

FH1504G6

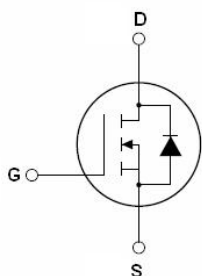
N-Channel Enhancement Mode MOSFET

Description

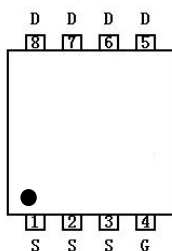
The FH1504G6 uses advanced trench technology to provide excellent $R_{DS(ON)}$, low gate charge This device is suitable for use in Load Switch, PWM Application, Power management and general purpose applications.

Features

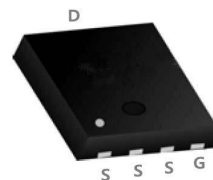
- ◆ $V_{DS} = 40V$; $I_D = 48A$
- $R_{DS(ON)}(Typ.) = 4.8 m\Omega$ @ $V_{GS} = 10V$
- $R_{DS(ON)}(Typ.) = 6.8 m\Omega$ @ $V_{GS} = 4.5V$
- ◆ Good stability and uniformity
- ◆ 100% avalanche tested
- ◆ Excellent package for good heat dissipation



Schematic diagram



Marking and pin Assignment



PDFN3.3x3.3-8L top and bottom view

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

Symbol	Parameter	Value	Units
V_{DS}	Drain-Source Voltage	40	V
I_D	Drain Current - Continuous (TC= 25°C)	48	A
	- Continuous (TC= 100°C)	31*	A
I_{DM}	Drain Current - Pulsed (Note 1)	192	A
V_{GS}	Gate-Source Voltage	±20	V
E_{AS}	Single Pulsed Avalanche Energy (Note 2)	81	mJ
P_D	Power Dissipation (TC = 25°C)	34	W
T_j, T_{stg}	Operating and Storage Temperature Range	-55 to +150	°C

* Drain current limited by maximum junction temperature

Thermal Characteristics

Symbol	Parameter	Value	Units
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	3.55	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	63.7	°C/W

Electrical Characteristics $T_C = 25^\circ\text{C}$ unless otherwise noted

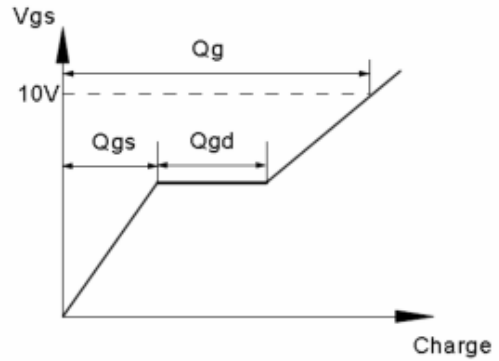
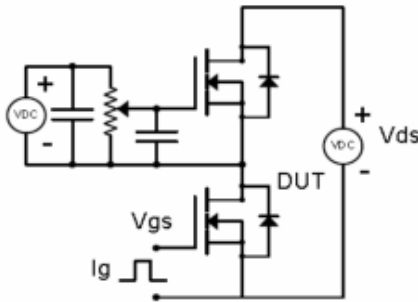
Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
Off Characteristics						
BV_{DSS}	Drain-Source Breakdown Voltage	$V_{GS} = 0\text{ V}, I_D = 250\ \mu\text{A}$	40			V
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 40\text{ V}, V_{GS} = 0\text{ V}$			1	μA
I_{GSSF}	Gate Leakage Current, Forward	$V_{GS} = 20\text{ V}, V_{DS} = 0\text{ V}$			100	nA
I_{GSSR}	Gate Leakage Current, Reverse	$V_{GS} = -20\text{ V}, V_{DS} = 0\text{ V}$			-100	nA
On Characteristics						
$V_{GS(TH)}$	Gate Threshold voltage	$V_{DS} = V_{GS}, I_D = 250\ \mu\text{A}$	1	1.6	2.2	V
$R_{DS(On)}$	Drain-Source on-state resistance	$V_{GS} = 10\text{ V}, I_D = 30\text{ A}$		4.8	6.5	m Ω
		$V_{GS} = 4.5\text{ V}, I_D = 20\text{ A}$		6.8	9.0	m Ω
g_{FS}	Forward Transconductance	$V_{DS} = 5\text{ V}, I_D = 20\text{ A}$	30			S
Dynamic Characteristics						
C_{iss}	Input capacitance	$V_{DS}=20\text{V}, V_{GS}=0\text{V},$ $F=1.0\text{MHz}$		2835		pF
C_{oss}	Output capacitance			210		pF
C_{riss}	Reverse transfer capacitance			195		pF
Switching Characteristics						
$t_{d(on)}$	Turn On Delay Time	$V_{DS}=20\text{V}, I_D=20\text{A},$ $V_{GS}=10\text{V}, R_G=3\Omega$ (Note 3, 4)		5		ns
t_r	Rising Time			4		ns
$t_{d(off)}$	Turn Off Delay Time			61		ns
t_f	Fall Time			21		ns
Q_g	Total Gate Charge	$V_{DD}=20\text{V}, I_D=30\text{A},$ $V_{GS}=10\text{V}$ (Note 3, 4)		54		nC
Q_{gs}	Gate-Source Charge			8.5		nC
Q_{gd}	Gate-Drain Charge			9		nC
Drain-Source Diode Characteristics and Maximum Ratings						
I_S	Maximum Continuous Drain-Source Diode Forward Current				45	A
I_{SM}	Maximum Pulsed Drain-Source Diode Forward Current				180	A
V_{SD}	Diode Forward Voltage	$V_{GS} = 0\text{ V}, I_S = 30\text{ A}$			1.2	V
t_{rr}	Body Diode Reverse Recovery Time	$I_F = 20\text{A}, di/dt = 100\text{A}/\mu\text{s}$		16		ns
Q_{rr}	Body Diode Reverse Recovery Charge				7	

