

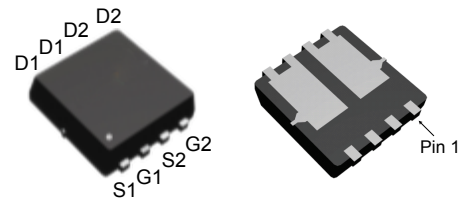
Features

- **N-Channel**
20V/20A,
 $R_{DS(ON)} = 13m\Omega(\text{typ.}) @ V_{GS}=4.5V$
 $R_{DS(ON)} = 18m\Omega(\text{typ.}) @ V_{GS}=2.5V$
- **P-Channel**
-20V/-18.8A,
 $R_{DS(ON)} = 25m\Omega(\text{typ.}) @ V_{GS}=-4.5V$
 $R_{DS(ON)} = 35m\Omega(\text{typ.}) @ V_{GS}=-2.5V$
- Reliable and Rugged
- Lead Free and Green Devices Available (RoHS Compliant)

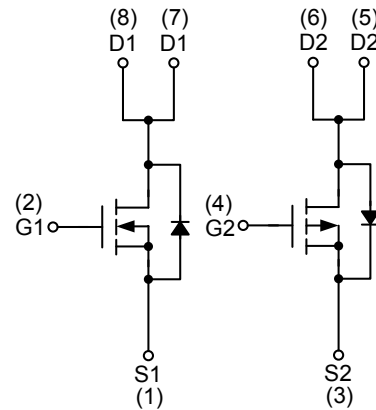
Applications

- Power Management in Notebook Computer, Portable Equipment and Battery Powered Systems

Pin Description



DFN3.3x3.3G-8_EP2



N-Channel MOSFET

P-Channel MOSFET

Absolute Maximum Ratings ($T_A = 25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter		N Channel	P Channel	Unit
Common Ratings					
V _{DSS}	Drain-Source Voltage		20	-20	V
V _{GSS}	Gate-Source Voltage		±12	±12	
T _J	Maximum Junction Temperature		150		°C
T _{STG}	Storage Temperature Range		-55 to 150		
I _S	Diode Continuous Forward Current	T _A =25°C	20	-18.8	A
I _D	Continuous Drain Current	T _A =25°C	20	-18.8	
I _{DM}	Pulsed Drain Current	T _A =25°C	60	-56.4	
P _D	Power Dissipation	T _A =25°C	13.9	13.9	W
		T _A =70°C	5.6	5.6	
R _{θJA}	Thermal Resistance-Junction to Ambient	t ≤ 10s	85		°C/W
		Steady State	135		
I _{AS}	Avalanche Current, Single pulse	L=0.5mH	19	-18	A
E _{AS}	Avalanche Energy, Single pulse	L=0.5mH	90	81	mJ

N Channel Electrical Characteristics (T_A = 25°C unless otherwise noted)

Symbol	Parameter	Test Conditions	N Channel			Unit
			Min.	Typ.	Max.	
Static Characteristics						
BV _{DSS}	Drain-Source Breakdown Voltage	V _{GS} =0V, I _{DS} =250μA	20	-	-	V
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} =16V, V _{GS} =0V	-	-	1	μA
		T _j =85°C	-	-	30	
V _{GS(th)}	Gate Threshold Voltage	V _{DS} =V _{GS} , I _{DS} =250μA	0.4	0.7	0.9	V
I _{GSS}	Gate Leakage Current	V _{GS} =±12V, V _{DS} =0V	-	-	±100	nA
R _{DS(ON)} ^a	Drain-Source On-state Resistance	V _{GS} =4.5V, I _{DS} =6.8A	-	13	17	mΩ
		V _{GS} =2.5V, I _{DS} =5A	-	18	23	
Diode Characteristics						
V _{SD} ^a	Diode Forward Voltage	I _{SD} =3A, V _{GS} =0V	-	0.7	1	V
t _{rr}	Reverse Recovery Time	I _{SD} =5A, dI _{SD} /dt=100A/μs	-	10.5	-	ns
Q _{rr}	Reverse Recovery Charge		-	2.5	-	nC
Dynamic Characteristics ^b						
R _g	Gate Resistance	V _{GS} =0V, V _{DS} =0V, F=1MHz	-	2.5	-	Ω
C _{iSS}	Input Capacitance	V _{GS} =0V, V _{DS} =10V, Frequency=1.0MHz	-	960	-	pF
C _{oSS}	Output Capacitance		-	130	-	
C _{rSS}	Reverse Transfer Capacitance		-	110	-	
t _{d(ON)}	Turn-on Delay Time	V _{DD} =10V, R _L =10Ω, I _{DS} =1A, V _{GEN} =10V, R _G =6Ω	-	4	8	ns
t _r	Turn-on Rise Time		-	12.5	23	
t _{d(OFF)}	Turn-off Delay Time		-	24	44	
t _f	Turn-off Fall Time		-	5	9	
Gate Charge Characteristics ^b						
Q _g	Total Gate Charge	V _{DS} =10V, V _{GS} =4.5V, I _{DS} =6.8A	-	6.5	10	nC
Q _{gs}	Gate-Source Charge		-	0.6	-	
Q _{gd}	Gate-Drain Charge		-	2.5	-	

Note a : Pulse test; pulse width≤300μs, duty cycle≤2%.

Note b : Guaranteed by design, not subject to production testing.

