

Dual N-Channel Enhancement Mode MOSFET

TDM3412

DESCRIPTION

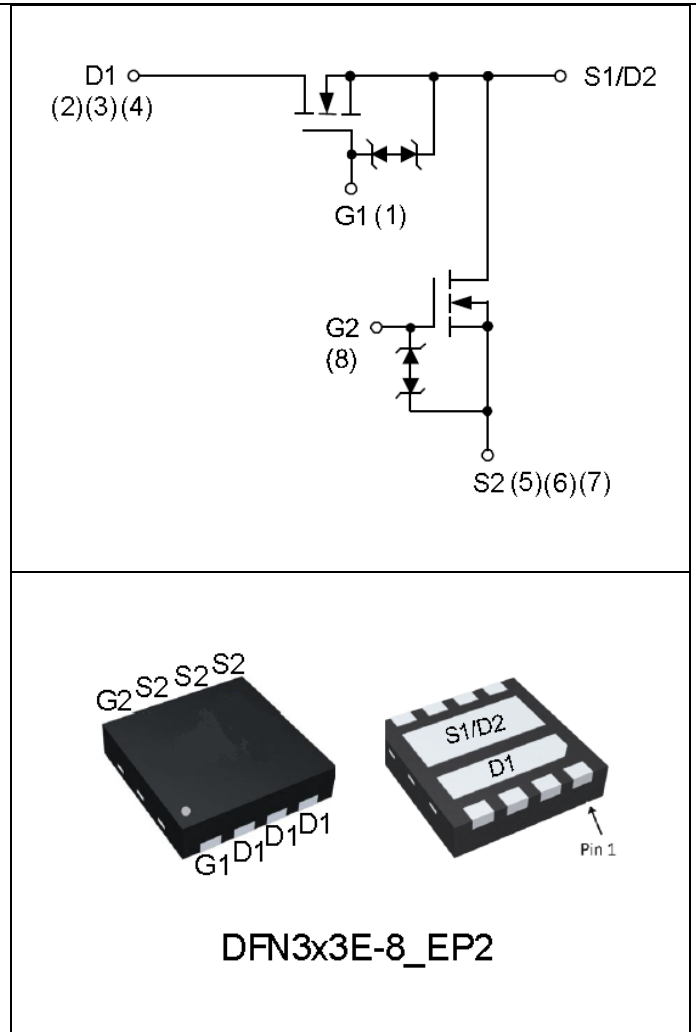
The TDM3412 uses advanced trench technology to provide excellent RDS(ON) and low gate charge. This device is suitable for use as a load switch or in PWM applications.

GENERAL FEATURES

- Channel 1
RDS(ON) < 17.5mΩ @ VGS=4.5V
RDS(ON) < 10.8mΩ @ VGS=10V
- Channel 2
RDS(ON) < 16mΩ @ VGS=4.5V
RDS(ON) < 10mΩ @ VGS=10V
- High Power and current handling capability
- ESD protection
- Lead free product is available
- Surface Mount Package

Application

- PWM applications
- Load switch
- Power management



ABSOLUTE MAXIMUM RATINGS(TA=25°C unless otherwise noted)

Parameter	Symbol	Channel 1	Channel 2	Unit
Drain-Source Voltage	Vds	30	30	V
Gate-Source Voltage	Vgs	+20	+20	V
Diode Continuous Forward Current	Is(Tc=25°C)	5	5	A
Continuous Drain Current(note1)	Id(Tc=25°C)	18	18	A
Pulse Drain Current Tested(note4)	Idp(Tc=25°C)	45	45	A
Maximum Power Dissipation	Pd(Tc=25°C)	20	20	W
Continuous Drain Current	Id(TA=25°C)	8.4	9.1	A
	Id(TA=70°C)	6.7	7.3	
Pulse Drain Current Tested	Idp(TA=25°C)	33.5	36	A
Maximum Power Dissipation	Pd(TA=25°C)	1.14	1.13	W
Thermal Resistance-Junction to Ambient(note 5)	RθJA(t≤10s)	66	60	°C/W
	RθJA(Steady State)	110	100	
Thermal Resistance-Junction to Case	RθJC(Steady State)	6	6	°C/W
Maximum Operating Junction Temperature	Tj	150		°C
Storage Temperature Range	Tstg	-55 To 150		°C

ELECTRICAL CHARACTERISTICS ($T_A=25^{\circ}\text{C}$ unless otherwise noted)

Parameter	Symbol	Condition	Channel1			Unit
			Min	Typ	Max	
OFF CHARACTERISTICS						
Drain-Source Breakdown Voltage	BV_{DSS}	$V_{GS}=0V, I_D=250\mu A$	30	-	-	V
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS}=24V, V_{GS}=0V$	-	-	1	μA
Gate-Body Leakage Current	I_{GSS}	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	± 10	μA
ON CHARACTERISTICS (Note 2)						
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=250\mu A$	1.4	1.8	2.5	V
Drain-Source On-State Resistance	$R_{DS(on)}$	$V_{GS}=10V, I_D=10A$	-	9	10.8	$m\Omega$
		$V_{GS}=4.5V, I_D=8A$	-	13.5	17.5	$m\Omega$
DYNAMIC CHARACTERISTICS (Note3)						
Gate Resistance	R_G	$V_{GS}=0V, V_{DS}=0V, F=1MHz$	-	1.35	2.5	Ω
Input Capacitance	C_{iss}	$V_{DS}=15V, V_{GS}=0V, F=1.0MHz$	-	450	600	PF
Output Capacitance	C_{oss}		-	318	-	PF
Reverse Transfer Capacitance	C_{rss}		-	22	-	PF
SWITCHING CHARACTERISTICS (Note 3)						
Turn-on Delay Time	$t_{d(on)}$	$V_{DS}=15V, R_L=15\Omega, V_{GEN}=10V, R_G=6\Omega, I_D=1A$	-	8.5	16	nS
Turn-on Rise Time	t_r		-	10	18	nS
Turn-Off Delay Time	$t_{d(off)}$		-	14	26	nS
Turn-Off Fall Time	t_f		-	10.6	19	nS
Total Gate Charge	Q_g	$V_{DS}=15V, I_D=10A, V_{GS}=10V$	-	8	12	nC
Gate-Source Charge	Q_{gs}		-	1.6	-	nC
Gate-Drain Charge	Q_{gd}		-	1.2	-	nC
Body Diode Reverse Recovery Time	T_{rr}	$I_{DS}=10A, di/dt=100A/\mu s$	-	20.5	-	nS
Body Diode Reverse Recovery Charge	Q_{rr}		-	7.2	-	nC
DRAIN-SOURCE DIODE CHARACTERISTICS						
Diode Forward Voltage (Note 2)	V_{SD}	$V_{GS}=0V, I_S=5A$	-	0.8	1.1	V

NOTES:

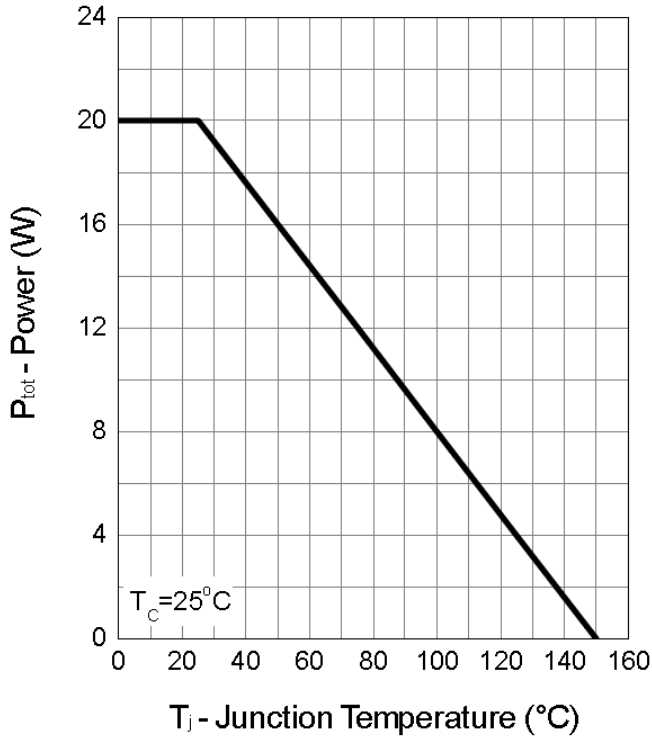
1. Max continuous current is limited by bonding wire.
2. Pulse Test: Pulse Width $\leq 300\mu s$, Duty Cycle $\leq 2\%$.
3. Guaranteed by design, not subject to production testing.
4. Pulse width is limited by max. junction temperature.
5. $R_{\theta JA}$ steady state $t=999s$

ELECTRICAL CHARACTERISTICS Cont. ($T_A=25^\circ\text{C}$ unless otherwise noted)

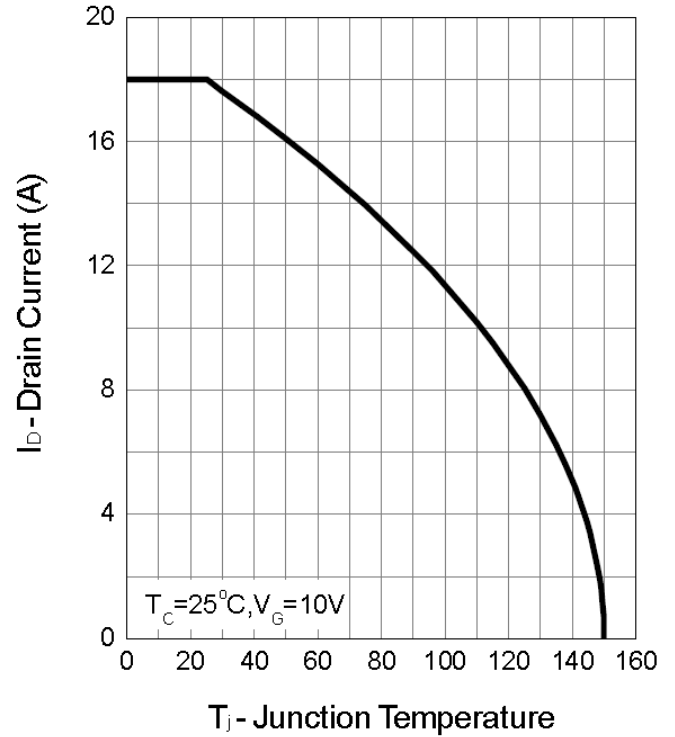
Parameter	Symbol	Condition	Channel2			Unit
			Min	Typ	Max	
OFF CHARACTERISTICS						
Drain-Source Breakdown Voltage	BV_{DSS}	$V_{GS}=0V, I_D=250\mu A$	30	-	-	V
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS}=24V, V_{GS}=0V$	-	-	1	μA
Gate-Body Leakage Current	I_{GSS}	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	± 10	μA
ON CHARACTERISTICS (Note 2)						
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=250\mu A$	1.4	1.8	2.5	V
Drain-Source On-State Resistance	$R_{DS(ON)}$	$V_{GS}=10V, I_D=10A$	-	8.2	10	$m\Omega$
		$V_{GS}=4.5V, I_D=8A$	-	12.3	16	$m\Omega$
DYNAMIC CHARACTERISTICS (Note3)						
Gate Resistance	R_G	$V_{GS}=0V, V_{DS}=0V, F=1MHz$	-	1.35	2.5	Ω
Input Capacitance	C_{iss}	$V_{DS}=15V, V_{GS}=0V, F=1.0MHz$	-	450	600	PF
Output Capacitance	C_{oss}		-	318	-	PF
Reverse Transfer Capacitance	C_{rss}		-	22	-	PF
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Turn-on Delay Time	$t_{d(on)}$	$V_{DS}=15V, R_L=15\Omega, V_{GEN}=10V, R_G=6\Omega, I_D=1A$	-	8.5	16	nS
Turn-on Rise Time	t_r		-	10	18	nS
Turn-Off Delay Time	$t_{d(off)}$		-	14	26	nS
Turn-Off Fall Time	t_f		-	10.6	19	nS
Total Gate Charge	Q_g	$V_{DS}=15V, I_D=10A, V_{GS}=10V$	-	8	12	nC
Gate-Source Charge	Q_{gs}		-	1.6	-	nC
Gate-Drain Charge	Q_{gd}		-	1.2	-	nC
Body Diode Reverse Recovery Time	T_{rr}	$I_{DS}=10A, di/dt=100A/\mu s$	-	20.5	-	nS
Body Diode Reverse Recovery Charge	Q_{rr}		-	7.2	-	nC
DRAIN-SOURCE DIODE CHARACTERISTICS						
Diode Forward Voltage (Note 2)	V_{SD}	$V_{GS}=0V, I_S=5A$	-	0.8	1.1	V

