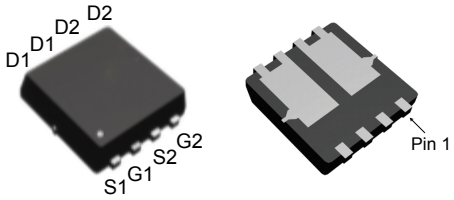
Features

- **N-Channel**
  20V/33A,
  $R_{DS(ON)}$= 7.7mΩ(typ.) @ V_{GS}=4.5V
  $R_{DS(ON)}$= 9mΩ(typ.) @ V_{GS}=2.5V
- **P-Channel**
  -20V/-22A,
  $R_{DS(ON)}$= 18mΩ(typ.) @ V_{GS}=-4.5V
  $R_{DS(ON)}$= 23mΩ(typ.) @ V_{GS}=-2.5V
- Reliable and Rugged
- Lead Free and Green Devices Available (RoHS Compliant)

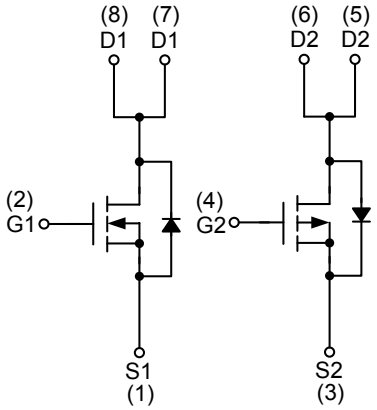
Applications

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

Pin Description



PDFN3.3x3.3-8L



N-Channel MOSFET P-Channel MOSFET

Absolute Maximum Ratings (T_A = 25°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	33	-22	A
I_D	Continuous Drain Current	T_A=25°C	33	-22	
I_{DM}	Pulsed Drain Current	T_A=25°C	99	-66	
P_D	Power Dissipation	T_A=25°C	13.9	13.9	W
		T_A=70°C	5.6	5.6	
$R_{\theta JA}$	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	-	7.7	10	mΩ
		V_{GS}=2.5V, I_{DS}=5A	-	9	12	
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	-	1160	-	pF
C_{oss}	Output Capacitance		-	140	-	
C_{rss}	Reverse Transfer Capacitance		-	123	-	
$t_{d(ON)}$	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.

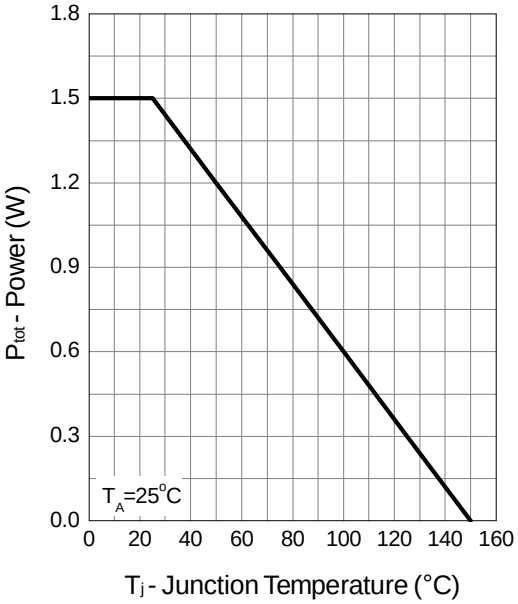
P Channel Electrical Characteristics (T_A = 25°C unless otherwise noted)

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	-	18	21	mΩ
		V_{GS}=-2.5V, I_{DS}=-3A	-	23	27	
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	-	975	-	pF
C_{oss}	Output Capacitance		-	176	-	
C_{rss}	Reverse Transfer Capacitance		-	99	-	
$t_{d(ON)}$	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	-	

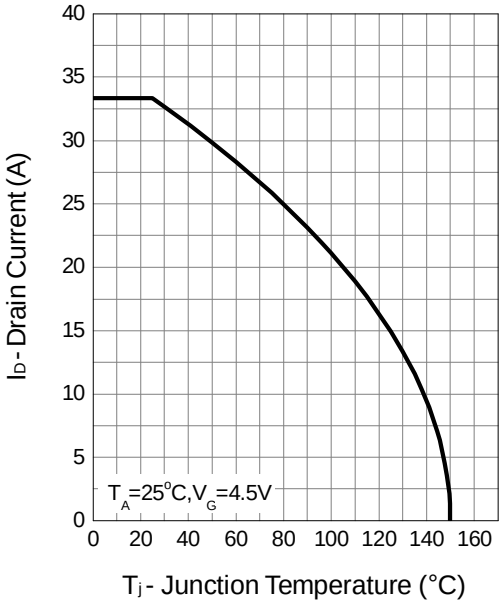
Note a：Pulse test; pulse width≤300μs, duty cycle≤2%.
Note b：Guaranteed by design, not subject to production testing.