P Channel Electrical Characteristics (T_A = 25°C unless otherwise noted)

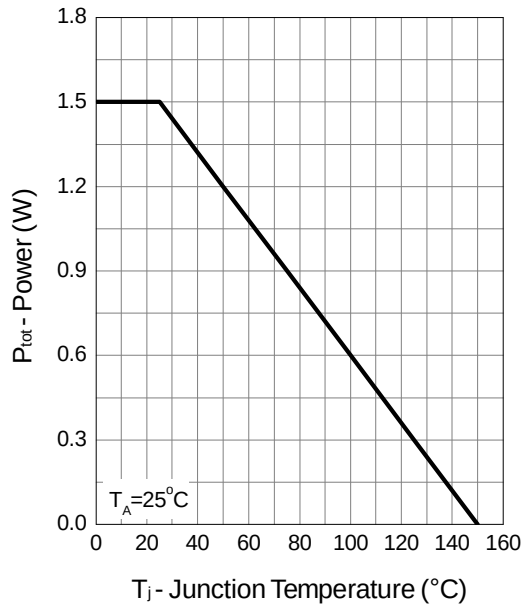
Symbol	Parameter	Test Conditions	P Channel			Unit
			Min.	Typ.	Max.	
Static Characteristics						
BV _{DSS}	Drain-Source Breakdown Voltage	V _{GS} =0V, I _{DS} =-250μA	-20	-	-	V
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} =-16V, V _{GS} =0V	-	-	-1	μA
		T _J =85°C	-	-	-30	μA
V _{GS(th)}	Gate Threshold Voltage	V _{DS} =V _{GS} , I _{DS} =-250μA	-0.4	-0.7	-0.9	V
I _{GSS}	Gate Leakage Current	V _{GS} =±12V, V _{DS} =0V	-	-	±100	nA
R _{DS(ON)} ^a	Drain-Source On-state Resistance	V _{GS} =-4.5V, I _{DS} =-4.4A	-	25	30	mΩ
		V _{GS} =-2.5V, I _{DS} =-3A	-	35	42	
Diode Characteristics						
V _{SD} ^a	Diode Forward Voltage	I _{SD} =-1A, V _{GS} =0V	-	-0.6	-1	V
t _{rr}	Reverse Recovery Time	I _{SD} =-4.4A, dI _{SD} /dt=100A/μs	-	30	-	ns
Q _{rr}	Reverse Recovery Charge		-	12	-	nC
Dynamic Characteristics ^b						
R _g	Gate Resistance	V _{GS} =0V, V _{DS} =0V, F=1MHz	-	8.9	-	Ω
C _{iss}	Input Capacitance	V _{GS} =0V, V _{DS} =-6V, Frequency=1.0MHz	-	884	-	pF
C _{oss}	Output Capacitance		-	164	-	
C _{rss}	Reverse Transfer Capacitance		-	94	-	
t _{d(ON)}	Turn-on Delay Time	V _{DD} =-10V, R _L =10Ω, I _{DS} =-1A, V _{GEN} =-4.5V, R _G =6Ω	-	5.4	-	ns
t _r	Turn-on Rise Time		-	42.	-	
t _{d(OFF)}	Turn-off Delay Time		-	425	-	
t _f	Turn-off Fall Time		-	48	-	
Gate Charge Characteristics ^b						
Q _g	Total Gate Charge	V _{DS} =-10V, V _{GS} =-4.5V, I _{DS} =-4.4A	-	8.4	-	nC
Q _{gs}	Gate-Source Charge		-	0.3	-	
Q _{gd}	Gate-Drain Charge		-	3.5	-	
Q _{gth}	Threshold Gate Charge		-	0.2	-	

Note a : Pulse test; pulse width≤300μs, duty cycle≤2%.

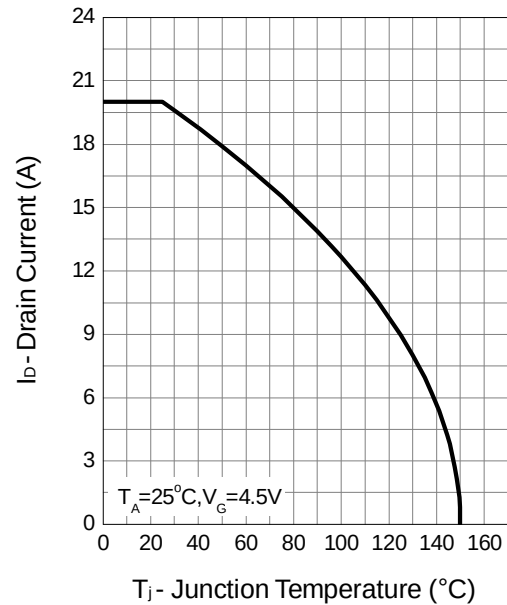
Note b : Guaranteed by design, not subject to production testing.

