

Complementary MOSFET

ELM16603EA-S

General Description

ELM16603EA-S uses advanced trench technology to provide excellent $R_{ds(on)}$ and low gate charge.

Features

- | | |
|---|--|
| N-channel | P-channel |
| • $V_{ds}=20V$ | $V_{ds}=-30V$ |
| • $I_d=1.7A(V_{gs}=4.5V)$ | $I_d=-2.3A(V_{gs}=-10V)$ |
| • $R_{ds(on)} < 225m\Omega (V_{gs}=4.5V)$ | $R_{ds(on)} < 135m\Omega (V_{gs}=-10V)$ |
| • $R_{ds(on)} < 290m\Omega (V_{gs}=2.5V)$ | $R_{ds(on)} < 185m\Omega (V_{gs}=-4.5V)$ |
| • $R_{ds(on)} < 425m\Omega (V_{gs}=1.8V)$ | $R_{ds(on)} < 265m\Omega (V_{gs}=-2.5V)$ |

Maximum Absolute Ratings

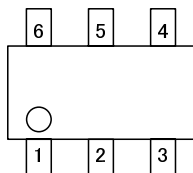
Parameter		Symbol	N-ch (Max.)	P-ch (Max.)	Unit	Note
Drain-source voltage		V_{ds}	20	-30	V	
Gate-source voltage		V_{gs}	± 8	± 12	V	
Continuous drain current	$T_a=25^\circ C$	I_d	1.7	-2.3	A	1
	$T_a=70^\circ C$		1.4	-1.8		
Pulsed drain current		I_{dm}	15	-30	A	2
Power dissipation	$T_a=25^\circ C$	P_d	1.15	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	$t \leq 10s$	$R\theta_{ja}$	N-ch	78	110	$^\circ C/W$	1
	Steady-state			106	150	$^\circ C/W$	
Maximum junction-to-lead	Steady-state	$R\theta_{jl}$		64	80	$^\circ C/W$	3
Maximum junction-to-ambient	$t \leq 10s$	$R\theta_{ja}$	P-ch	78	110	$^\circ C/W$	1
	Steady-state			106	150	$^\circ C/W$	
Maximum junction-to-lead	Steady-state	$R\theta_{jl}$		64	80	$^\circ C/W$	3

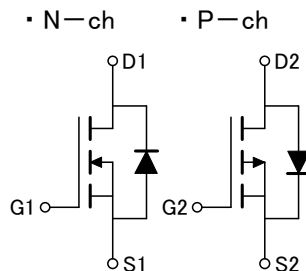
Pin Configuration

SOT-26 (TOP VIEW)



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

Circuit



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ELM16603EA-S

Electrical Characteristics (N-ch)

T_a=25°C

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
STATIC PARAMETERS						
Drain-source breakdown voltage	BV _{dss}	I _d =250 μA, V _{gs} =0V	20			V
Zero gate voltage drain current	I _{dss}	V _{ds} =16V V _{gs} =0V			1	μA
		T _j =55°C			5	
Gate-body leakage current	I _{gss}	V _{ds} =0V, V _{gs} =±8V			25	nA
Gate threshold voltage	V _{gs(th)}	V _{ds} =V _{gs} , I _d =250 μA	0.40	0.55	0.80	V
On state drain current	I _{d(on)}	V _{gs} =4.5V, V _{ds} =5V	5			A
Static drain-source on-resistance	R _{ds(on)}	V _{gs} =4.5V I _d =1.7A		186	225	mΩ
		T _j =125°C		262	315	
		V _{gs} =2.5V, I _d =1A		241	290	
		V _{gs} =1.8V, I _d =0.7A		326	425	
Forward transconductance	G _{fs}	V _{ds} =5V, I _d =1.7A		2.8		S
Diode forward voltage	V _{sd}	I _s =1A, V _{gs} =0V		0.69	1.00	V
Max.body-diode continuous current	I _s				0.4	A
DYNAMIC PARAMETERS						
Input capacitance	C _{iss}			101	125	pF
Output capacitance	C _{oss}	V _{gs} =0V, V _{ds} =10V, f=1MHz		17		pF
Reverse transfer capacitance	C _{rss}			14		pF
Gate resistance	R _g	V _{gs} =0V, V _{ds} =0V, f=1MHz		3	4	Ω
SWITCHING PARAMETERS						
Total gate charge	Q _g			1.57	8.10	nC
Gate-source charge	Q _{gs}	V _{gs} =4.5V, V _{ds} =10V, I _d =1.7A		0.13		nC
Gate-drain charge	Q _{gd}			0.36		nC
Turn-on delay time	t _{d(on)}			3.2		ns
Turn-on rise time	t _r	V _{gs} =5V, V _{ds} =10V		4.0		ns
Turn-off delay time	t _{d(off)}	R _l =3 Ω, R _{gen} =3 Ω		15.5		ns
Turn-off fall time	t _f			2.4		ns
Body-diode reverse recovery time	t _{rr}	I _f =1A, dI/dt=100A/μs		6.7	16.0	ns
Body-diode reverse recovery charge	Q _{rr}	I _f =1A, dI/dt=100A/μs		1.6		nC