N Channel Typical Operating Characteristics

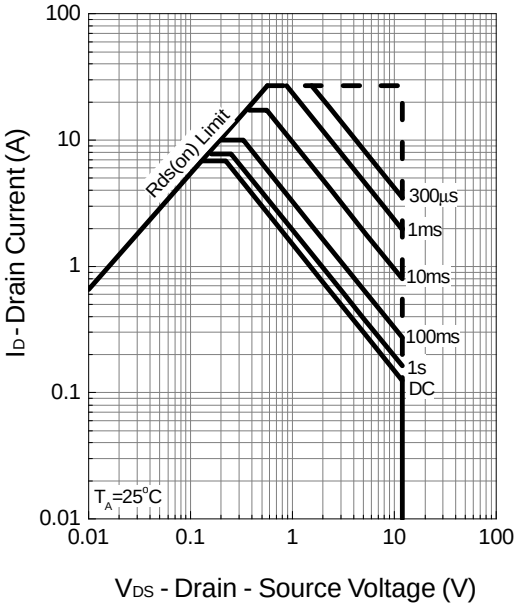
Power Dissipation



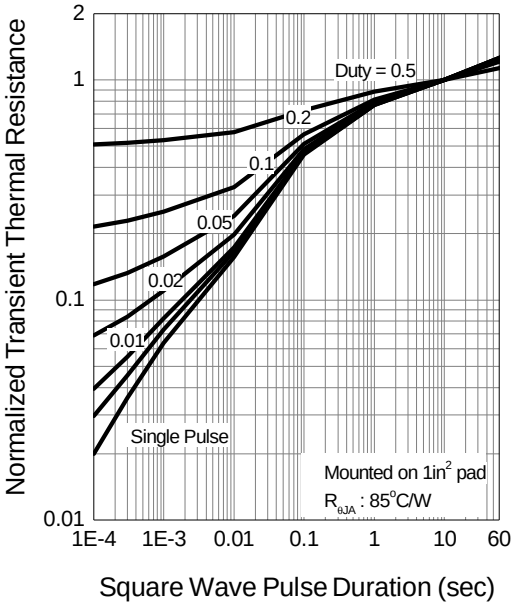
Drain Current



Safe Operation Area

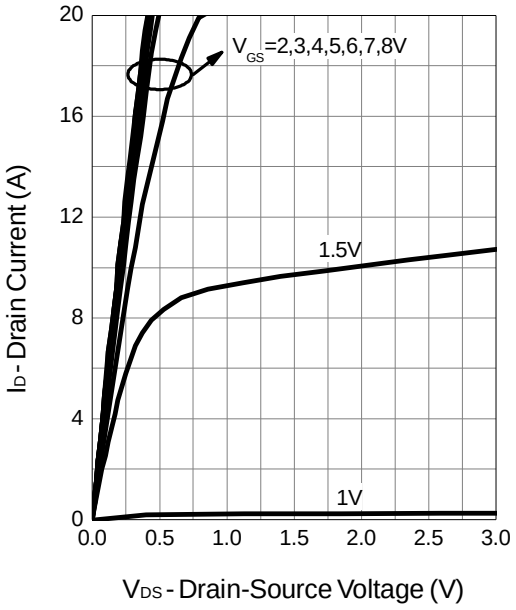


Thermal Transient Impedance

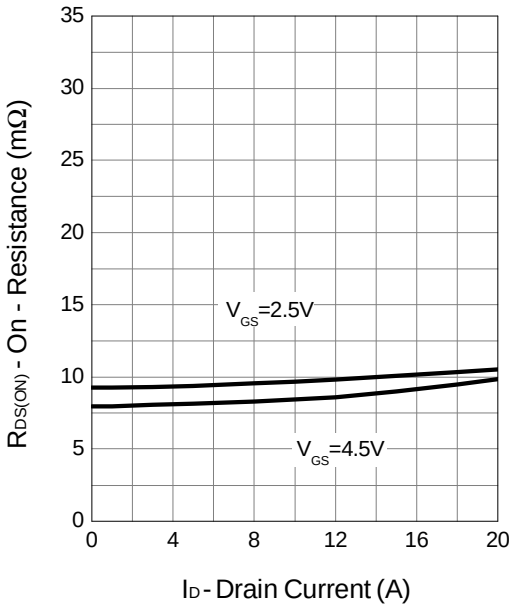


N Channel Typical Operating Characteristics (Cont.)