Channel 1 Typical Operating Characteristics

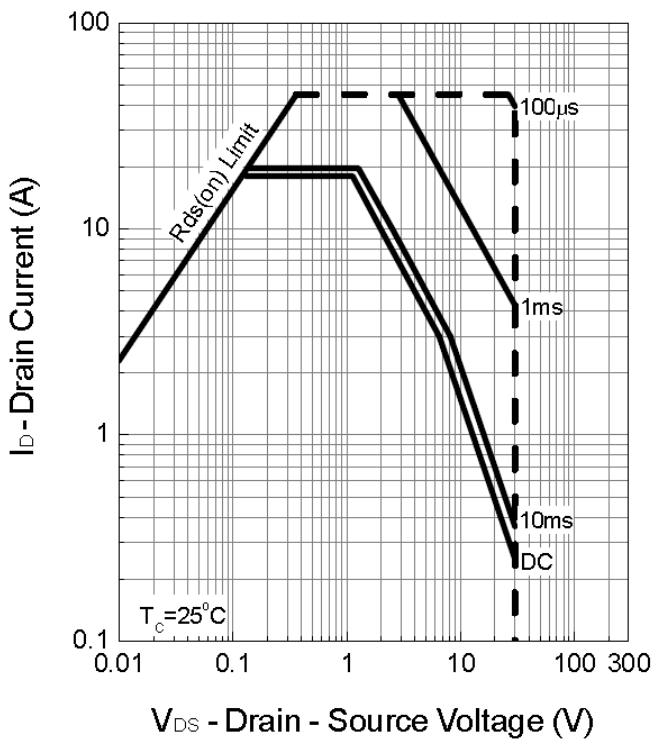
Power Dissipation



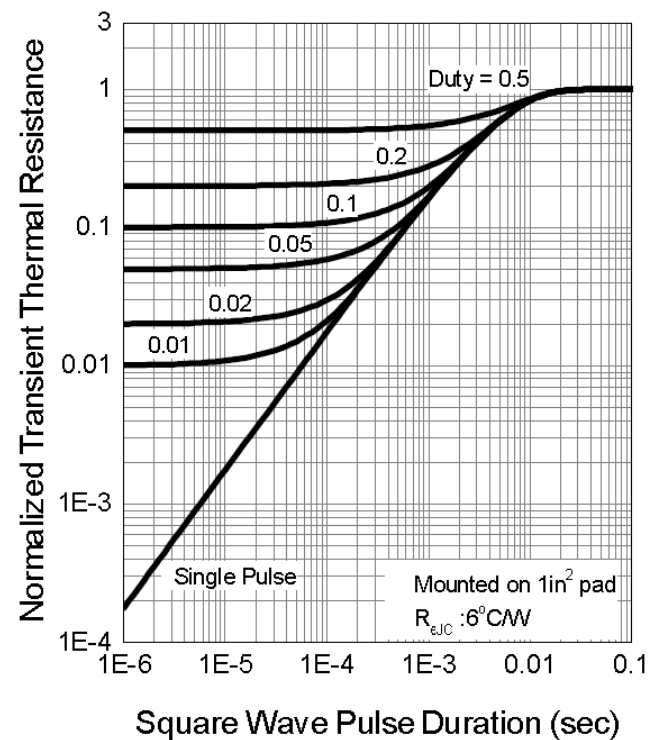
Drain Current



Safe Operation Area



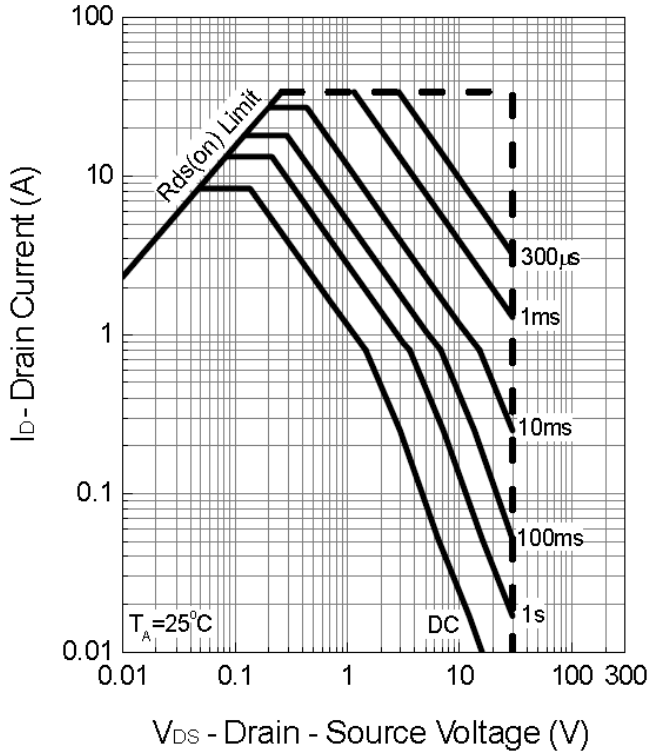
Thermal Transient Impedance



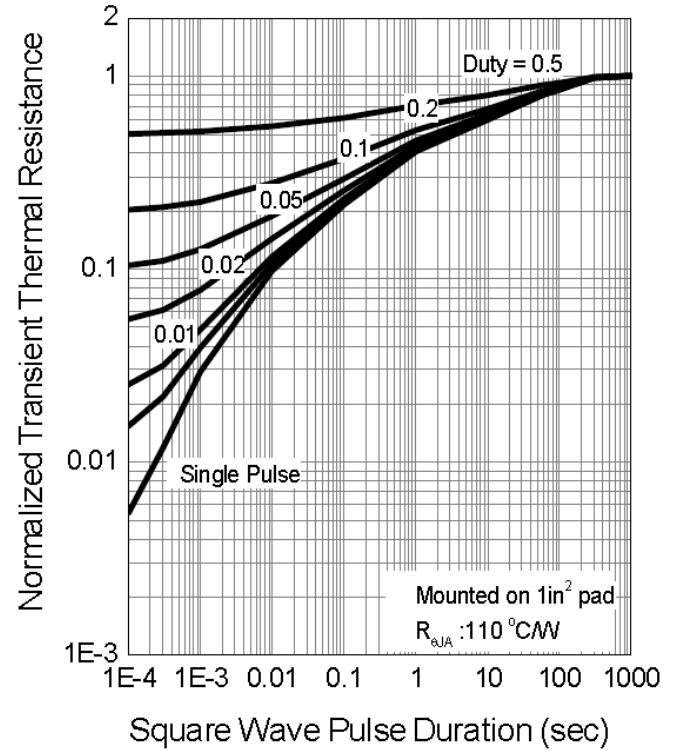
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Channel 1 Typical Operating Characteristics(Cont.)

