

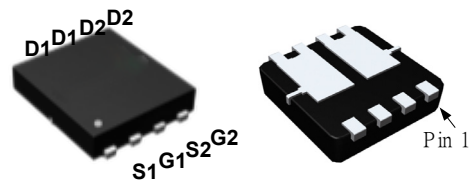
Features

- N Channel : 40V/20A,
 $R_{DS(ON)}=16m\Omega(\text{typ.})@V_{GS}=10V$
 $R_{DS(ON)}=21m\Omega(\text{typ.})@V_{GS}=4.5V$
- P Channel : -40V/-15A,
 $R_{DS(ON)}=32m\Omega(\text{typ.})@V_{GS}=-10V$
 $R_{DS(ON)}=42m\Omega(\text{typ.})@V_{GS}=-4.5V$
- 100% UIS + R_g Tested
- Reliable and Rugged
- Lead Free and Green Devices Available (RoHS Compliant)
- Moisture Sensitivity Level MSL1 (per JEDEC J-STD-020D)

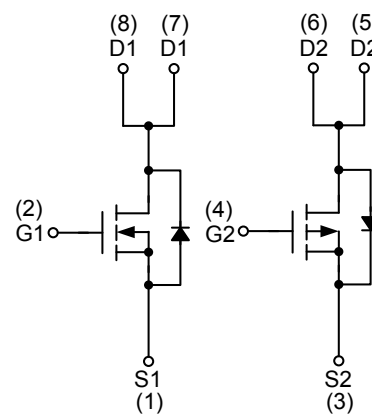
Applications

- For Fan Pre-driver H-Bridge.
- Motor Control.
- Synchronous Rectification.

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		40	-40	V
V _{GSS}	Gate-Source Voltage		±20	±20	
T _J	Maximum Junction Temperature		150		°C
T _{STG}	Storage Temperature Range		-55 to 150		
I _S	Diode Continuous Forward Current	T _C =25°C	20	-15	A
I _D	Continuous Drain Current	T _C =25°C	20	-15	A
		T _C =100°C	15	-12	A
I _{DM} ^a	Pulse Drain Current Tested	T _C =25°C	60	-45	A
P _D	Maximum Power Dissipation	T _C =25°C	13.9	13.9	W
		T _C =100°C	5.6	5.6	
R _{θJC}	Thermal Resistance-Junction to Case		9	9	°C/W
R _{θJA} ^c	Thermal Resistance-Junction to Ambient	Steady State	95		°C/W
I _{AS} ^b	Avalanche Current, Single pulse	L=0.5mH	10	-11	A
E _{AS} ^b	Avalanche Energy, Single pulse	L=0.5mH	25	30	mJ

Note * : Calculated continuous current based on maximum allowable junction temperature. Bonding wire limitation current is 8A.

Note a : Pulse width limited by maximum junction temperature.

Note b : UIS tested and pulse width limited by maximum junction temperature (initial temperature $T_J=25^{\circ}\text{C}$).

Note c : Surface Mounted on 1in^2 pad area.

N Channel Electrical Characteristics ($T_A = 25^\circ\text{C}$ 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	40	-	-	V
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} =32V, V _{GS} =0V	-	-	1	μA
		T _J =85°C	-	-	30	
V _{GS(th)}	Gate Threshold Voltage	V _{DS} =V _{GS} , I _{DS} =250μA	1.5	2	2.5	V
I _{GSS}	Gate Leakage Current	V _{GS} =±20V, V _{DS} =0V	-	-	±100	nA
R _{DS(ON)} ^d	Drain-Source On-state Resistance	V _{GS} =10V, I _{DS} =6A	-	16	19	mΩ
		V _{GS} =4.5V, I _{DS} =5A	-	21	23	
Diode Characteristics						
V _{SD} ^d	Diode Forward Voltage	I _{SD} =1A, V _{GS} =0V	-	0.75	1.1	V
t _{rr}	Reverse Recovery Time	I _{SD} =8A, dI _{SD} /dt=100A/μs	-	14.5	-	ns
Q _{rr}	Reverse Recovery Charge		-	9	-	nC
Dynamic Characteristics ^e						
R _G	Gate Resistance	V _{GS} =0V,V _{DS} =0V,F=1MHz	-	2.3	-	Ω
C _{iss}	Input Capacitance	V _{GS} =0V, V _{DS} =20V, Frequency=1.0MHz	-	726	-	pF
C _{oss}	Output Capacitance		-	92	-	
C _{rss}	Reverse Transfer Capacitance		-	60	-	
t _{d(ON)}	Turn-on Delay Time	V _{DD} =20V, R _L =20Ω, I _{DS} =1A, V _{GEN} =10V, R _G =6Ω	-	9.2	16.5	ns
t _r	Turn-on Rise Time		-	6.9	12.88	
t _{d(OFF)}	Turn-off Delay Time		-	21	38.6	
t _f	Turn-off Fall Time		-	5.1	9.2	
Gate Charge Characteristics ^e						
Q _g	Total Gate Charge	V _{DS} =20V, V _{GS} =10V, I _{DS} =8A	-	12.88	18	nC
Q _g	Total Gate Charge	V _{DS} =20V, V _{GS} =4.5V, I _{DS} =8A	-	6.44	-	
Q _{gs}	Gate-Source Charge		-	2.3	-	
Q _{gd}	Gate-Drain Charge		-	2.66	-	

Note d : Pulse test ; pulse width $\leq 300\mu s$, duty cycle $\leq 2\%$.

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

P Channel Electrical Characteristics ($T_A = 25^\circ\text{C}$ unless otherwise noted)