N Channel Typical Operating Characteristics

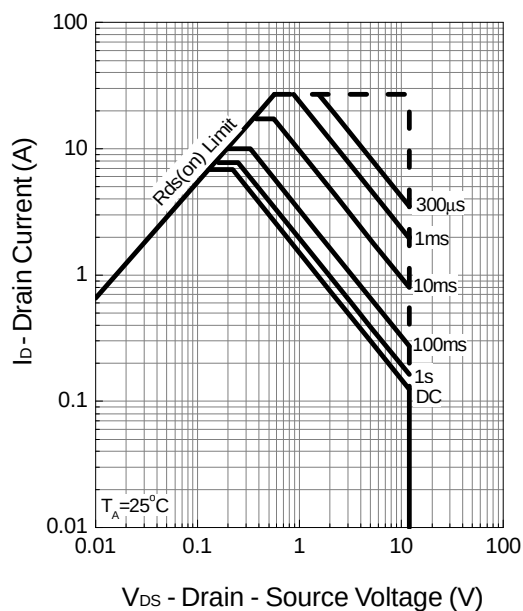
Power Dissipation



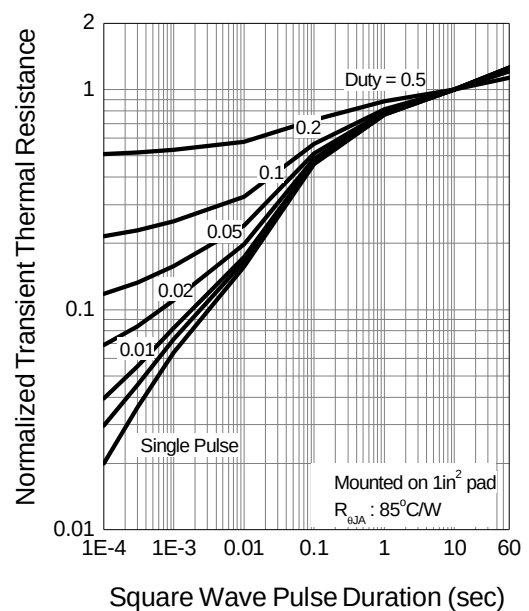
Drain Current



Safe Operation Area

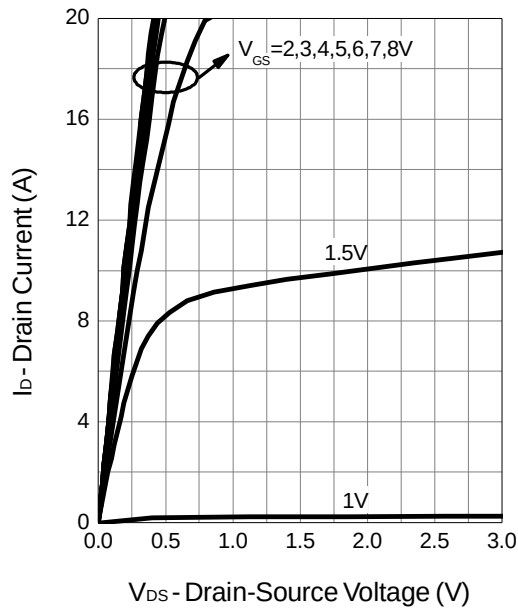


Thermal Transient Impedance

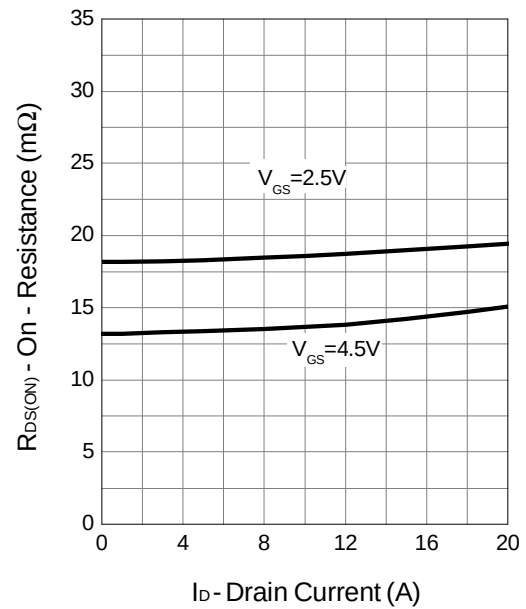


N Channel Typical Operating Characteristics (Cont.)

