Complementary MOSFET

ELM16604EA-S

■General Description

ELM16604EA-S uses advanced trench technology to provide excellent Rds(on) and low gate charge.

■Features

N-channel	P-channel
• Vds=20V	Vds=-20V
• Id=3.4A(Vgs=4.5V)	Id=-2.5A(Vgs=-4.5V)
• Rds(on) < 60mΩ(Vgs=4.5V)	Rds(on) < 110mΩ(Vgs=-4.5V)
• Rds(on) < 75mΩ(Vgs=2.5V)	Rds(on) < 140mΩ(Vgs=-2.5V)
• Rds(on) < 100mΩ(Vgs=1.8V)	Rds(on) < 200mΩ(Vgs=-1.8V)

■Maximum Absolute Ratings

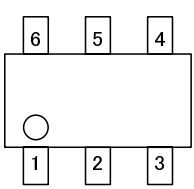
Parameter		Symbol	N-ch (Max.)	P-ch (Max.)	Unit	Note
Drain-source voltage		Vds	20	-20	V	
Gate-source voltage		Vgs	±8	±8	V	
Continuous drain current	Ta=25℃	Id	3.4	-2.5	A	1
	Ta=70℃		2.7	-2.0		
Pulsed drain current		Idm	15	-15	A	2
Power dissipation	Ta=25℃	Pd	1.15	1.15	W	
	Ta=70℃		0.73	0.73		
Junction and storage temperature range		Tj,Tstg	-55 to 150	-55 to 150	℃	

■Thermal Characteristics

Parameter		Symbol	Device	Typ.	Max.	Unit	Note
Maximum junction-to-ambient	t≤10s	Rθja	N-ch	78	110	℃/W	1
Maximum junction-to-ambient	Steady-state			106	150	℃/W	
Maximum junction-to-lead	Steady-state	Rθjl		64	80	℃/W	3
Maximum junction-to-ambient	t≤10s	Rθja	P-ch	78	110	℃/W	1
Maximum junction-to-ambient	Steady-state			106	150	℃/W	
Maximum junction-to-lead	Steady-state	Rθjl		64	80	℃/W	3

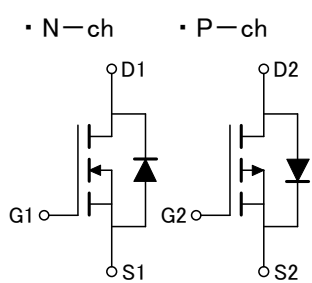
■Pin Configuration

SOT-26 (TOP VIEW)



Pin No.	Pin name
1	GATE1
2	SOURCE2
3	GATE2
4	DRAIN2
5	SOURCE1
6	DRAIN1

■Circuit



■Electrical Characteristics (N-ch)

Ta=25℃

Parameter	Symbol	Conditions		Min.	Typ.	Max.	Unit
STATIC PARAMETERS							
Drain-source breakdown voltage	BVdss	Id=250μA, Vgs=0V		20			V
Zero gate voltage drain current	Idss	Vds=16V, Vgs=0V				1	μA
			Tj=55℃			5	
Gate-body leakage current	Igss	Vds=0V, Vgs=±8V				100	nA
Gate threshold voltage	Vgs(th)	Vds=Vgs, Id=250μA		0.4	0.6	1.0	V
On state drain current	Id(on)	Vgs=4.5V, Vds=5V		15			A
Static drain-source on-resistance	Rds(on)	Vgs=4.5V, Id=3.4A			46	60	mΩ
			Tj=125℃		63	80	
		Vgs=2.5V, Id=3A			57	75	
		Vgs=1.8V, Id=2A			72	100	
Forward transconductance	Gfs	Vds=5V, Id=3.4A			10		S
Diode forward voltage	Vsd	Is=1A, Vgs=0V			0.76	1.00	V
Max.body-diode continuous current	Is					2	A
DYNAMIC PARAMETERS							
Input capacitance	Ciss	Vgs=0V, Vds=10V, f=1MHz			436	570	pF
Output capacitance	Coss				66		pF
Reverse transfer capacitance	Crss				44		pF
Gate resistance	Rg	Vgs=0V, Vds=0V, f=1MHz			3	4	Ω
SWITCHING PARAMETERS							
Total gate charge	Qg	Vgs=4.5V, Vds=10V, Id=3.4A			6.2	8.1	nC
Gate-source charge	Qgs				1.6		nC
Gate-drain charge	Qgd				0.5		nC
Turn-on delay time	td(on)	Vgs=5V, Vds=10V, Rl=3Ω, Rgen=3Ω			5.5		ns
Turn-on rise time	tr				6.3		ns
Turn-off delay time	td(off)				40.0		ns
Turn-off fall time	tf				12.7		ns
Body-diode reverse recovery time	trr	If=3.4A, dI/dt=100A/μs			12.3	16.0	ns
Body-diode reverse recovery charge	Qrr	If=3.4A, dI/dt=100A/μs			3.5		nC

