Complementary MOSFET

ELM35603KA-S

■General Description

ELM35603KA-S uses advanced trench technology to provide excellent Rds(on) and low gate charge.

■Features

N-channel	P-channel
• Vds=40V	Vds=-40V
• Id=10A	Id=-7A
• Rds(on) < 22mΩ(Vgs=10V)	Rds(on) < 33mΩ(Vgs=-10V)
• Rds(on) < 33mΩ(Vgs=7V)	Rds(on) < 40mΩ(Vgs=-7V)

■Maximum Absolute Ratings

Ta=25°C. Unless otherwise noted.

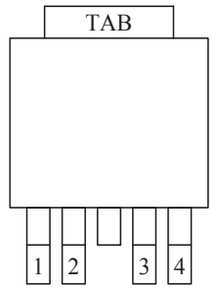
Parameter		Symbol	N-ch (Max.)	P-ch (Max.)	Unit	Note
Drain-source voltage		Vds	40	-40	V	
Gate-source voltage		Vgs	±20	±20	V	
Continuous drain current	Ta=25°C	Id	10.0	-7.0	A	
	Ta=70°C		8.5	-6.0		
Pulsed drain current		Idm	50	-50	A	3
Power dissipation	Tc=25°C	Pd	3.0	3.0	W	
	Tc=70°C		2.1	2.1		
Junction and storage temperature range		Tj,Tstg	-55 to 150	-55 to 150	°C	

■Thermal Characteristics

Parameter	Symbol	Device	Typ.	Max.	Unit	Note
Maximum junction-to-ambient	Rθja	N-ch		42	°C/W	
Maximum junction-to-case	Rθjc	N-ch		6	°C/W	
Maximum junction-to-ambient	Rθja	P-ch		42	°C/W	
Maximum junction-to-case	Rθjc	P-ch		6	°C/W	

■Pin configuration

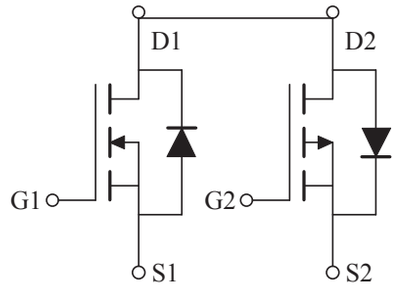
TO-252-4(TOP VIEW)



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

■Circuit

• N-ch • P-ch



■Electrical Characteristics (N-ch)

Ta=25°C. Unless otherwise noted.

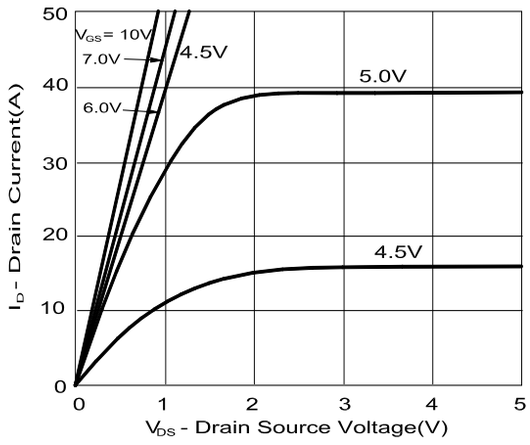
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit	Note
STATIC PARAMETERS							
Drain-source breakdown voltage	BVdss	Id=250μA, Vgs=0V	40			V	
Zero gate voltage drain current	Idss	Vds=32V, Vgs=0V			1	μA	
		Vds=30V, Vgs=0V, Ta=55°C			10		
Gate-body leakage current	Igss	Vds=0V, Vgs=±20V			±100	nA	
Gate threshold voltage	Vgs(th)	Vds=Vgs, Id=250μA	1.2	2.0	3.0	V	
On state drain current	Id(on)	Vgs=10V, Vds=5V	50			A	1
Static drain-source on-resistance	Rds(on)	Vgs=10V, Id=10A		19	22	mΩ	1
		Vgs=7V, Id=7A		25	33		
Forward transconductance	Gfs	Vds=10V, Id=10A		25		S	1
Diode forward voltage	Vsd	If=10A, Vgs=0V			1.2	V	1
DYNAMIC PARAMETERS							
Input capacitance	Ciss	Vgs=0V, Vds=10V, f=1MHz		1145	1450	pF	
Output capacitance	Coss			253	355	pF	
Reverse transfer capacitance	Crss			94	142	pF	
SWITCHING PARAMETERS							
Total gate charge	Qg	Vgs=10V, Vds=20V, Id=10A		23.0		nC	2
Gate-source charge	Qgs			3.6		nC	2
Gate-drain charge	Qgd			3.0		nC	2
Turn-on delay time	td(on)	Vgs=10V, Vds=20V, Id=1A Rgen=6Ω		3.2	6.4	ns	2
Turn-on rise time	tr			10.8	21.7	ns	2
Turn-off delay time	td(off)			17.1	30.8	ns	2
Turn-off fall time	tf			5.3	10.7	ns	2
Body diode reverse recovery time	trr	If=10A, dIf/dt=100A/μs		60		ns	
Body diode reverse recovery charge	Qrr			43		nC	