Notes:

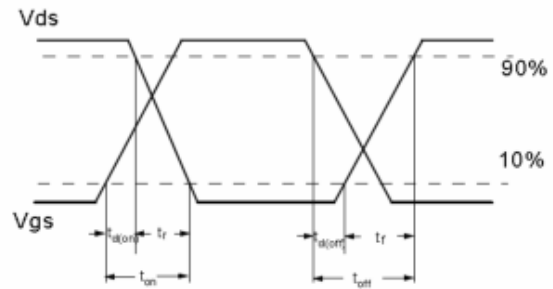
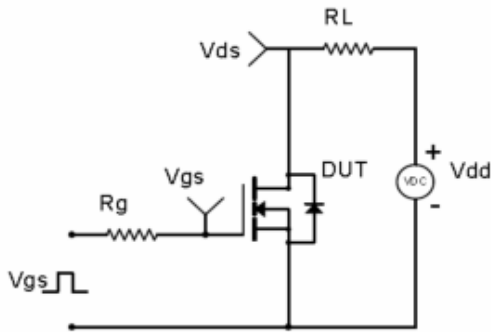
1. Repetitive Rating : Pulse width limited by maximum junction temperature
2. $L = 0.5\text{ mH}, V_{DD} = 20\text{V}, V_{GS} = 10\text{V}, R_G = 25\ \Omega$, Starting $T_j = 25^\circ\text{C}$
3. $I_{SD} \leq I_{Max}, di/dt = 100\text{A}/\mu\text{s}, V_{DD} \leq BV_{DSS}$, Starting $T_j = 25^\circ\text{C}$
4. Pulse Test : Pulse width $\leq 300\mu\text{s}$, Duty cycle $\leq 2\%$
5. Essentially independent of operating temperature

Test Circuit & Waveform

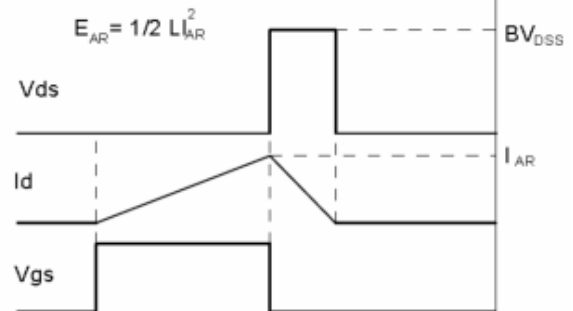
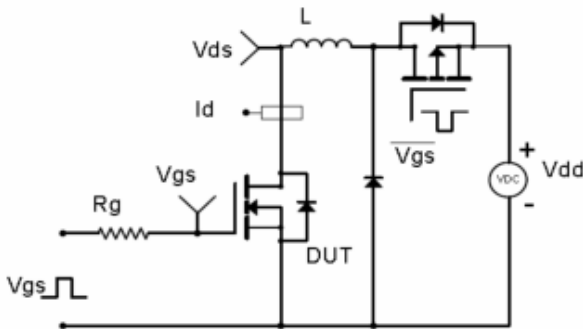
Gate Charge Test Circuit & Waveform



