

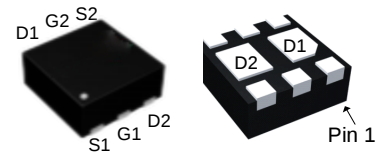
Features

- **N-Channel**
12V/4.5A,
 $R_{DS(ON)} = 24m\Omega(\text{typ.}) @ V_{GS}=4.5V$
 $R_{DS(ON)} = 28m\Omega(\text{typ.}) @ V_{GS}=2.5V$
- **P-Channel**
-12V/-4.5A,
 $R_{DS(ON)} = 50m\Omega(\text{typ.}) @ V_{GS}=-4.5V$
 $R_{DS(ON)} = 66m\Omega(\text{typ.}) @ V_{GS}=-2.5V$
- Reliable and Rugged
- Lead Free and Green Devices Available (RoHS Compliant)

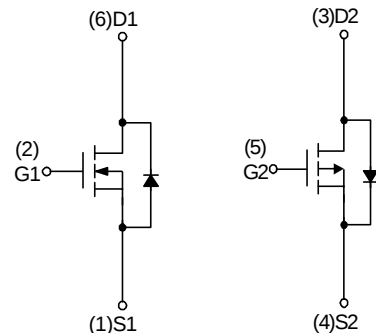
Applications

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

Pin Description



DFN2x2-6



N-Channel

P-Channel

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		12	-12	V
V _{GSS}	Gate-Source Voltage		±8	±8	
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	4.5	-4.5	A
I _D	Continuous Drain Current	T _A =25°C	4.5	-4.5	
I _{DM}	Pulsed Drain Current	T _A =25°C	13.5	-13.5	
P _D	Power Dissipation	T _A =25°C	1.5	1.5	W
		T _A =70°C	0.9	0.9	
R _{θJA}	Thermal Resistance-Junction to Ambient	t ≤ 10s	85		°C/W
		Steady State	135		
I _{AS}	Avalanche Current, Single pulse	L=0.5mH	6	-6	A
E _{AS}	Avalanche Energy, Single pulse	L=0.5mH	9	9	mJ

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	12	-	-	V
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} =9.6V, 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} =±8V, V _{DS} =0V	-	-	±100	nA
R _{DS(ON)} ^a	Drain-Source On-state Resistance	V _{GS} =4.5V, I _{DS} =4.5A	-	24	29	mΩ
		V _{GS} =2.5V, I _{DS} =4A	-	28	34	
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} =6V, Frequency=1.0MHz	-	510	670	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 $\leq 300\mu s$, duty cycle $\leq 2\%$.