NOTE :

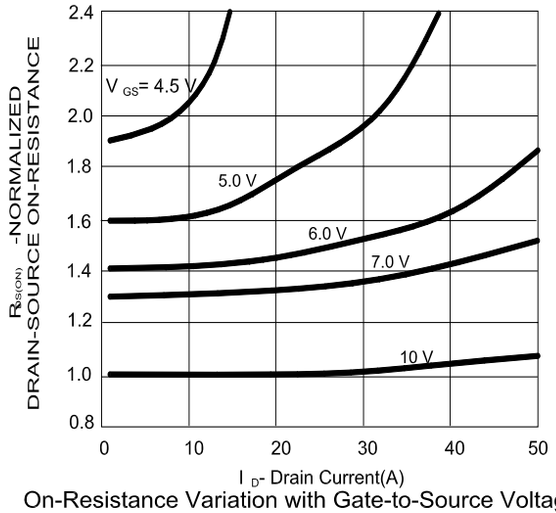
1. Pulse test : Pulsed width≤300μsec and Duty cycle≤2%.
2. Independent of operating temperature.
3. Pulsed width limited by maximum junction temperature.
4. Duty cycle ≤ 1%.

■Typical Electrical and Thermal Characteristics (N-ch)

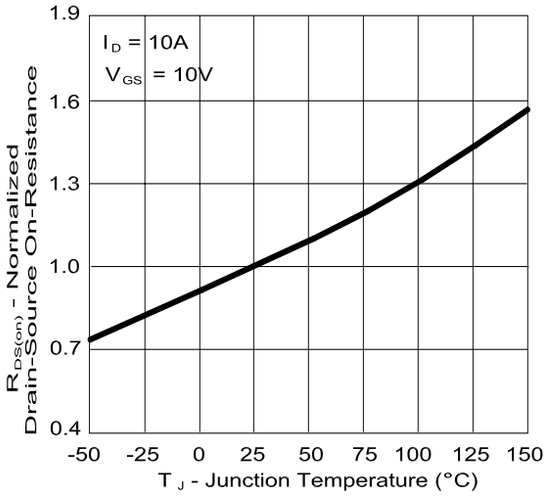
On-Region Characteristics



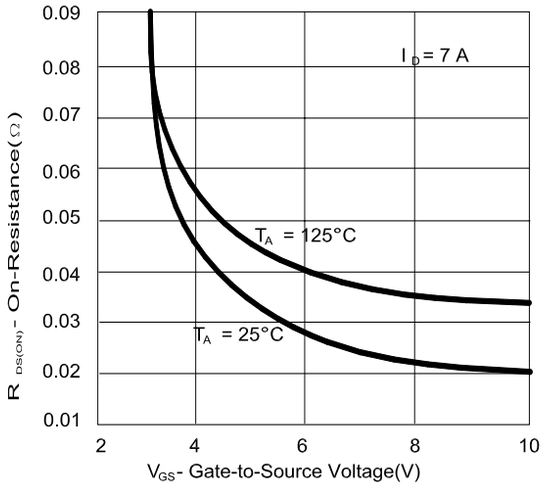
On-Resistance Variation with Drain Current and Gate Voltage



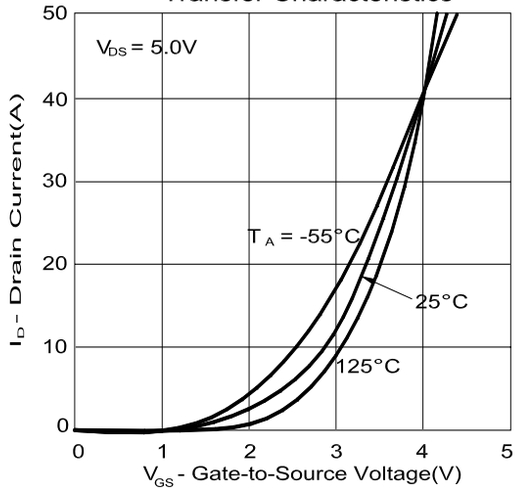
On-Resistance Variation with Temperature