NOTE :

1. The value of R_{θja} is measured with the device mounted on 1in² FR-4 board of 2oz. Copper, in still air environment with T_a=25°C. The value in any given applications depends on the user's specific board design, The current rating is based on the t_{≤10s} thermal resistance rating.
2. Repetitive rating, pulse width limited by junction temperature.
3. The R_{θja} is the sum of the thermal impedance from junction to lead R_{θjl} and lead to ambient.
4. The static characteristics in Figures 1 to 6 are obtained using 80 μs 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 T_a=25°C. The SOA curve provides a single pulse rating.

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Typical Electrical and Thermal Characteristics (N-ch)

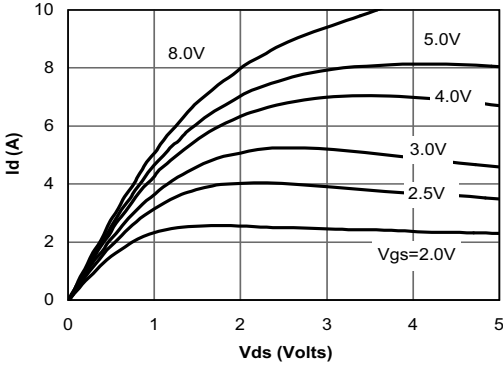


Fig 1: On-Region Characteristics

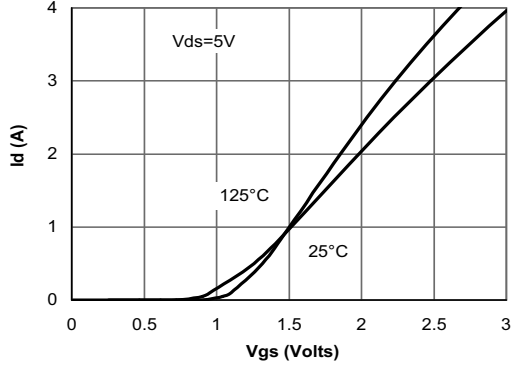


Figure 2: Transfer Characteristics

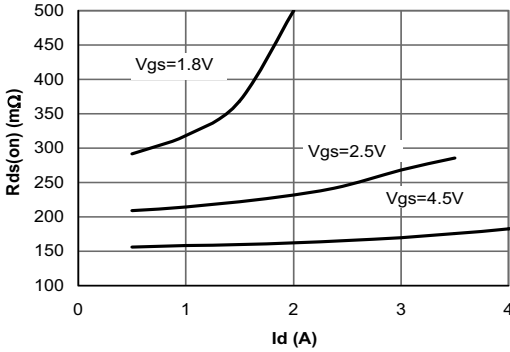


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

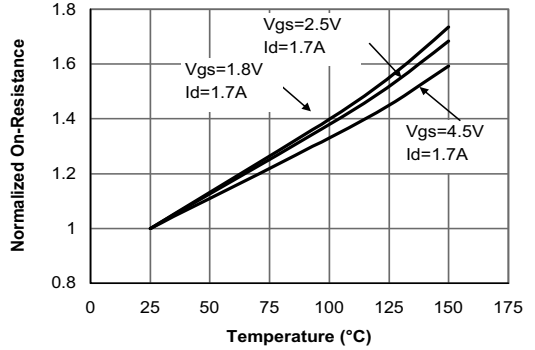


Figure 4: On-Resistance vs. Junction Temperature

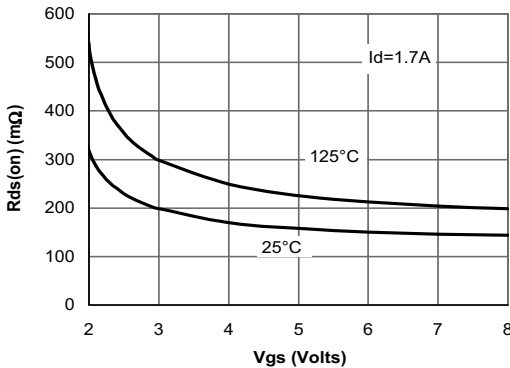


Figure 5: On-Resistance vs. Gate-Source Voltage

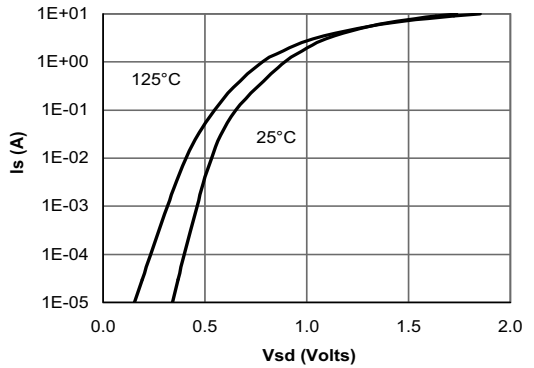


Figure 6: Body-Diode Characteristics

Complementary MOSFET

ELM16603EA-S

