

Complementary MOSFET

ELM35604KA-S

General Description

ELM35604KA-S uses advanced trench technology to provide excellent $R_{ds(on)}$ and low gate charge.

Features

- | | |
|--|---|
| N-channel | P-channel |
| • $V_{ds}=30V$ | $V_{ds}=-30V$ |
| • $I_d=8.5A$ | $I_d=-7A$ |
| • $R_{ds(on)} < 21m\Omega (V_{gs}=10V)$ | $R_{ds(on)} < 35m\Omega (V_{gs}=-10V)$ |
| • $R_{ds(on)} < 32m\Omega (V_{gs}=4.5V)$ | $R_{ds(on)} < 60m\Omega (V_{gs}=-4.5V)$ |

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}	± 20	± 20	V	
Continuous drain current	$T_a=25^{\circ}C$	I_d	8.5	-7.0	A	
	$T_a=70^{\circ}C$		7.0	-5.8		
Pulsed drain current		I_{dm}	50	-50	A	1
Power dissipation	$T_a=25^{\circ}C$	P_d	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	$^{\circ}C$	

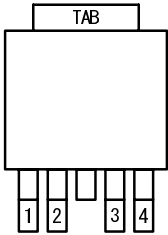
Thermal Characteristics

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 $\leq 1\%$.

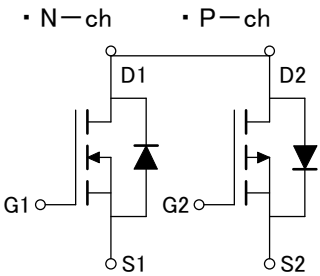
Pin Configuration

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	30			V	
Zero gate voltage drain current	I _{dss}	V _{ds} =24V, V _{gs} =0V			1	μA	
		V _{ds} =20V, 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	0.8	1.5	2.5	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 =8A		17.5	21.0	mΩ	1
		V _{gs} =4.5V, I _d =6A		24.0	32.0		
Forward transconductance	G _{fs}	V _{ds} =10V, I _d =8A		13		S	1
Diode forward voltage	V _{sd}	I _f =3A, V _{gs} =0V			1.2	V	1
DYNAMIC PARAMETERS							
Input capacitance	C _{iss}	V _{gs} =0V, V _{ds} =10V, f=1MHz		1200		pF	
Output capacitance	C _{oss}			180		pF	
Reverse transfer capacitance	C _{rss}			160		pF	
SWITCHING PARAMETERS							
Total gate charge	Q _g	V _{gs} =10V, V _{ds} =15V, I _d =8A		16		nC	2
Gate-source charge	Q _{gs}			6		nC	2
Gate-drain charge	Q _{gd}			8		nC	2
Turn-on delay time	t _{d(on)}	V _{gs} =10V, V _{ds} =15V, I _d ≅ 1A R _{gen} =3.3 Ω		20		ns	2
Turn-on rise time	t _r			10		ns	2
Turn-off delay time	t _{d(off)}			30		ns	2
Turn-off fall time	t _f			65		ns	2
Body diode reverse recovery time	t _{rr}	I _f =8A, dI/dt=100A/μs		42		ns	
Body diode reverse recovery charge	Q _{rr}			30		nC	

NOTE :

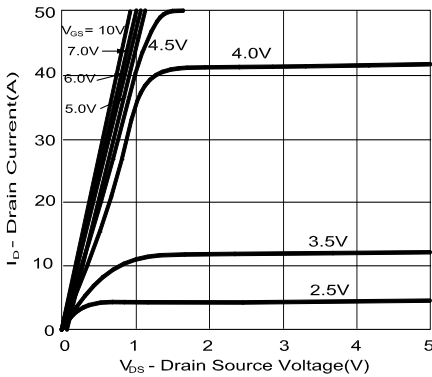
1. Pulse test : Pulse width ≤ 300 μsec, duty cycle ≤ 2%.
2. Independent of operating temperature.
3. Pulse width limited by maximum junction temperature.