NOTE :

1. The value of Rθja is measured with the device mounted on 1in² FR-4 board of 2oz. Copper, in still air environment with Ta=25℃. The value in any given applications depends on the user's specific board design, The current rating is based on the t≤10s themal resistance rating.
2. Repetitive rating, pulse width limited by junction temperature.
3. The Rθja is the sum of the thermal impedance from junction to lead Rθjl and lead to ambient.
4. The static characteristics in Figures 1 to 6 are obtained using 80μs pulses, duty cycle 0.5%max.
5. These tests are performed with the device mounted on 1in² FR-4 board with 2oz. Copper, in a still air environment with Ta=25℃. The SOA curve provides a single pulse rating.

■Typical Electrical and Thermal Characteristics (N-ch)

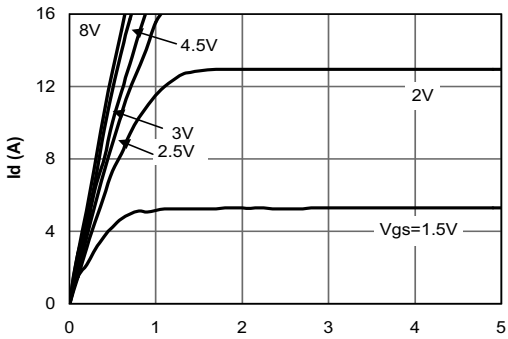


Fig 1: On-Region Characteristics

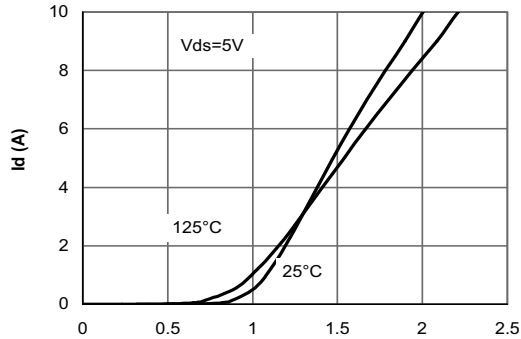


Figure 2: Transfer Characteristics

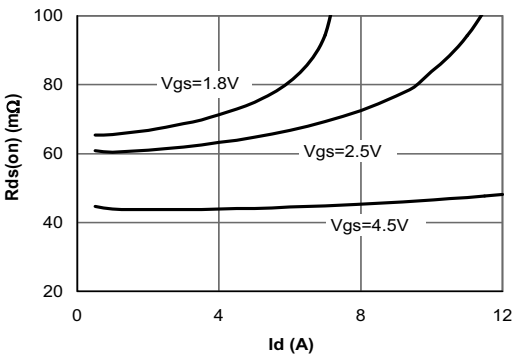


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

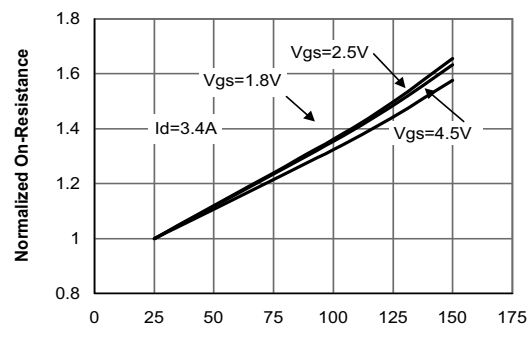