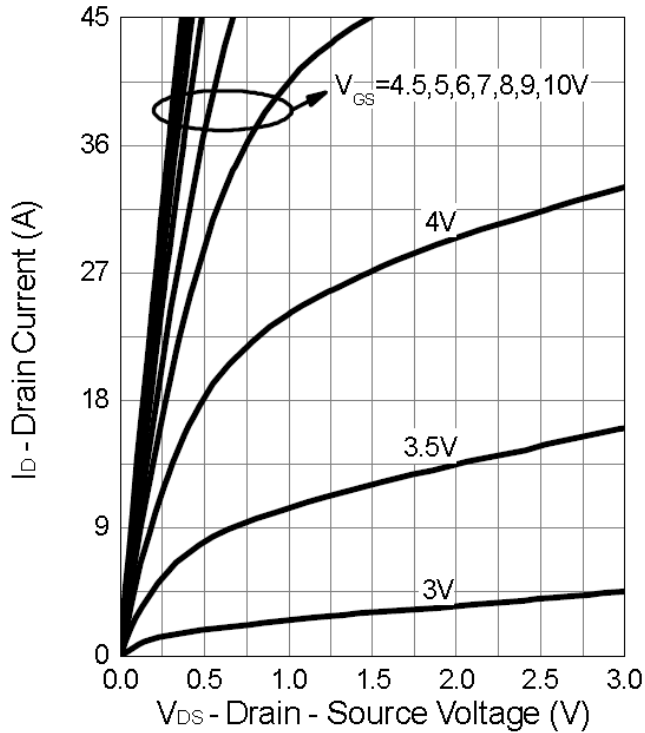
Safe Operation Area



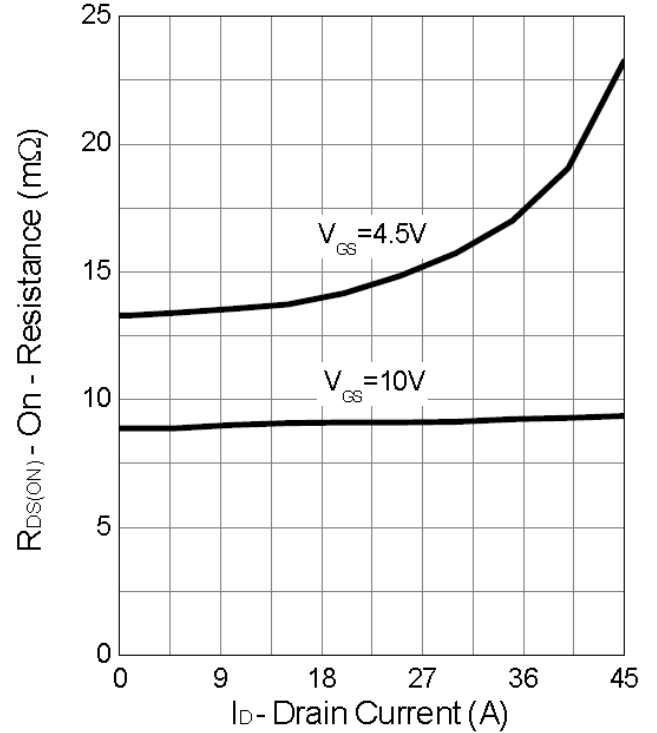
Thermal Transient Impedance



Output Characteristics



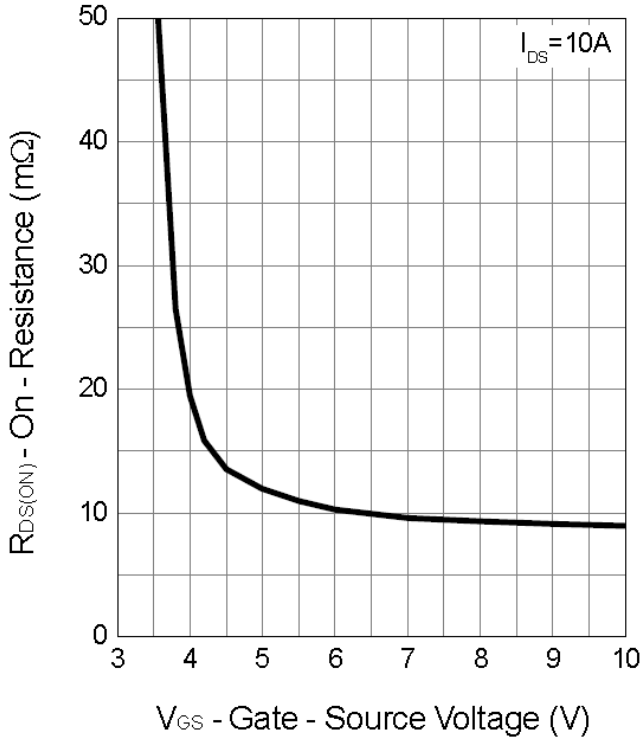
Drain-Source On Resistance



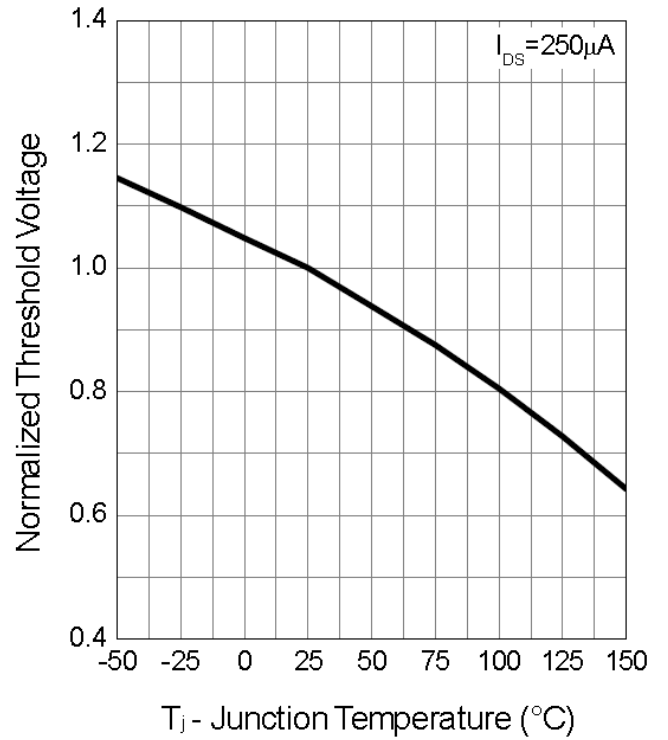
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Channel 1 Typical Operating Characteristics (Cont.)