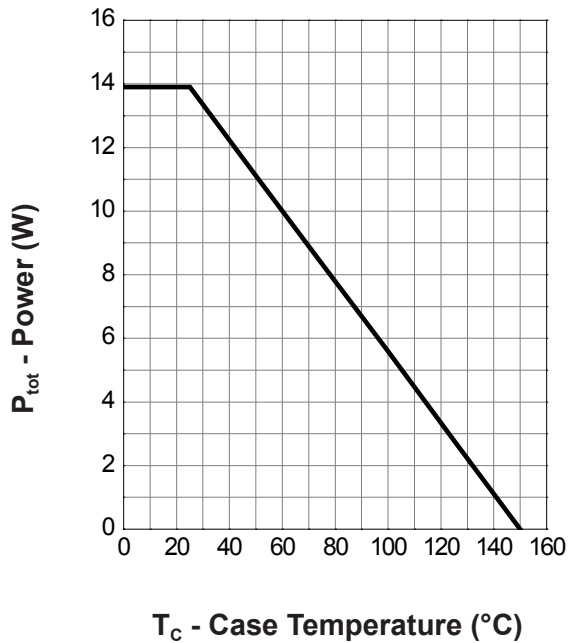
Symbol	Parameter	Test Conditions	P Channel			Unit
			Min.	Typ.	Max.	
Static Characteristics						
BV _{DSS}	Drain-Source Breakdown Voltage	V _{GS} =0V, I _{DS} =-250μA	-40	-	-	V
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} =-32V, V _{GS} =0V	-	-	-1	μA
		T _J =85°C	-	-	-30	
V _{GS(th)}	Gate Threshold Voltage	V _{DS} =V _{GS} , I _{DS} =250μA	-1.5	-2	-2.5	V
I _{GSS}	Gate Leakage Current	V _{GS} =±20V, V _{DS} =0V	-	-	±100	nA
R _{DS(ON)} ^d	Drain-Source On-state Resistance	V _{GS} =-10V, I _{DS} =-12A	-	32	38	mΩ
		V _{GS} =-4.5V, I _{DS} =-10A	-	42	47	
Diode Characteristics						
V _{SD} ^d	Diode Forward Voltage	I _{SD} =-1A, V _{GS} =0V	-	-0.75	-1.1	V
t _{rr}	Reverse Recovery Time	I _{SD} =-8A, dI _{SD} /dt=100A/μs	-	16	-	ns
Q _{rr}	Reverse Recovery Charge		-	11	-	nC
Dynamic Characteristics ^e						
R _G	Gate Resistance	V _{GS} =0V,V _{DS} =0V,F=1MHz	-	8	-	Ω
C _{iss}	Input Capacitance	V _{GS} =0V, V _{DS} =-20V, Frequency=1.0MHz	-	614	-	pF
C _{oss}	Output Capacitance		-	96	-	
C _{rss}	Reverse Transfer Capacitance		-	73	-	
t _{d(ON)}	Turn-on Delay Time	V _{DD} =-20V, R _L =-20Ω, I _{DS} =-1A, V _{GEN} =-10V, R _G =6Ω	-	8.3	14.7	ns
t _r	Turn-on Rise Time		-	6.4	12	
t _{d(OFF)}	Turn-off Delay Time		-	28.5	51.5	
t _f	Turn-off Fall Time		-	15.6	28.5	
Gate Charge Characteristics ^e						
Q _g	Total Gate Charge	V _{DS} =-20V, V _{GS} =-4.5V, I _{DS} =-8A	-	6.6	-	nC
Q _g	Total Gate Charge	V _{DS} =-20V, V _{GS} =-10V, I _{DS} =-8A	-	13	18	
Q _{gs}	Gate-Source Charge		-	2.2	-	
Q _{gd}	Gate-Drain Charge		-	3.5	-	

Note d : Pulse test ; pulse width $\leq 300\mu s$, duty cycle $\leq 2\%$.

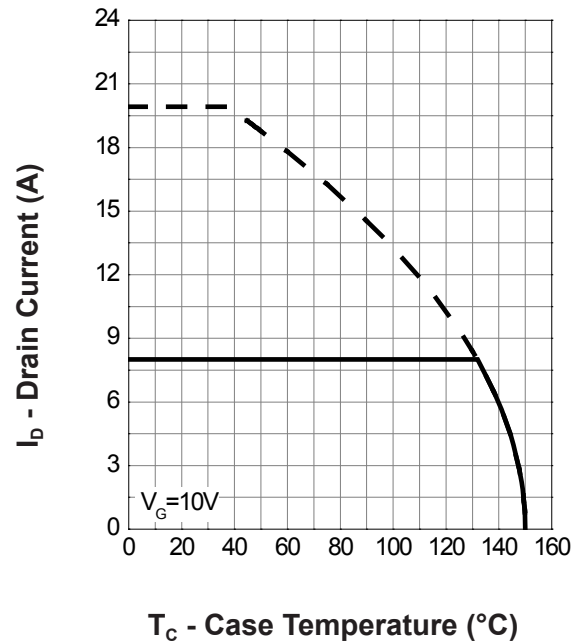
Note e : Guaranteed by design, not subject to production testing.