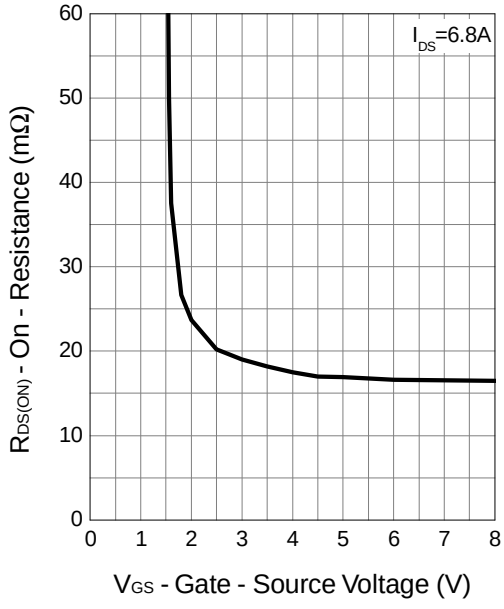
Output Characteristics



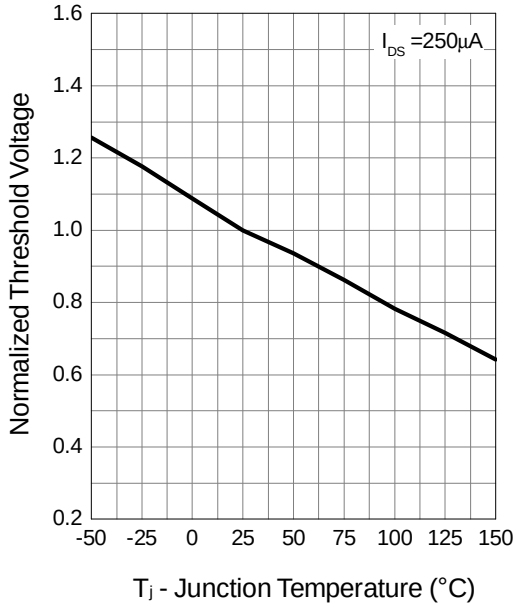
Drain-Source On Resistance



Gate-Source On Resistance

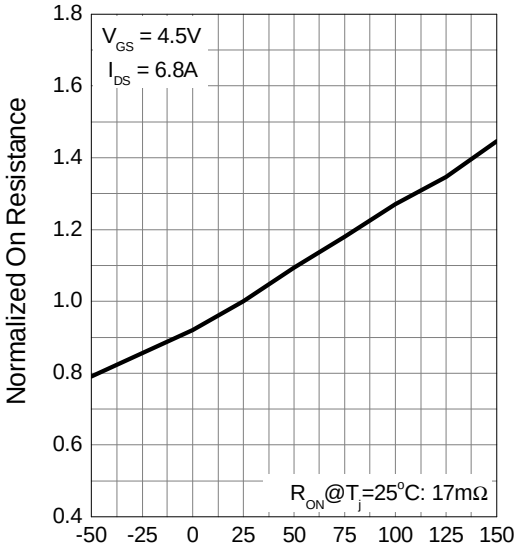


Gate Threshold Voltage



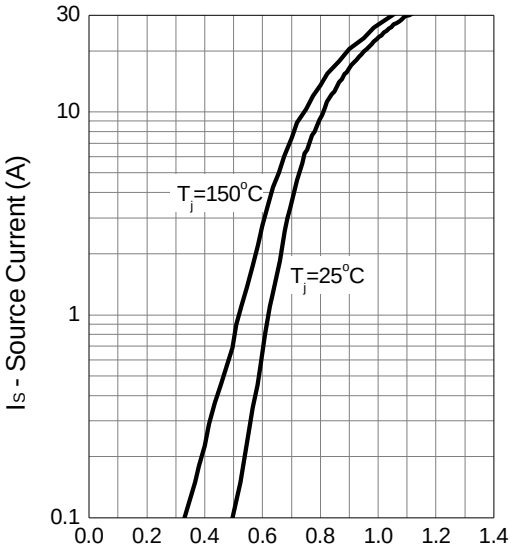
N Channel Typical Operating Characteristics (Cont.)

