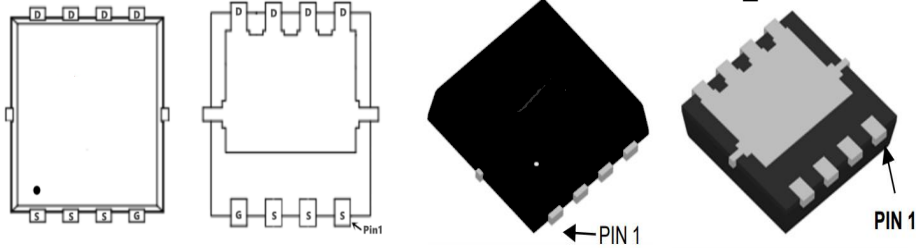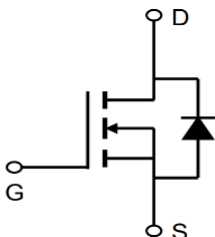# TMN3023DF

N-Channel Enhancement Mosfet

General Description
• Low $R_{DS(ON)}$
• RoHS and Halogen-Free Compliant

Applications
• Load switch
• PWM

General Features

V_{DS} = 30V I_D =23A

$R_{DS(ON)}$ = 16 mΩ (typ.) @ V_{GS}=10V

100% UIS Tested
100% R_g Tested

Green Product

DF:DFN3x3_8L

← PIN 1

PIN 1

Marking: 23N03 OR 7410

Absolute Maximum Ratings (T_A = 25°C Unless Otherwise Noted)

Symbol	Parameter		Rating	Unit
V_{DSS}	Drain-Source Voltage		30	V
V_{GSS}	Gate-Source Voltage		±20	
I_D [a]	Continuous Drain Current (V_{GS}=10V)	T_A=25°C	7	A
		T_A=70°C	5.6	
I_{DM} [a]	Pulsed Drain Current (V_{GS}=10V)		28	
I_D [c]	Continuous Drain Current (V_{GS}=10V)	T_C=25°C	23	
		T_C=70°C	19	
I_S [a]	Diode Continuous Forward Current		1.5	
I_{AS} [b]	Avalanche Current, Single pulse	L=0.1mH	13	
		L=0.5mH	7	
E_{AS} [b]	Avalanche Energy, Single pulse	L=0.1mH	8.45	mJ
		L=0.5mH	12.25	
T_J	Maximum Junction Temperature		150	°C
T_{STG}	Storage Temperature Range		-55 to 150	
P_D [a]	Maximum Power Dissipation	T_A=25°C	1.56	W
		T_A=70°C	1	
P_D [c]	Maximum Power Dissipation	T_C=25°C	17.8	
		T_C=70°C	11.4	
$R_{\theta JA}$ [a]	Thermal Resistance-Junction to Ambient	t ≤ 10s	50	°C/W
		Steady State	80	
$R_{\theta JC}$ [c]	Thermal Resistance-Junction to Case	Steady State	7	

Note a：Surface Mounted on 1in^2 pad area, t ≤ 10sec.
  b：UIS tested and pulse width limited by maximum junction temperature 150°C (initial temperature T_j=25°C)·
  c：The power dissipation P_D is based on $T_{J(MAX)}$ = 150°C, and it is useful for reducing junction-to-case thermal resistance ($R_{\theta JC}$) when additional heat sink is used.

Electrical Characteristics (T_J=25℃ unless otherwise specified)