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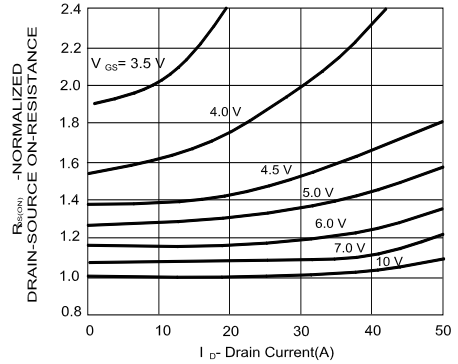
ELM35604KA-S

Typical Electrical and Thermal Characteristics (N-ch)

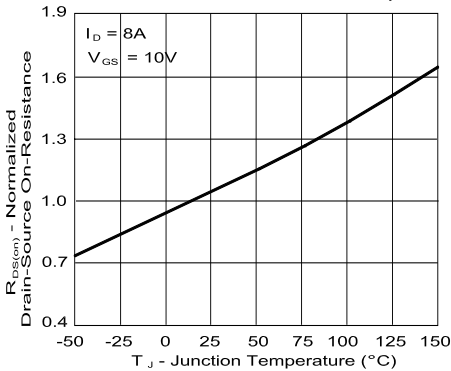
On-Region Characteristics



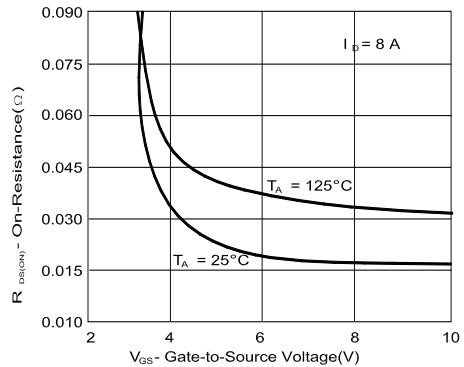
On-Resistance Variation with Drain Current and Gate Voltage



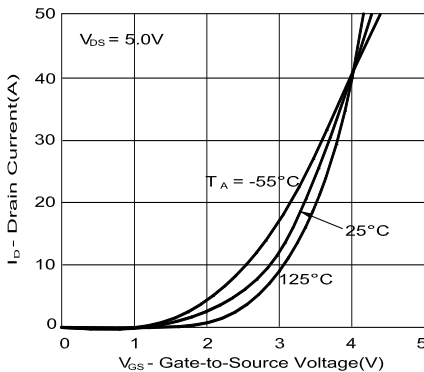
On-Resistance Variation with Temperature



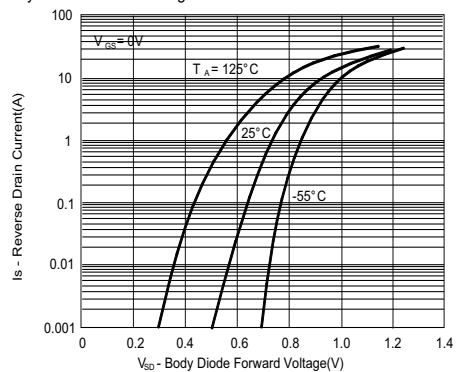
On-Resistance Variation with Gate-to-Source Voltage



Transfer Characteristics



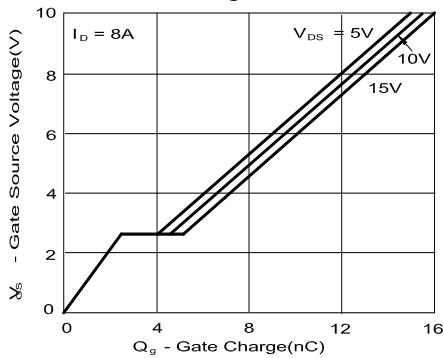
Body Diode Forward Voltage Variation with Source Current and Temperature



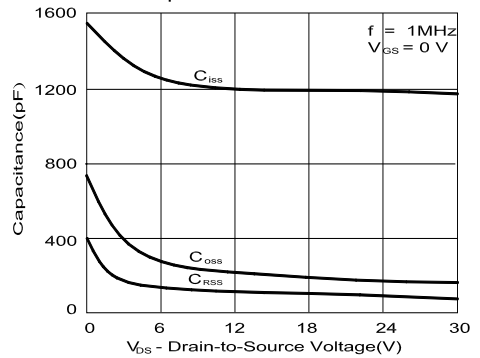
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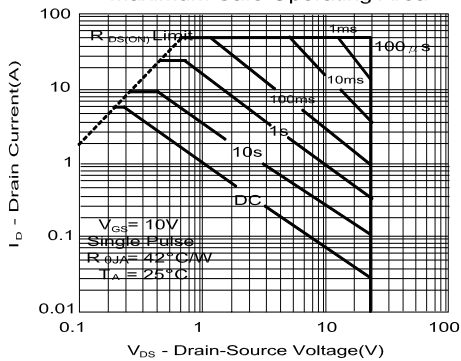
Gate Charge Characteristics