N Channel Typical Operating Characteristics

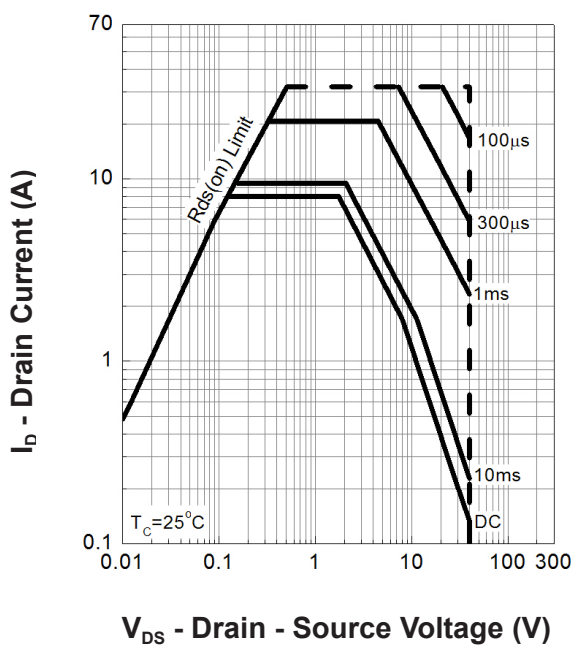
Power Dissipation



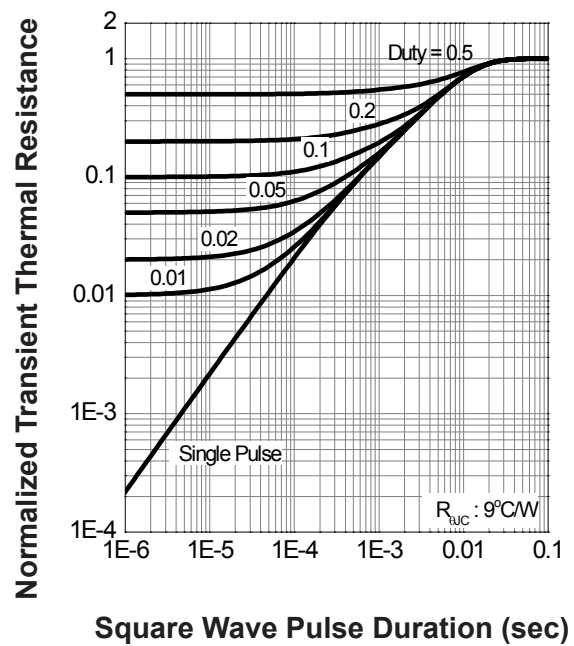
Drain Current



Safe Operation Area

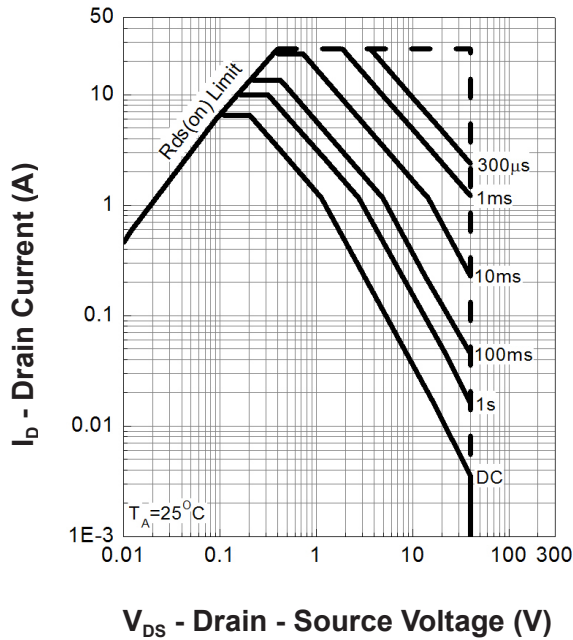


Thermal Transient Impedance

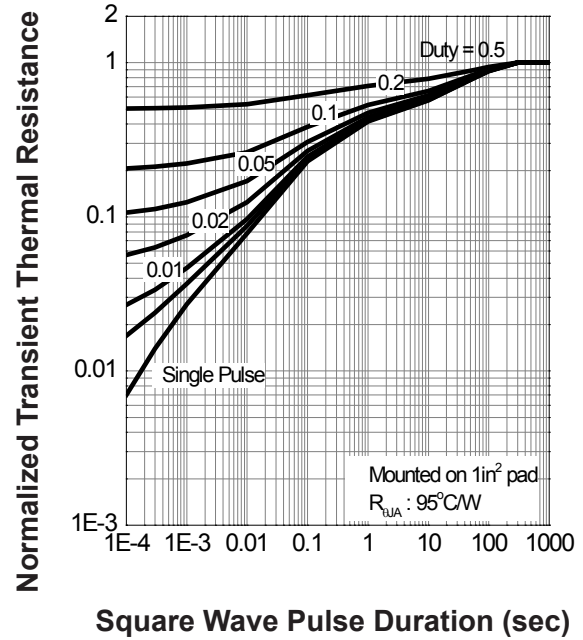


N Channel Typical Operating Characteristics(Cont.)

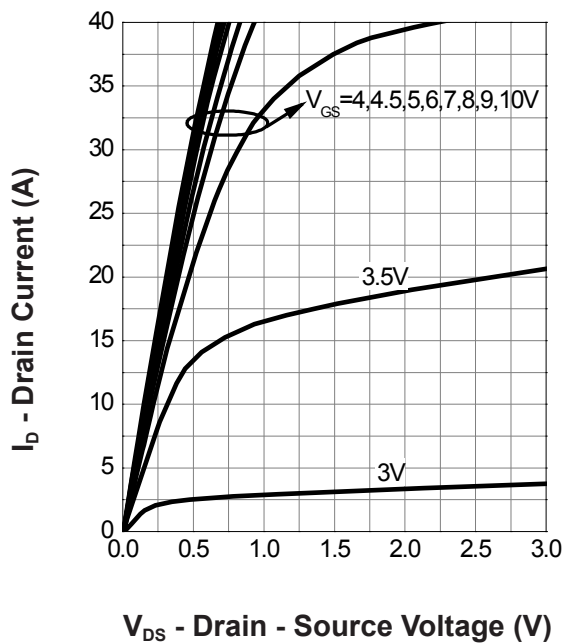
Safe Operation Area



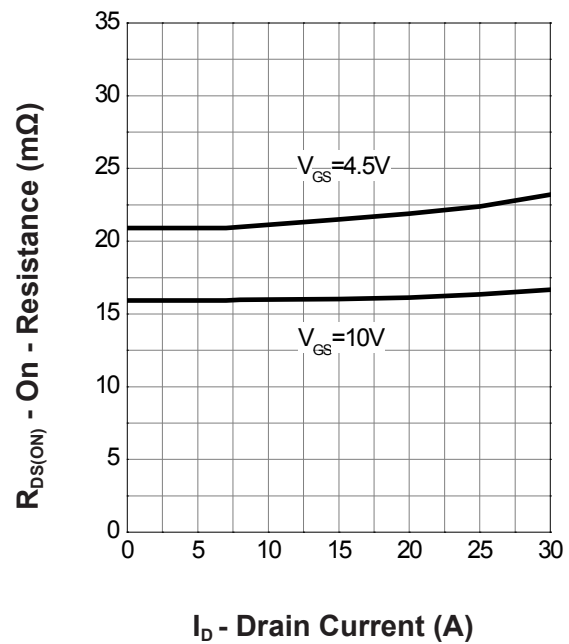
Thermal Transient Impedance



Output Characteristics

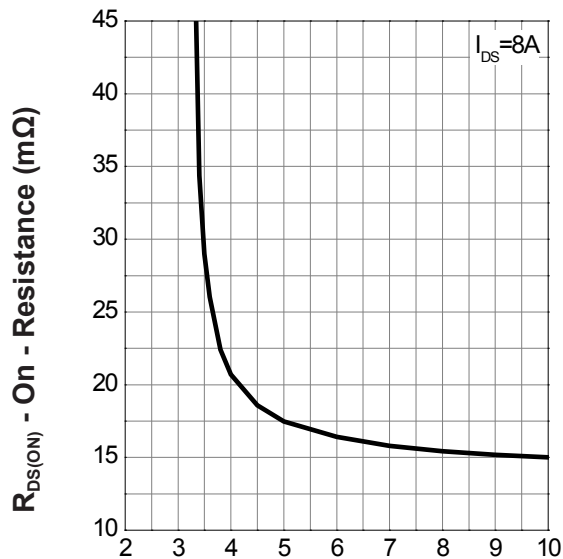


Drain-Source On Resistance



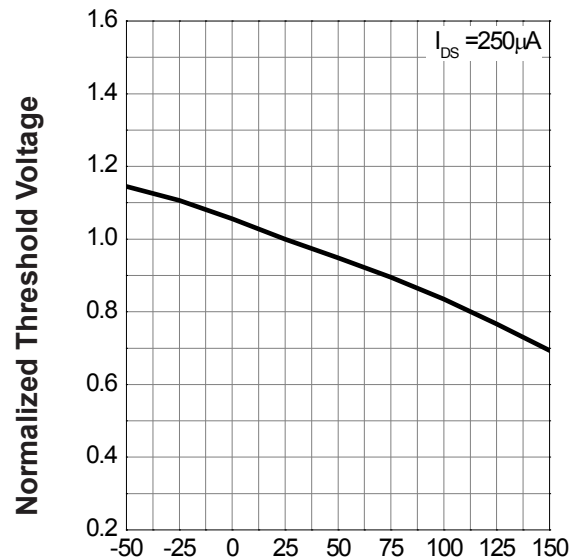
N Channel Typical Operating Characteristics(Cont.)