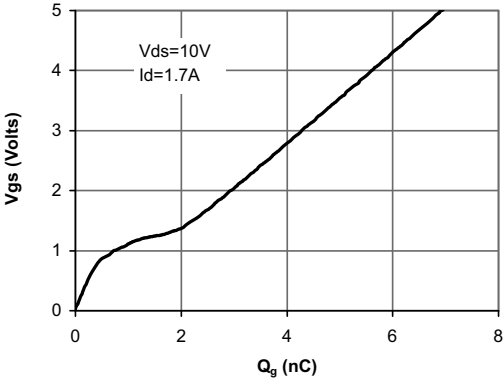


Figure 7: Gate-Charge Characteristics

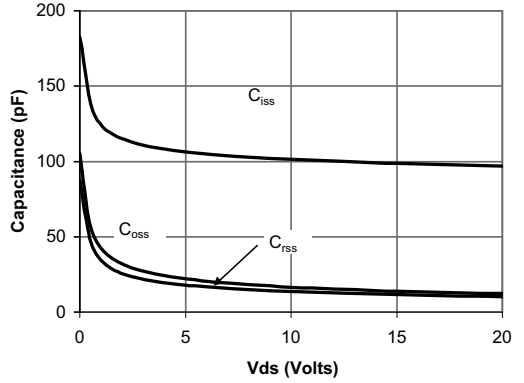


Figure 8: Capacitance Characteristics

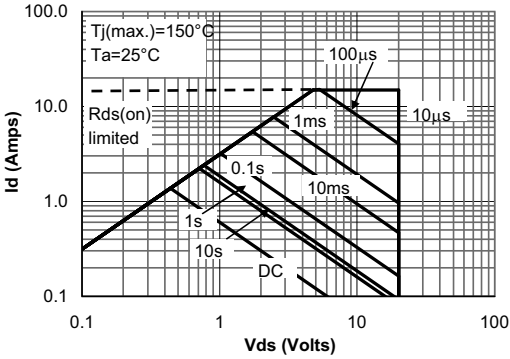


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

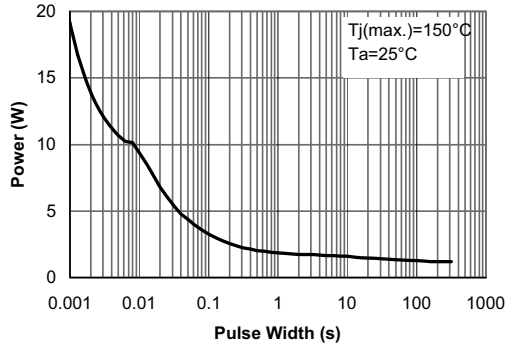


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

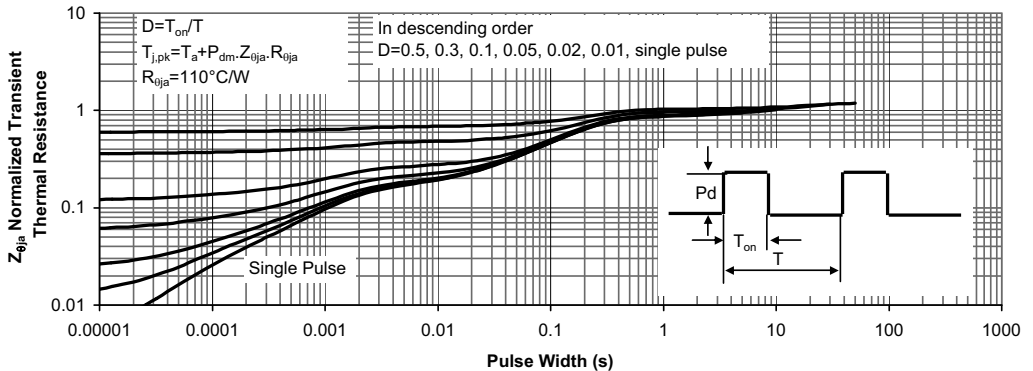


Figure 11: Normalized Maximum Transient Thermal Impedance

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Electrical Characteristics (P-ch)

T_a=25°C

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
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			-1	μA
		V _{gs} =0V			-5	
		T _j =55°C				
Gate-body leakage current	I _{gss}	V _{ds} =0V, V _{gs} =±12V			±100	nA
Gate threshold voltage	V _{gs(th)}	V _{ds} =V _{gs} , I _d =-250 μA	-0.6	-1.0	-1.4	V
On state drain current	I _{d(on)}	V _{gs} =-4.5V, V _{ds} =-5V	-10			A
Static drain-source on-resistance	R _{ds(on)}	V _{gs} =-10V		107	135	mΩ
		I _d =-2.3A				
			T _j =125°C			
		V _{gs} =-4.5V, I _d =-2A		135	185	mΩ
		V _{gs} =-2.5V, I _d =-1A		195	265	mΩ
Forward transconductance	G _{fs}	V _{ds} =-5V, I _d =-2.3A		8		S
Diode forward voltage	V _{sd}	I _s =-1A, V _{gs} =0V		-0.85	-1.00	V
Max. body-diode continuous current	I _s				-1.35	A
DYNAMIC PARAMETERS						