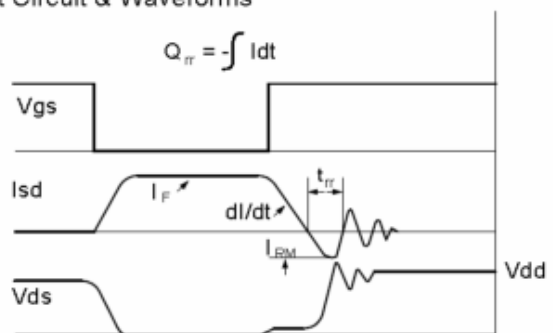
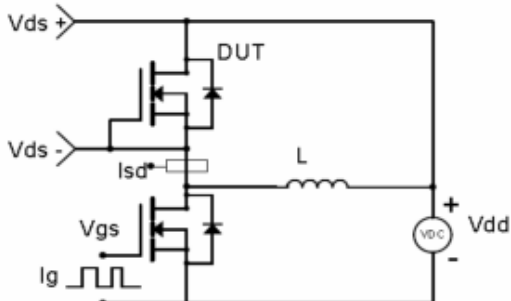
Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms



Typical Performance Characteristics

Fig.1 Power Dissipation Derating Curve

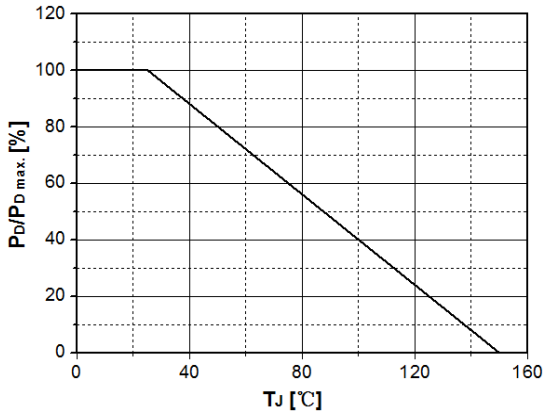


Fig.2 Avalanche Energy Derating Curve vs. Junction Temperature

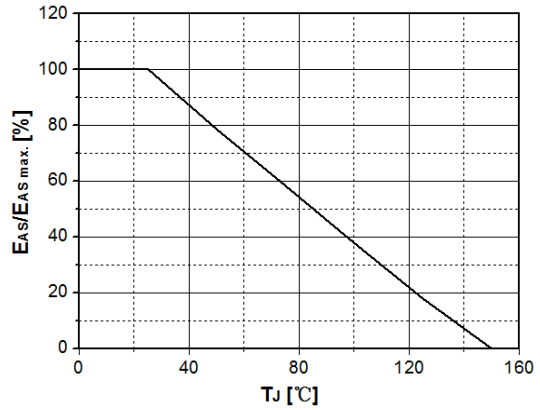


Fig.3 Typical Output Characteristics

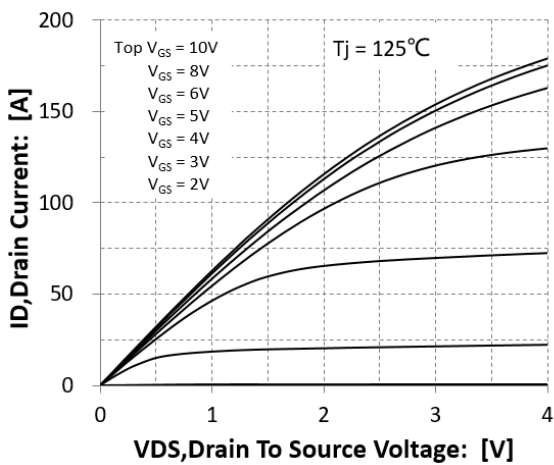


Fig. 4 Transconductance vs. Drain Current

