

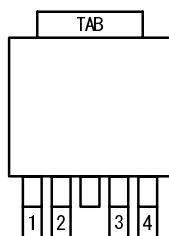
Thermal Characteristics

Parameter	Symbol	Device	Typ.	Max.	Unit	Note
Maximum junction-to-ambient	$R\theta_{ja}$	N-ch		42	$^\circ C/W$	
Maximum junction-to-case	$R\theta_{jc}$	N-ch		6	$^\circ C/W$	
Maximum junction-to-ambient	$R\theta_{ja}$	P-ch		42	$^\circ C/W$	
Maximum junction-to-case	$R\theta_{jc}$	P-ch		6	$^\circ C/W$	

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

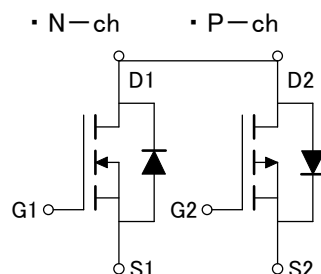
Pin Configuration

TO-252-4 (TOP VIEW)



Pin No.	Pin name
1	SOURCE1
2	GATE1
3	SOURCE2
4	GATE2
TAB	DRAIN1/DRAIN2

Circuit



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■ Electrical Characteristics (N-ch)

T_a=25°C

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit	Note
STATIC PARAMETERS							
Drain-source breakdown voltage	BV _{dss}	I _d =250 μA, V _{gs} =0V	40			V	
Zero gate voltage drain current	I _{dss}	V _{ds} =32V, V _{gs} =0V			1	μA	
		V _{ds} =30V, V _{gs} =0V, T _j =55°C			10		
Gate-body leakage current	I _{gss}	V _{ds} =0V, V _{gs} =±20V			±100	nA	
Gate threshold voltage	V _{gs(th)}	V _{ds} =V _{gs} , I _d =250 μA	1.2	2.0	3.0	V	
On state drain current	I _{d(on)}	V _{gs} =10V, V _{ds} =5V	50			A	1
Static drain-source on-resistance	R _{ds(on)}	V _{gs} =10V, I _d =10A		19	22	mΩ	1
		V _{gs} =7V, I _d =7A		25	33		
Forward transconductance	G _{fs}	V _{ds} =10V, I _d =10A		25		S	1
Diode forward voltage	V _{sd}	I _f =10A, V _{gs} =0V			1.2	V	1
DYNAMIC PARAMETERS							
Input capacitance	C _{iss}	V _{gs} =0V, V _{ds} =10V, f=1MHz		1145	1450	pF	
Output capacitance	C _{oss}			253	355	pF	
Reverse transfer capacitance	C _{rss}			94	142	pF	
SWITCHING PARAMETERS							
Total gate charge	Q _g	V _{gs} =10V, V _{ds} =20V, I _d =10A		23.0		nC	2
Gate-source charge	Q _{gs}			3.6		nC	2
Gate-drain charge	Q _{gd}			3.0		nC	2
Turn-on delay time	t _{d(on)}	V _{gs} =10V, V _{ds} =20V, I _d ≅1A R _{gen} =6 Ω		3.2	6.4	ns	2
Turn-on rise time	t _r			10.8	21.7	ns	2
Turn-off delay time	t _{d(off)}			17.1	30.8	ns	2
Turn-off fall time	t _f			5.3	10.7	ns	2
Body diode reverse recovery time	t _{rr}	I _f =10A, dI/dt=100A/μs		60		ns	
Body diode reverse recovery charge	Q _{rr}			43		nC	

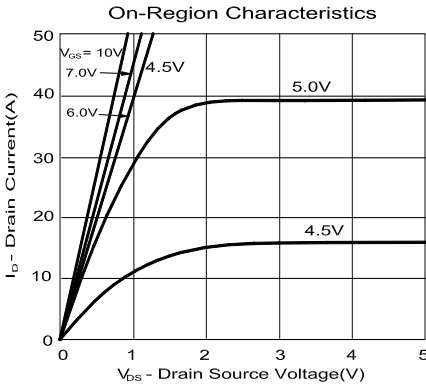
NOTE :