Input capacitance	C _{iss}			409		pF
Output capacitance	C _{oss}	V _{gs} =0V, V _{ds} =-15V, f=1MHz		55		pF
Reverse transfer capacitance	C _{rss}			42		pF
Gate resistance	R _g	V _{gs} =0V, V _{ds} =0V, f=1MHz		12		Ω
SWITCHING PARAMETERS						
Total gate charge	Q _g	V _{gs} =-4.5V, V _{ds} =-15V		0.72		nC
Gate-source charge	Q _{gs}	I _d =-2.5A		1.34		nC
Gate-drain charge	Q _{gd}			4.80		nC
Turn-on delay time	t _{d(on)}			8.5		ns
Turn-on rise time	t _r	V _{gs} =-10V, V _{ds} =-15V		10.0		ns
Turn-off delay time	t _{d(off)}	R _l =6 Ω, R _{gen} =6 Ω		55.0		ns
Turn-off fall time	t _f			25.5		ns
Body diode reverse recovery time	t _{rr}	I _f =-2.5A, dI/dt=100A/μs		26.0		ns
Body diode reverse recovery charge	Q _{rr}	I _f =-2.5A, dI/dt=100A/μs		15.6		nC

NOTE :

1. The value of R_{θja} is measured with the device mounted on 1in² FR-4 board of 2oz. Copper, in still air environment with T_a=25°C. The value in any given applications depends on the user's specific board design, The current rating is based on the t_{≤10s} thermal resistance rating.
2. Repetitive rating, pulse width limited by junction temperature.
3. The R_{θja} is the sum of the thermal impedance from junction to lead R_{θjl} 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 T_a=25°C. The SOA curve provides a single pulse rating.