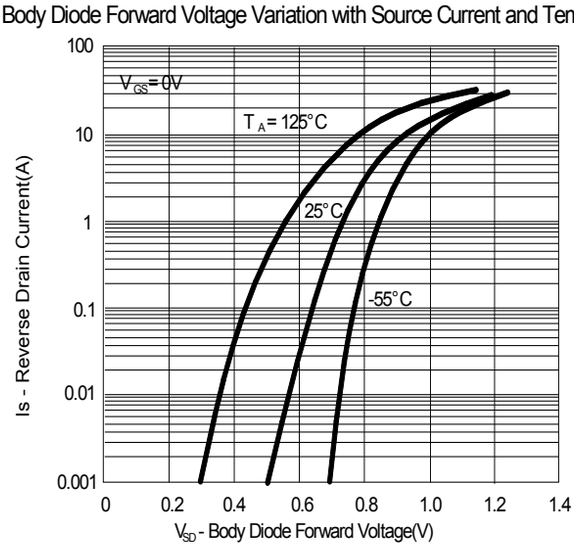
On-Resistance Variation with Gate-to-Source Voltage



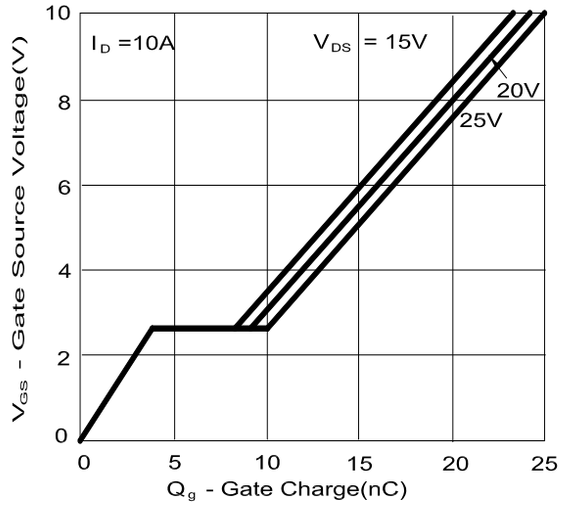
Transfer Characteristics



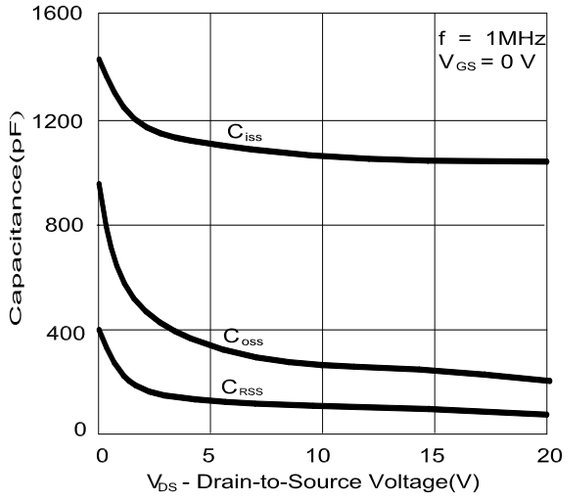
Body Diode Forward Voltage Variation with Source Current and Temperature



