

Dual Enhancement Mode Power MOSFET (N- and P- Channel)

DESCRIPTION

The PED2312 uses advanced trench technology to provide excellent $R_{DS(ON)}$, low gate charge and operation with gate voltages as low as 2.5V. This device is suitable for use as a load switch or in PWM applications.

GENERAL FEATURES

● P-Channel

$$V_{DS} = -20V, I_D = -3A$$

$$R_{DS(ON)} = 110m\Omega @ V_{GS} = -2.5V$$

$$R_{DS(ON)} = 85 m\Omega @ V_{GS} = -4.5V$$

● N-Channel

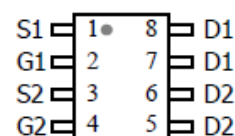
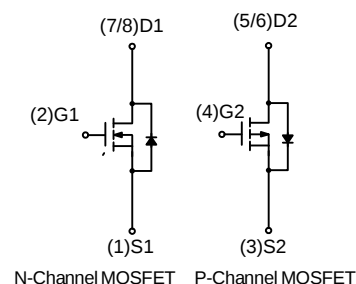
$$V_{DS} = 20V, I_D = 3A$$

$$R_{DS(ON)} = 65m\Omega @ V_{GS} = 2.5V$$

$$R_{DS(ON)} = 50 m\Omega @ V_{GS} = 4.5V$$

Application

- PWM applications
- Load switch
- Power management



Schematic diagram



DFN3X2-8L top view

Absolute Maximum Ratings (TA=25°C unless otherwise noted)

Parameter	Symbol	N-Channel	P-Channel	Unit
Drain-Source Voltage	V_{DS}	20	-20	V
Gate-Source Voltage	V_{GS}	± 10	± 12	V
Drain Current-Continuous	I_D	3.5	-3	A
Drain Current -Pulsed (Note 1)	I_{DM}	10	-10	A
Maximum Power Dissipation	P_D	0.8	0.8	W
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-55 To 150		°C

Thermal Characteristic

Thermal Resistance, Junction-to-Ambient (Note 2)	$R_{\theta JA}$	100	°C/W
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N-Channel**Electrical Characteristics (TA=25°C unless otherwise noted)**

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	BV _{DSS}	V _{GS} =0V I _D =250μA	20		-	V
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} =20V,V _{GS} =0V	-	-	1	μA
Gate-Body Leakage Current	I _{GSS}	V _{GS} =±10V,V _{DS} =0V	-	-	±100	nA
On Characteristics (Note 3)						
Gate Threshold Voltage	V _{GS(th)}	V _{DS} =V _{GS} ,I _D =250μA	0.5	0.7	1.0	V
Drain-Source On-State Resistance	R _{DS(ON)}	V _{GS} =2.5V, I _D =2.5A	-	65	90	mΩ
		V _{GS} =4.5V, I _D =2.9A	-	50	65	mΩ
Forward Transconductance	g _{FS}	V _{DS} =5V,I _D =2.9A	-	8	-	S
Dynamic Characteristics (Note4)						
Input Capacitance	C _{ISS}	V _{DS} =10V,V _{GS} =0V, F=1.0MHz	-	300	-	PF
Output Capacitance	C _{OSS}		-	120	-	PF
Reverse Transfer Capacitance	C _{rSS}		-	80	-	PF
Switching Characteristics (Note 4)						
Turn-on Delay Time	t _{d(on)}	V _{DD} =10V,I _D =2.9A V _{GS} =4.5V,R _{GEN} =6Ω	-	10	15	nS
Turn-on Rise Time	t _r		-	50	85	nS
Turn-Off Delay Time	t _{d(off)}		-	17	45	nS
Turn-Off Fall Time	t _f		-	10	20	nS
Total Gate Charge	Q _g	V _{DS} =10V,I _D =2.9A, V _{GS} =4.5V	-	4.0	10	nC
Gate-Source Charge	Q _{gs}		-	0.65	-	nC
Gate-Drain Charge	Q _{gd}		-	1.2	-	nC
Drain-Source Diode Characteristics						
Diode Forward Voltage (Note 3)	V _{SD}	V _{GS} =0V,I _S =2.9A	-	0.75	1.2	V
Diode Forward Current (Note 2)	I _S		-	-	2.9	A

P-Channel

Electrical Characteristics (TA=25°C unless otherwise noted)