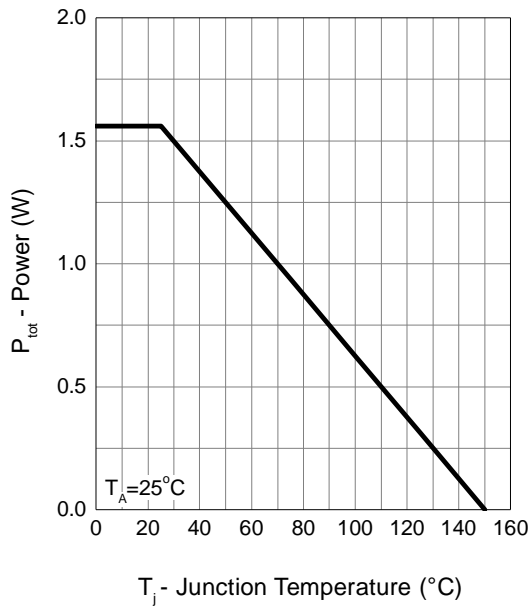| Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
Static Characteristics						
BV_{DSS}	Drain-Source Breakdown Voltage	V_{GS}=0V, I_{DS}=250µA	30	-	-	V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS}=24V, V_{GS}=0V	-	-	1	µA
		T_J=85°C	-	-	30	
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS}=V_{GS}, I_{DS}=250µA	1.0	1.8	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}=8A	-	16	21	mΩ
		T_J=125°C	-	25.5	-	
		V_{GS}=4.5V, I_{DS}=5A	-	21	26	
Diode Characteristics						
V_{SD} [d]	Diode Forward Voltage	I_{SD}=1A, V_{GS}=0V	-	0.75	1.1	V
t_{rr} [e]	Reverse Recovery Time	I_{SD}=8A, dI_{SD}/dt=100A/µs	-	12	-	ns
t_a	Charge Time		-	6.2	-	
t_b	Discharge Time		-	5.8	-	
Q_{rr} [e]	Reverse Recovery Charge		-	3.7	-	nC
Dynamic Characteristics [e]						
R_G	Gate Resistance	V_{GS}=0V, V_{DS}=0V, F=1MHz	1	1.5	3	Ω
C_{iss}	Input Capacitance	V_{GS}=0V, V_{DS}=15V, Frequency=1.0MHz	300	415	550	pF
C_{oss}	Output Capacitance		50	70	100	
C_{rss}	Reverse Transfer Capacitance		30	40	60	
$t_{d(ON)}$	Turn-on Delay Time	V_{DD}=15V, R_L=15Ω, I_{DS}=1A, V_{GEN}=10V, R_G=6Ω	-	5.5	9	ns
t_r	Turn-on Rise Time		-	9	18	
$t_{d(OFF)}$	Turn-off Delay Time		-	14	25	
t_f	Turn-off Fall Time		-	3.6	7	
Gate Charge Characteristics [e]						
Q_g	Total Gate Charge	V_{DS}=15V, V_{GS}=4.5V, I_{DS}=8A	-	3.8	5.5	nC
Q_g	Total Gate Charge	V_{DS}=15V, V_{GS}=10V, I_{DS}=8A	-	8	13	
Q_{gth}	Threshold Gate Charge		-	0.4	0.7	
Q_{gs}	Gate-Source Charge		-	1.1	1.8	
Q_{gd}	Gate-Drain Charge		-	1.6	2.1	

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

Typical Operating Characteristics

Power Dissipation
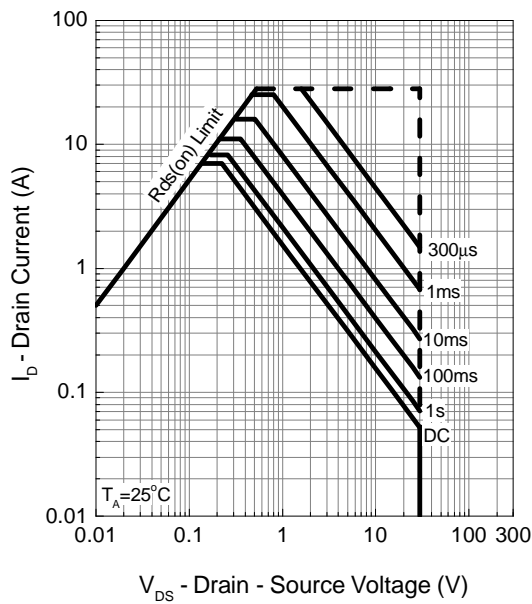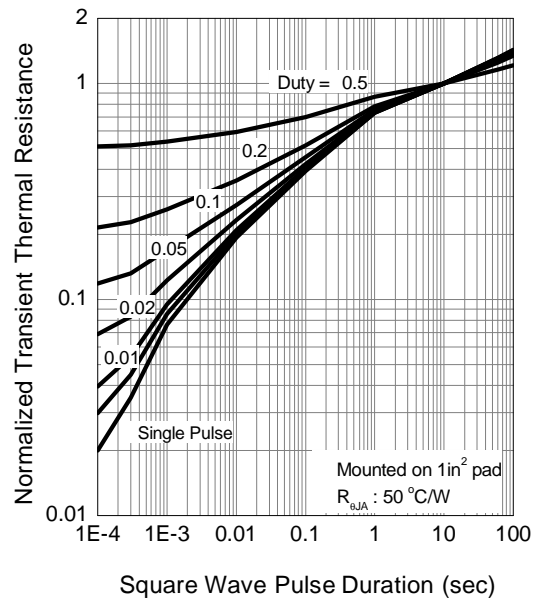