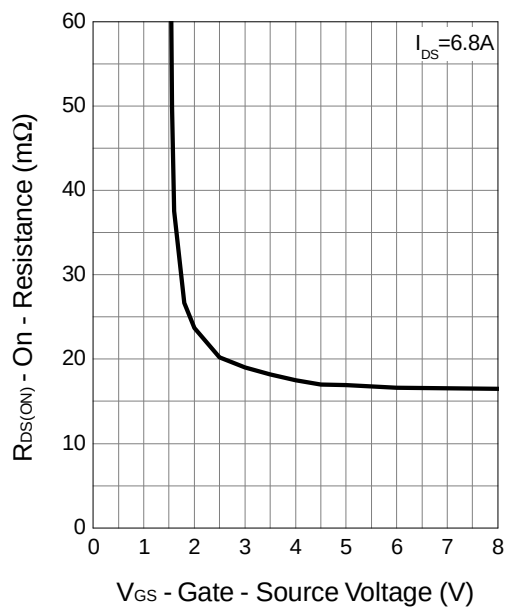
Output Characteristics



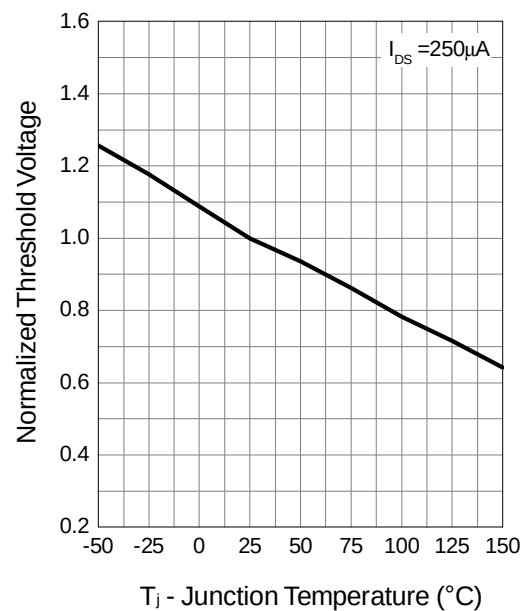
Drain-Source On Resistance



Gate-Source On Resistance

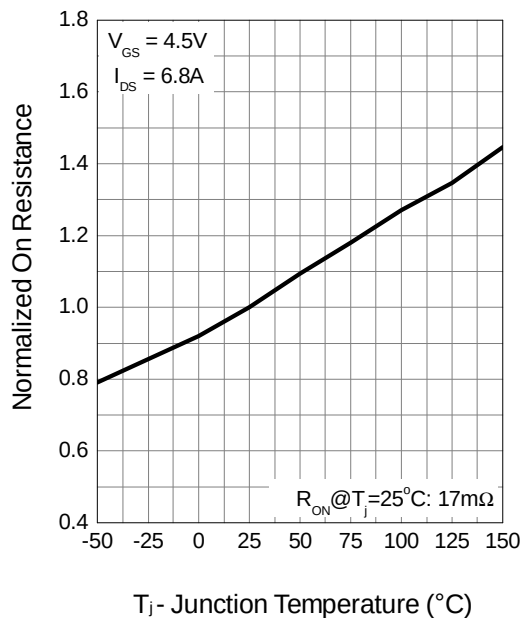


Gate Threshold Voltage

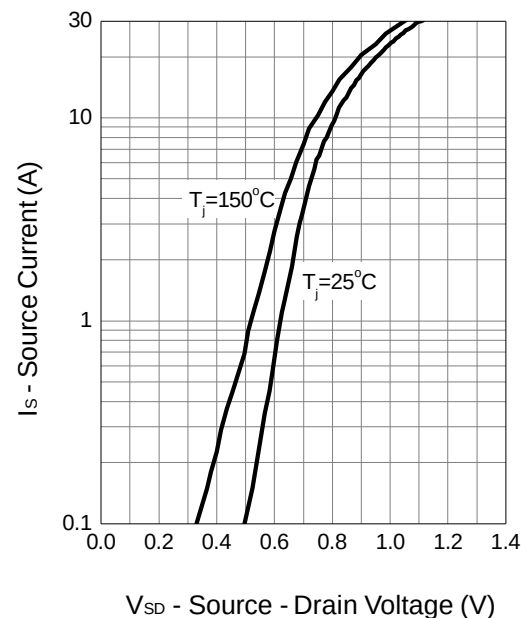


N Channel Typical Operating Characteristics (Cont.)