Drain-Source On Resistance



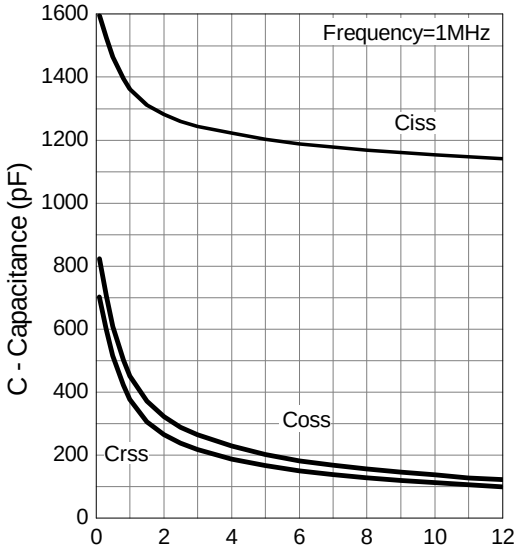
T_j - Junction Temperature (°C)

Source-Drain Diode Forward



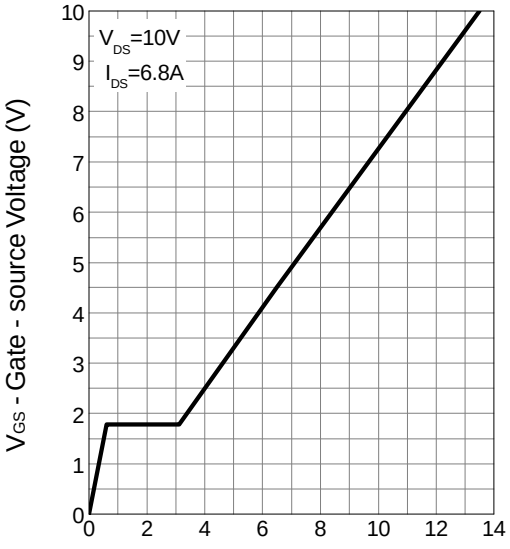
V_{SD} - Source - Drain Voltage (V)

Capacitance



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

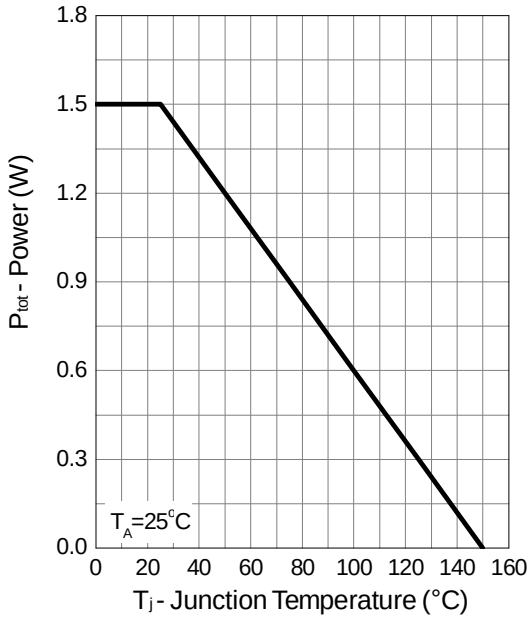
Gate Charge



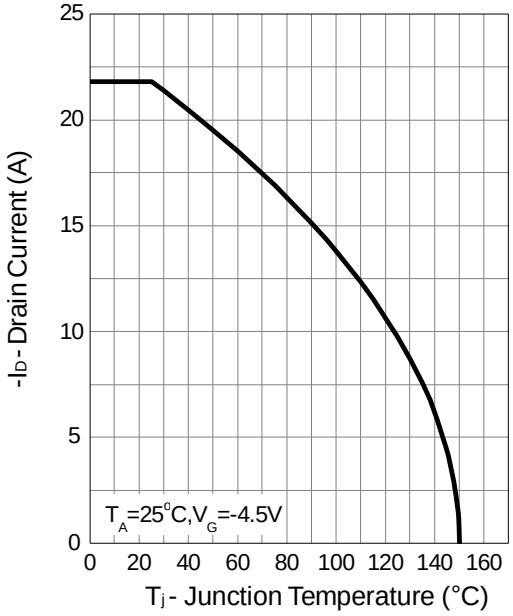
Q_G - Gate Charge (nC)