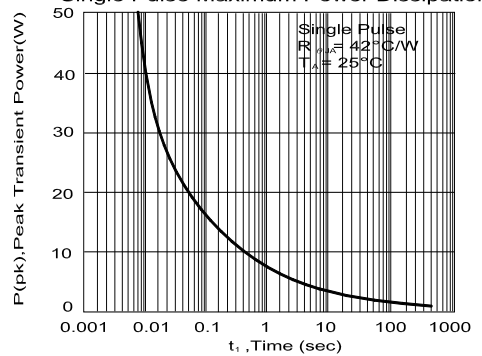
Capacitance Characteristics



Maximum Safe Operating Area



Single Pulse Maximum Power Dissipation



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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 =-250 μA, V _{gs} =0V	-30			V	
Zero gate voltage drain current	I _{dss}	V _{ds} =-24V, V _{gs} =0V			-1	μA	
		V _{ds} =-20V, 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	-0.8	-1.5	-2.5	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	35	mΩ	1
		V _{gs} =-4.5V, I _d =-5A		46	60		
Forward transconductance	G _{fs}	V _{ds} =-10V, I _d =-7A		10		S	1
Diode forward voltage	V _{sd}	I _f =-3A, V _{gs} =0V			-1.2	V	1
DYNAMIC PARAMETERS							
Input capacitance	C _{iss}	V _{gs} =0V, V _{ds} =-10V, f=1MHz		970		pF	
Output capacitance	C _{oss}			270		pF	
Reverse transfer capacitance	C _{rss}			180		pF	
SWITCHING PARAMETERS							
Total gate charge	Q _g	V _{gs} =-10V, V _{ds} =-15V I _d =-7A		13		nC	2
Gate-source charge	Q _{gs}			4		nC	2
Gate-drain charge	Q _{gd}			6		nC	2
Turn-on delay time	t _{d(on)}	V _{gs} =-10V, V _{ds} =-15V I _d ≈-1A, R _{gen} =3.3 Ω		22		ns	2
Turn-on rise time	t _r			12		ns	2
Turn-off delay time	t _{d(off)}			32		ns	2
Turn-off fall time	t _f			75		ns	2
Body diode reverse recovery time	t _{rr}	I _f =-7A, dI/dt=100A/μs		55		ns	
Body diode reverse recovery charge	Q _{rr}			52		nC	

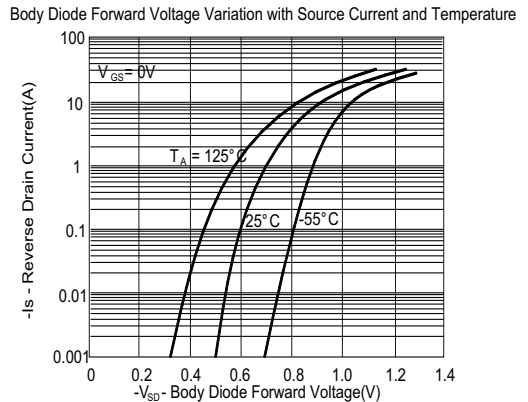
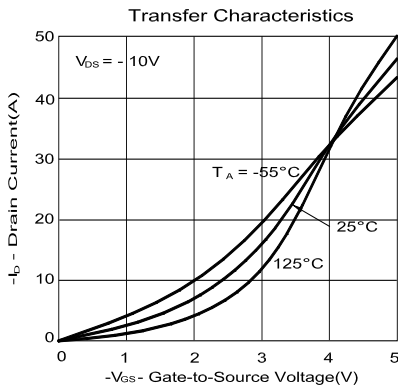
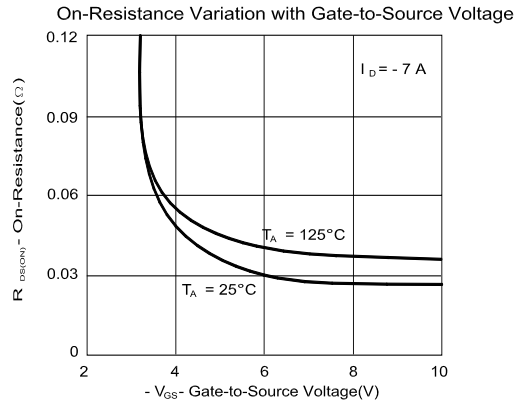
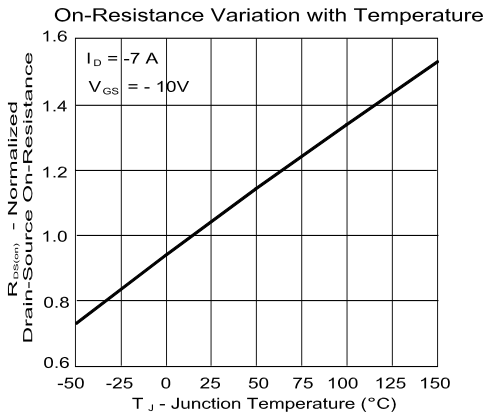
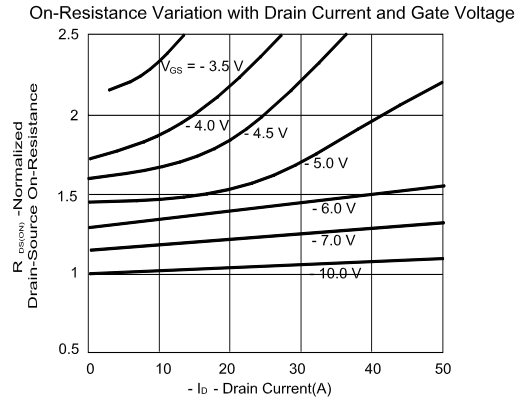
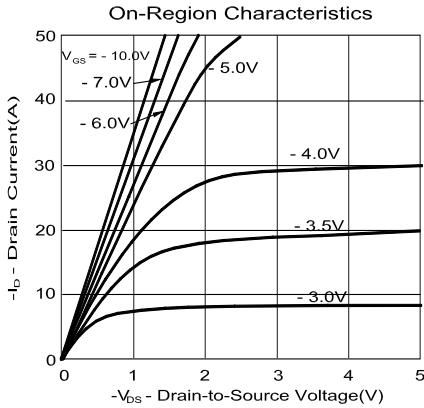
NOTE :