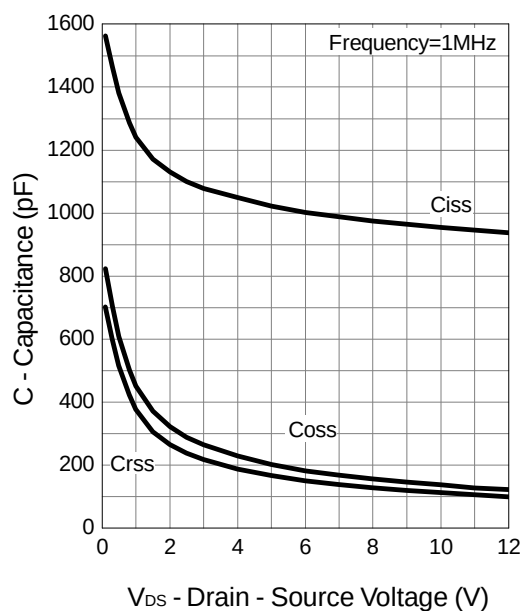
Drain-Source On Resistance



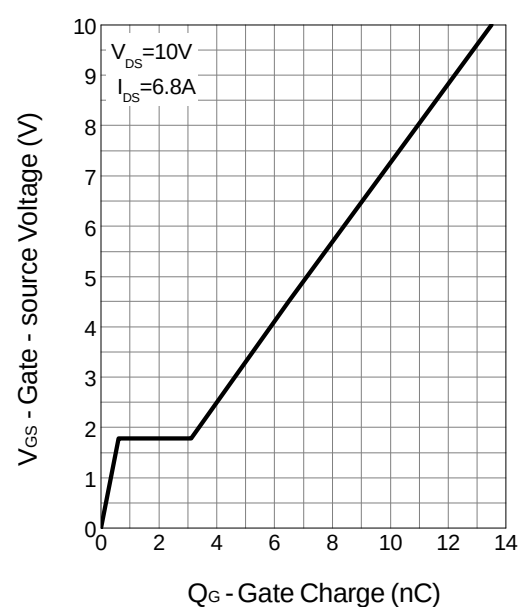
Source-Drain Diode Forward



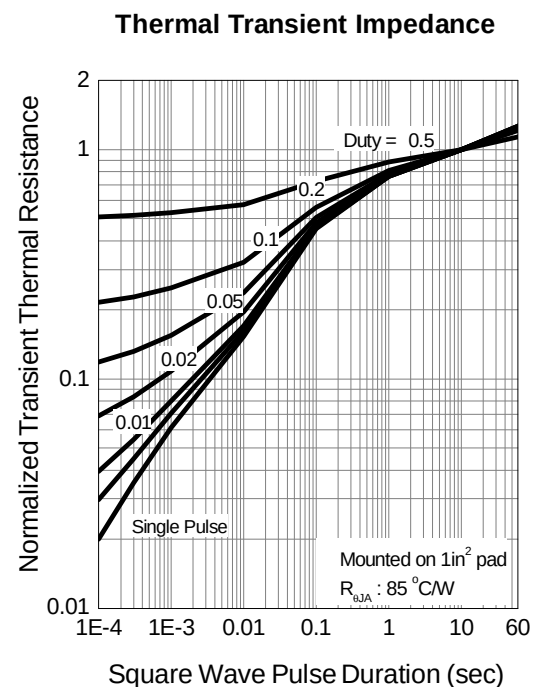
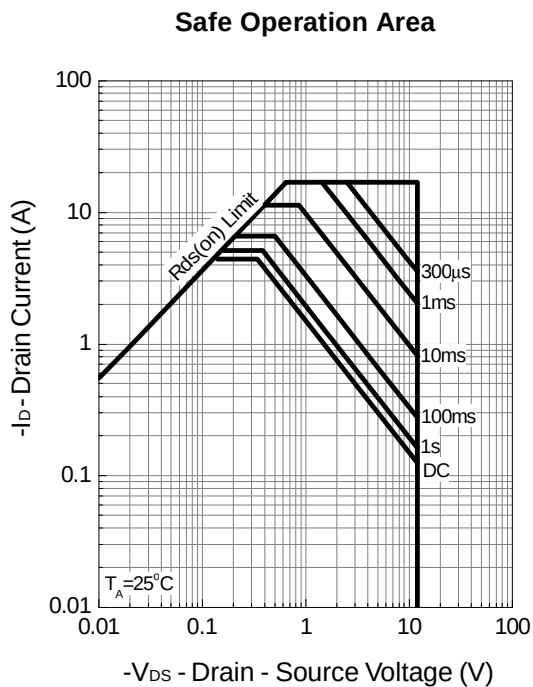
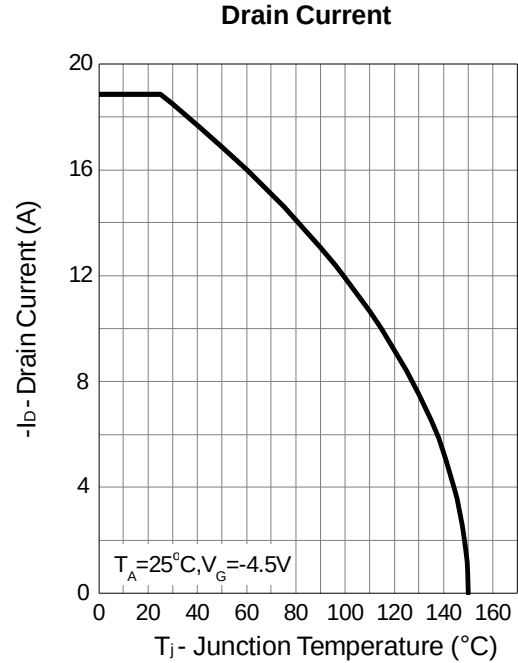
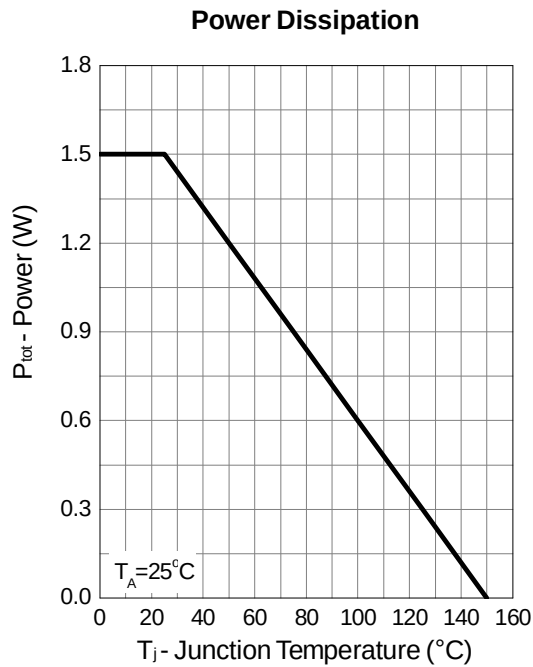
Capacitance