P Channel Typical Operating Characteristics

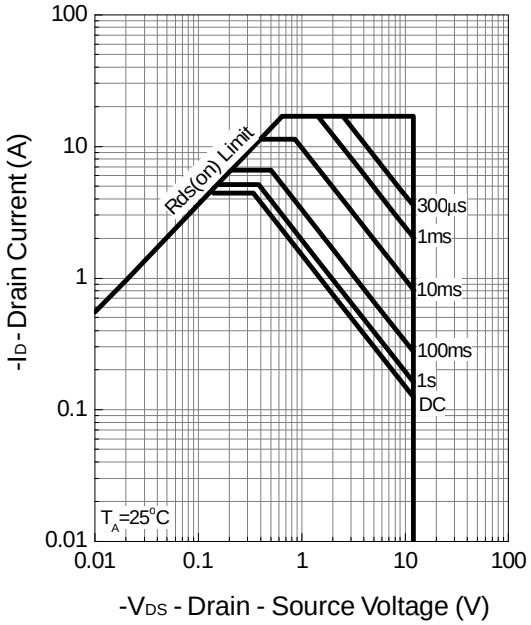
Power Dissipation



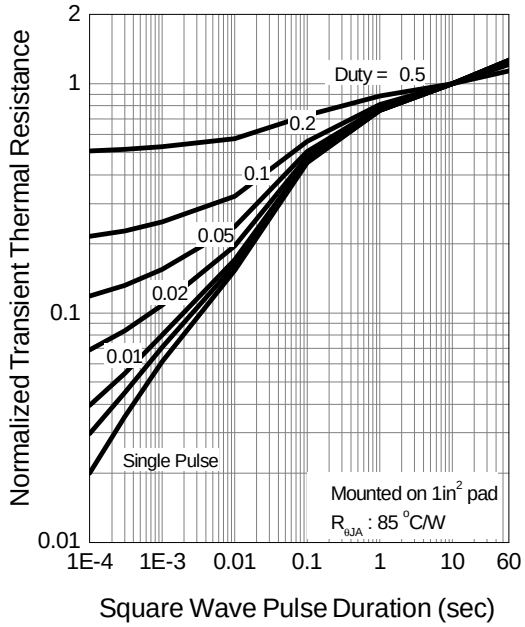
Drain Current



Safe Operation Area

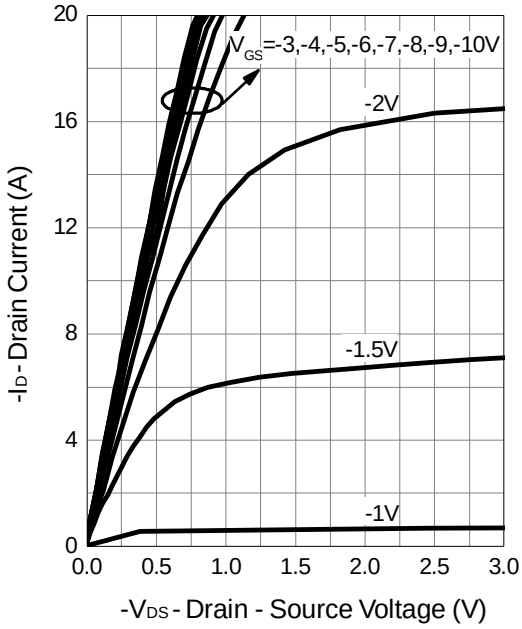


Thermal Transient Impedance

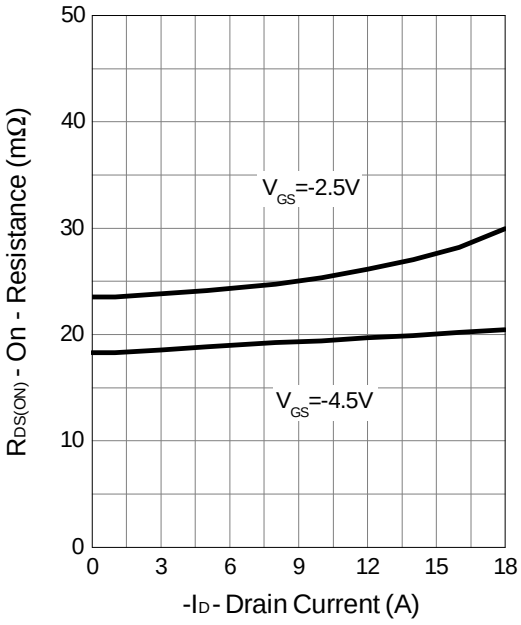


P Channel Typical Operating Characteristics (Cont.)