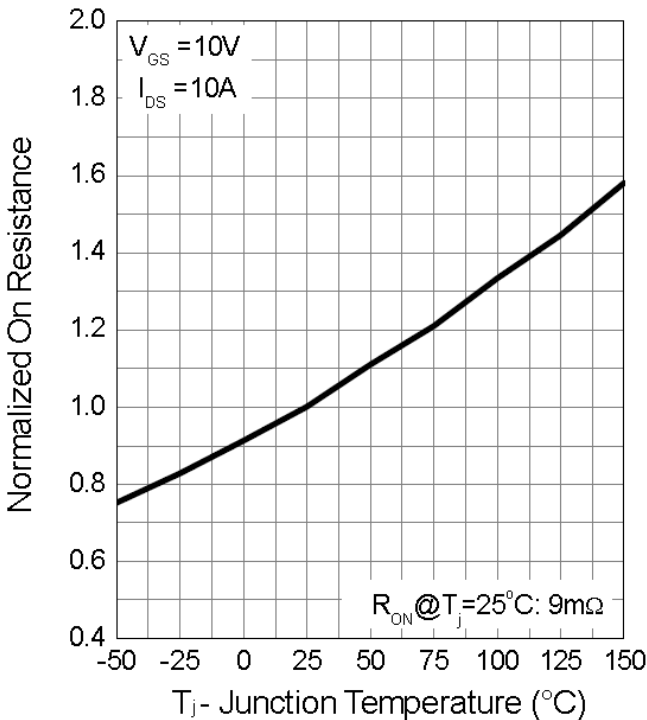
Gate-Source On Resistance



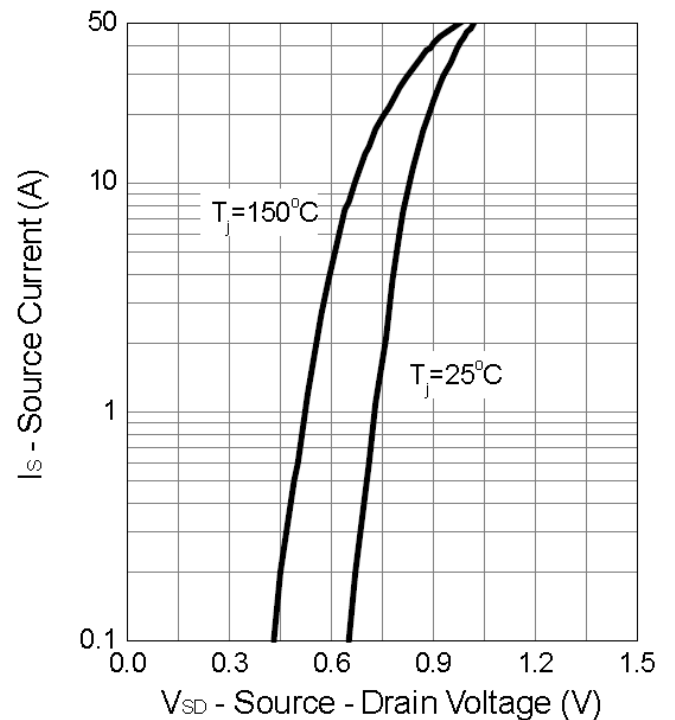
Gate Threshold Voltage



Drain-Source On Resistance



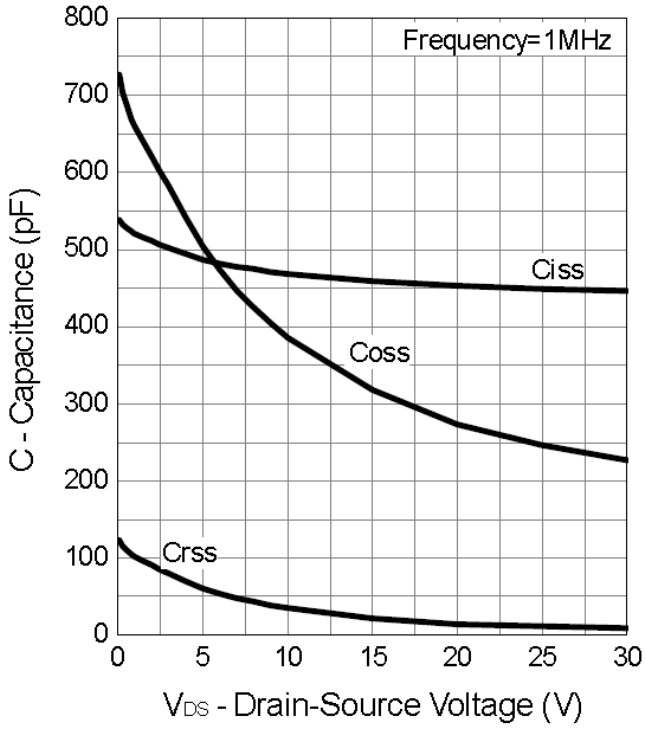
Source-Drain Diode Forward



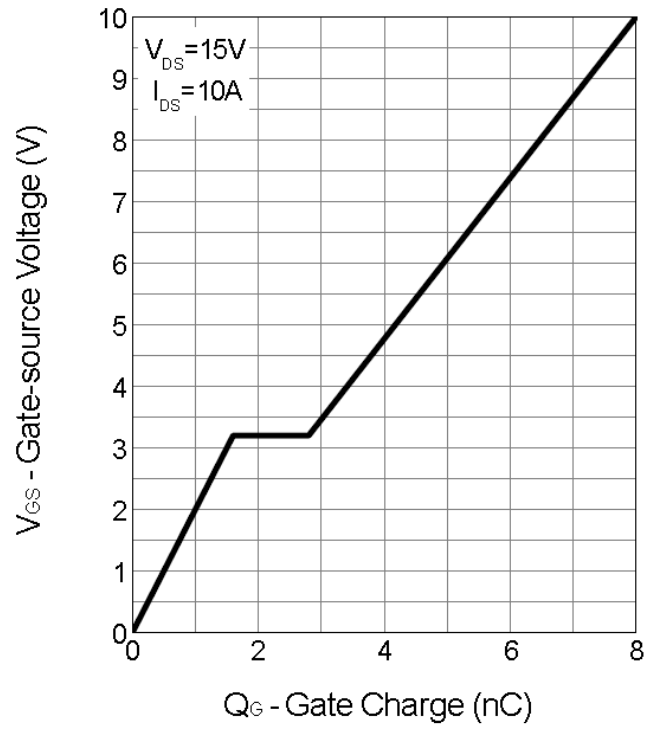
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Channel 1 Typical Operating Characteristics (Cont.)

Capacitance



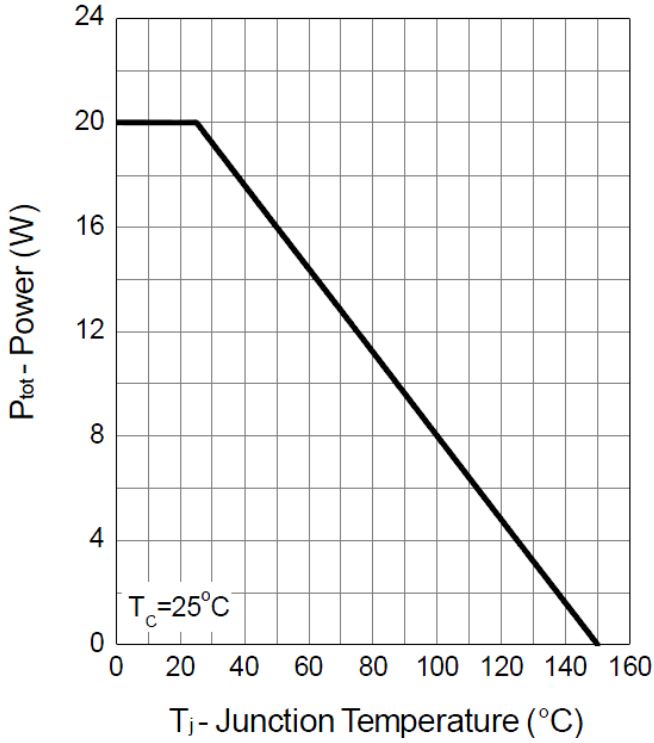
Gate Charge



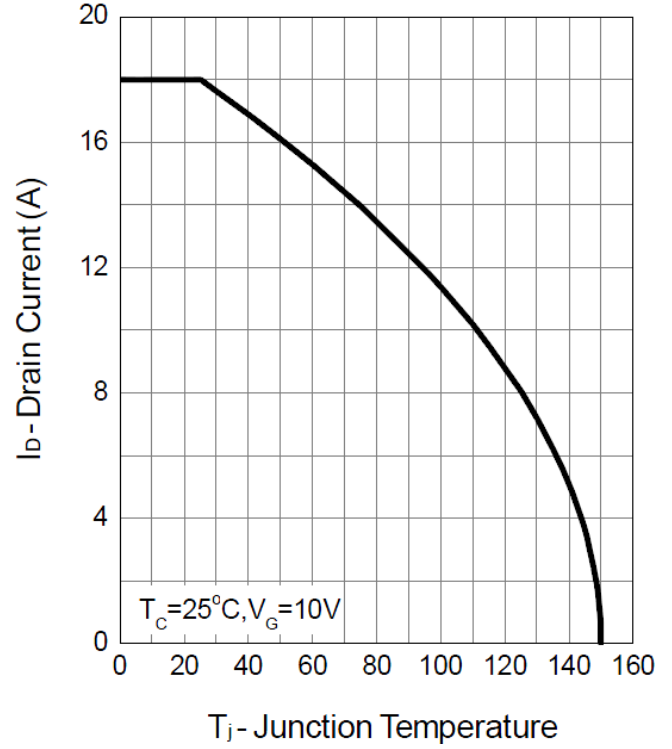
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Channel 2 Typical Operating Characteristics