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	BV _{DSS}	V _{GS} =0V I _D =-250μA	-20		-	V
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} =-20V,V _{GS} =0V	-	-	-1	μA
Gate-Body Leakage Current	I _{GSS}	V _{GS} =±12V,V _{DS} =0V	-	-	±100	nA
On Characteristics (Note 3)						
Gate Threshold Voltage	V _{GS(th)}	V _{DS} =V _{GS} ,I _D =-250μA	-0.45	-0.7	-1	V
Drain-Source On-State Resistance	R _{DS(ON)}	V _{GS} =-4.5V, I _D =-2.5A	-	85	110	mΩ
		V _{GS} =-2.5V, I _D =-2A	-	110	140	mΩ
Forward Transconductance	g _{FS}	V _{DS} =-5V,I _D =-2.8A	-	9.5	-	S
Dynamic Characteristics (Note4)						
Input Capacitance	C _{iss}	V _{DS} =-10V,V _{GS} =0V, F=1.0MHz	-	405	-	PF
Output Capacitance	C _{oss}		-	75	-	PF
Reverse Transfer Capacitance	C _{rss}		-	55	-	PF
Switching Characteristics (Note 4)						
Turn-on Delay Time	t _{d(on)}	V _{DD} =-10V,I _D =-1A V _{GS} =-4.5V,R _{GEN} =10Ω	-	11	-	nS
Turn-on Rise Time	t _r		-	35	-	nS
Turn-Off Delay Time	t _{d(off)}		-	30	-	nS
Turn-Off Fall Time	t _f		-	10	-	nS
Total Gate Charge	Q _g	V _{DS} =-10V,I _D =-3A, V _{GS} =-2.5V	-	3.3	12	nC
Gate-Source Charge	Q _{gs}		-	0.7	-	nC
Gate-Drain Charge	Q _{gd}		-	1.3	-	nC
Drain-Source Diode Characteristics						
Diode Forward Voltage (Note 3)	V _{SD}	V _{GS} =0V,I _S =1.3A	-	-	-1.2	V
Diode Forward Current (Note 2)	I _S		-	-	-1.3	A

Notes:

1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Surface Mounted on FR4 Board, $t \leq 10$ sec.
3. Pulse Test: Pulse Width $\leq 300\mu s$, Duty Cycle $\leq 2\%$.
4. Guaranteed by design, not subject to production