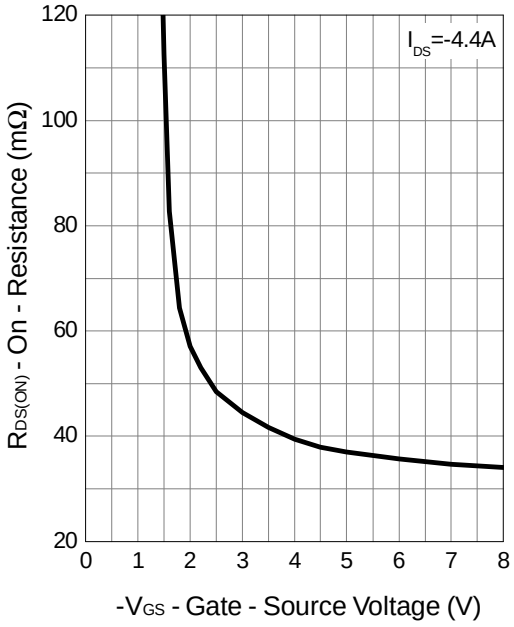
Output Characteristics



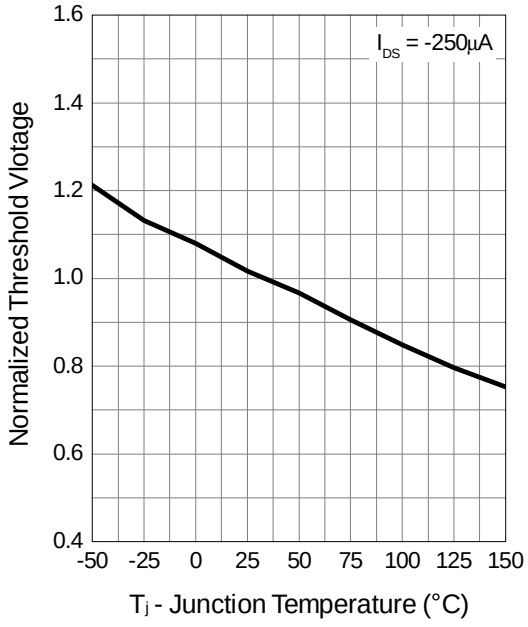
Drain-Source On Resistance



Gate-Source On Resistance

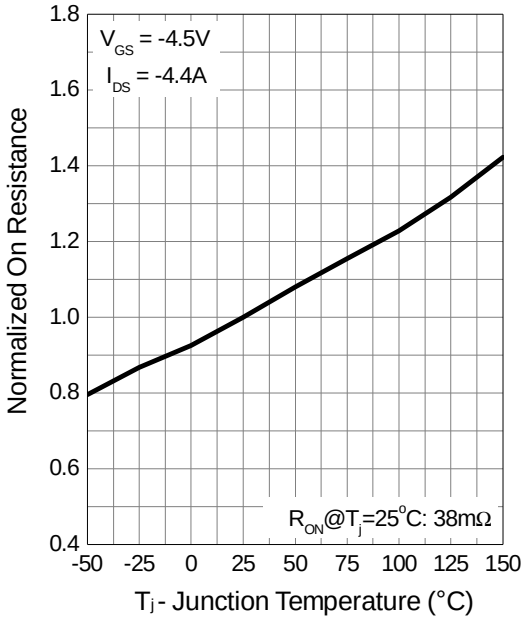


Gate Threshold Voltage

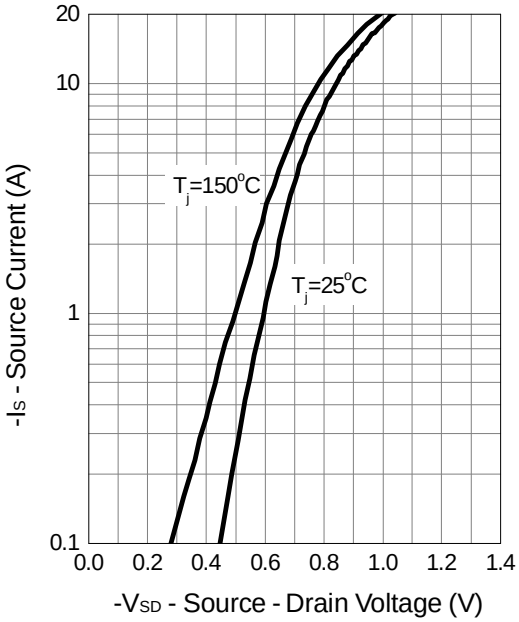


P Channel Typical Operating Characteristics (Cont.)