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

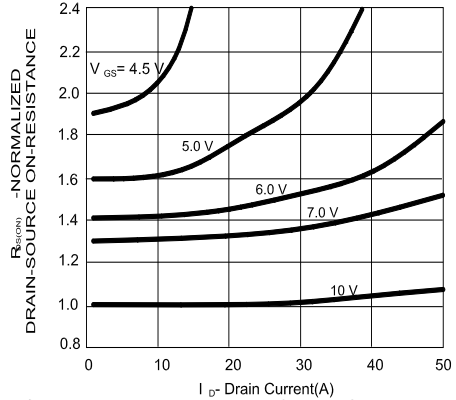
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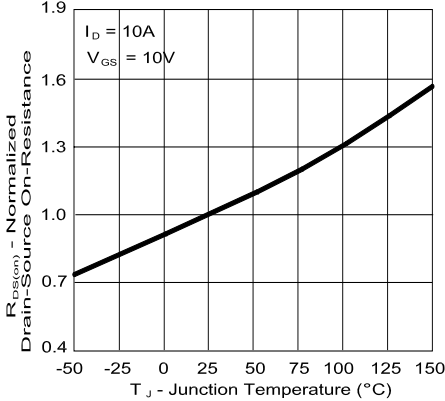
Typical Electrical and Thermal Characteristics (N-ch)



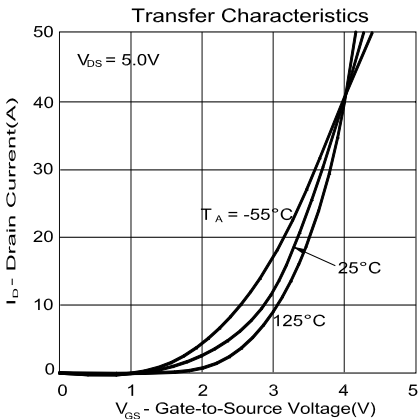
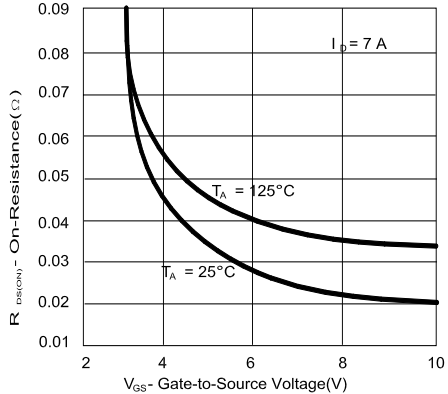
On-Resistance Variation with Drain Current and Gate Voltage



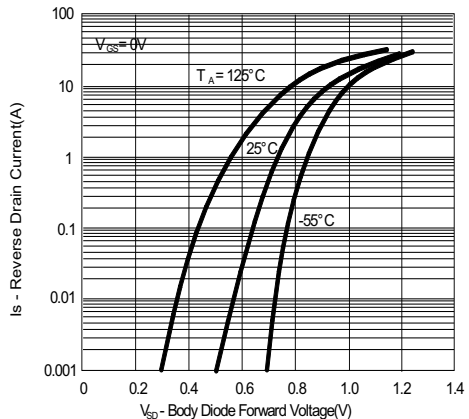
On-Resistance Variation with Temperature