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

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

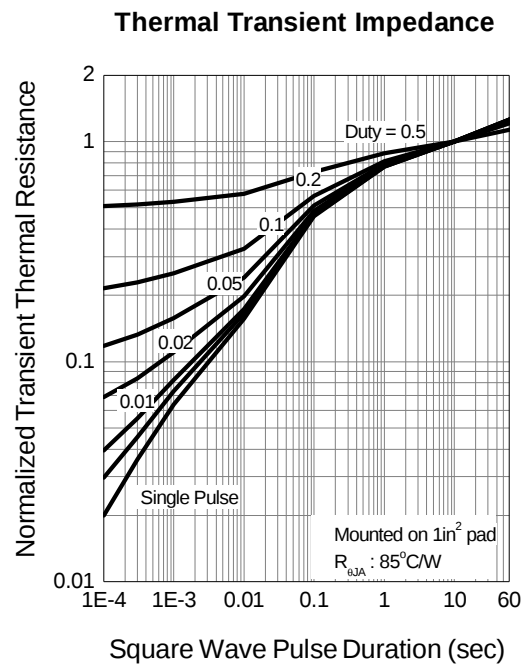
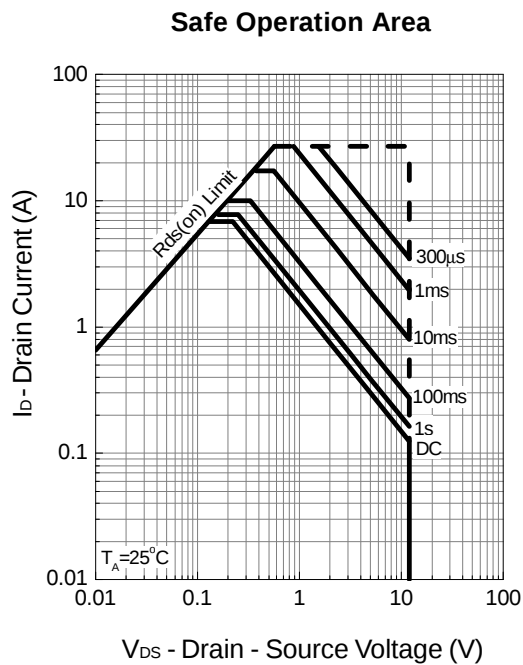
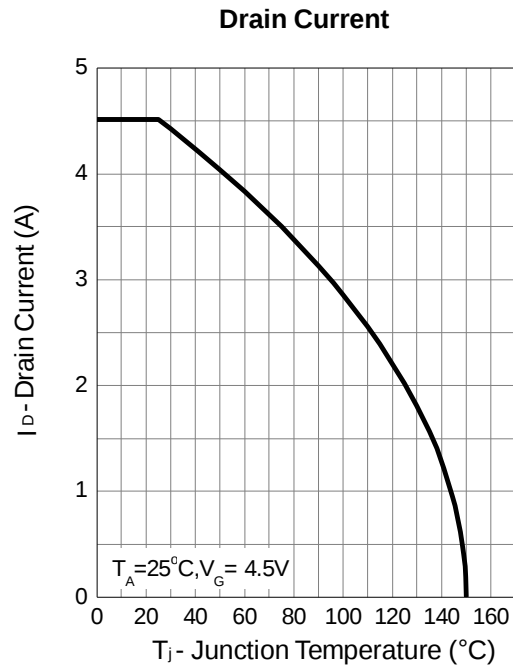
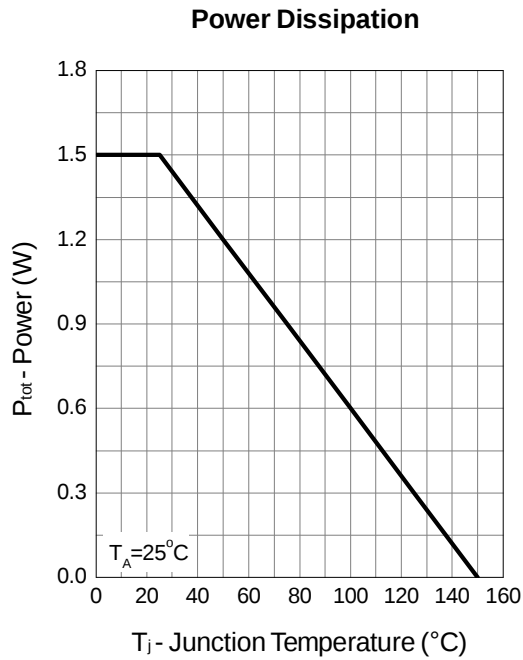
Symbol	Parameter	Test Conditions	P Channel			Unit
			Min.	Typ.	Max.	
Static Characteristics						
BV _{DSS}	Drain-Source Breakdown Voltage	V _{GS} =0V, I _{DS} =-250μA	-12	-	-	V
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} =-10V, V _{GS} =0V	-	-	-1	μA
		T _J =85°C	-	-	-30	μA
V _{GS(th)}	Gate Threshold Voltage	V _{DS} =V _{GS} , I _{DS} =-250μA	-0.4	-0.7	-0.9	V
I _{GSS}	Gate Leakage Current	V _{GS} =±8V, V _{DS} =0V	-	-	±100	nA
R _{DS(ON)} ^a	Drain-Source On-state Resistance	V _{GS} =-4.5V, I _{DS} =-4.5A	-	50	61	mΩ
		V _{GS} =-2.5V, I _{DS} =-3A	-	66	81	
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	-	584	-	pF
C _{oss}	Output Capacitance		-	264	-	
C _{rss}	Reverse Transfer Capacitance		-	234	-	
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		-	42.4	-	
t _{d(OFF)}	Turn-off Delay Time		-	25	-	
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 $\leq 300\mu s$, duty cycle $\leq 2\%$.