Figure 4: On-Resistance vs. Junction Temperature

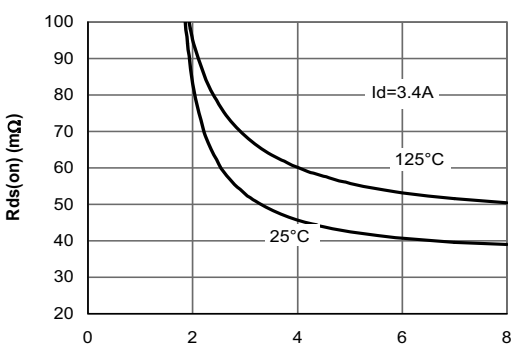


Figure 5: On-Resistance vs. Gate-Source Voltage

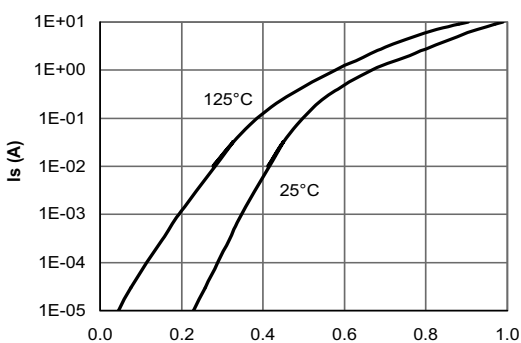


Figure 6: Body-Diode Characteristics

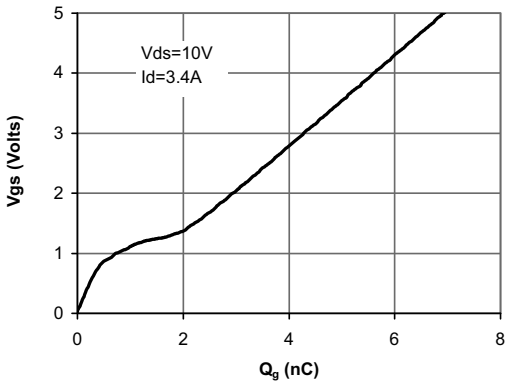


Figure 7: Gate-Charge Characteristics

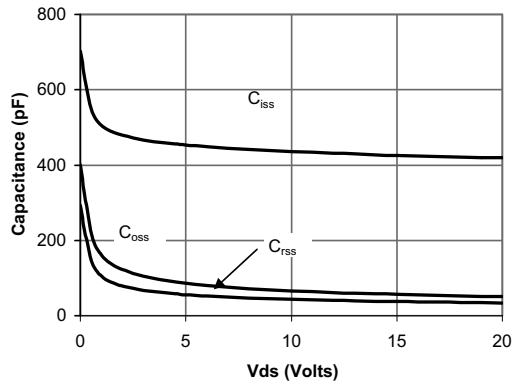


Figure 8: Capacitance Characteristics

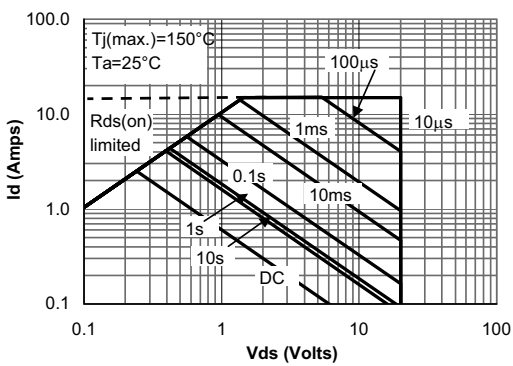


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

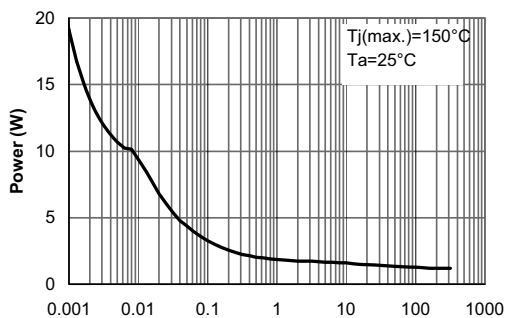


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

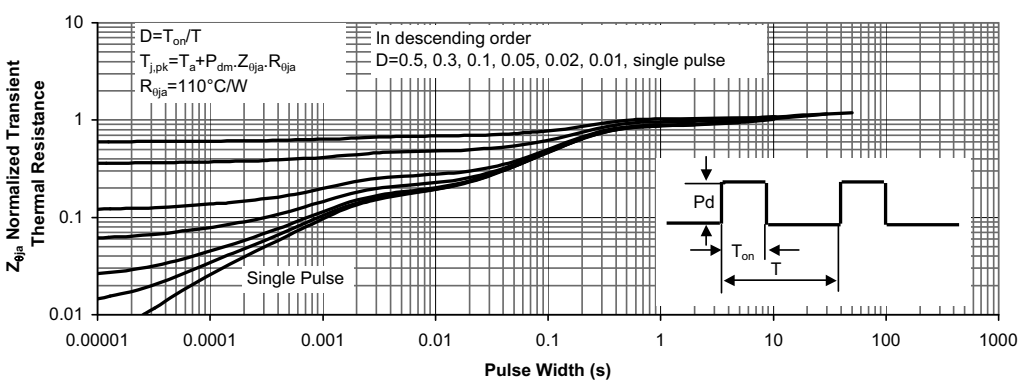


Figure 11: Normalized Maximum Transient Thermal Impedance

■Electrical Characteristics (P-ch)

Ta=25℃

Parameter	Symbol	Conditions		Min.	Typ.	Max.	Unit
STATIC PARAMETERS							
Drain-source breakdown voltage	BVdss	Id=-250μA, Vgs=0V		-20			V
Zero gate voltage drain current	Idss	Vds=-16V, Vgs=0V				-1	μA
			Tj=55℃			-5	
Gate-body leakage current	Igss	Vds=0V, Vgs=±8V				±100	nA
Gate threshold voltage	Vgs(th)	Vds=Vgs, Id=-250μA		-0.30	-0.55	-1.00	V