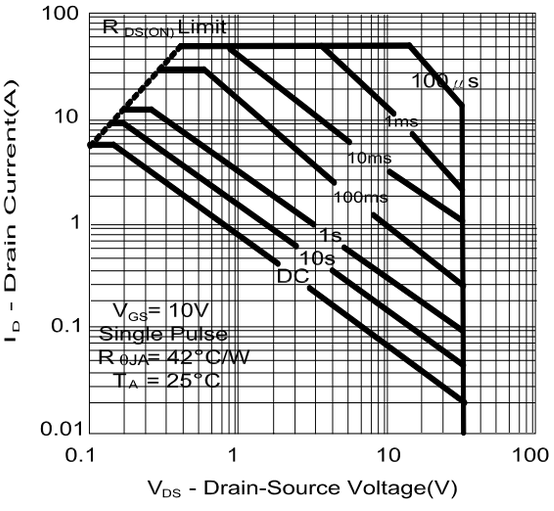
Gate Charge Characteristics



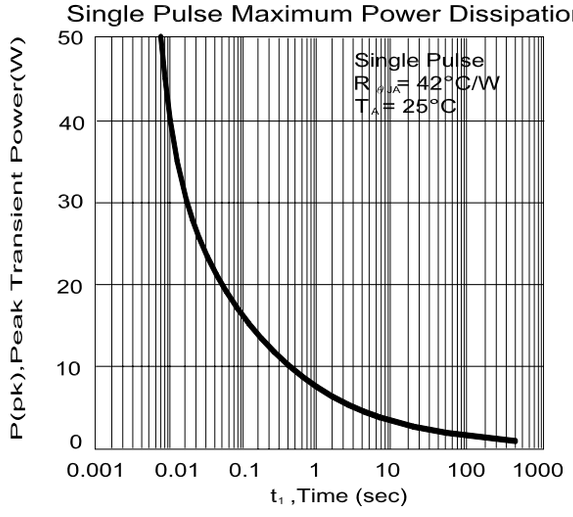
Capacitance Characteristics



Maximum Safe Operating Area



Single Pulse Maximum Power Dissipation



■Electrical Characteristics (P-ch)

Ta=25°C. Unless otherwise noted.

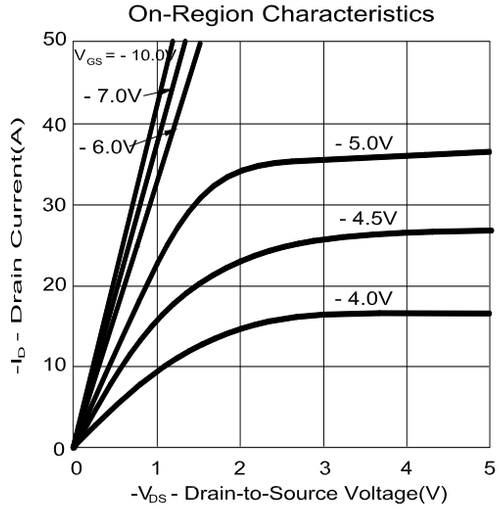
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit	Note
STATIC PARAMETERS							
Drain-source breakdown voltage	BVdss	Id=-250μA, Vgs=0V	-40			V	
Zero gate voltage drain current	Idss	Vds=-32V, Vgs=0V			-1	μA	
		Vds=-30V, Vgs=0V, Ta=55°C			-10		
Gate-body leakage current	Igss	Vds=0V, Vgs=±20V			±100	nA	
Gate threshold voltage	Vgs(th)	Vds=Vgs, Id=-250μA	-1.2	-2.0	-3.0	V	
On state drain current	Id(on)	Vgs=-10V, Vds=-5V	-50			A	1
Static drain-source on-resistance	Rds(on)	Vgs=-10V, Id=-7A		28	33	mΩ	1
		Vgs=-7V, Id=-5A		32	40		
Forward transconductance	Gfs	Vds=-10V, Id=-7A		18		S	1
Diode forward voltage	Vsd	If=-7A, Vgs=0V			-1.2	V	1
DYNAMIC PARAMETERS							
Input capacitance	Ciss	Vgs=0V, Vds=-10V, f=1MHz		1000	1260	pF	
Output capacitance	Coss			450	625	pF	
Reverse transfer capacitance	Crss			108	163	pF	
SWITCHING PARAMETERS							
Total gate charge	Qg	Vgs=-10V, Vds=-20V Id=-7A		20.0		nC	2
Gate-source charge	Qgs			3.2		nC	2
Gate-drain charge	Qgd			2.7		nC	2
Turn-on delay time	td(on)	Vgs=-10V, Vds=-20V Id=-1A, Rgen=6Ω		9.7	19.4	ns	2
Turn-on rise time	tr			14.0	28.1	ns	2
Turn-off delay time	td(off)			28.7	51.6	ns	2
Turn-off fall time	tf			17.8	32.2	ns	2
Body diode reverse recovery time	trr	If=-7A, dIf/dt=100A/μs		80		ns	
Body diode reverse recovery charge	Qrr			75		nC	

NOTE :