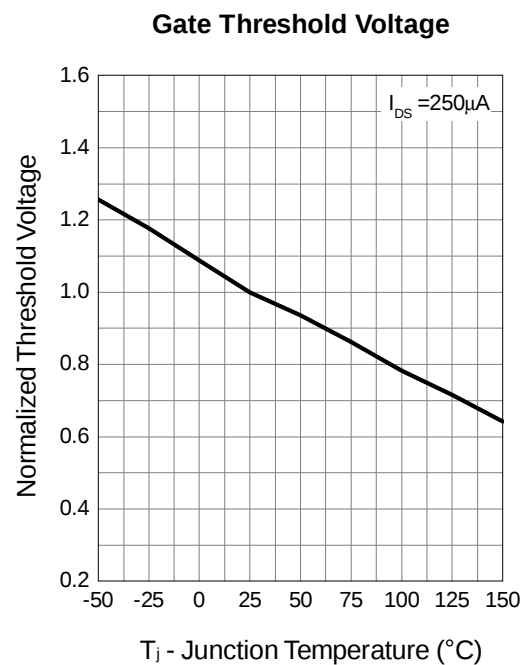
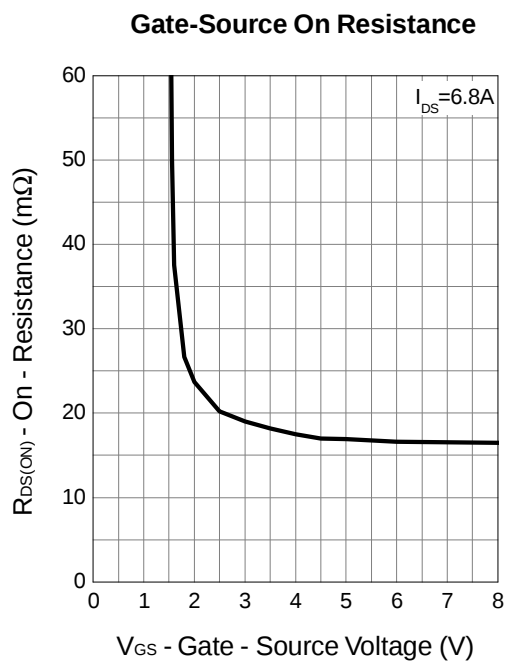
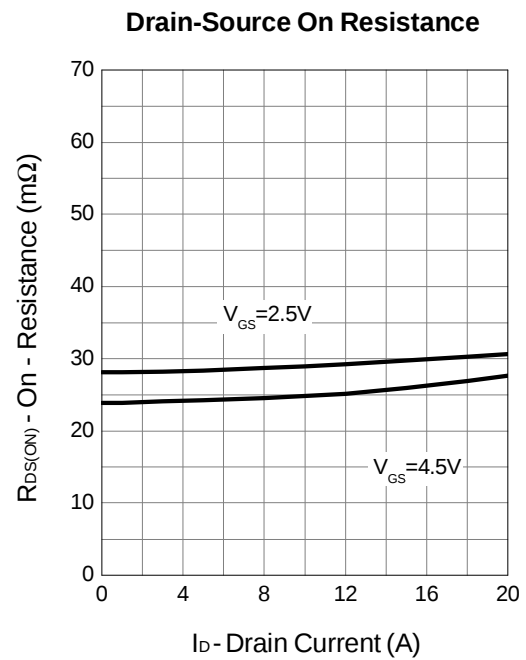
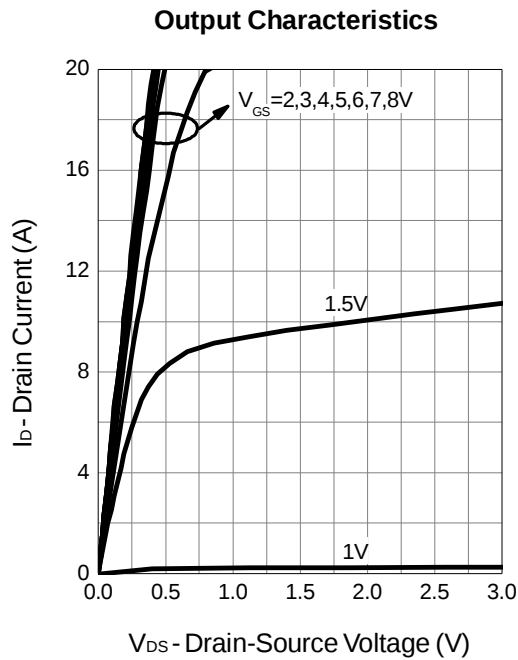
Note b Guaranteed by design, not subject to production testing.