On state drain current	Id(on)	Vgs=-4.5V, Vds=-5V		-15			A
Static drain-source on-resistance	Rds(on)	Vgs=-4.5V, Id=-2.5A			86	110	mΩ
			Tj=125℃		116	145	
		Vgs=-2.5V, Id=-2A			113	140	mΩ
		Vgs=-1.8V, Id=-1A			151	200	mΩ
Forward transconductance	Gfs	Vds=-5V, Id=-3A		4	6		S
Diode forward voltage	Vsd	Is=-1A, Vgs=0V			-0.78	-1.00	V
Max. body-diode continuous current	Is					-2	A
DYNAMIC PARAMETERS							
Input capacitance	Ciss	Vgs=0V, Vds=-10V, f=1MHz			540	700	pF
Output capacitance	Coss				72		pF
Reverse transfer capacitance	Crss				49		pF
Gate resistance	Rg	Vgs=0V, Vds=0V, f=1MHz			12.0	15.6	Ω
SWITCHING PARAMETERS							
Total gate charge	Qg	Vgs=-4.5V, Vds=-10V, Id=-2.5A			6.1	8.0	nC
Gate-source charge	Qgs				0.6		nC
Gate-drain charge	Qgd				1.6		nC
Turn-on delay time	td(on)	Vgs=-4.5V, Vds=-10V, Rl=3.9Ω, Rgen=3Ω			10		ns
Turn-on rise time	tr				12		ns
Turn-off delay time	td(off)				44		ns
Turn-off fall time	tf				22		ns
Body diode reverse recovery time	trr	If=-2.5A, dI/dt=100A/μs			21.0	28.0	ns
Body diode reverse recovery charge	Qrr	If=-2.5A, dI/dt=100A/μs			7.5		nC