P_{tot} - Power (W) vs T_j - Junction Temperature (°C)

$T_A = 25^oC$

Drain Current

I_D - Drain Current (A) vs T_j - Junction Temperature (°C)

$T_A = 25^oC, V_G = 10V$

Safe Operation Area

I_D - Drain Current (A) vs V_{DS} - Drain - Source Voltage (V)

Rds(on) Limit

300µs
1ms
10ms
100ms
1s
DC

$T_A = 25^oC$

Thermal Transient Impedance

Normalized Transient Thermal Resistance vs Square Wave Pulse Duration (sec)

Duty = 0.5
0.2
0.1
0.05
0.02
0.01
Single Pulse

Mounted on 1in^2 pad
$R_{\theta JA}$: 50 ^oC/W

Power Dissipation

Drain Current
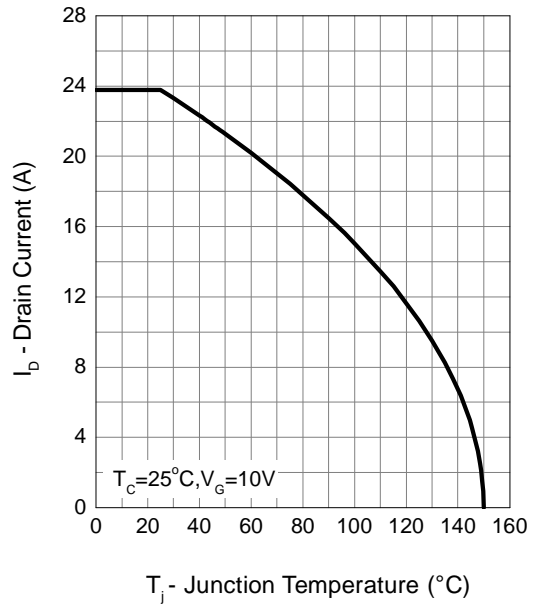
Safe Operation Area
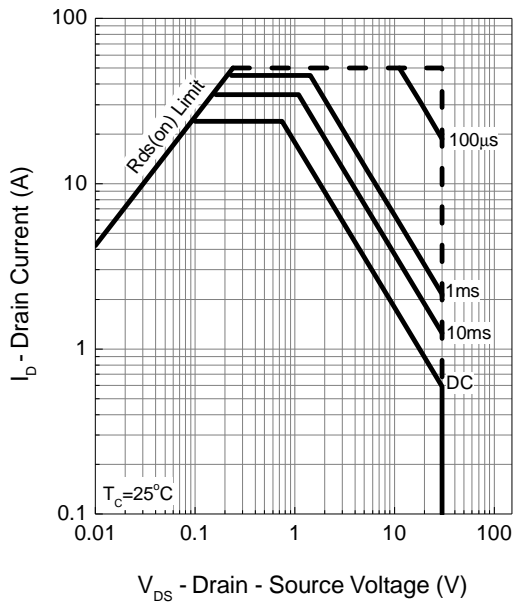
Thermal Transient Impedance
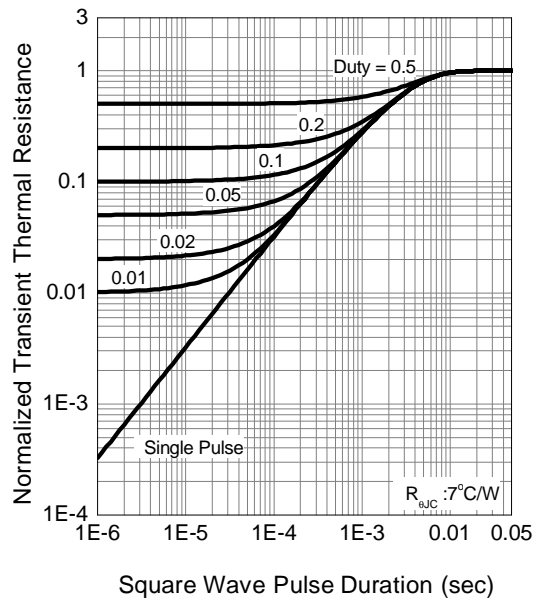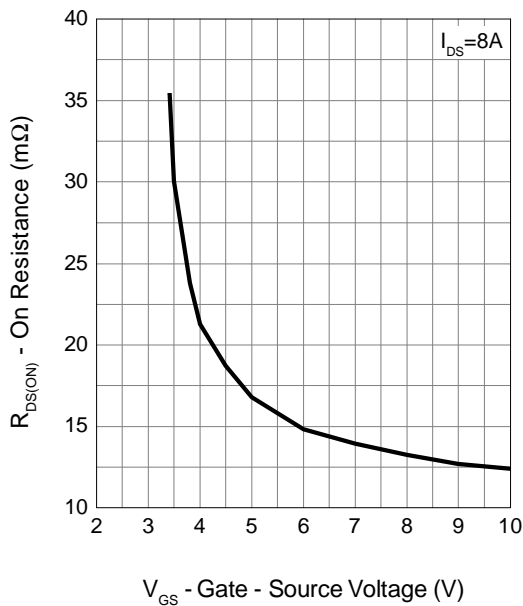
Output Characteristics
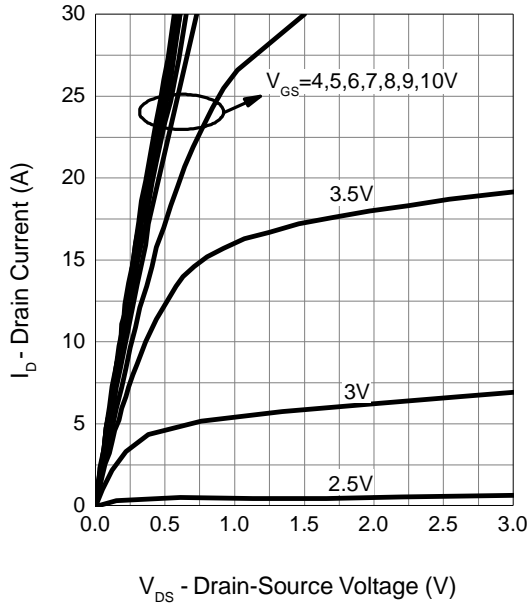
Drain-Source On Resistance
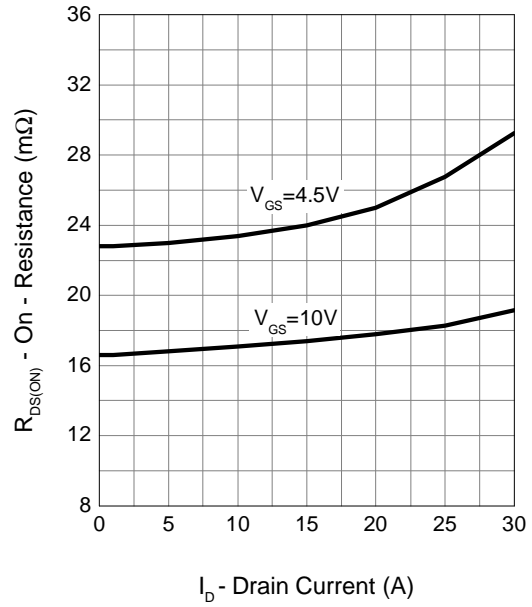
Gate-Source On Resistance