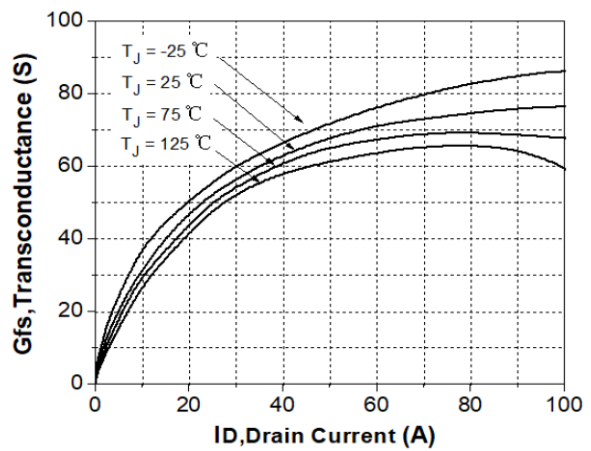


Fig.5 Typical Transfer Characteristics

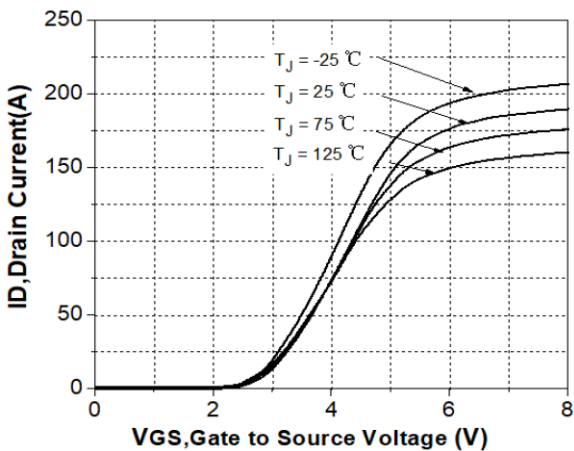


Fig. 6 State Resistance vs. Drain Current @-25°C

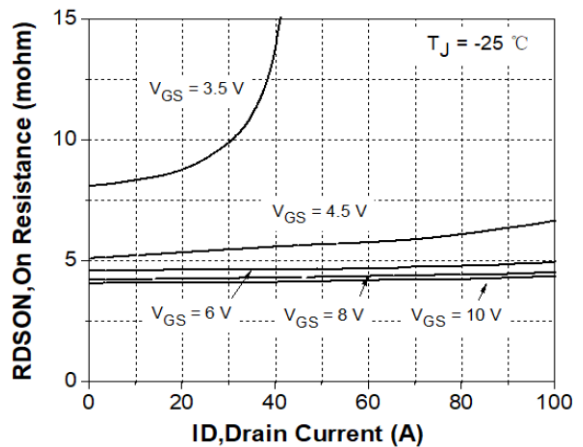


Fig.7 State Resistance vs. Drain Current @25°C

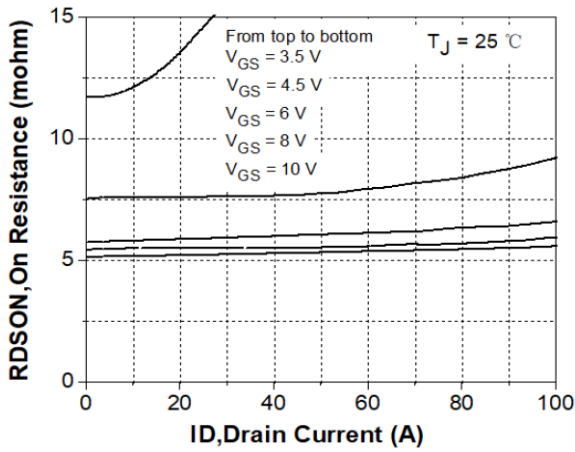


Fig. 8 State Resistance vs. Drain Current @125°C

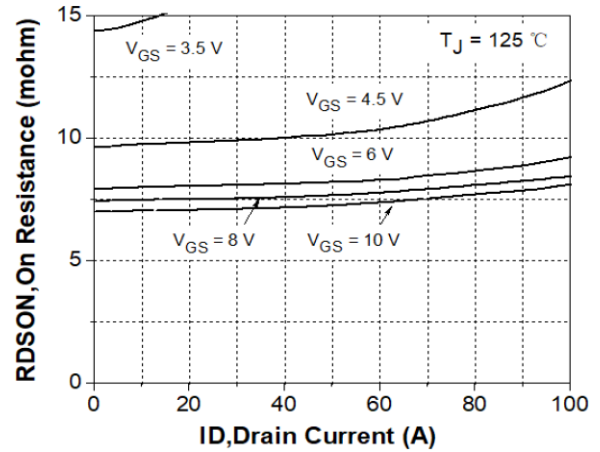


Fig.9 Typical Capacitance vs. Drain Source Voltage