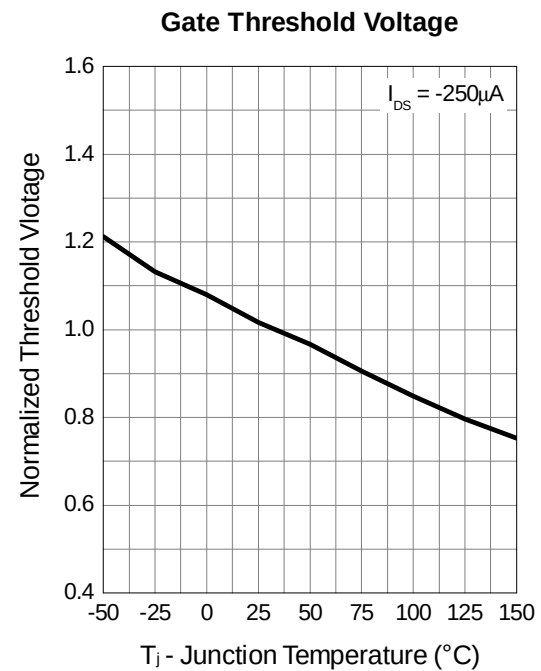
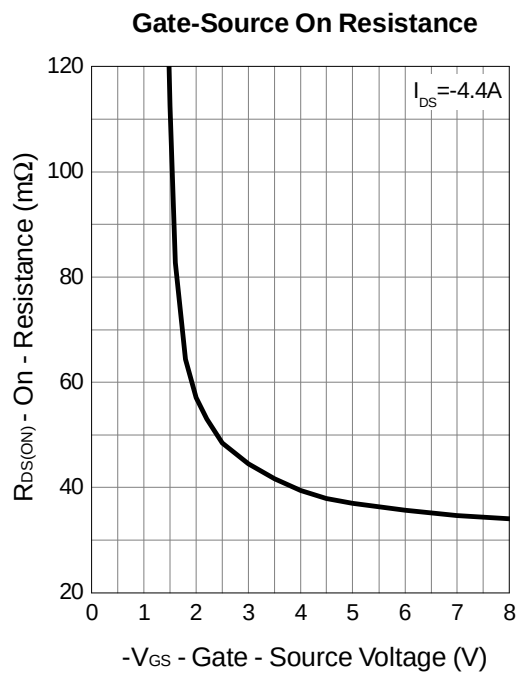
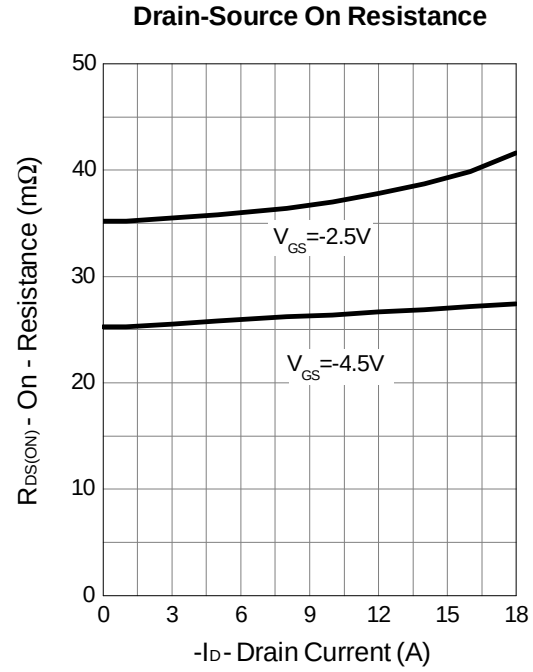
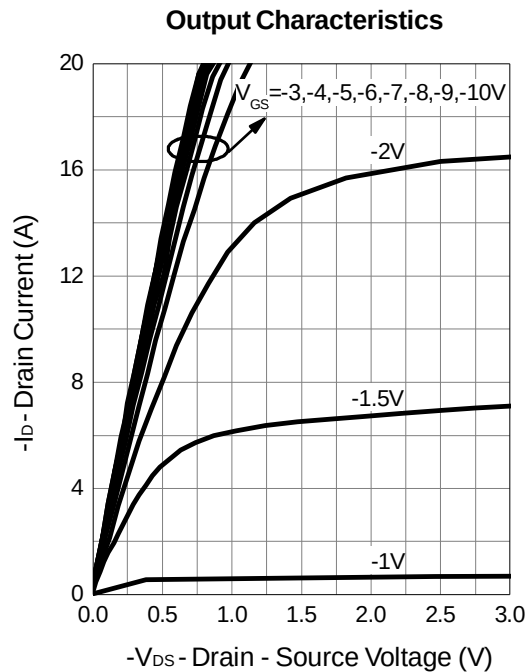
Gate Charge