Gate Threshold Voltage

Drain-Source On Resistance

$V_{GS} = 10V$
$I_{DS} = 8A$

Normalized On Resistance

R_{ON} @ T_j=25°C: 17mΩ

T_j - Junction Temperature (°C)
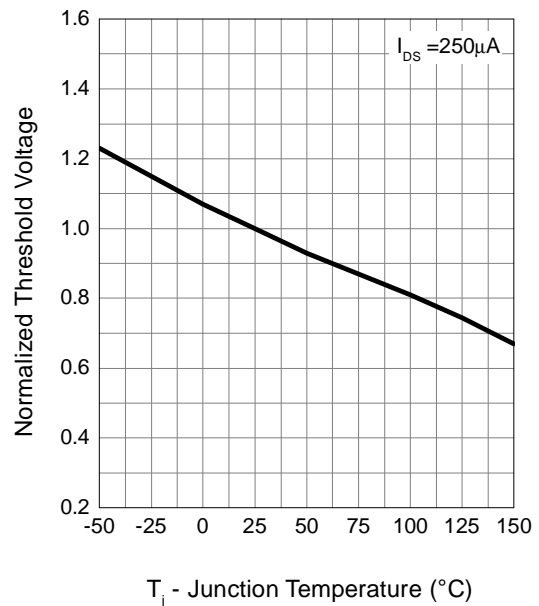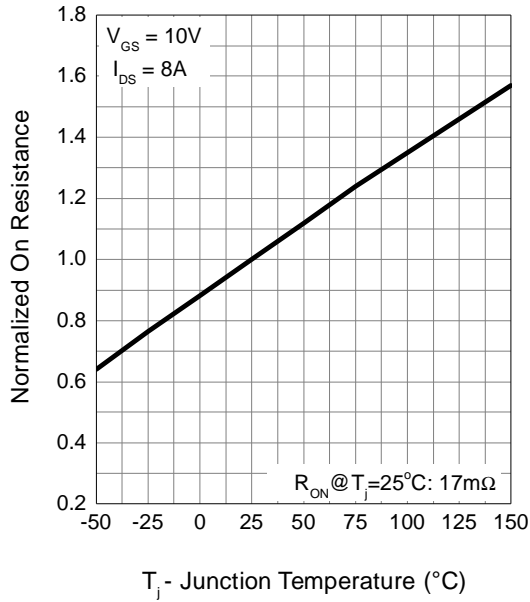
Source-Drain Diode Forward

I_S - Source Current (A)

T_j=150°C

T_j=25°C

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

Capacitance

Frequency=1MHz

C - Capacitance (pF)