On-Resistance Variation with Gate-to-Source Voltage

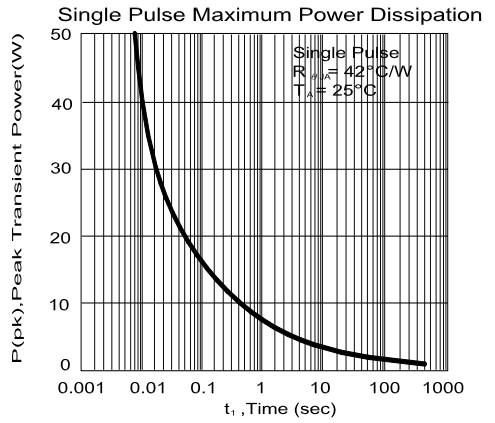
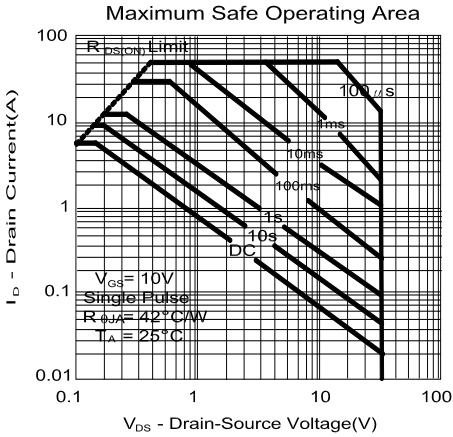
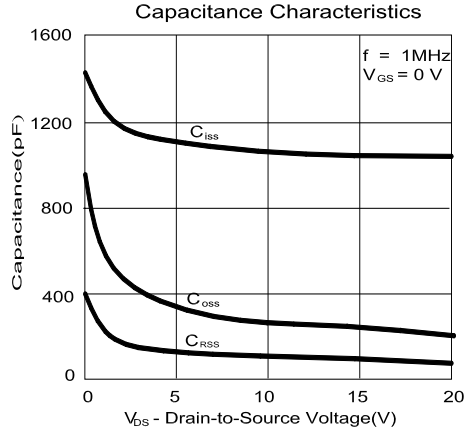
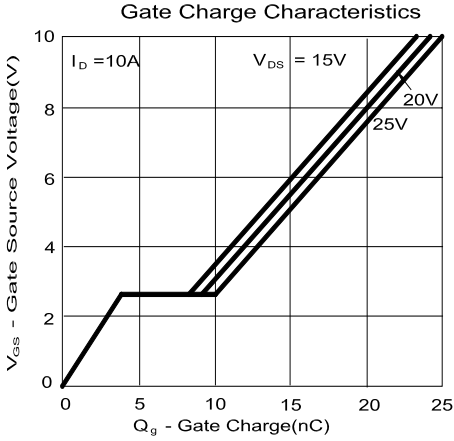


Body Diode Forward Voltage Variation with Source Current and Temperature



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■ Electrical Characteristics (P-ch)

T_a=25°C

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit	Note
STATIC PARAMETERS							
Drain-source breakdown voltage	BV _{dss}	I _d =-250μA, V _{gs} =0V	-40			V	
Zero gate voltage drain current	I _{dss}	V _{ds} =-32V, V _{gs} =0V			-1	μA	
		V _{ds} =-30V, V _{gs} =0V, T _j =55°C			-10		
Gate-body leakage current	I _{gss}	V _{ds} =0V, V _{gs} =±20V			±100	nA	
Gate threshold voltage	V _{gs(th)}	V _{ds} =V _{gs} , I _d =-250μA	-1.2	-2.0	-3.0	V	
On state drain current	I _{d(on)}	V _{gs} =-10V, V _{ds} =-5V	-50			A	1
Static drain-source on-resistance	R _{ds(on)}	V _{gs} =-10V, I _d =-7A		28	33	mΩ	1
		V _{gs} =-7V, I _d =-5A		32	40		
Forward transconductance	G _{fs}	V _{ds} =-10V, I _d =-7A		18		S	1
Diode forward voltage	V _{sd}	I _f =-7A, V _{gs} =0V			-1.2	V	1
DYNAMIC PARAMETERS							
Input capacitance	C _{iss}	V _{gs} =0V, V _{ds} =-10V, f=1MHz		1000	1260	pF	
Output capacitance	C _{oss}			450	625	pF	
Reverse transfer capacitance	C _{rss}			108	163	pF	
SWITCHING PARAMETERS							
Total gate charge	Q _g	V _{gs} =-10V, V _{ds} =-20V I _d =-7A		20.0		nC	2
Gate-source charge	Q _{gs}			3.2		nC	2
Gate-drain charge	Q _{gd}			2.7		nC	2
Turn-on delay time	t _{d(on)}	V _{gs} =-10V, V _{ds} =-20V I _d ≅-1A, R _{gen} =6Ω		9.7	19.4	ns	2
Turn-on rise time	t _r			14.0	28.1	ns	2
Turn-off delay time	t _{d(off)}			28.7	51.6	ns	2
Turn-off fall time	t _f			17.8	32.2	ns	2
Body diode reverse recovery time	t _{rr}		I _f =-7A, dI/dt=100A/μs		80		ns
Body diode reverse recovery charge	Q _{rr}			75		nC	