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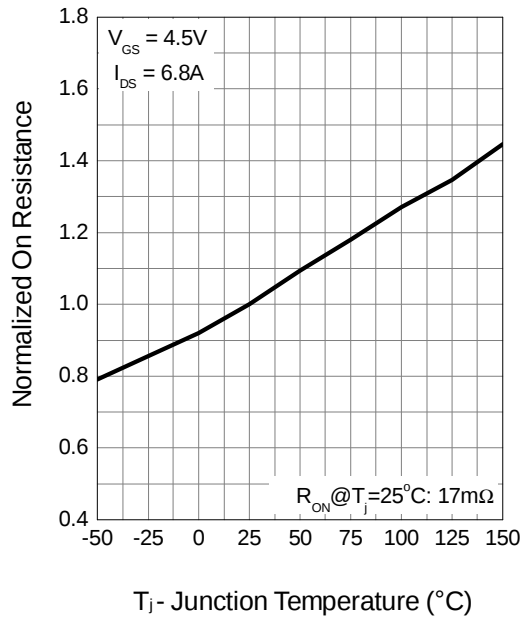
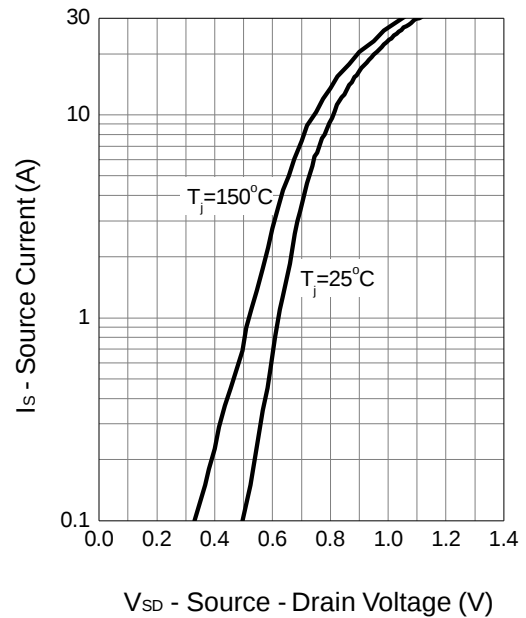
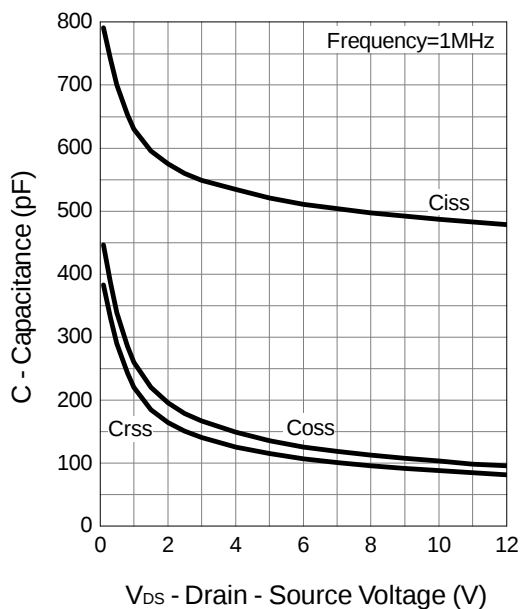
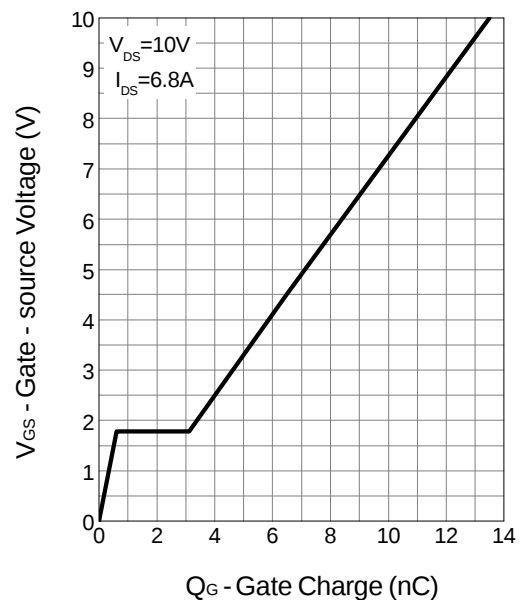
N Channel Typical Operating Characteristics