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Typical Electrical and Thermal Characteristics (P-ch)

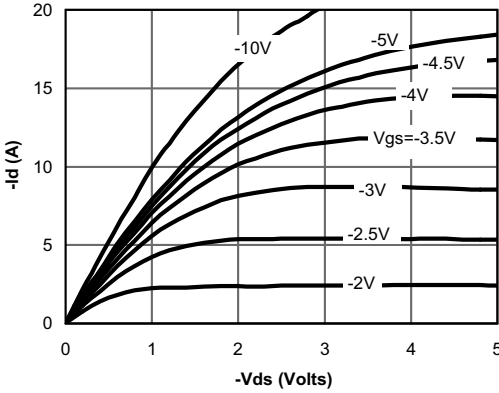


Fig 1: On-Region Characteristics

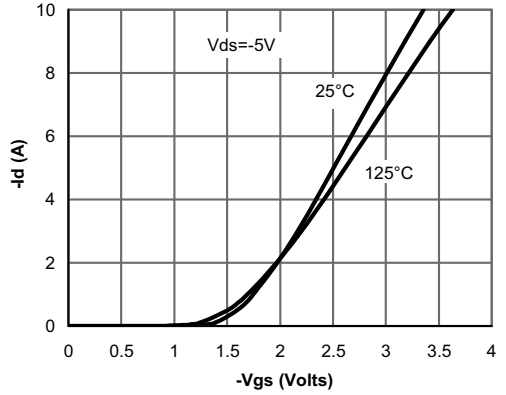


Figure 2: Transfer Characteristics

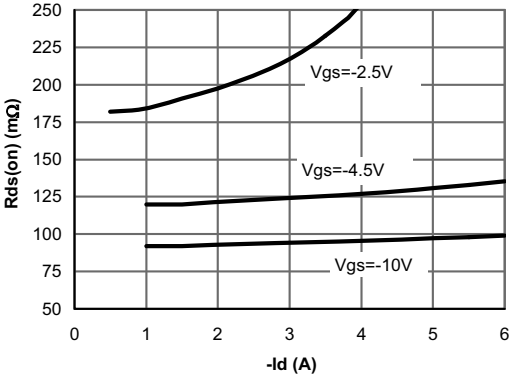


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

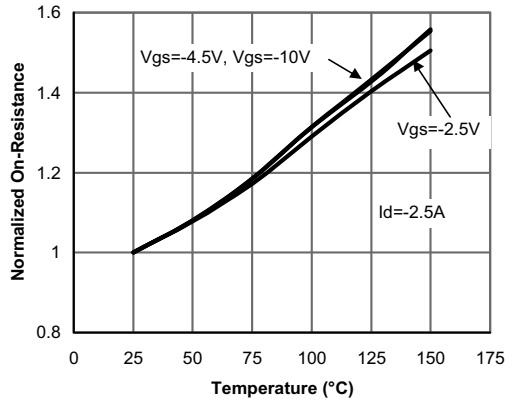


Figure 4: On-Resistance vs. Junction Temperature

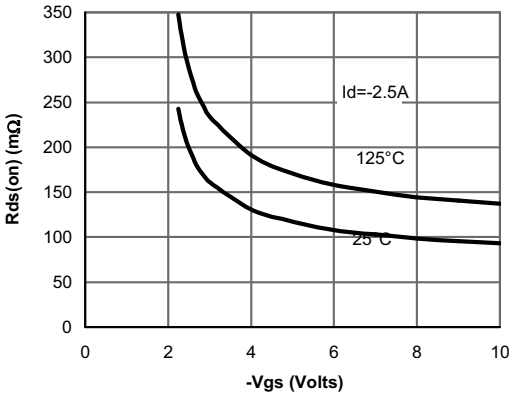


Figure 5: On-Resistance vs. Gate-Source Voltage

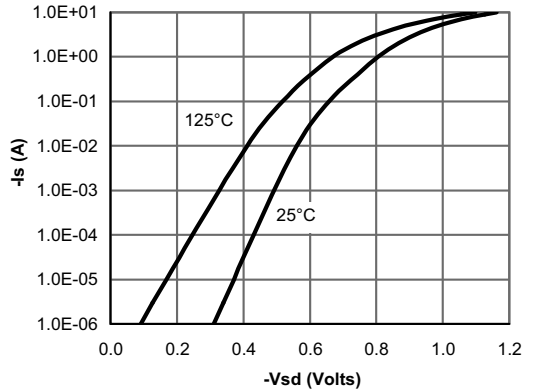