NOTE :

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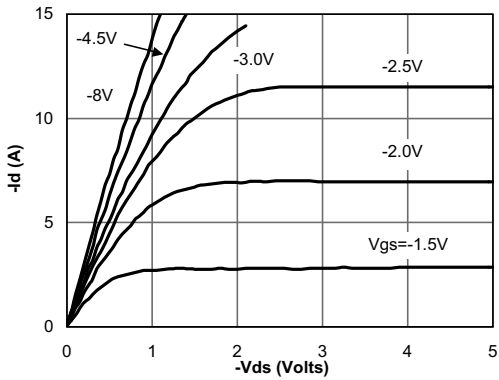

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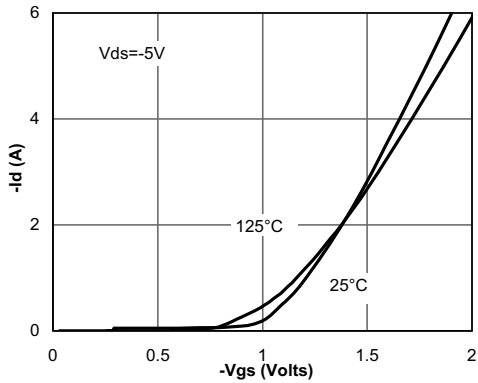
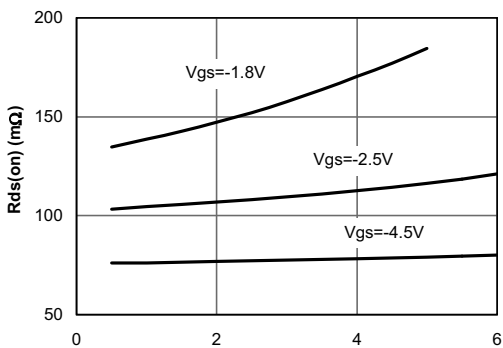


Figure 2: Transfer Characteristics



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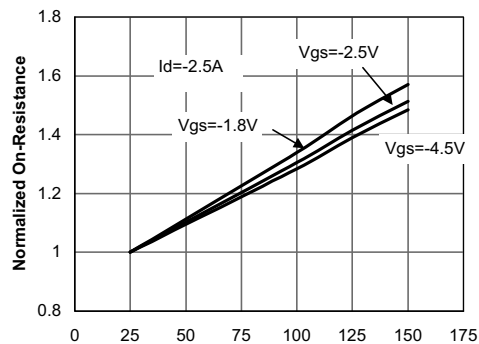