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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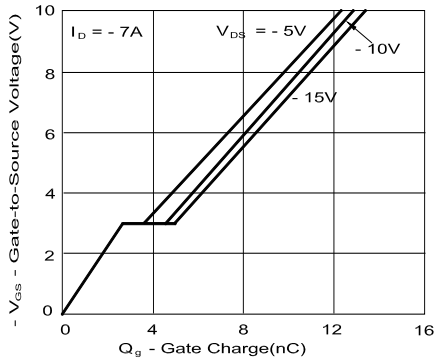
Typical Electrical and Thermal Characteristics (P-ch)



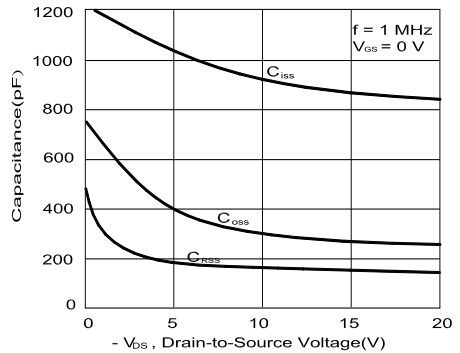
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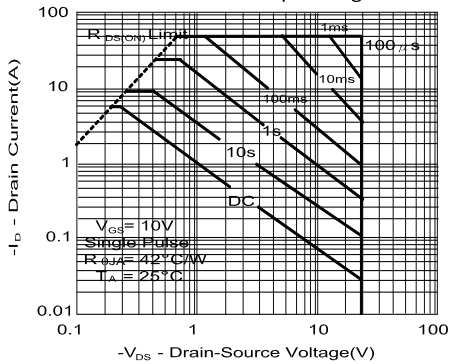
Gate Charge Characteristics



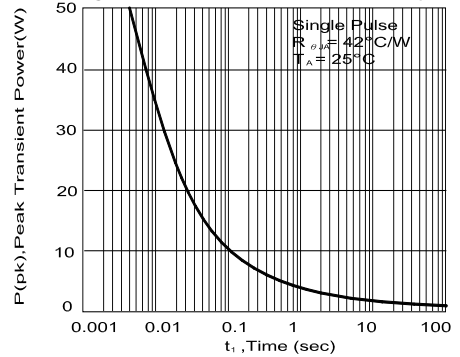
Capacitance Characteristics



Maximum Safe Operating Area



Single Pulse Maximum Power Dissipation



Transient Thermal Response Curve