NOTE :

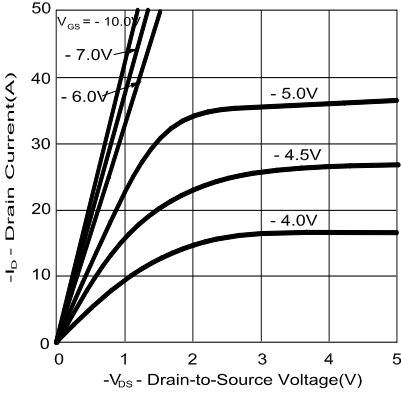
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2. Independent of operating temperature.
3. Pulse width limited by maximum junction temperature.

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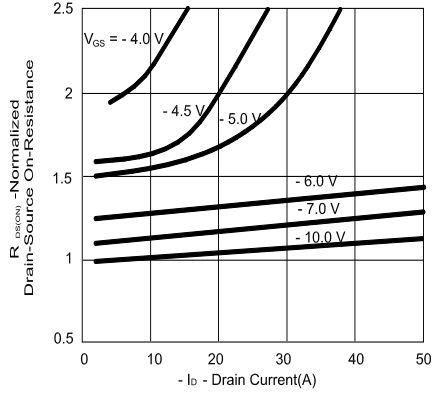
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Typical Electrical and Thermal Characteristics (P-ch)

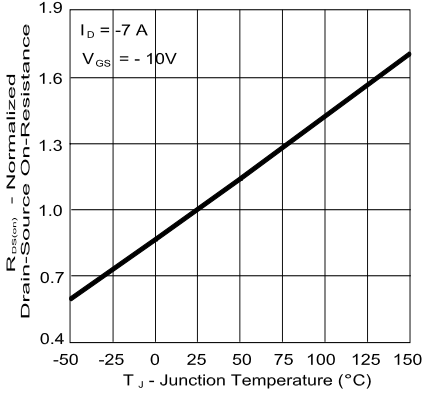
On-Region Characteristics



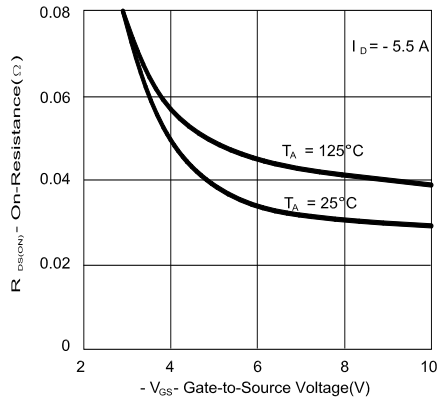
On-Resistance Variation with Drain Current and Gate Voltage



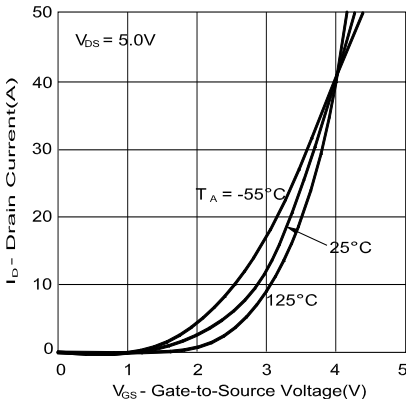
On-Resistance Variation with Temperature



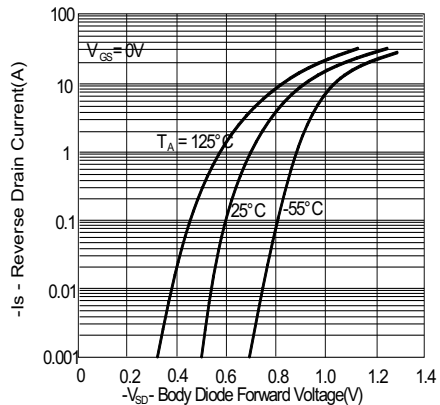
On-Resistance Variation with Gate-to-Source Voltage



Transfer Characteristics



Body Diode Forward Voltage Variation with Source Current and Temperature



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