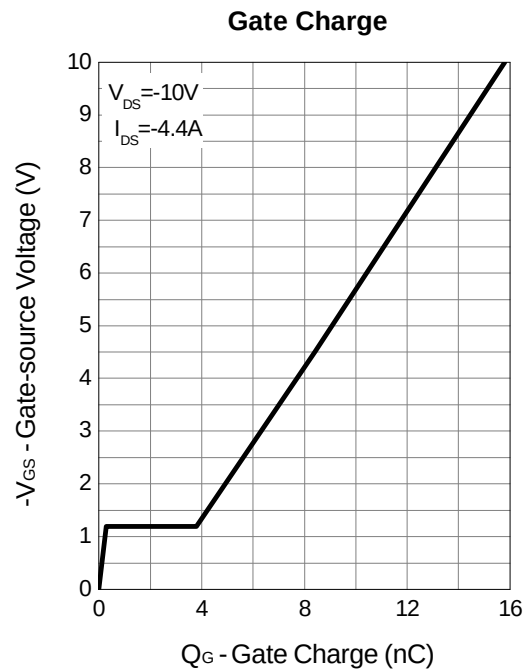
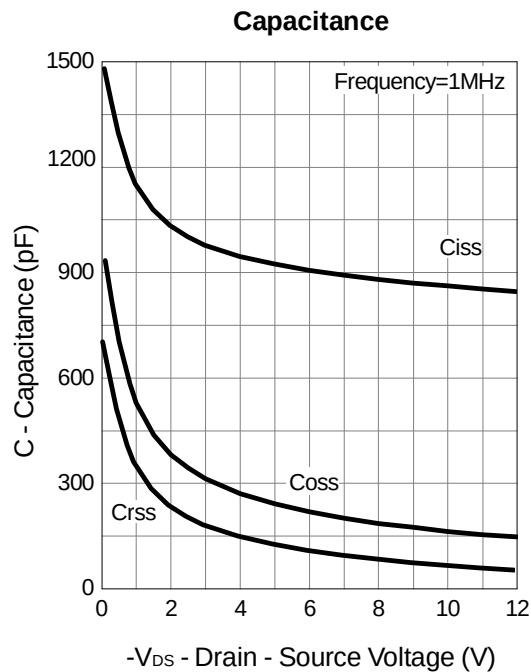
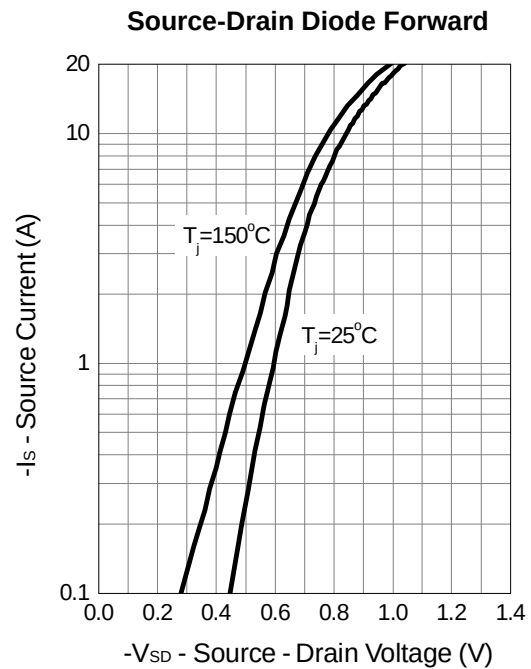
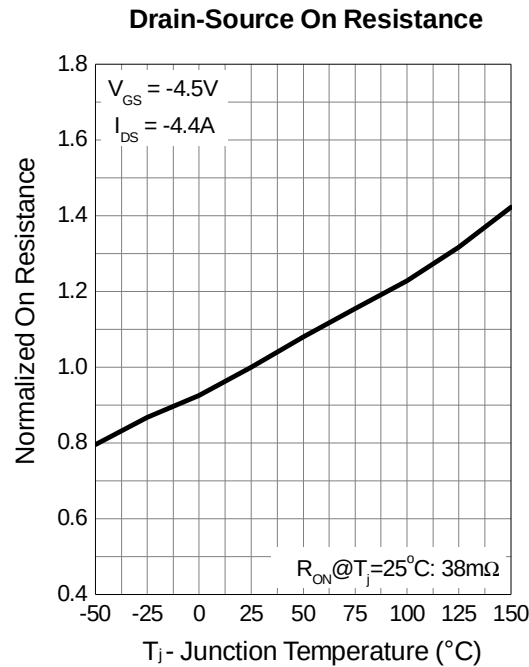
P Channel Typical Operating Characteristics



P Channel Typical Operating Characteristics (Cont.)

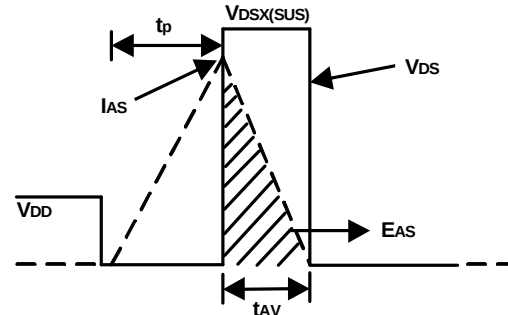
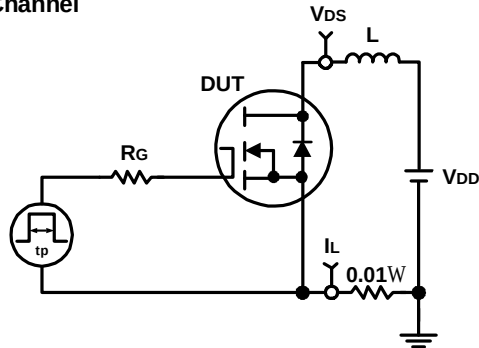


P Channel Typical Operating Characteristics (Cont.)

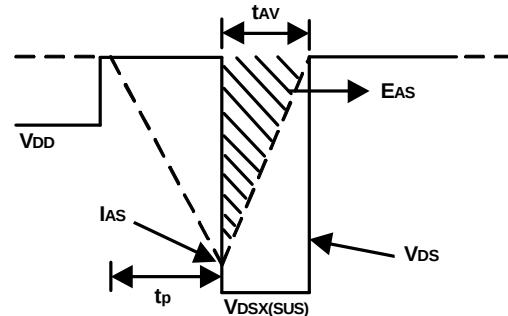
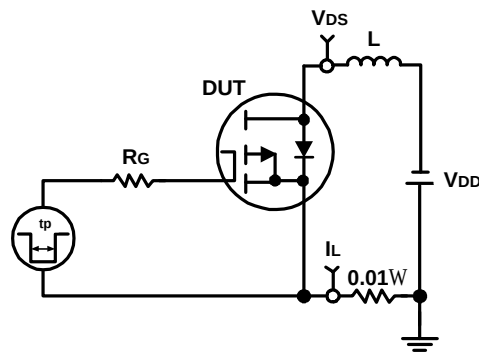