N-CHANNEL TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

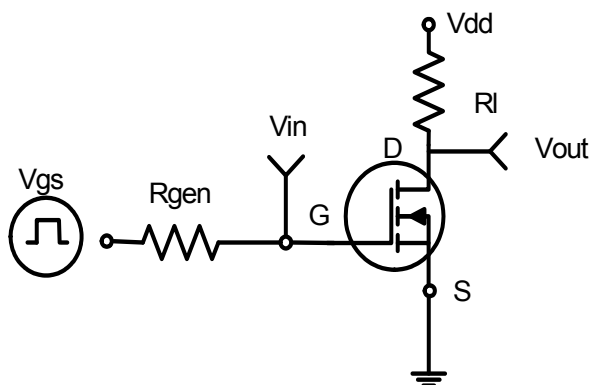


Figure 1: Switching Test Circuit

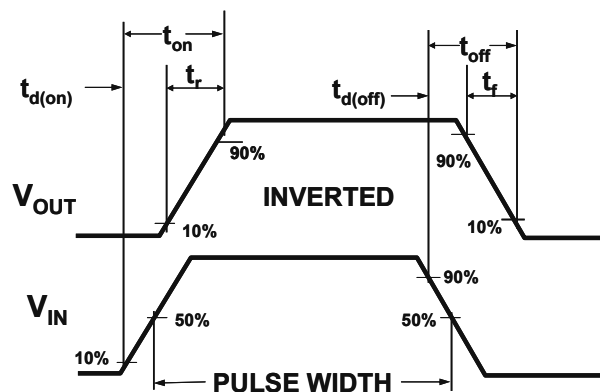


Figure 2: Switching Waveforms

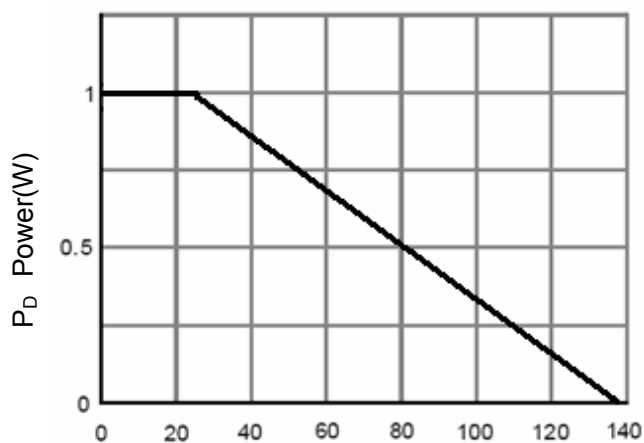


Figure 3 Power Dissipation

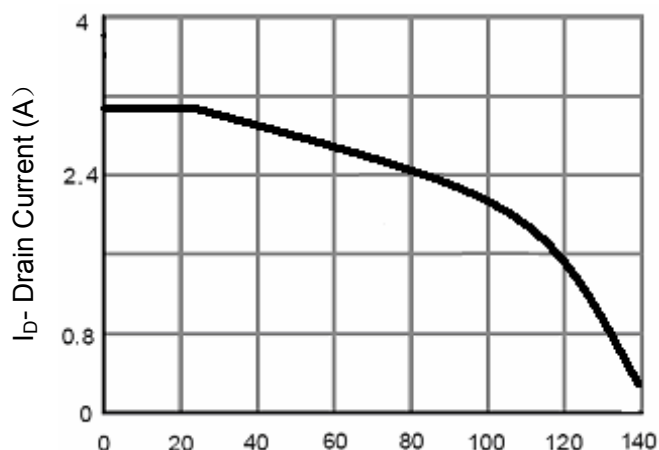


Figure 4 Drain Current

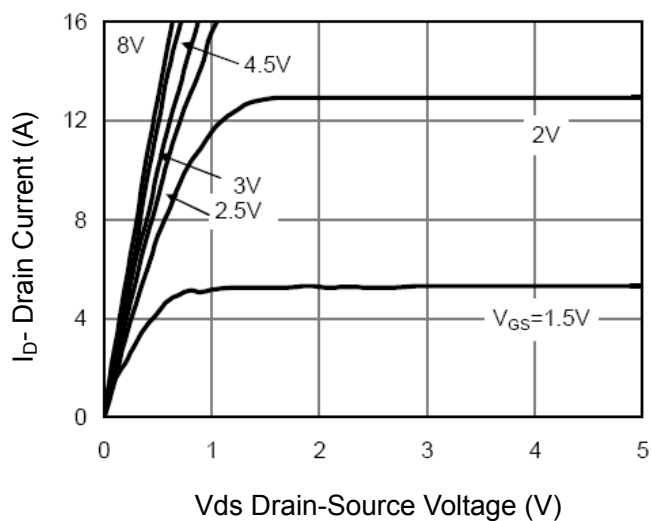


Figure 5 Output CHARACTERISTICS

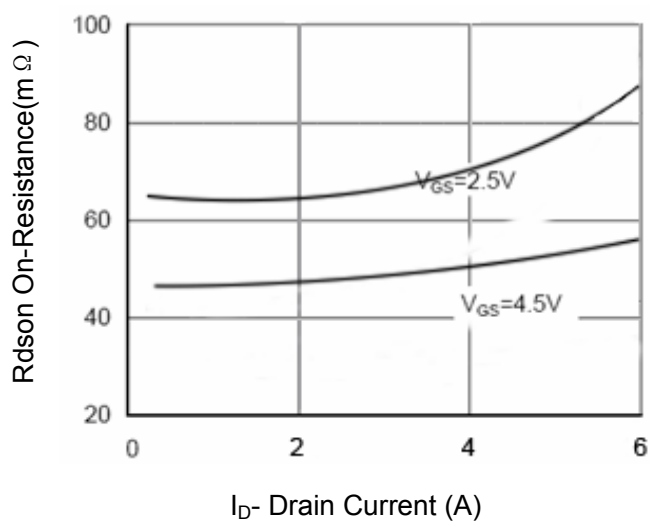