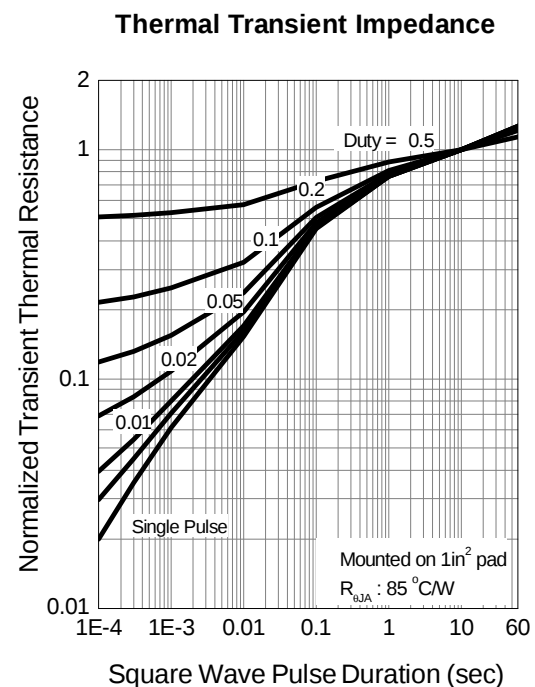
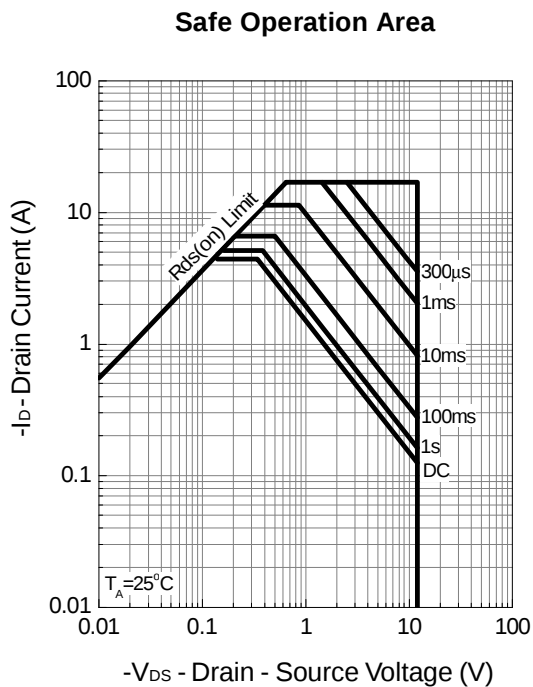
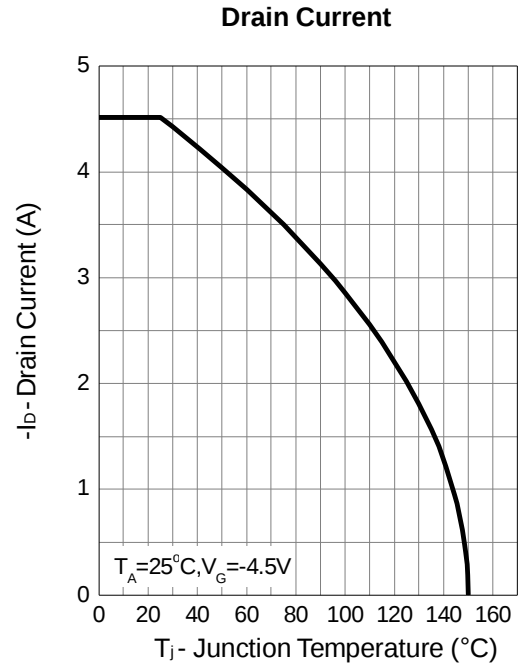
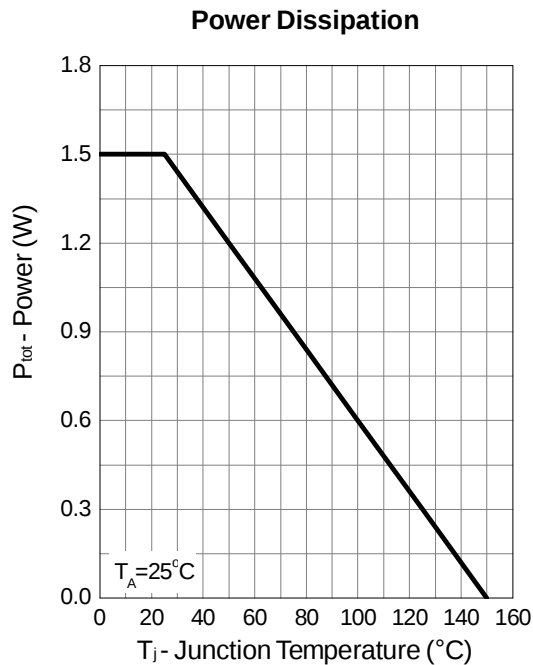
N Channel Typical Operating Characteristics (Cont.)