Gate-Source On Resistance



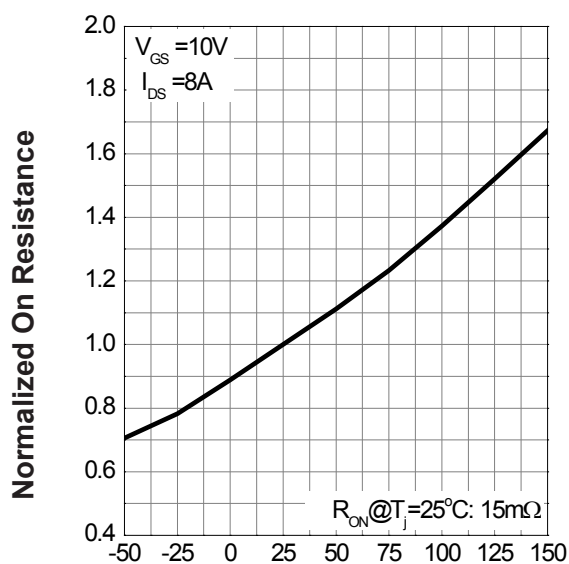
V_{GS} - Gate - Source Voltage (V)

Gate Threshold Voltage



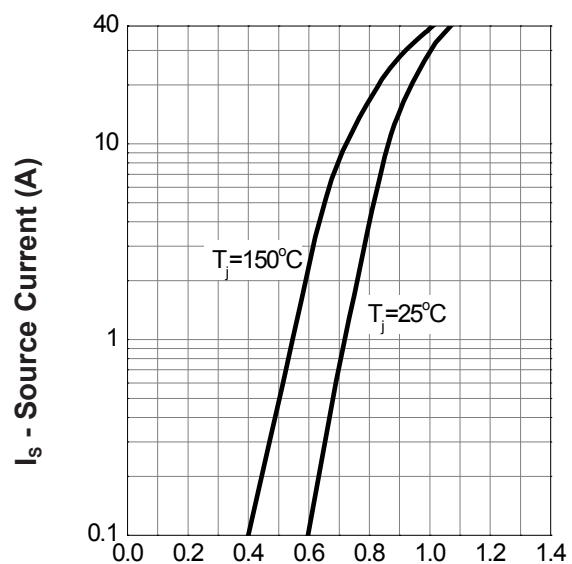
T_J - Junction Temperature ($^{\circ}C$)

Drain-Source On Resistance



T_J - Junction Temperature ($^{\circ}C$)

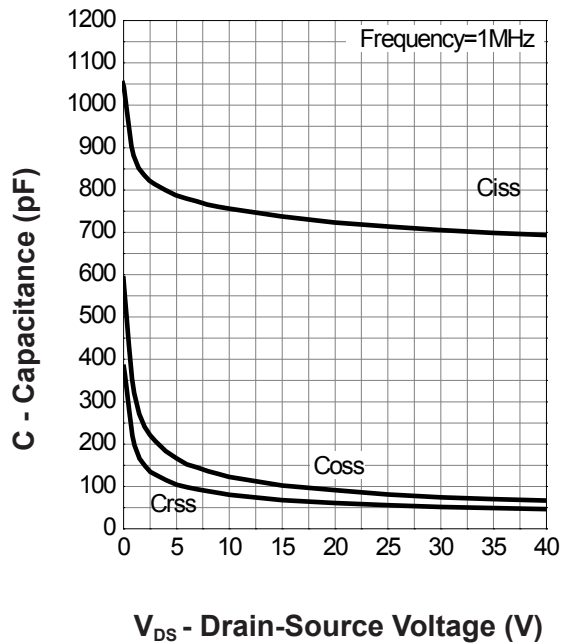
Source-Drain Diode Forward



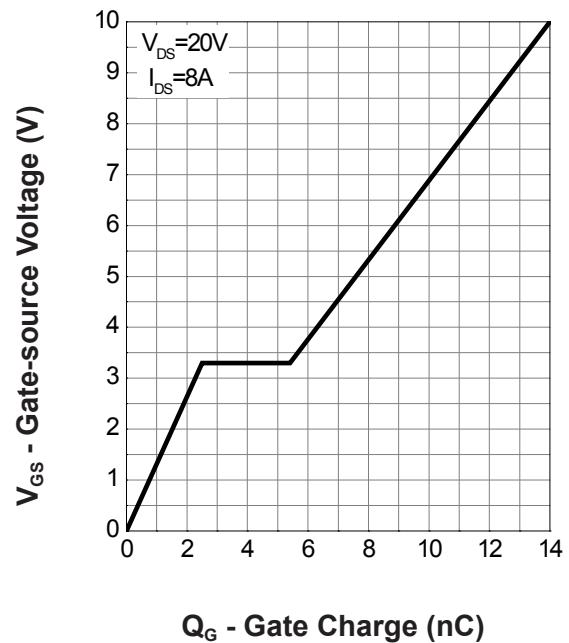
V_{SD} - Source - Drain Voltage (V)

N Channel Typical Operating Characteristics(Cont.)