Figure 6 Drain-Source On-Resistance

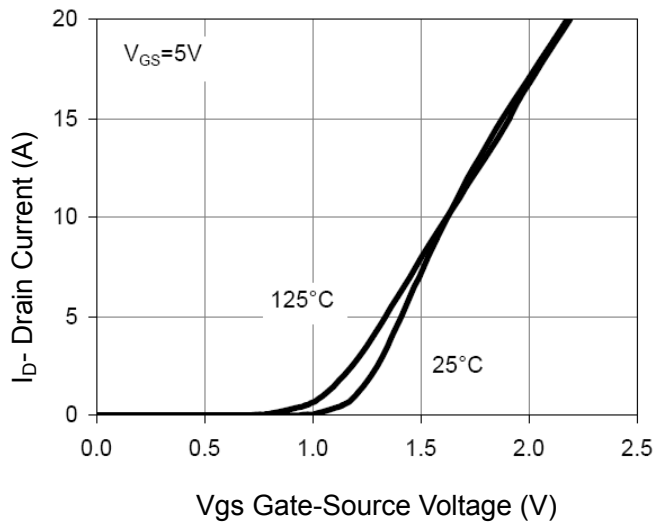


Figure 7 Transfer Characteristics

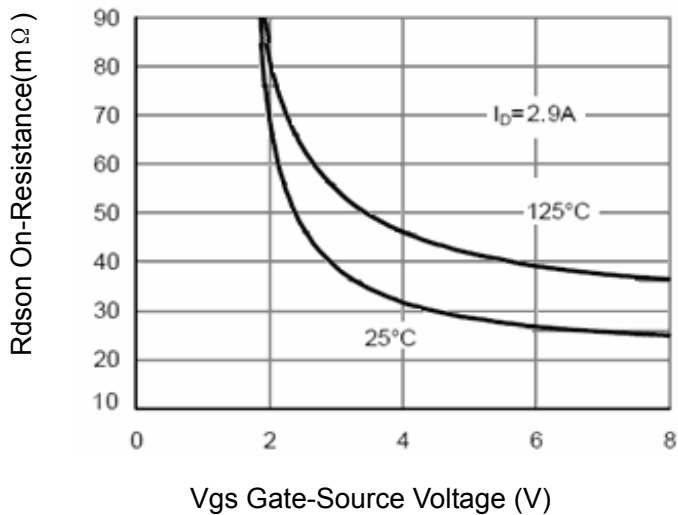


Figure 9 Rdson vs Vgs

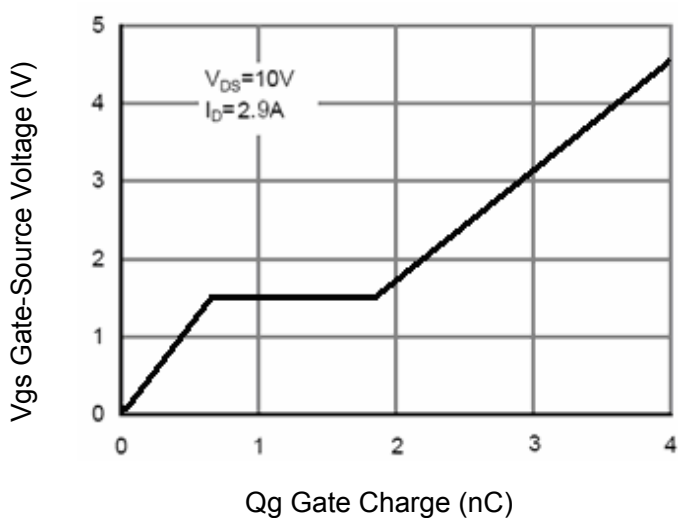


Figure 11 Gate Charge

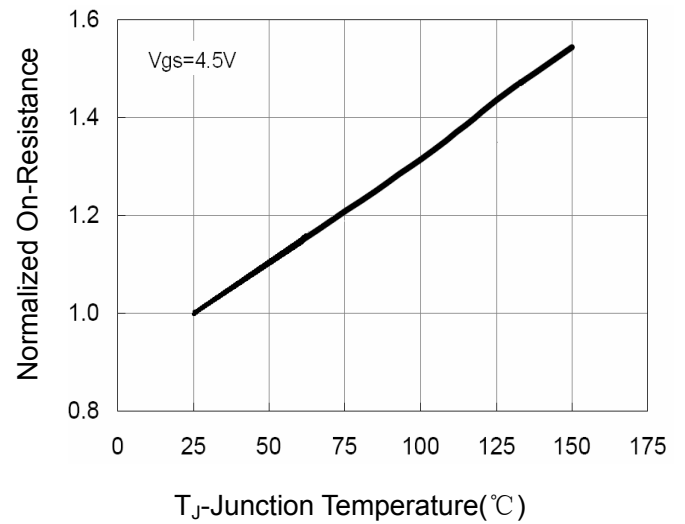


Figure 8 Drain-Source On-Resistance

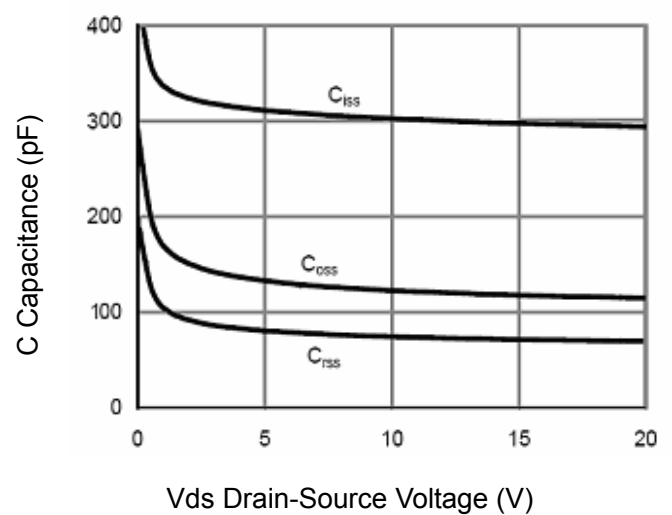


Figure 10 Capacitance vs Vds

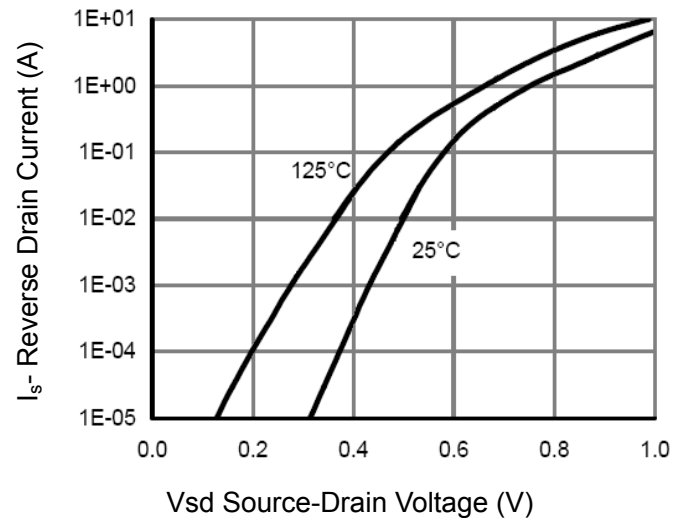


Figure 12 Source- Drain Diode Forward