Ciss

Crss

Coss

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

Gate Charge

V_{DS}=15V
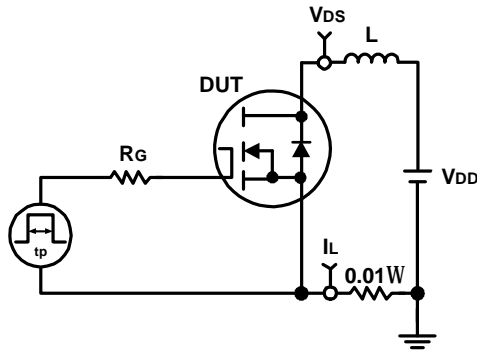I_{DS}=8A

V_{GS} - Gate - source Voltage (V)
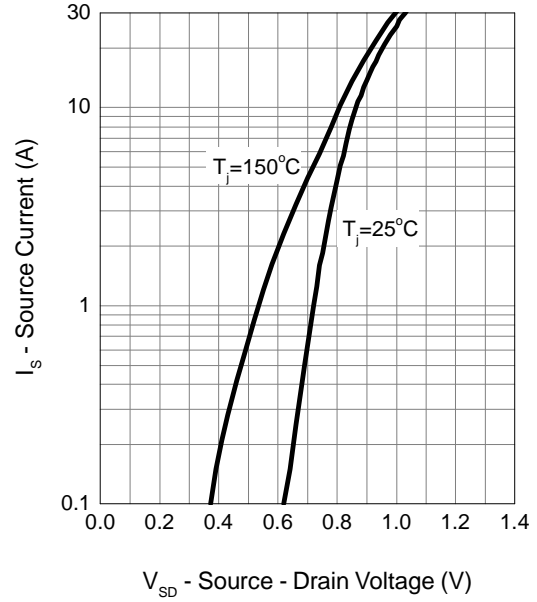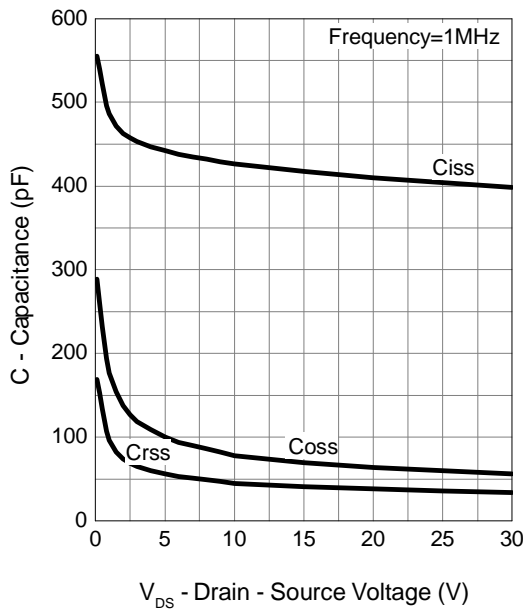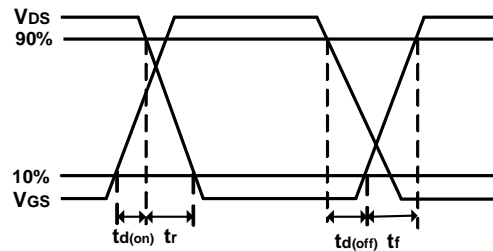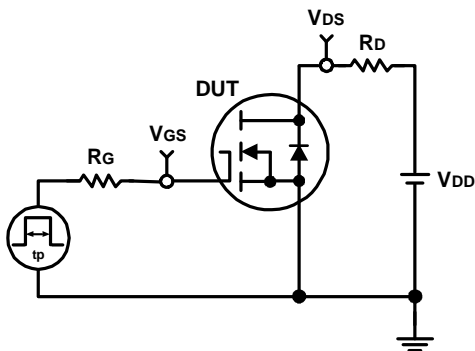
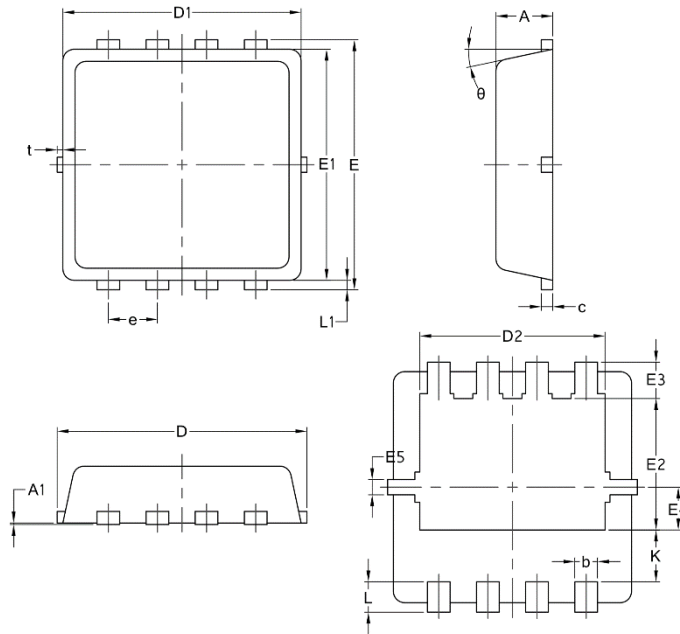Q_G - Gate Charge (nC)
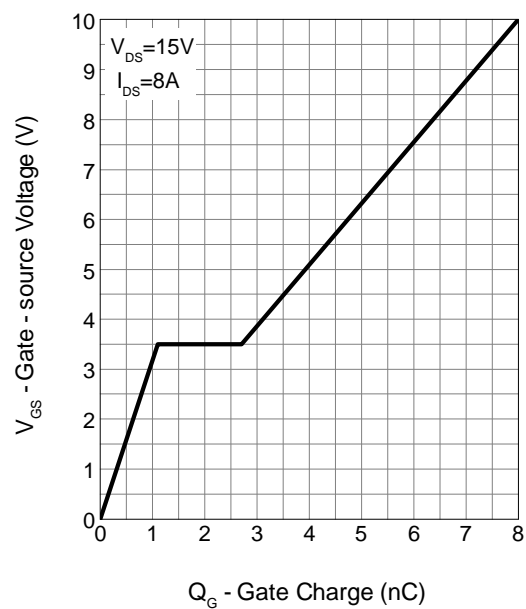
Transfer Characteristics
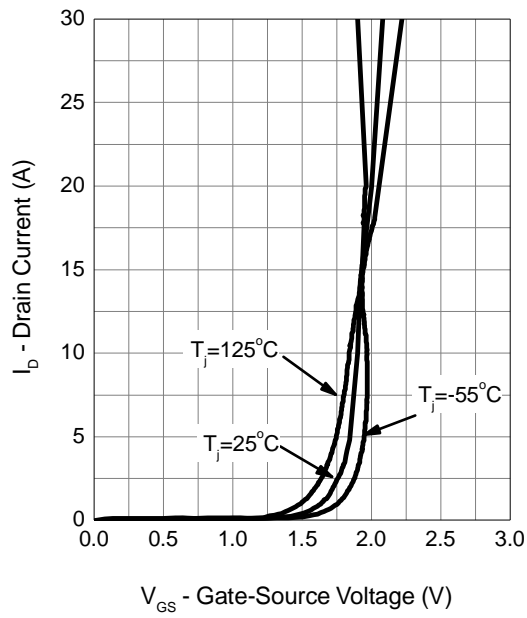
Avalanche Test Circuit and Waveforms