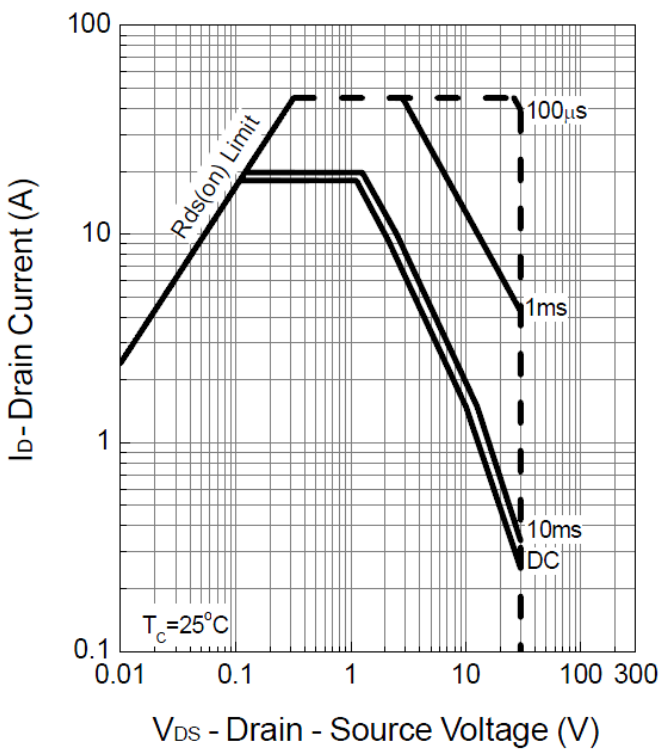
Power Dissipation



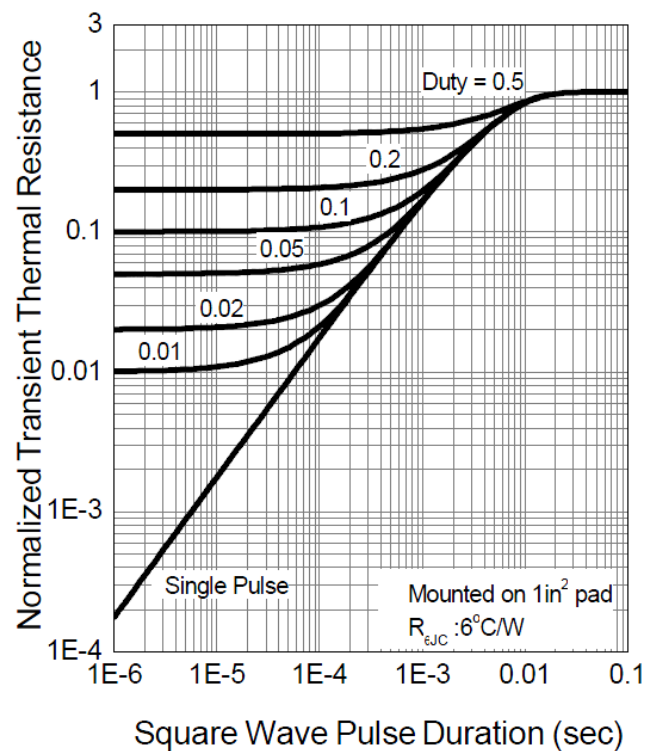
Drain Current



Safe Operation Area



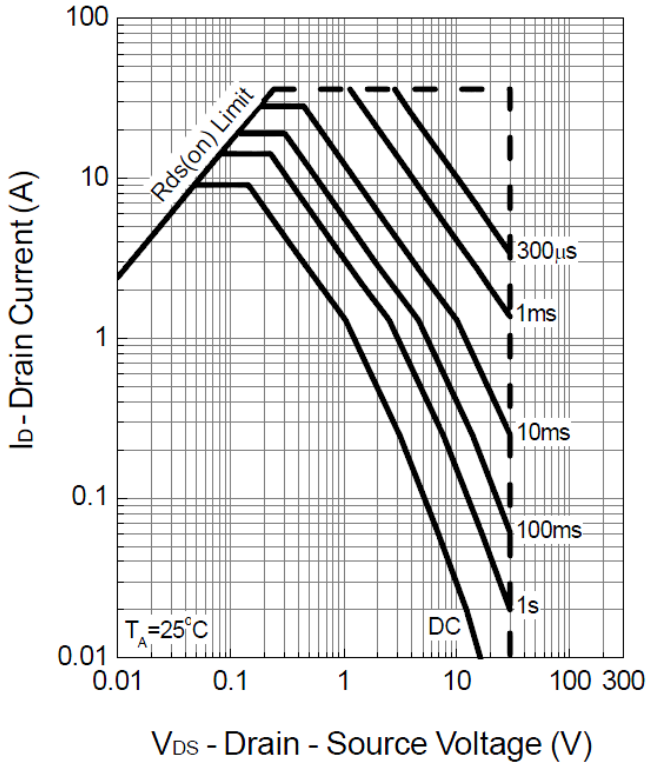
Thermal Transient Impedance



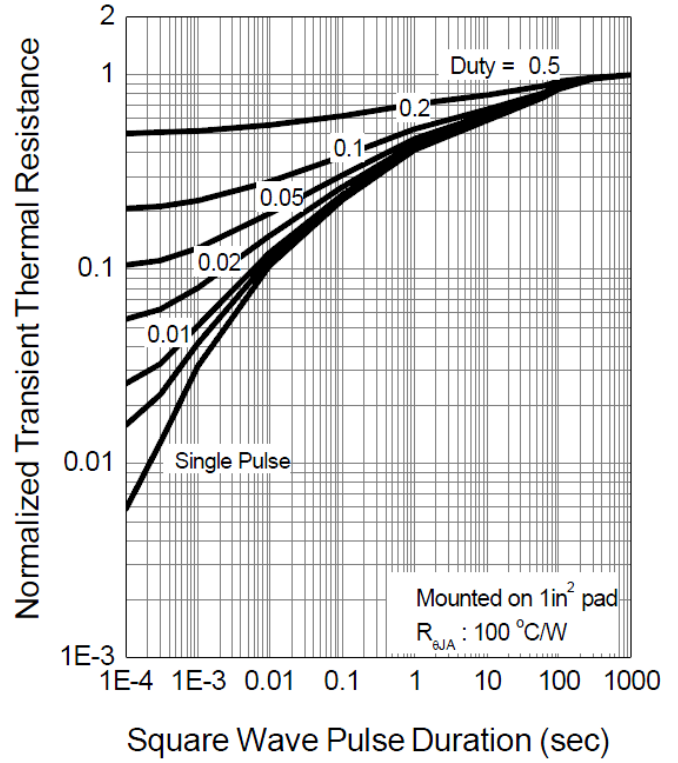
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Channel 2 Typical Operating Characteristics (Cont.)