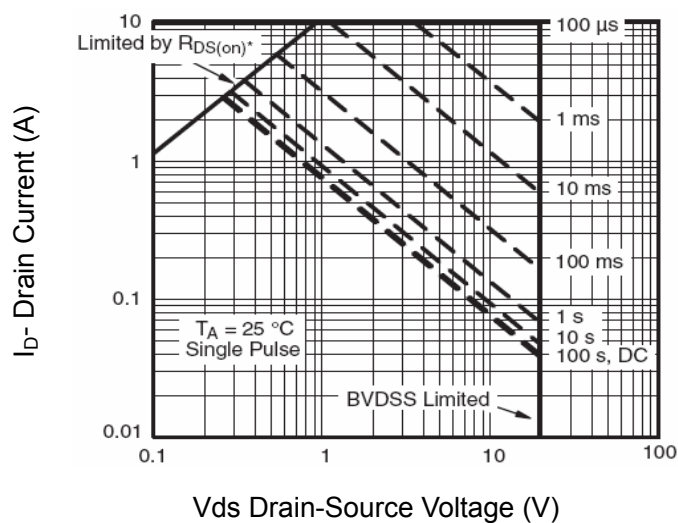


Figure 13 Safe Operation Area

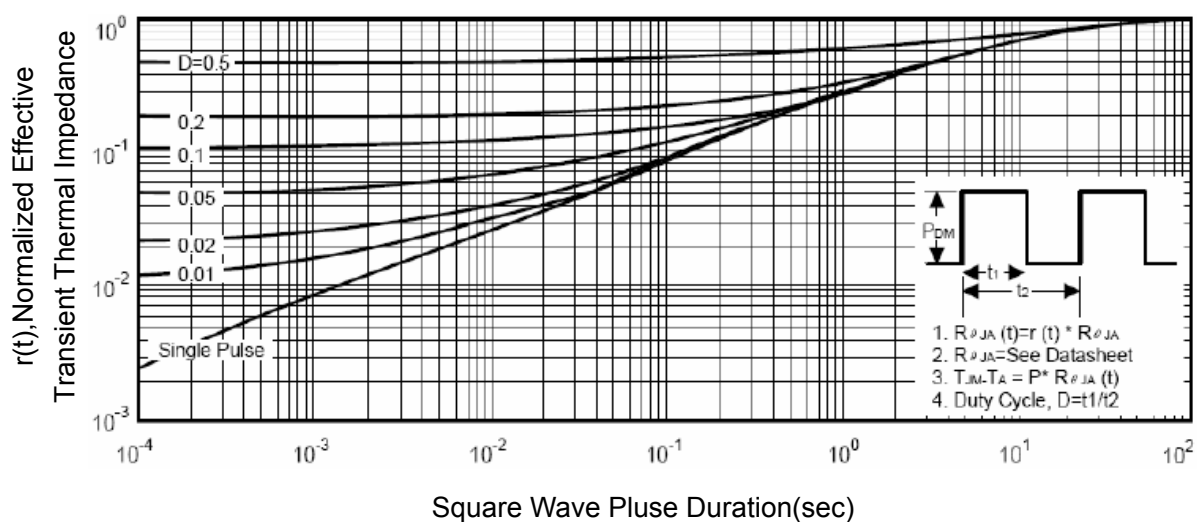


Figure 14 Normalized Maximum Transient Thermal Impedance

P-CHANNEL TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

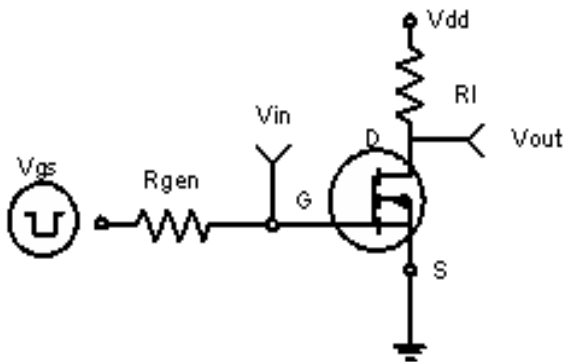


Figure 1: Switching Test Circuit

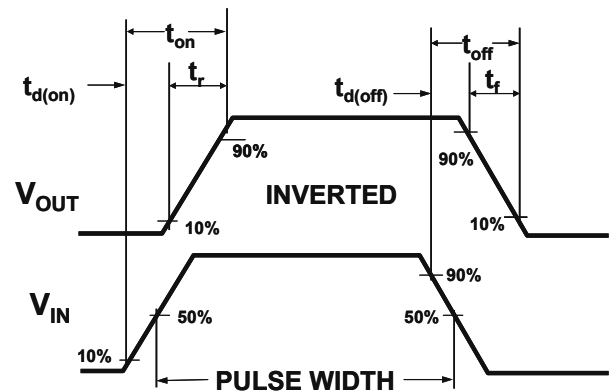


Figure 2: Switching Waveforms

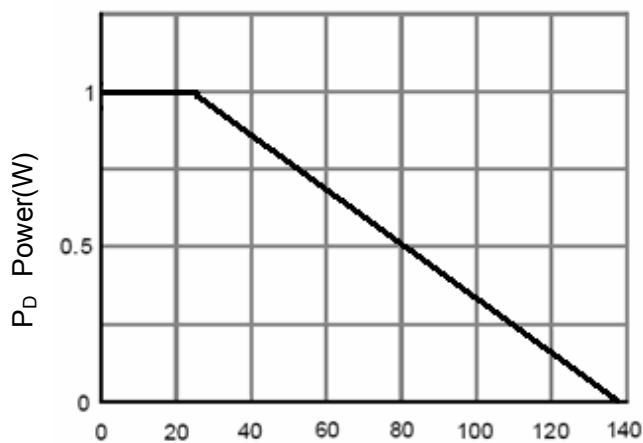


Figure 3 Power Dissipation