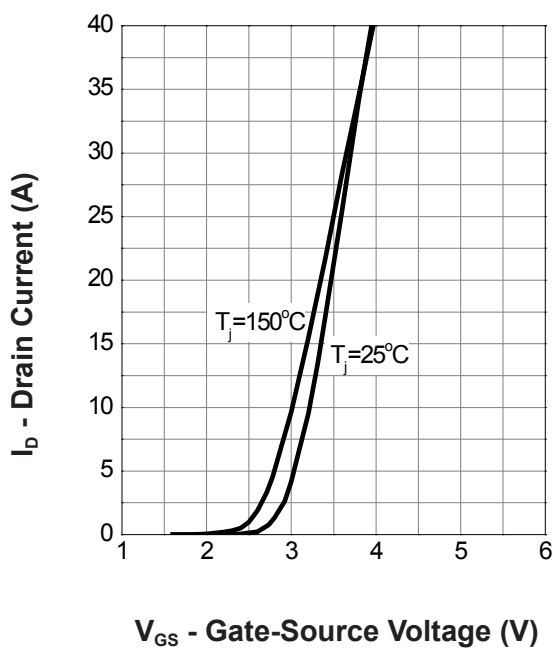
Capacitance



Gate Charge

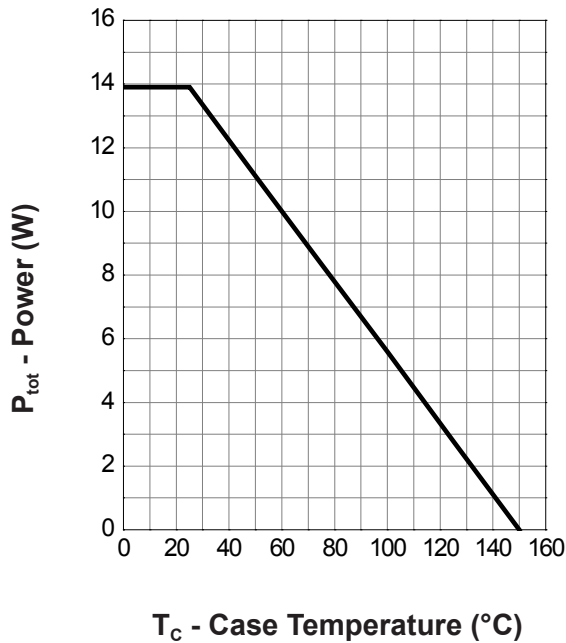


Transfer Characteristics

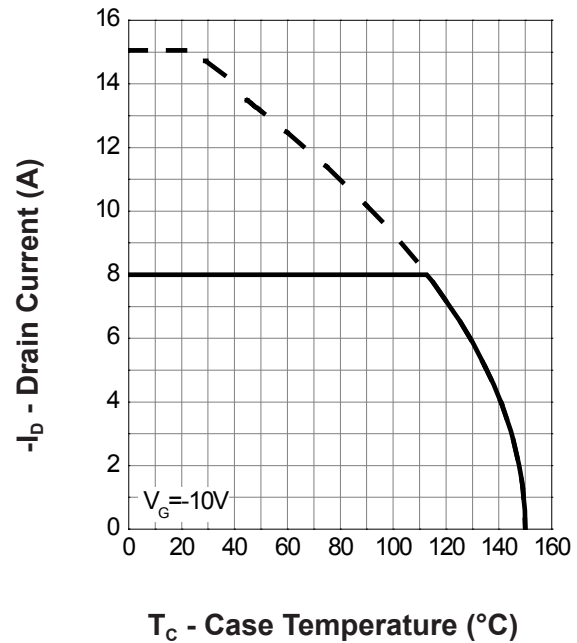


P Channel Typical Operating Characteristics

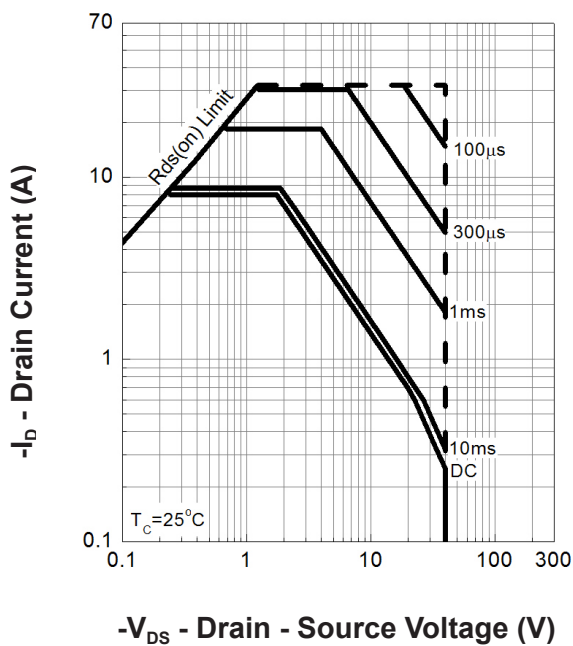
Power Dissipation



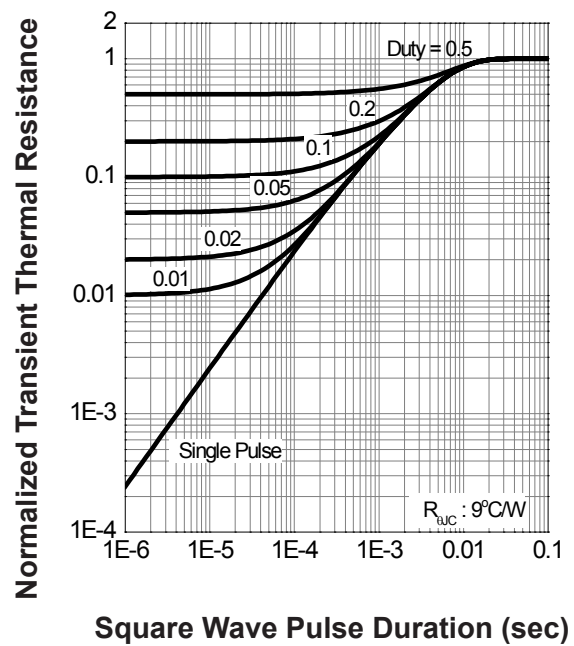
Drain Current



Safe Operation Area

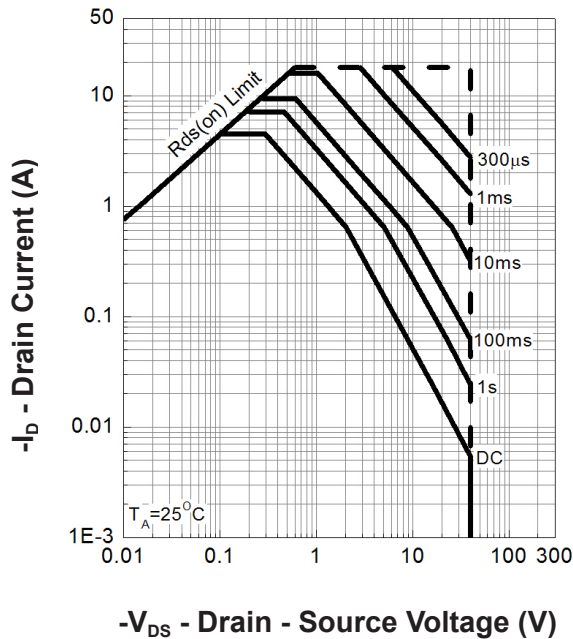


Thermal Transient Impedance

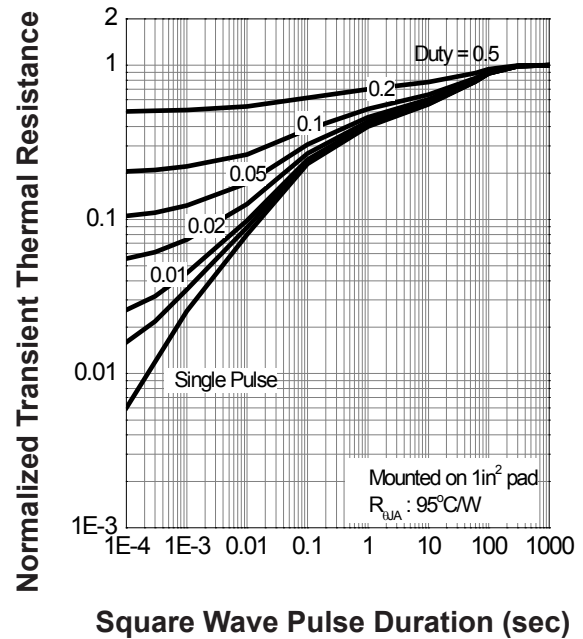


P Channel Typical Operating Characteristics(Cont.)