Figure 6: Body-Diode Characteristics

Complementary MOSFET

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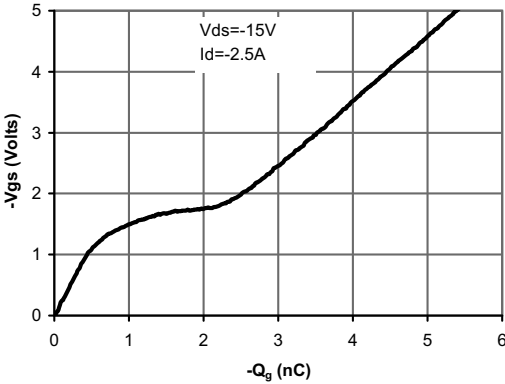


Figure 7: Gate-Charge Characteristics

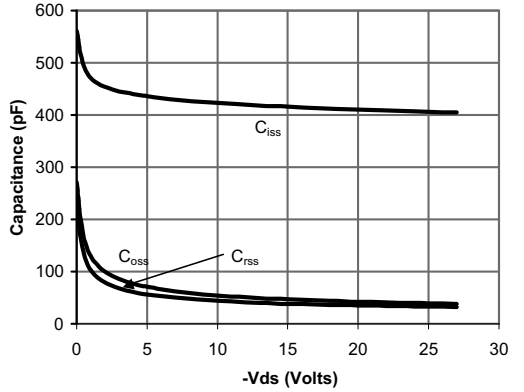


Figure 8: Capacitance Characteristics

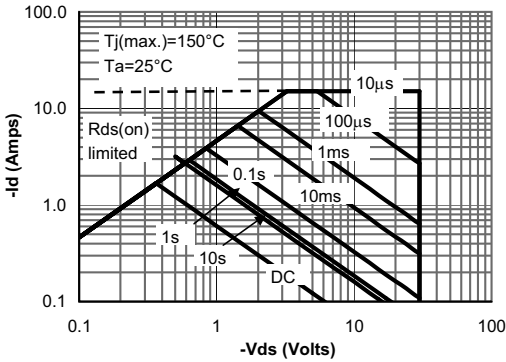


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

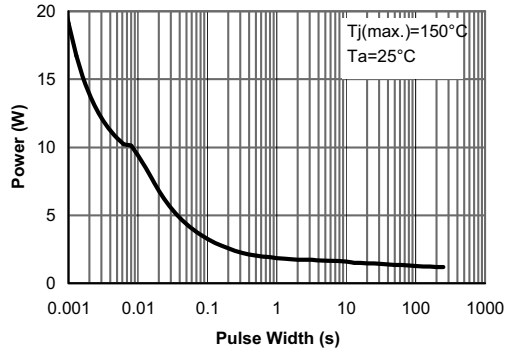


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

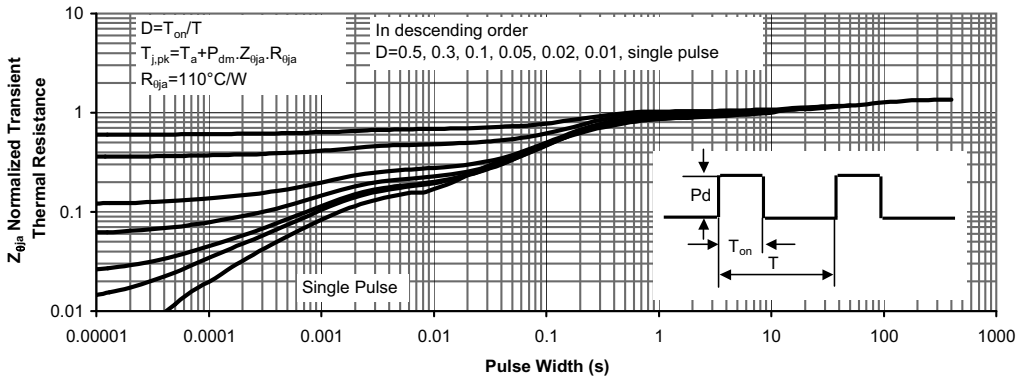


Figure 11: Normalized Maximum Transient Thermal Impedance