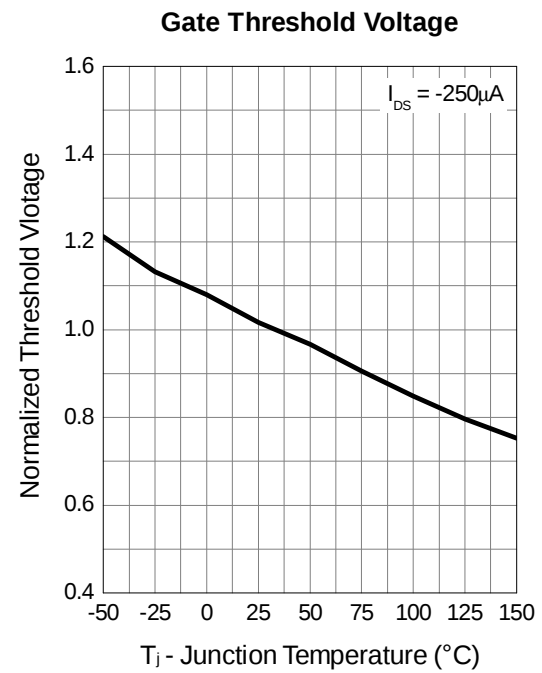
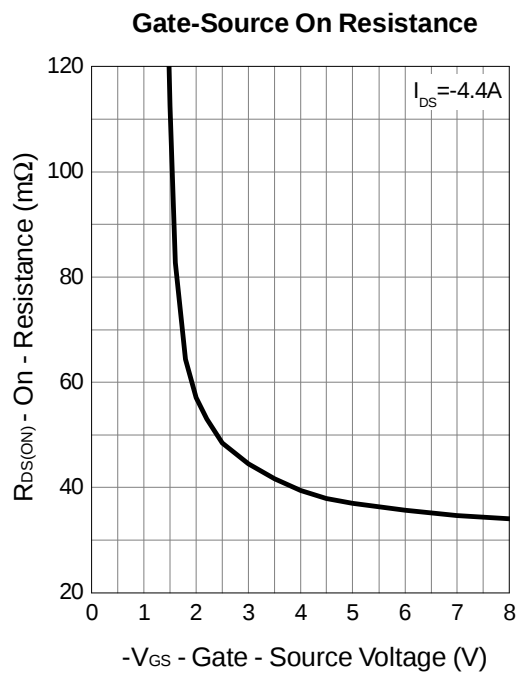
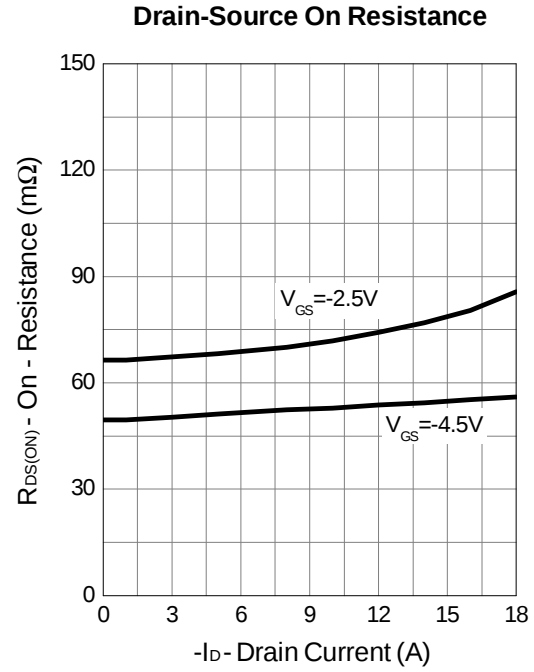
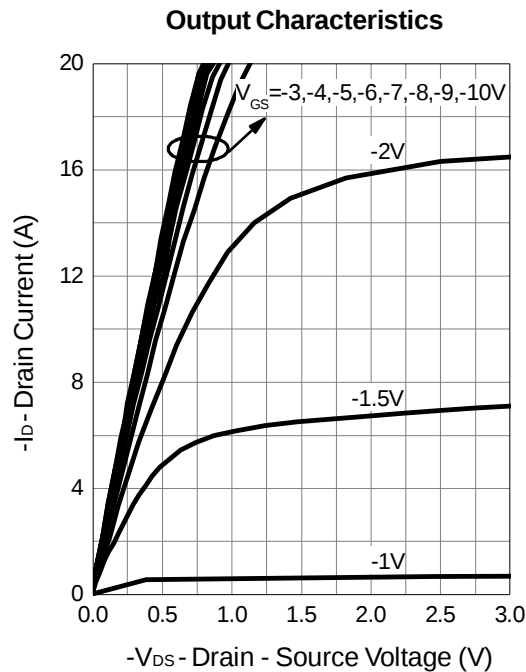
N Channel Typical Operating Characteristics (Cont.)