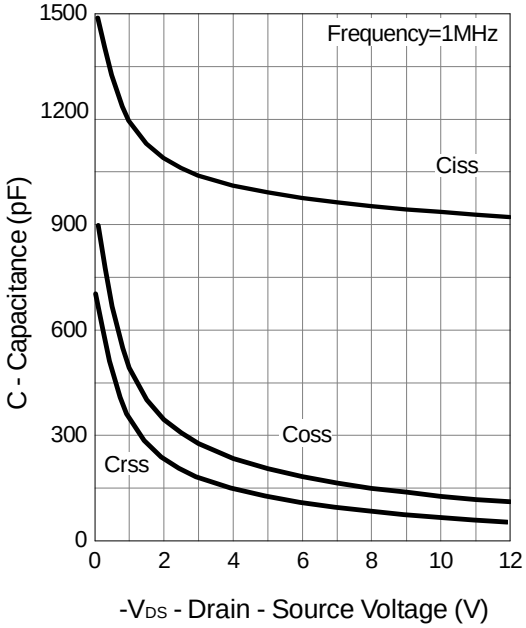
Drain-Source On Resistance



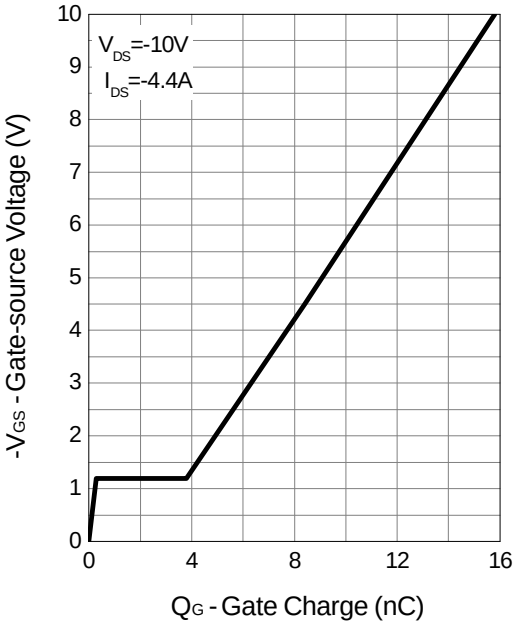
Source-Drain Diode Forward



Capacitance

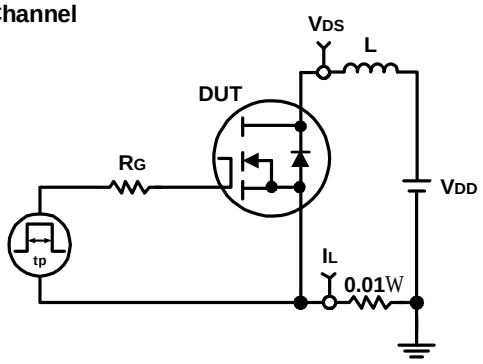


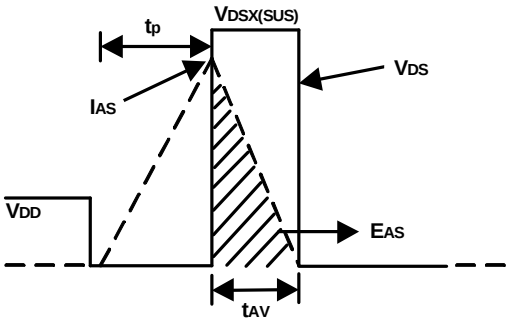
Gate Charge



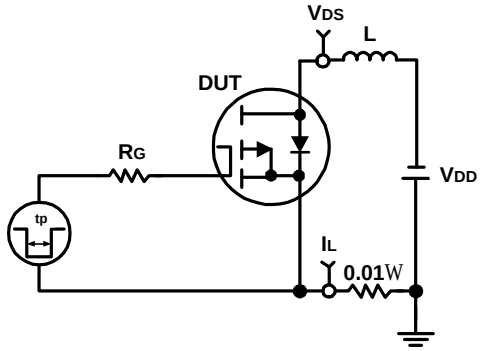
Avalanche Test Circuit and Waveforms

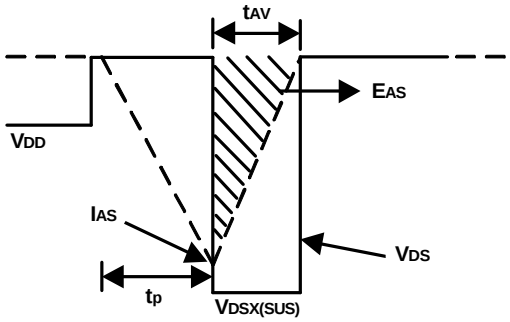
N Channel





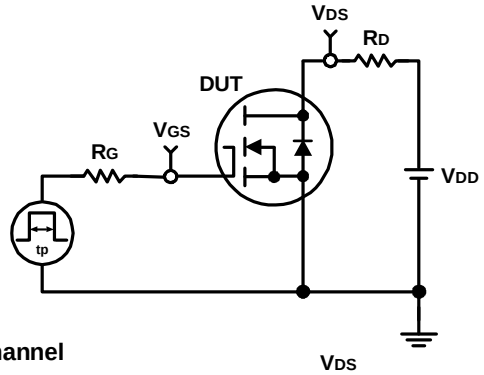
P Channel

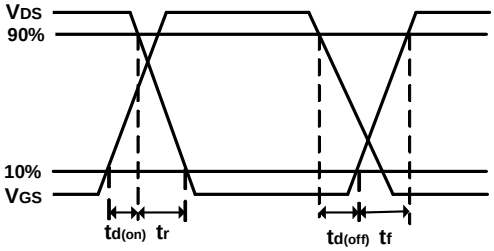