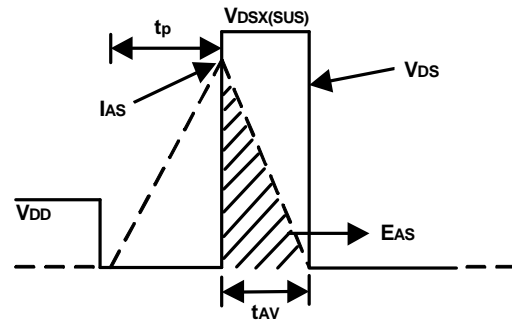
Switching Time Test Circuit and Waveforms

Package Mechanical Data：DFN3x3－8L

Symbol	Common		
	mm		
	Mim	Nom	Max
A	0.70	0.75	0.85
A1	/	/	0.05
b	0.20	0.30	0.40
c	0.10	0.152	0.25
D	3.15	3.30	3.45
D1	3.00	3.15	3.25
D2	2.29	2.45	2.65
E	3.15	3.30	3.45
E1	2.90	3.05	3.20
E2	1.54	1.74	1.94
E3	0.28	0.48	0.65
E4	0.37	0.57	0.77
E5	0.10	0.20	0.30
e	0.60	0.65	0.70
K	0.59	0.69	0.89
L	0.30	0.40	0.50
L1	0.06	0.125	0.20
t	0	0.075	0.13
Φ	10	12	14

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