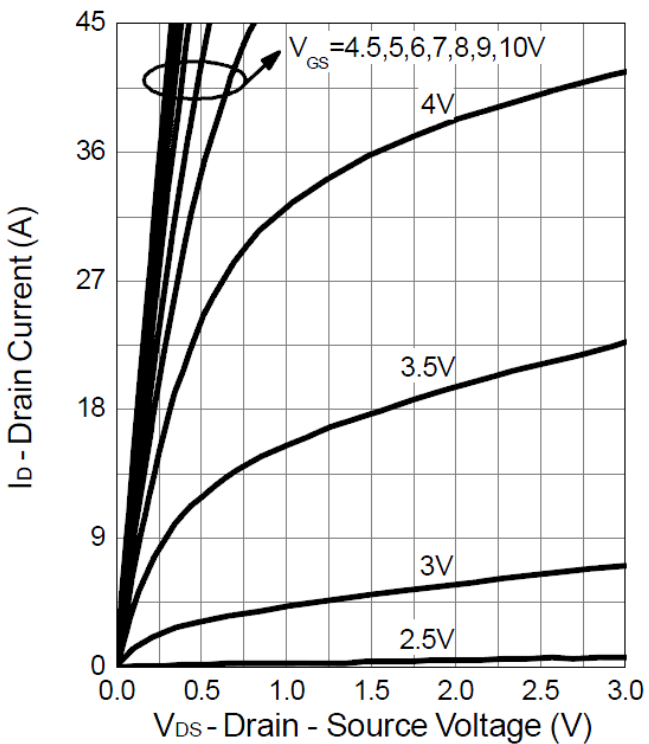
Safe Operation Area



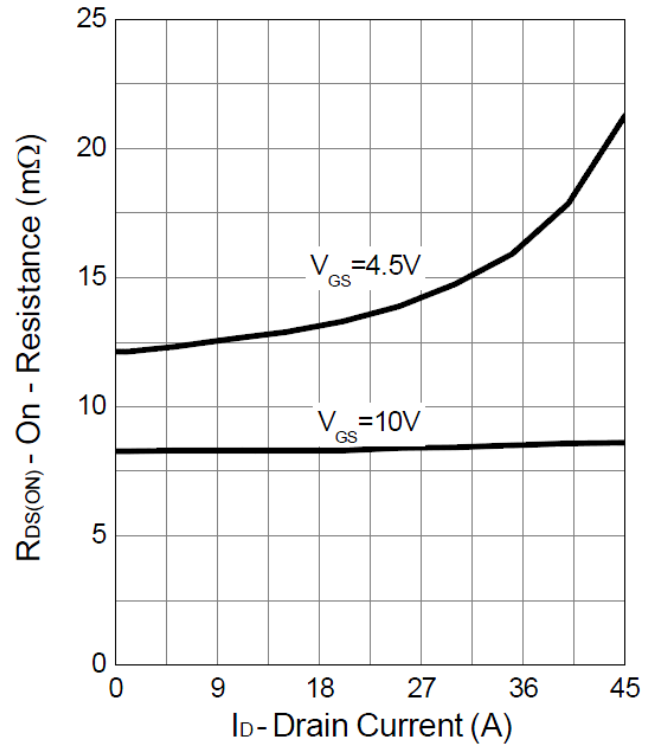
Thermal Transient Impedance



Output Characteristics



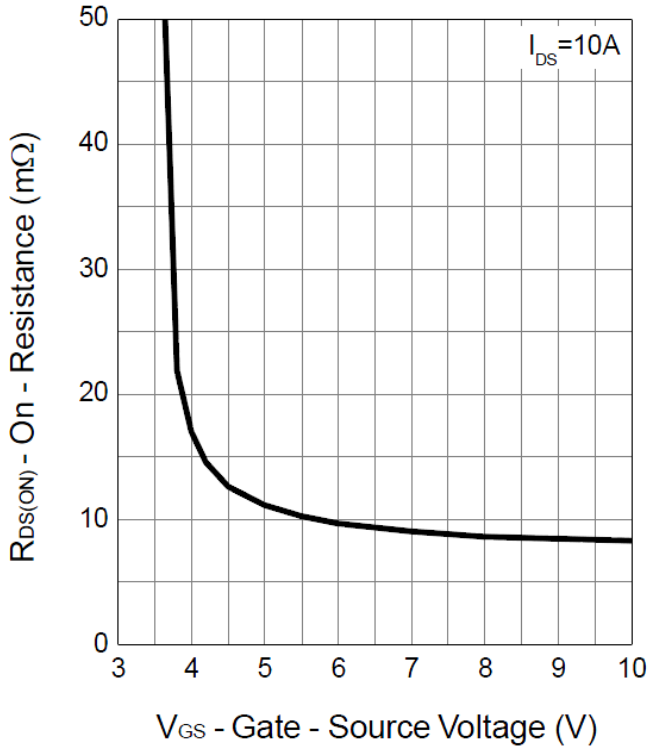
Drain-Source On Resistance



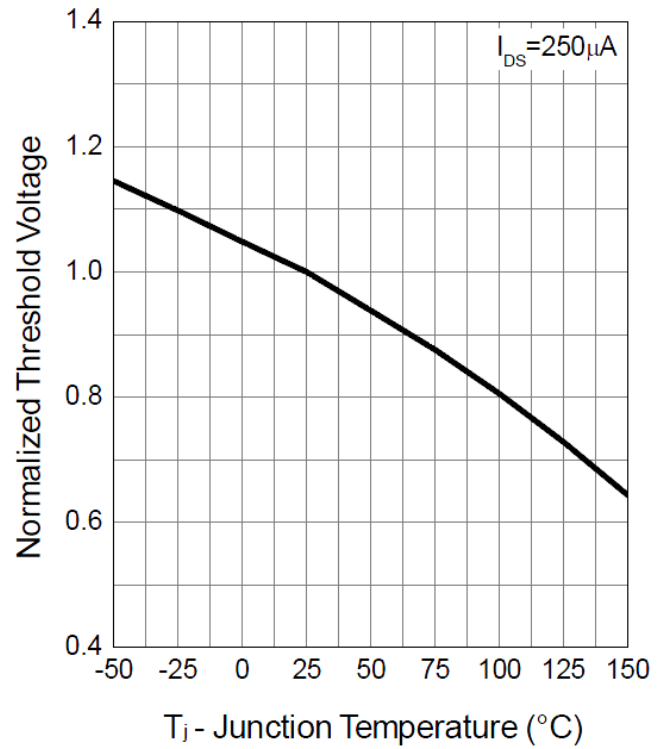
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Channel 2 Typical Operating Characteristics (Cont.)