Drain-Source On Resistance

Source-Drain Diode Forward

Capacitance

Gate Charge


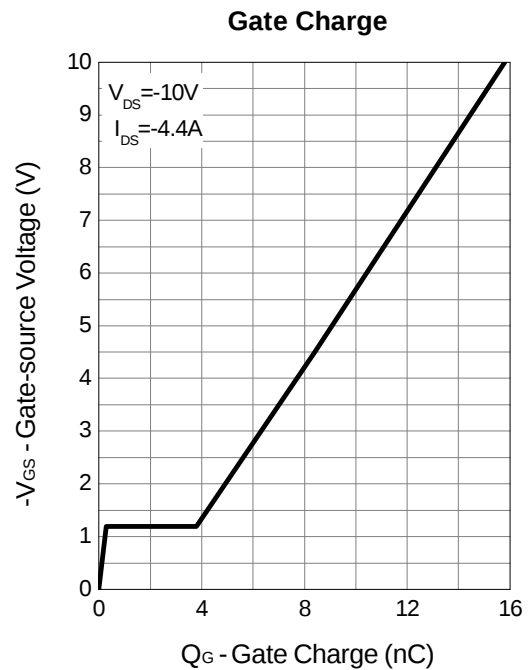
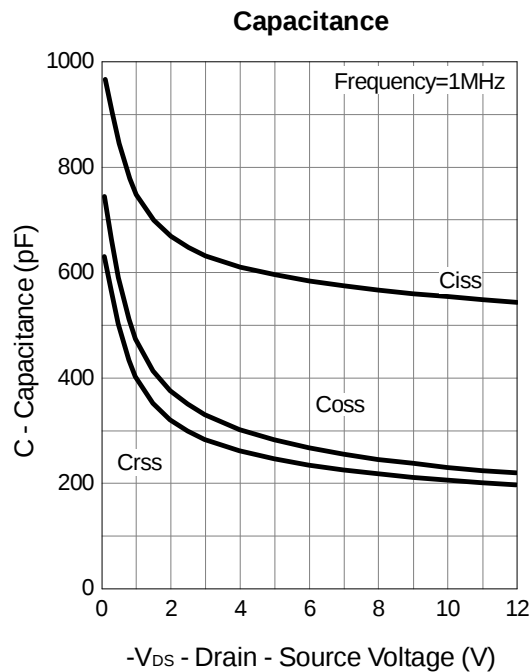
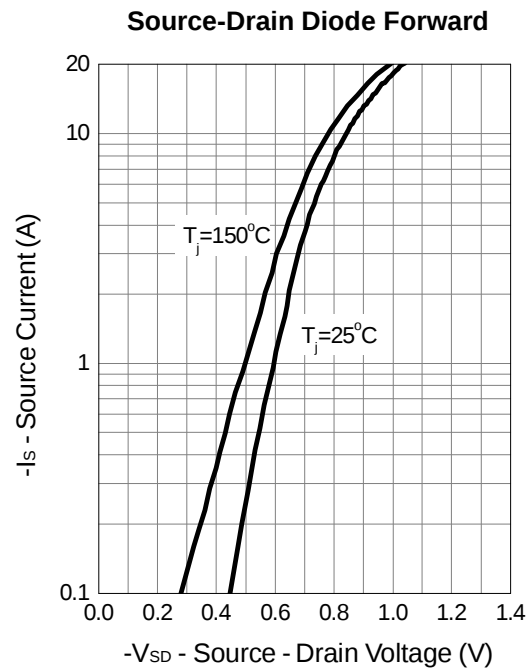
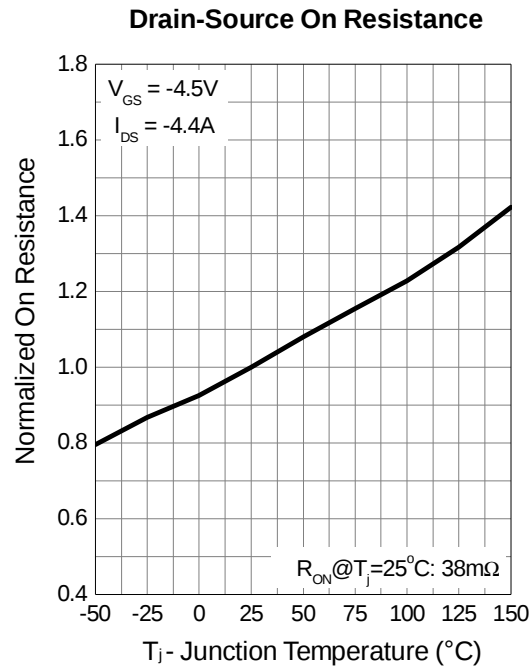
P Channel Typical Operating Characteristics



P Channel Typical Operating Characteristics (Cont.)

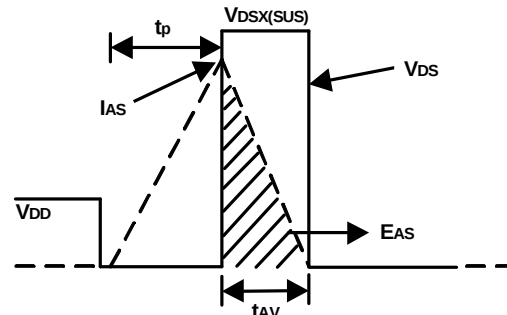
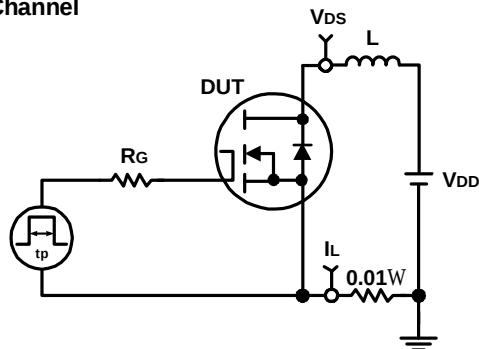


P Channel Typical Operating Characteristics (Cont.)

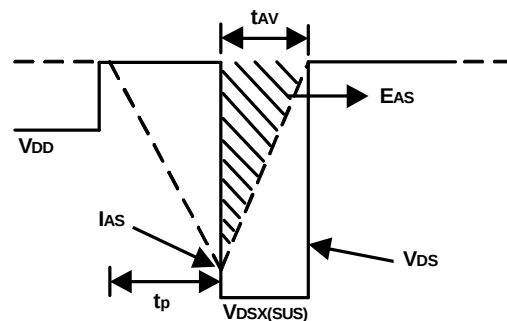
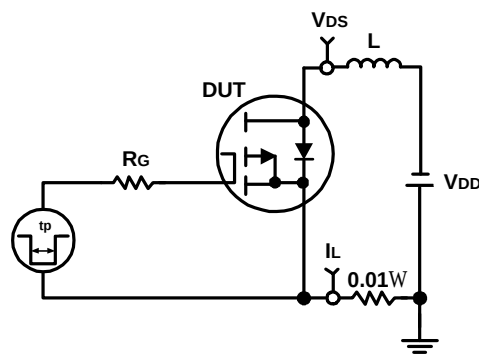