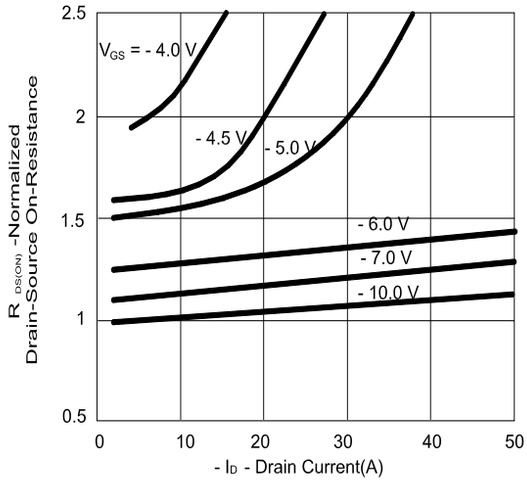
1. Pulse test : Pulsed width≤300μsec and Duty cycle≤2%.
2. Independent of operating temperature.
3. Pulsed width limited by maximum junction temperature.

■Typical Electrical and Thermal Characteristics (P-ch)

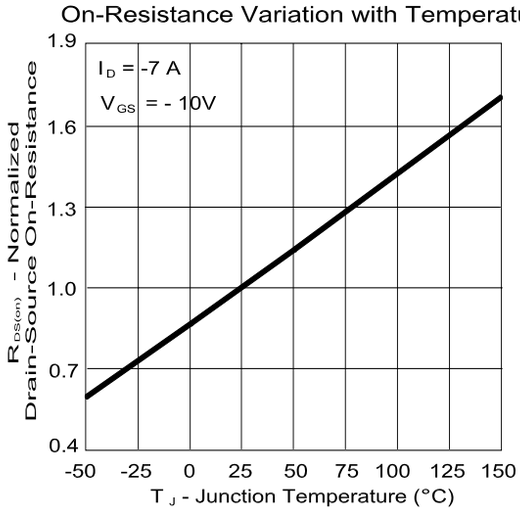
On-Region Characteristics



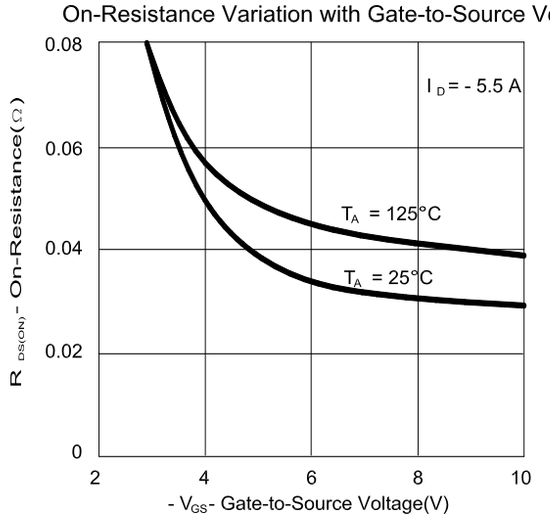
On-Resistance Variation with Drain Current and Gate Voltage



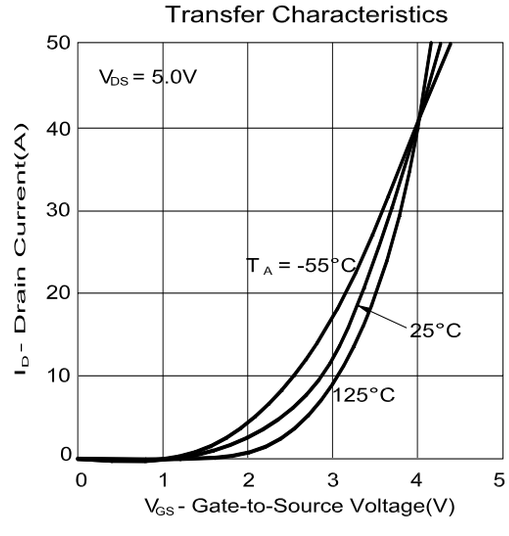
On-Resistance Variation with Temperature