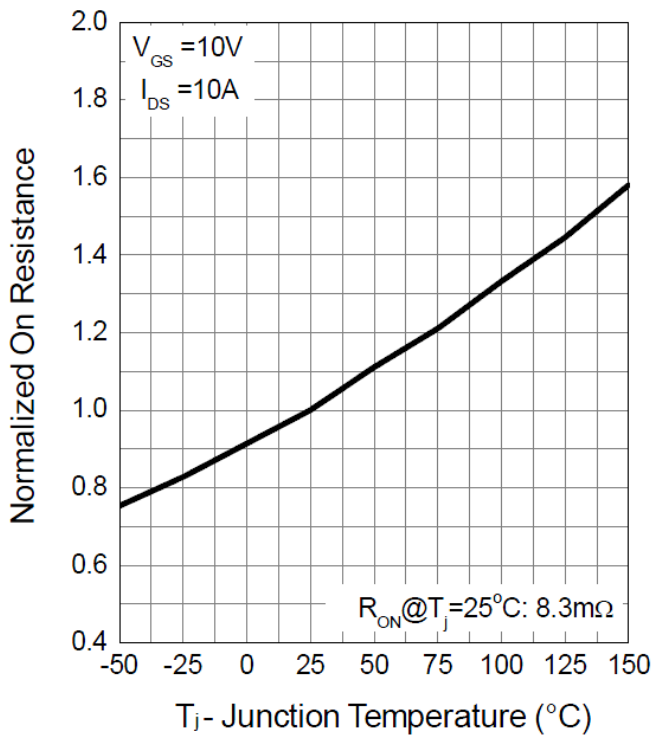
Gate-Source On Resistance



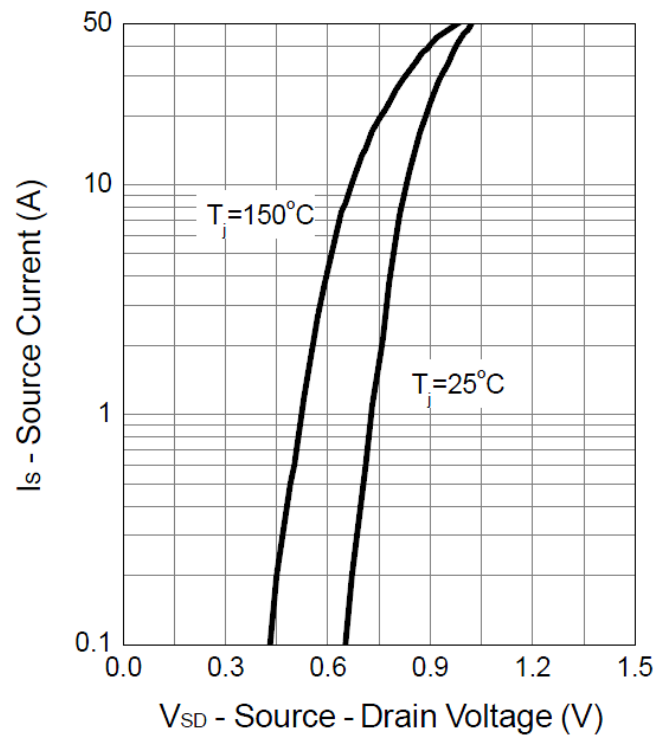
Gate Threshold Voltage



Drain-Source On Resistance

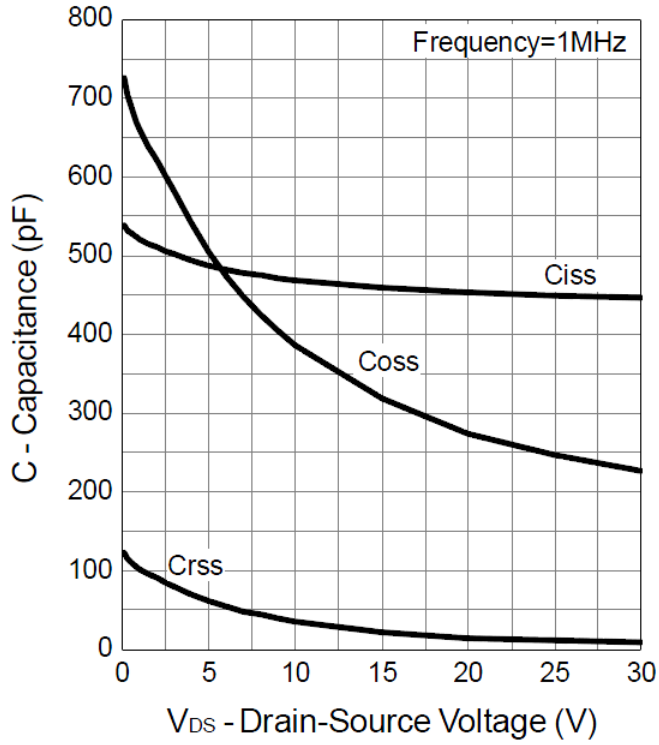


Source-Drain Diode Forward

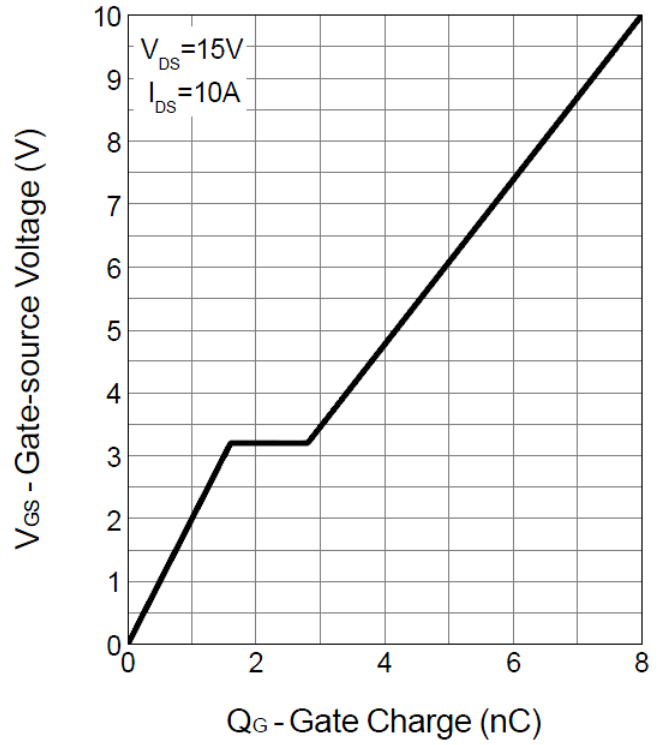


Channel 2 Typical Operating Characteristics (Cont.)

Capacitance

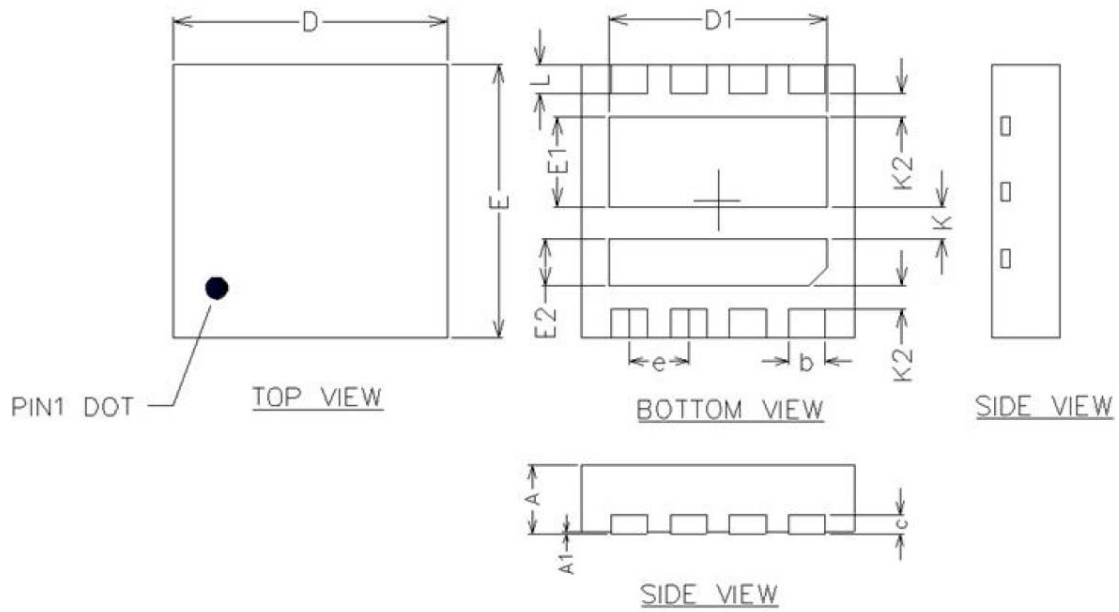


Gate Charge



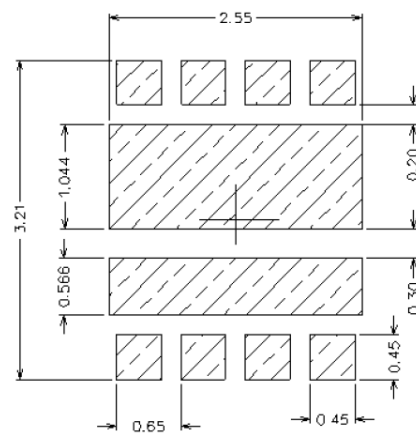
Package Information

DFN3*3E-8 Package



SYMBOLS	DFN3x3E-8_EP2_S			
	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
A	0.7	0.8	0.028	0.032
A1	0	0.05	0	0.002
c	0.203 REF.		0.008 REF.	
b	0.35	0.45	0.014	0.018
D	2.9	3.1	0.114	0.122
D1	2.3	2.5	0.09	0.098
E	2.9	3.1	0.114	0.122
E1	0.89	1.09	0.035	0.043
E2	0.42	0.62	0.016	0.024
e	0.65 BSC		0.026 BSC	
L	0.27	0.37	0.011	0.015
K	0.35 REF.		0.014 REF.	
K1	0.06 REF.		0.002 REF.	
K2	0.25 REF.		0.010 REF.	

RECOMMENDED LAND PATTERN



Design Notes