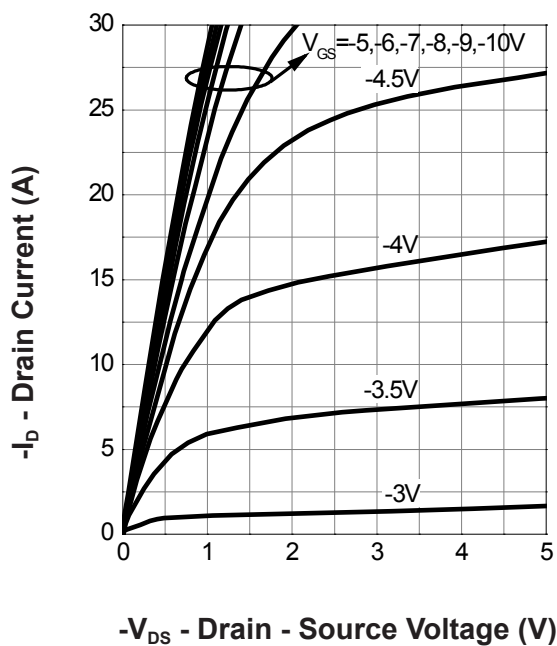
Safe Operation Area



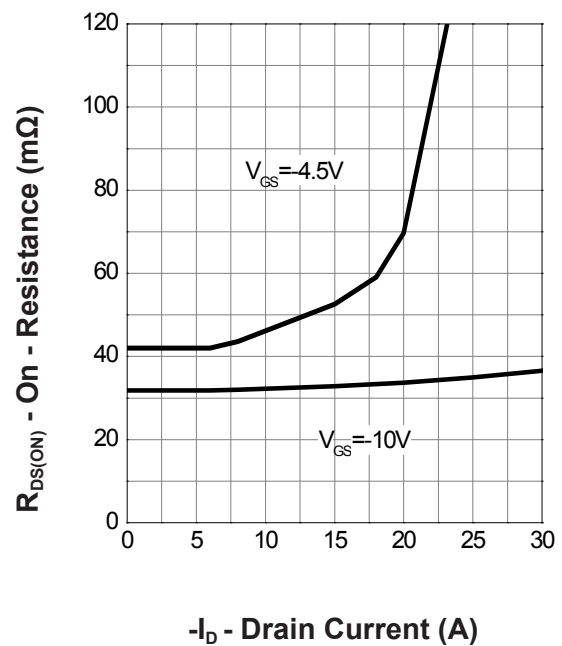
Thermal Transient Impedance



Output Characteristics

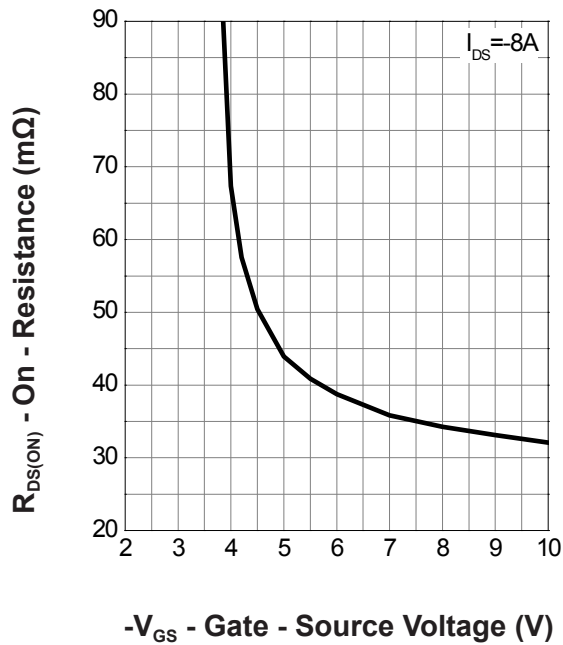


Drain-Source On Resistance

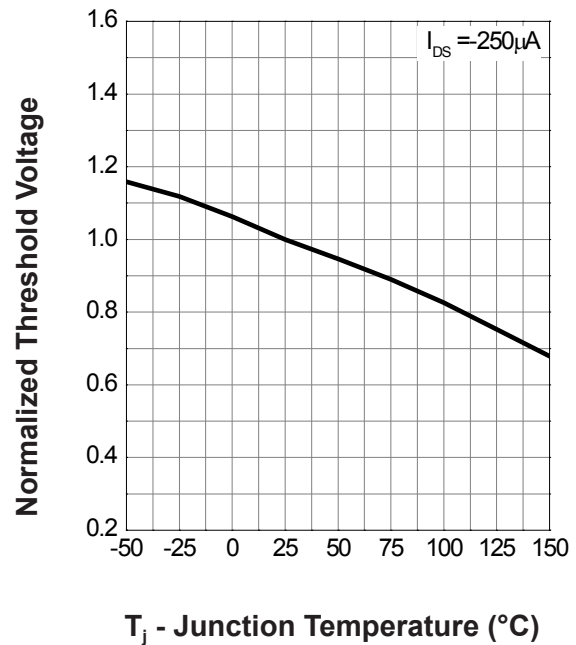


P Channel Typical Operating Characteristics(Cont.)