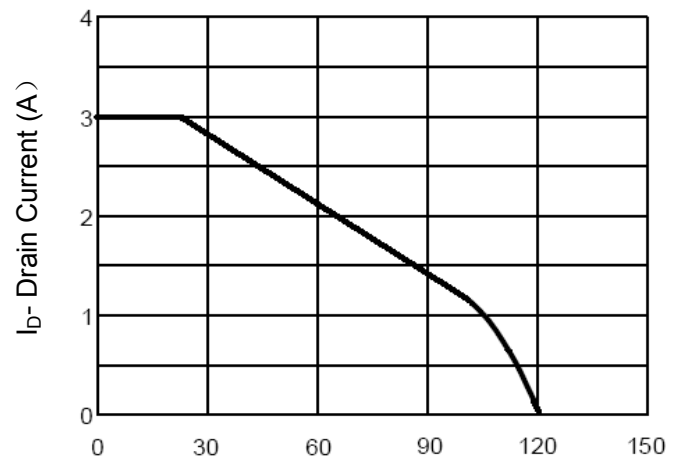


Figure 4 Drain Current

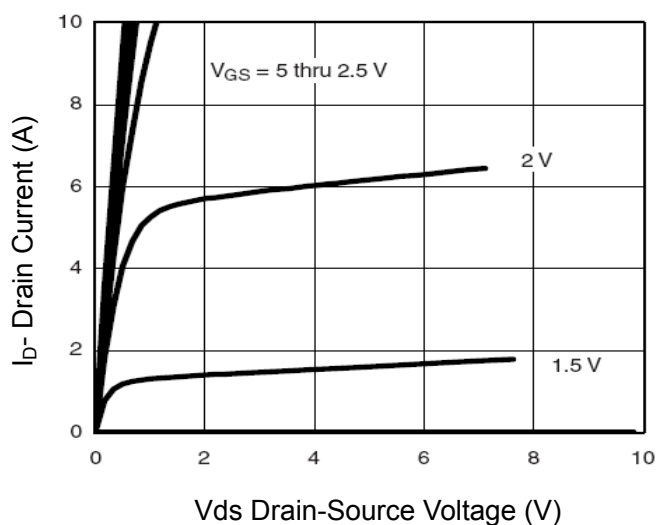


Figure 5 Output CHARACTERISTICS

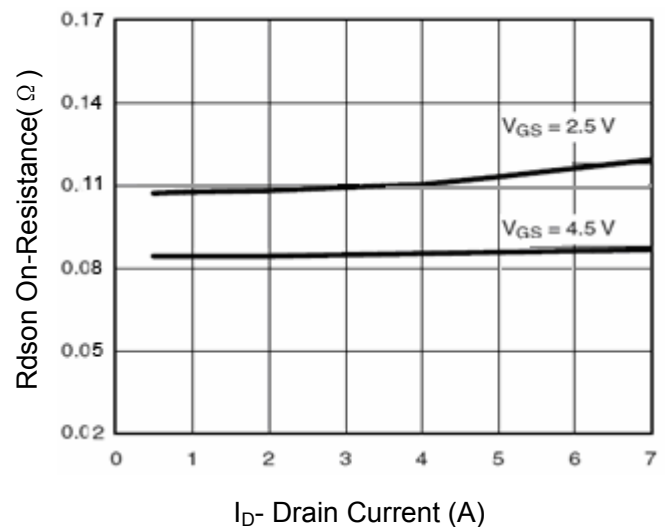


Figure 6 Drain-Source On-Resistance

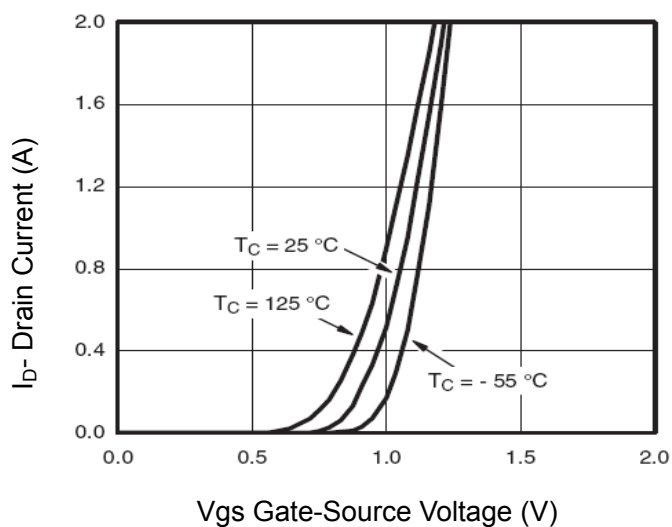


Figure 7 Transfer Characteristics

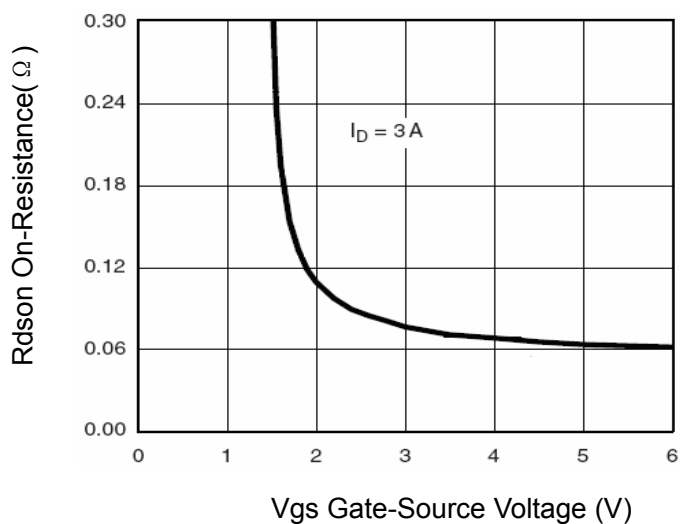


Figure 9 $R_{DS(on)}$ vs V_{GS}

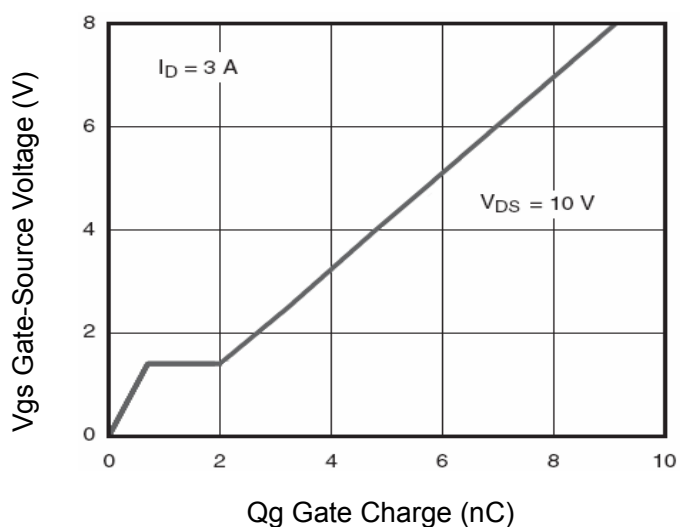


Figure 11 Gate Charge