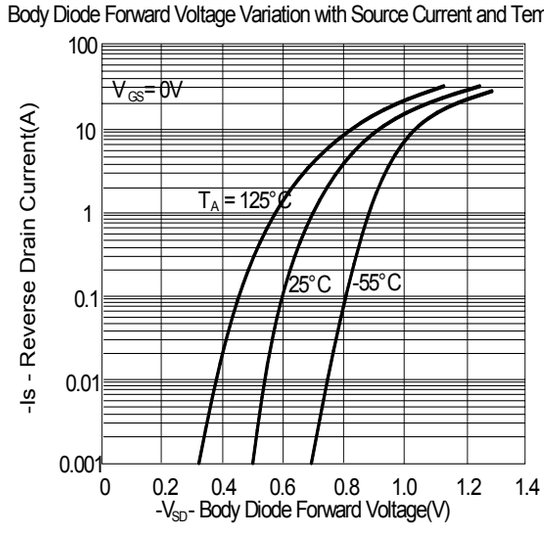
On-Resistance Variation with Gate-to-Source Voltage



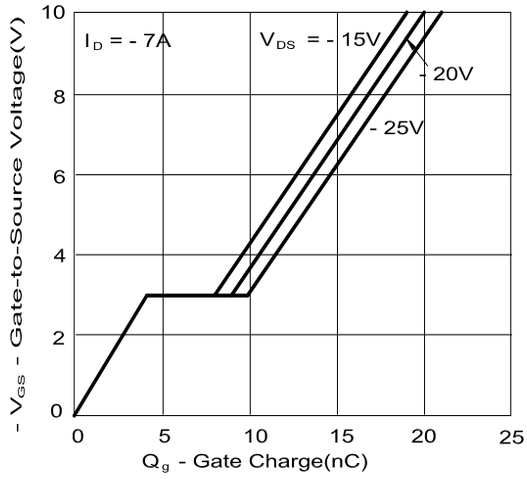
Transfer Characteristics



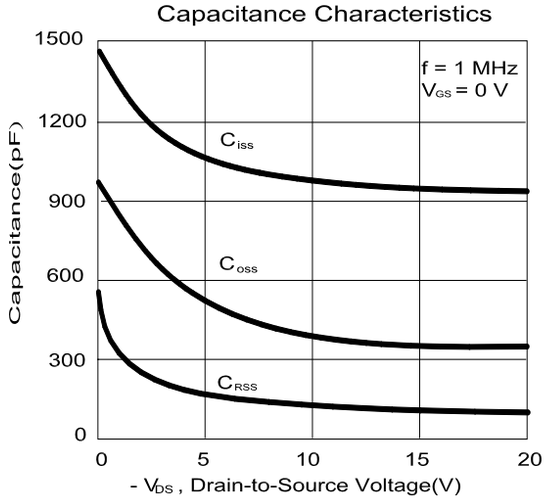
Body Diode Forward Voltage Variation with Source Current and Temperature



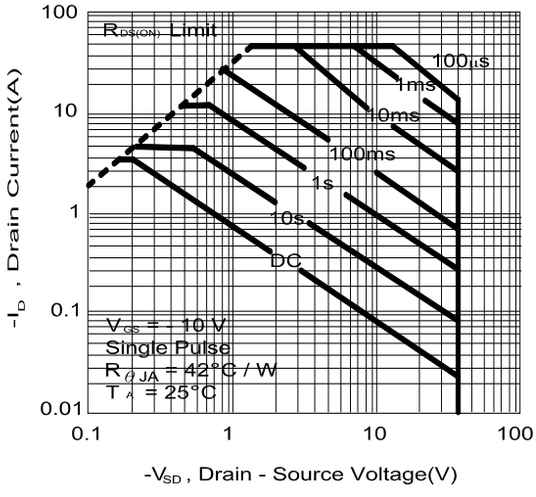
Gate Charge Characteristics



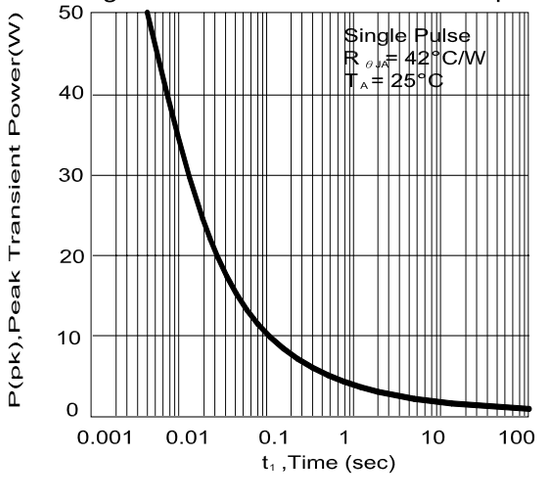
Capacitance Characteristics



Maximum Safe Operating Area



Single Pulse Maximum Power Dissipation



Transient Thermal Response Curve