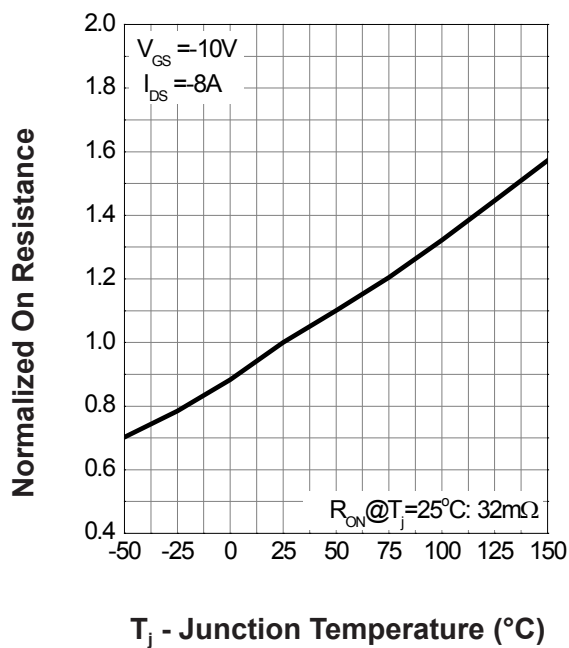
Gate-Source On Resistance



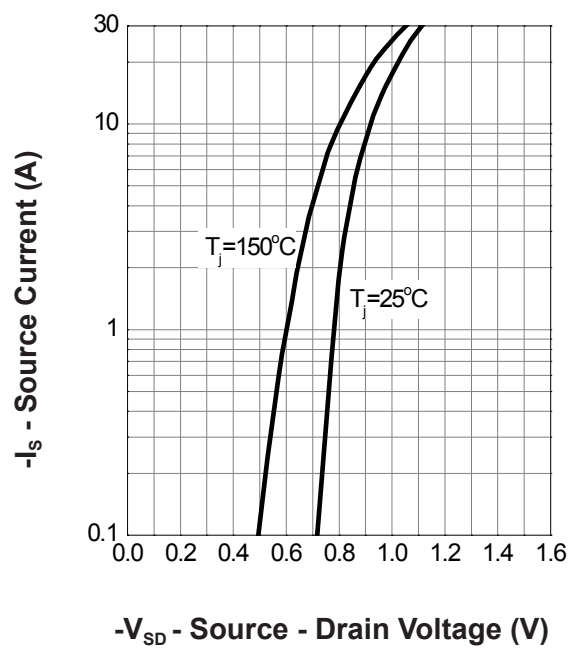
Gate Threshold Voltage



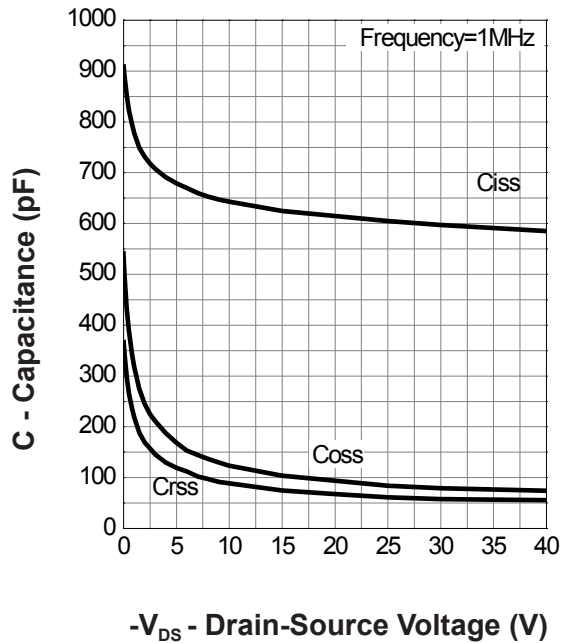
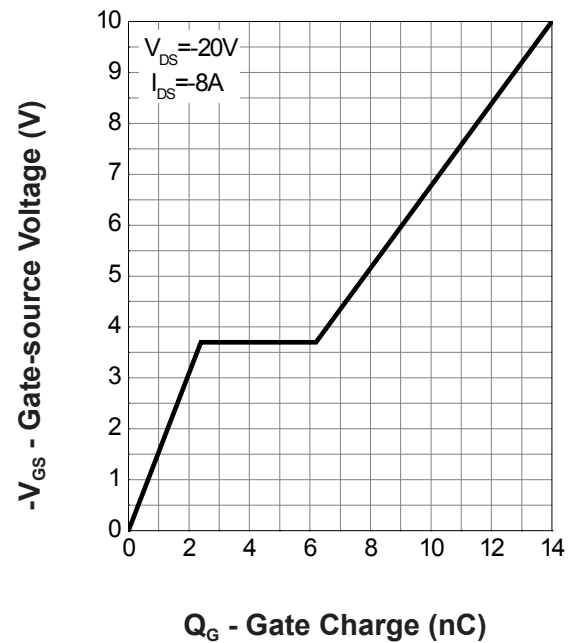
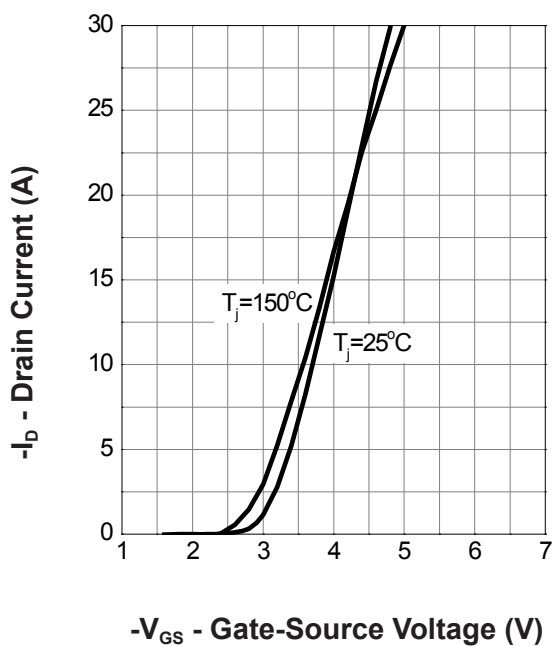
Drain-Source On Resistance



Source-Drain Diode Forward

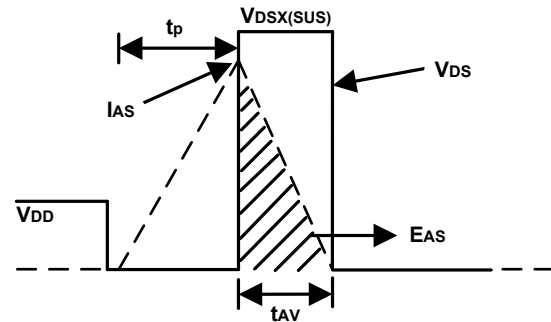
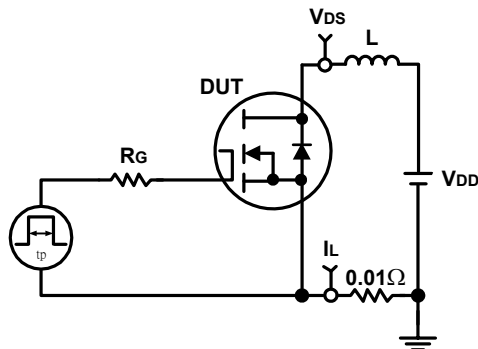


P Channel Typical Operating Characteristics(Cont.)