Avalanche Test Circuit and Waveforms

N Channel

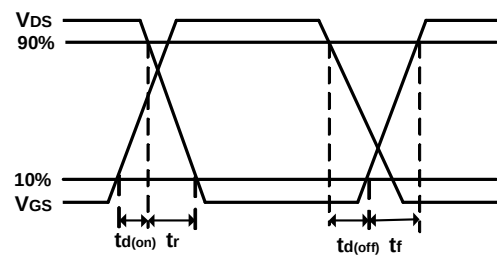
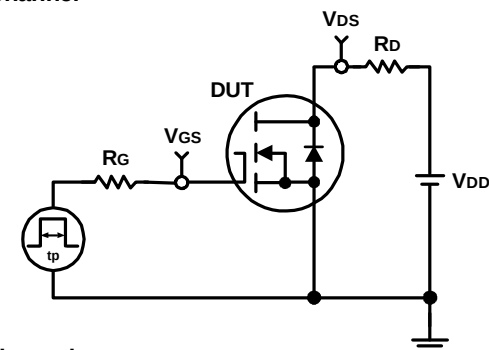


P Channel

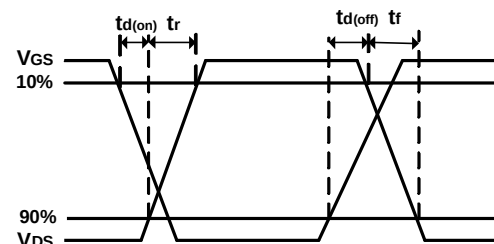
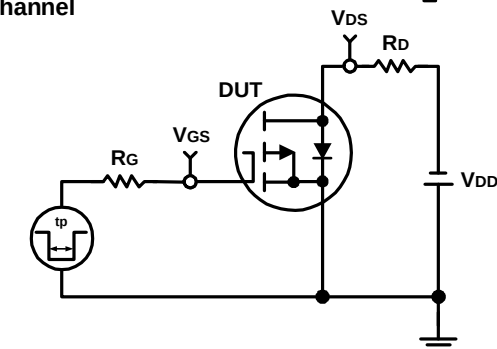


Switching Time Test Circuit and Waveforms

N Channel

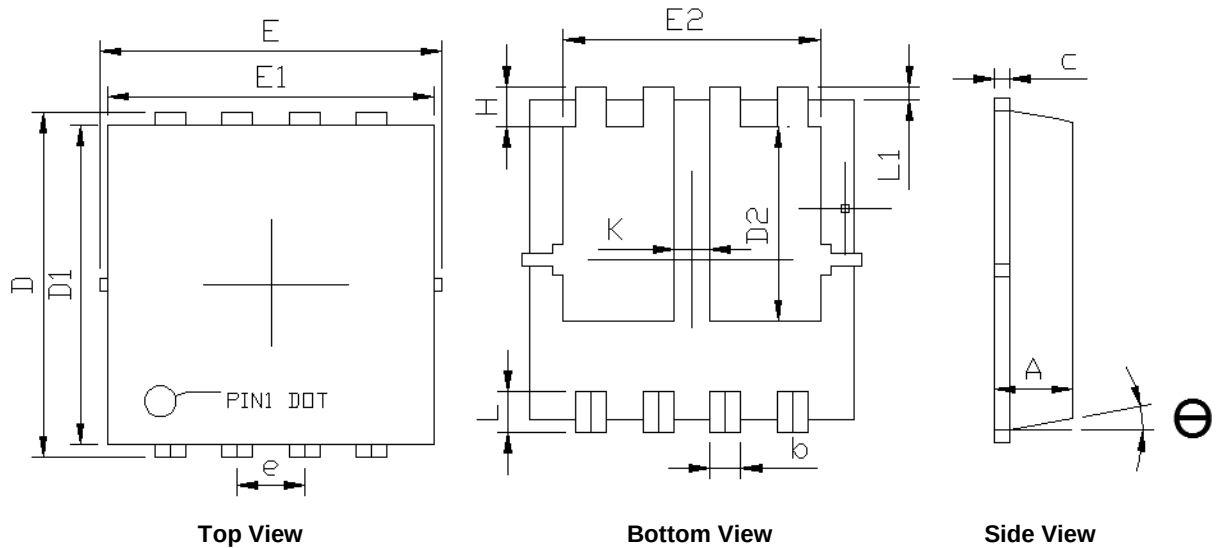


P Channel



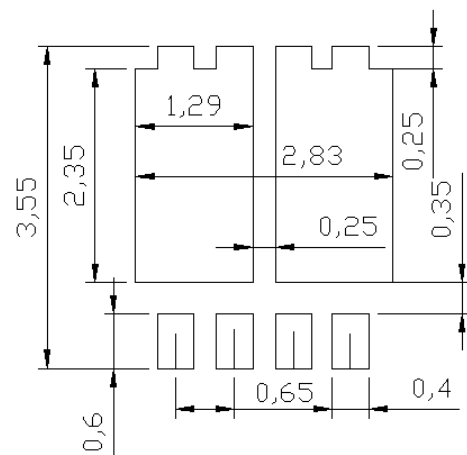
Package Information

DFN3.3x3.3G-8_EP2



SYMBOLS	DFN3.3x3.3G-8_EP2_P			
	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
A	0.70	0.80	0.028	0.031
b	0.25	0.35	0.010	0.014
c	0.10	0.25	0.004	0.010
D	3.25	3.45	0.128	0.136
D1	3.00	3.20	0.118	0.126
D2	1.78	1.98	0.070	0.078
E	3.00	3.40	0.118	0.134
E1	3.00	3.20	0.118	0.126
E2	2.39	2.59	0.094	0.102
e	0.65BSC		0.026 BSC	
H	0.30	0.50	0.012	0.020
L	0.30	0.50	0.012	0.020
L1	0.13 REF		0.005 REF	
K	0.30	-	0.012	-
θ	-	12°	-	12°

RECOMMENDED LAND PATTERN



UNIT: mm