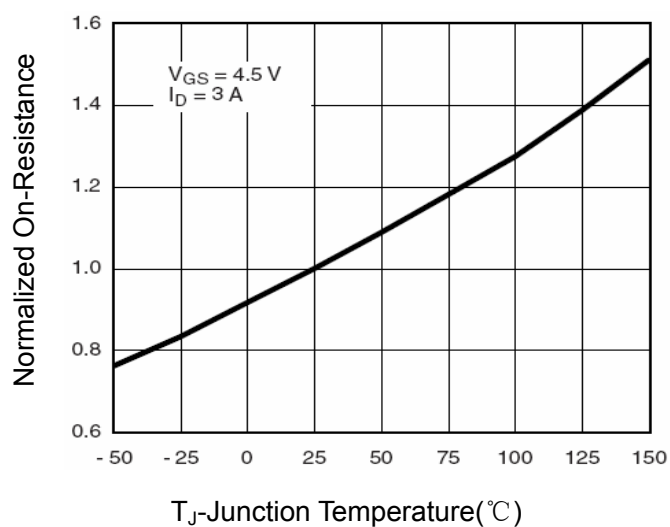


Figure 8 Drain-Source On-Resistance

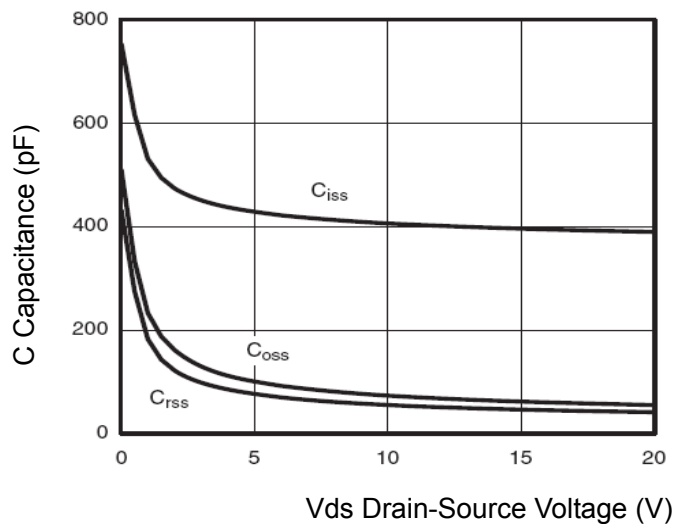


Figure 10 Capacitance vs V_{DS}

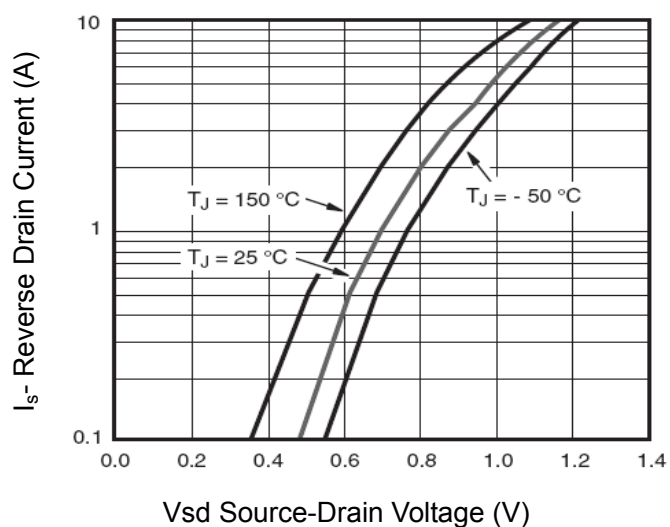


Figure 12 Source- Drain Diode Forward

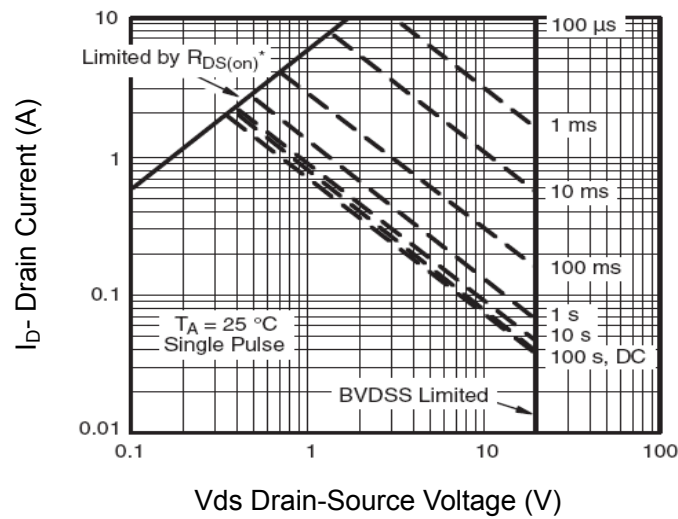


Figure 13 Safe Operation Area

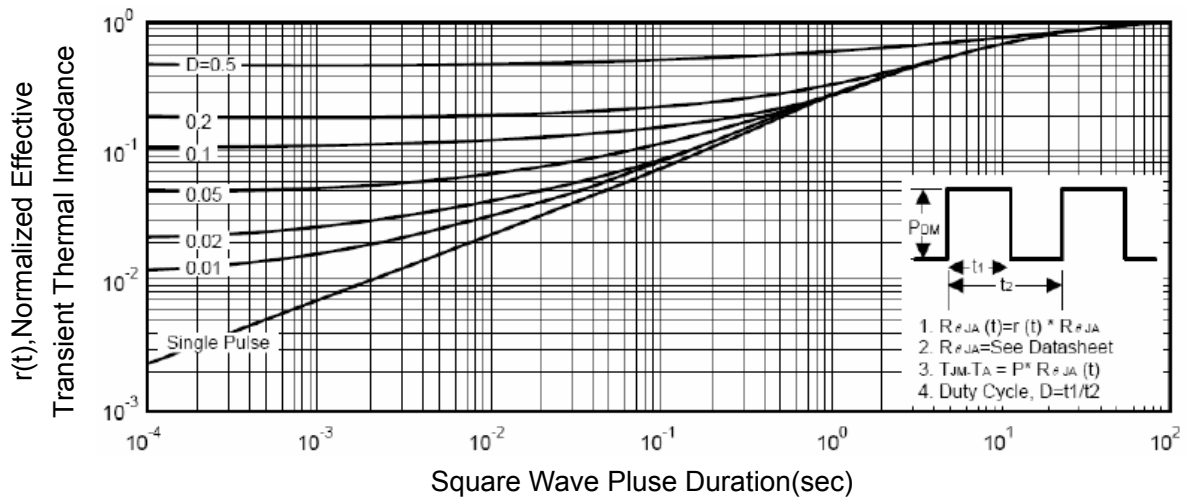
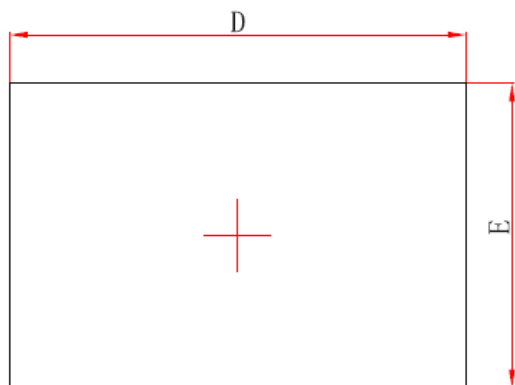
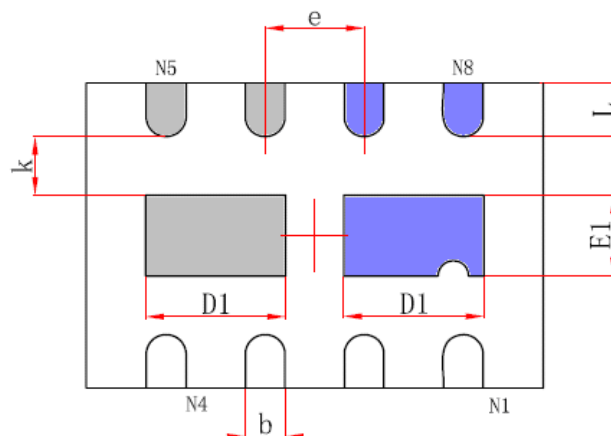


Figure 14 Normalized Maximum Transient Thermal Impedance

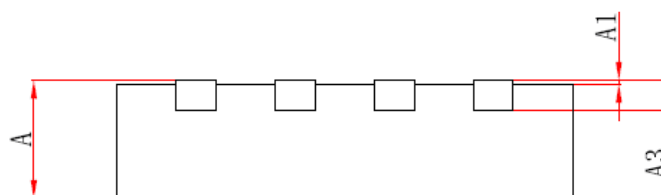
DFN3X2-8L PACKAGE INFORMATION



Top View



Bottom View



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	0.700/0.800	0.800/0.900	0.028/0.031	0.031/0.035
A1	0.000	0.050	0.000	0.002
A3	0.203REF.		0.008REF.	
D	2.900	3.100	0.114	0.122
E	1.900	2.100	0.075	0.083
D1	0.820	1.020	0.032	0.040
E1	0.430	0.630	0.017	0.025
k	0.200MIN.		0.008MIN.	
b	0.250	0.350	0.010	0.014
e	0.650TYP.		0.026TYP.	
L	0.250	0.450	0.010	0.018