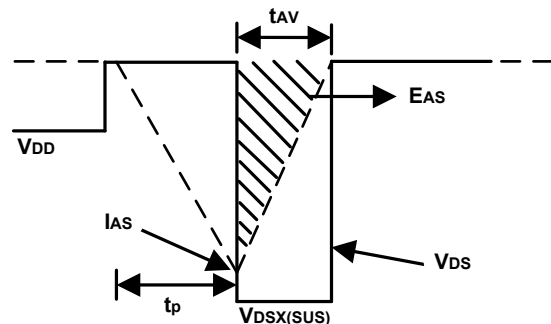
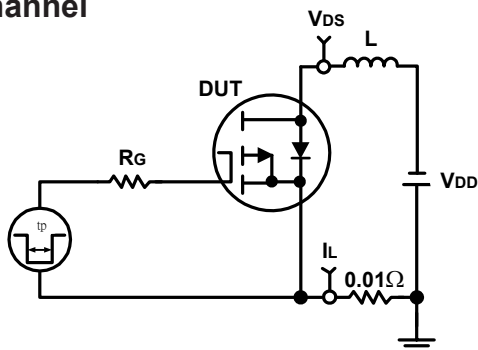
Capacitance

Gate Charge

Transfer Characteristics


Avalanche Test Circuit and Waveforms

N Channel

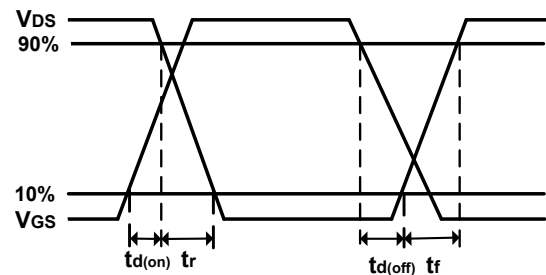
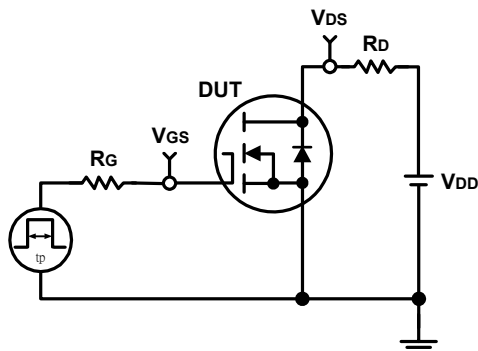


P Channel

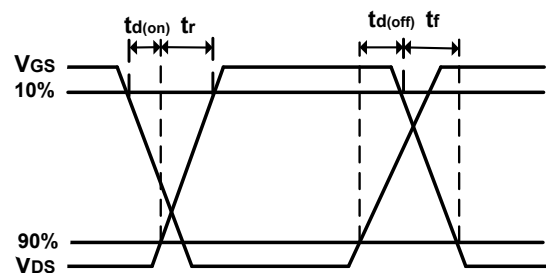
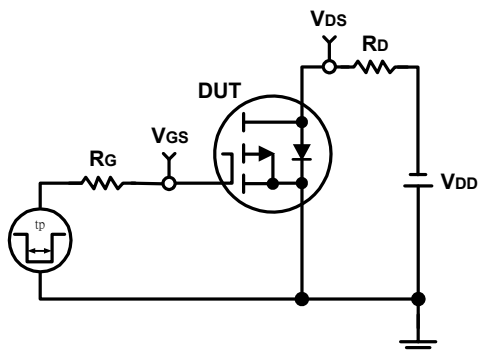


Switching Time Test Circuit and Waveforms

N Channel

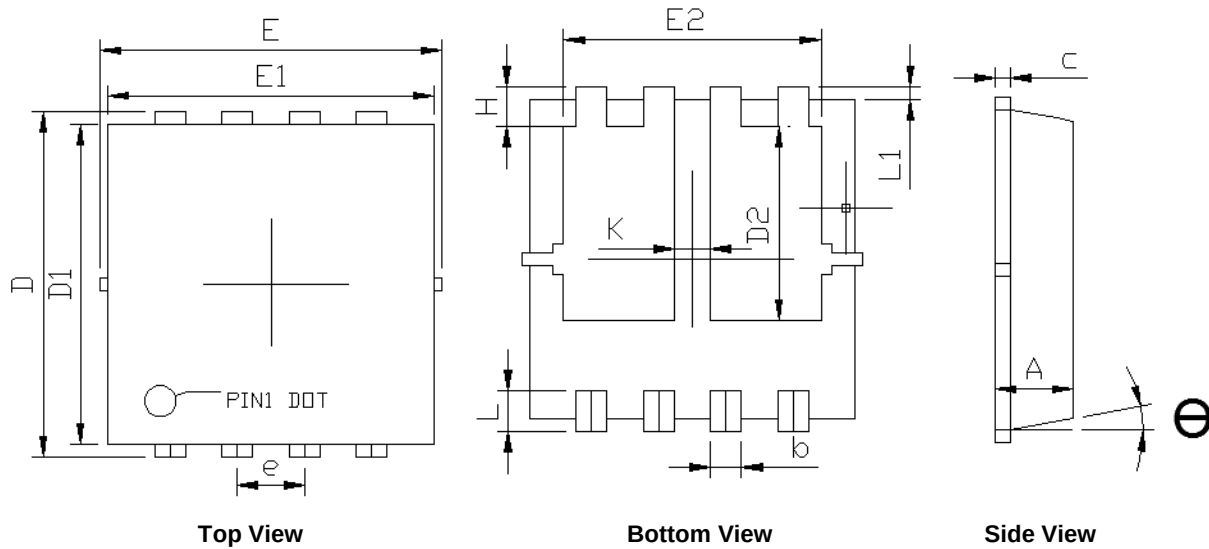


P Channel



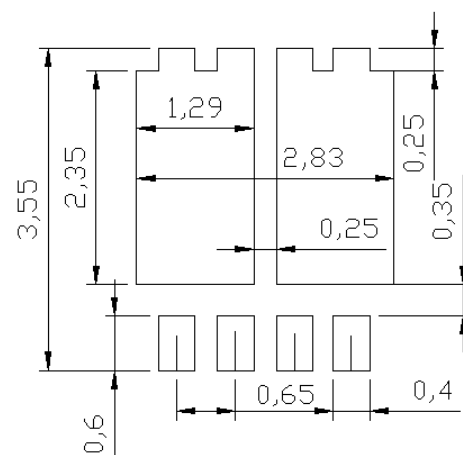
Package Information

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