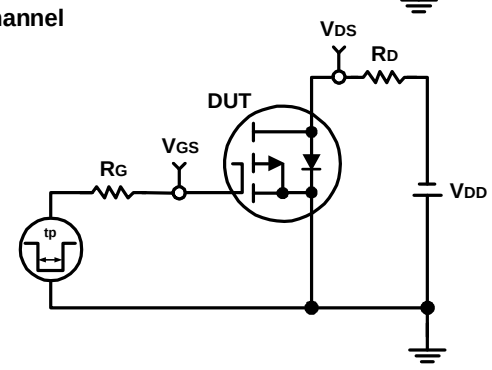
Switching Time Test Circuit and Waveforms

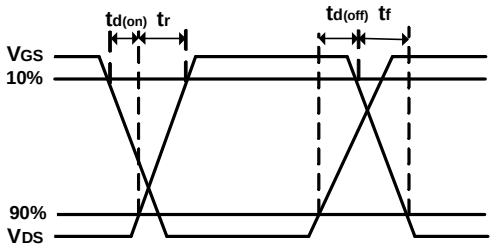
N Channel





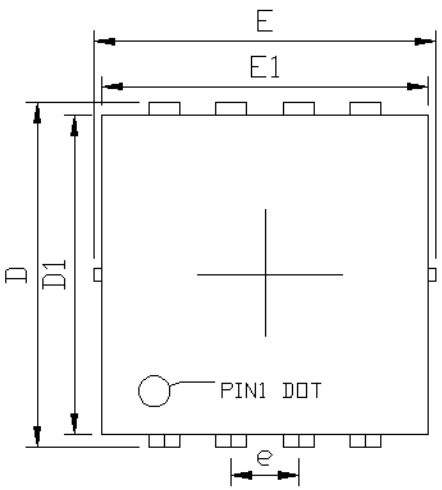
P Channel



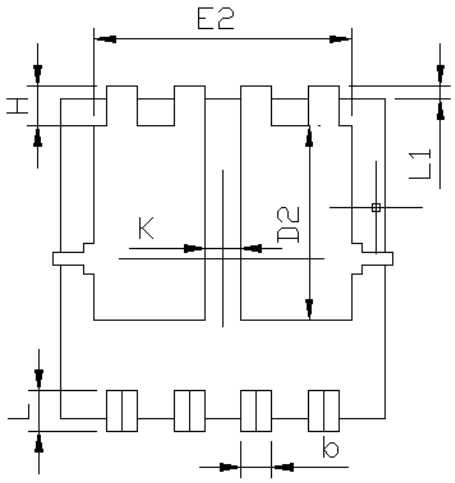


Package Information

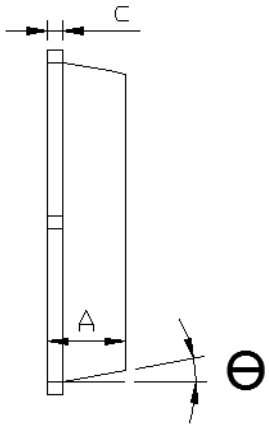
PDFN3.3x3.3-8L



Top View



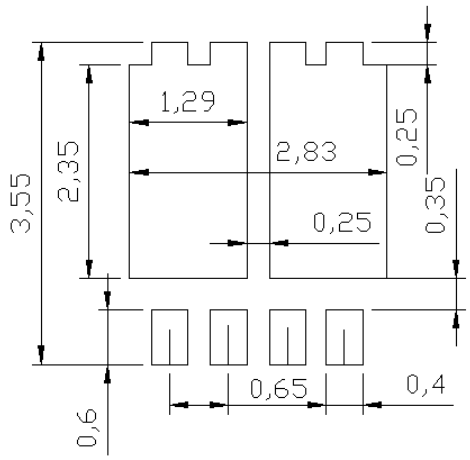
Bottom View



Side View

SYMBOLS	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