Avalanche Test Circuit and Waveforms

N Channel

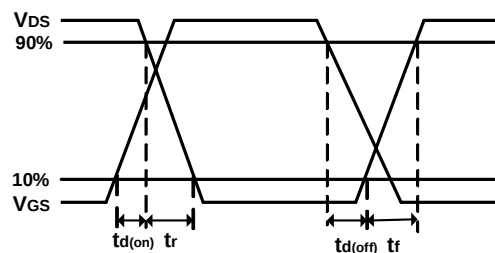
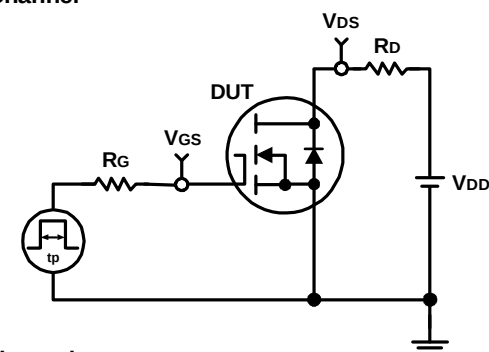


P Channel

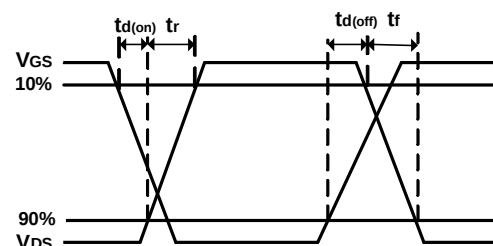
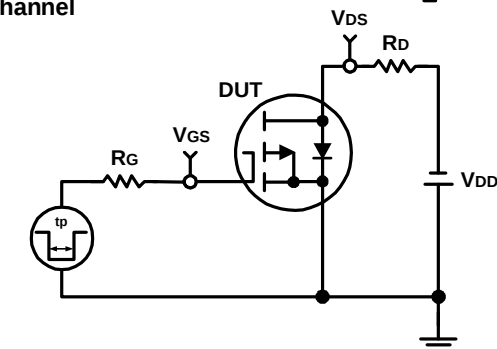


Switching Time Test Circuit and Waveforms

N Channel

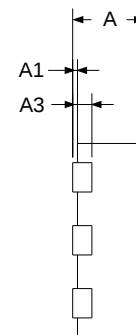
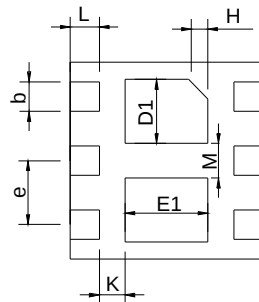
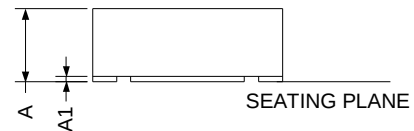
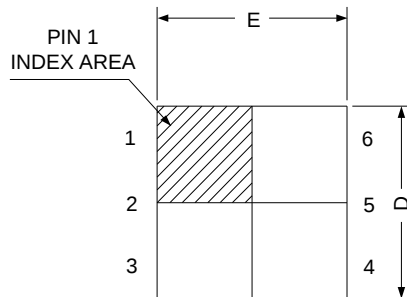


P Channel



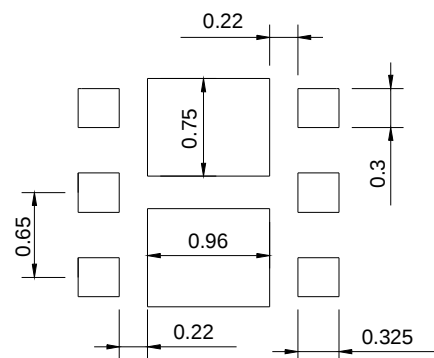
Package Information

DFN2x2-6



SYMBOL	DFN2x2-6			
	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
A	0.70	0.80	0.028	0.031
A1	0.00	0.05	0.000	0.002
A3	0.200 REF		0.008 REF	
b	0.25	0.35	0.010	0.014
D	1.90	2.10	0.075	0.083
D1	0.55	0.75	0.022	0.030
E	1.90	2.10	0.075	0.083
E1	0.76	0.96	0.030	0.038
e	0.65 BSC		0.026 BSC	
H	0.20 BSC		0.008 BSC	
K	0.17	0.37	0.007	0.015
L	0.25	0.35	0.010	0.014
M	0.25	0.45	0.010	0.018

RECOMMENDED LAND PATTERN



UNIT: mm