Figure 4: On-Resistance vs. Junction Temperature

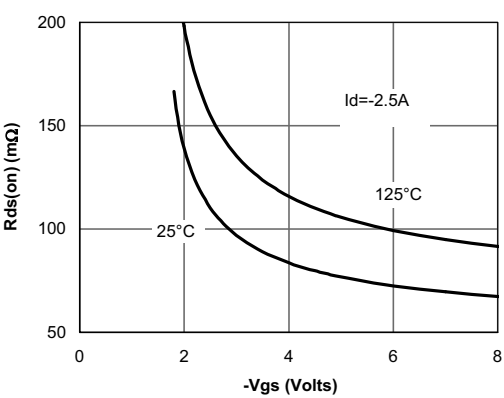


Figure 5: On-Resistance vs. Gate-Source Voltage

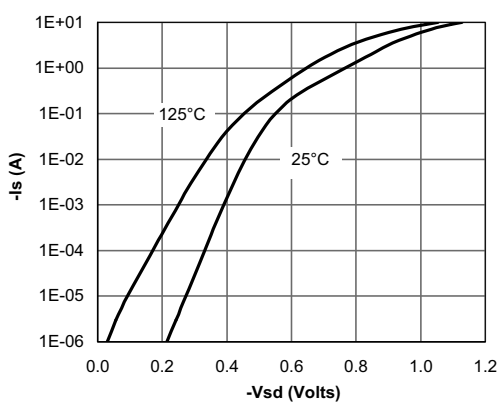


Figure 6: Body-Diode Characteristics

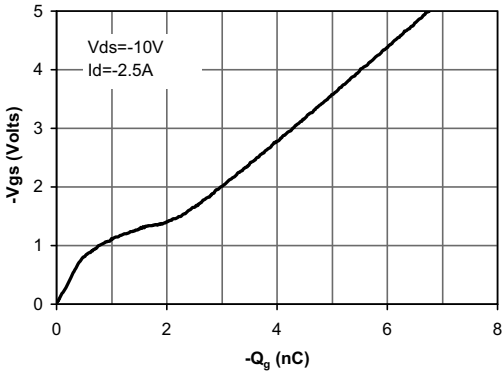
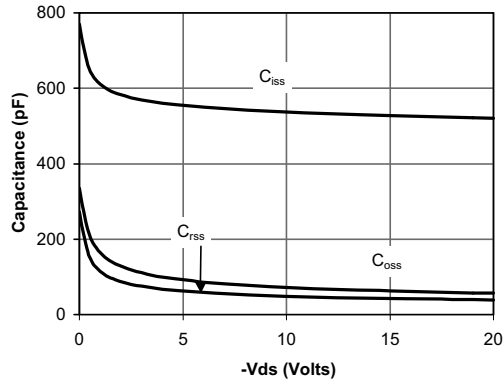


Figure 7: Gate-Charge Characteristics



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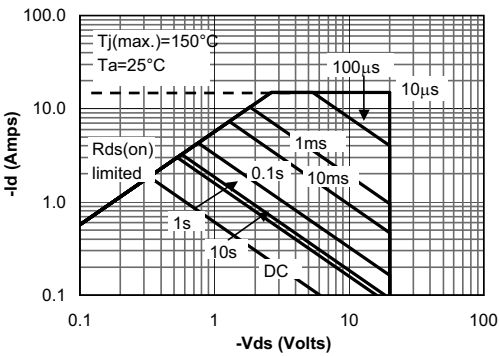

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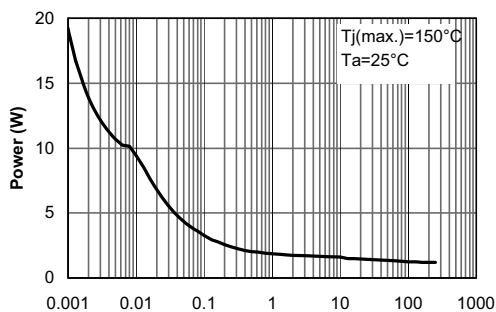

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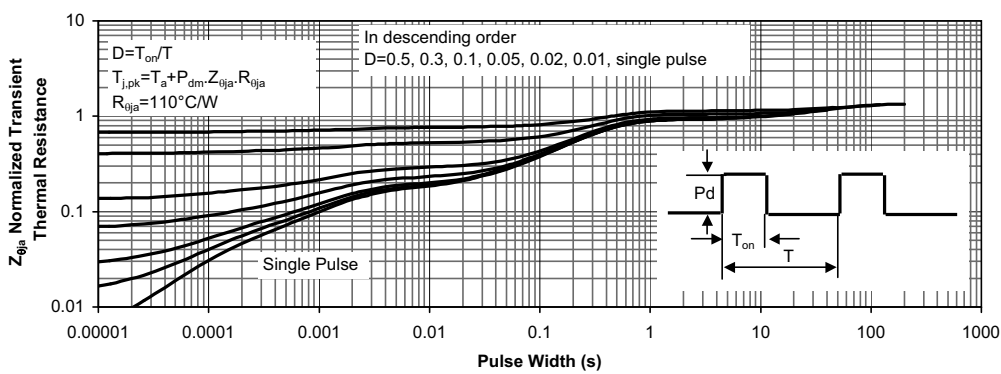

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