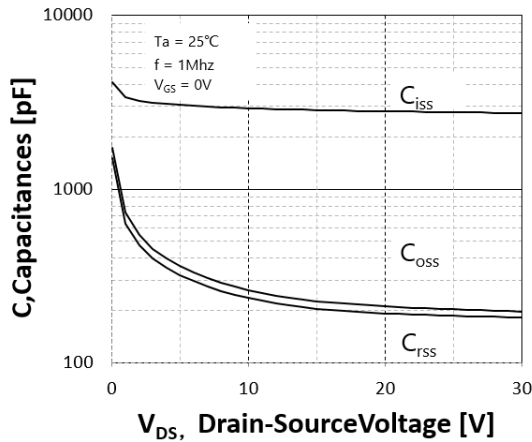


Fig.10 Dynamic Input Characteristics

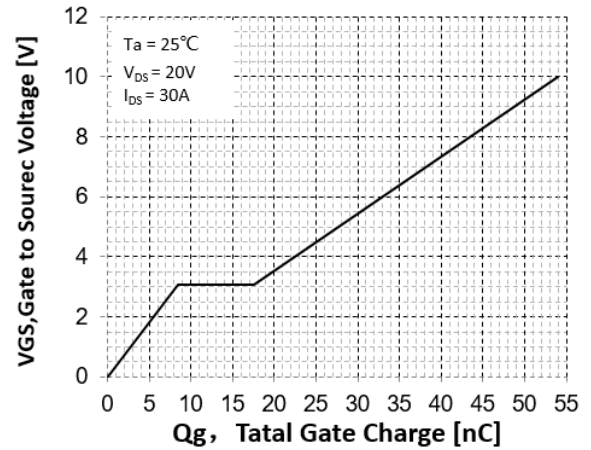


Fig.11 Breakdown Voltage vs. Junction Temperature

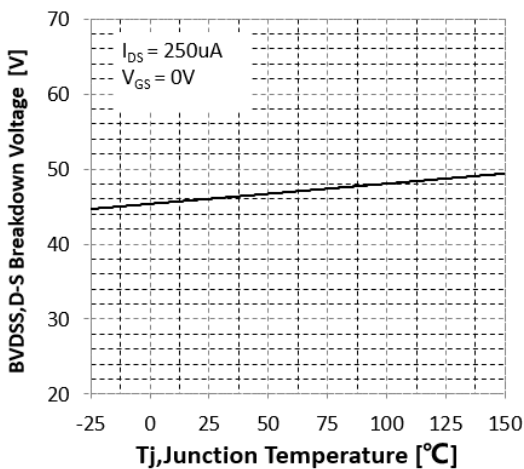


Fig. 12 Gate Threshold Voltage vs. Junction Temperature

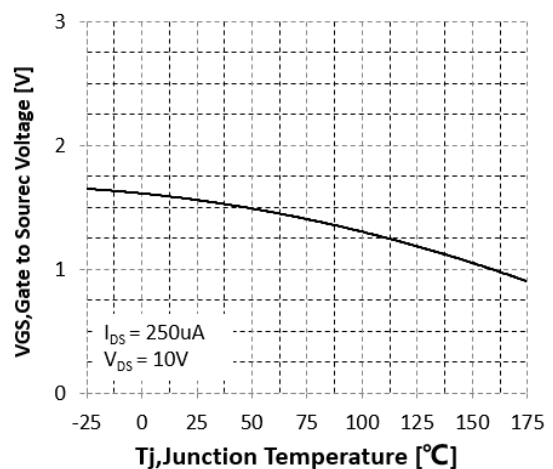


Fig.13 On-Resistance Variation vs. Junction Temperature

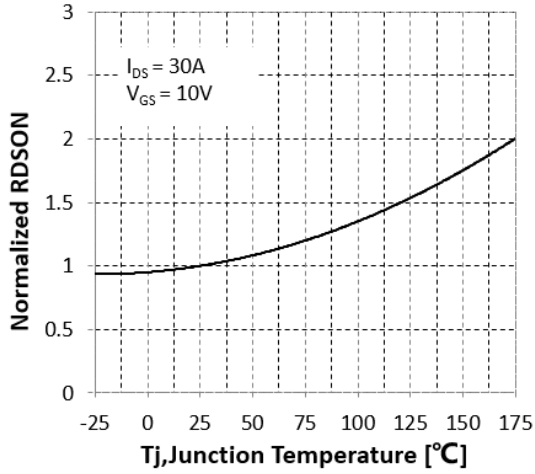


Fig.14 Maximum Drain Current vs. Case Temperature

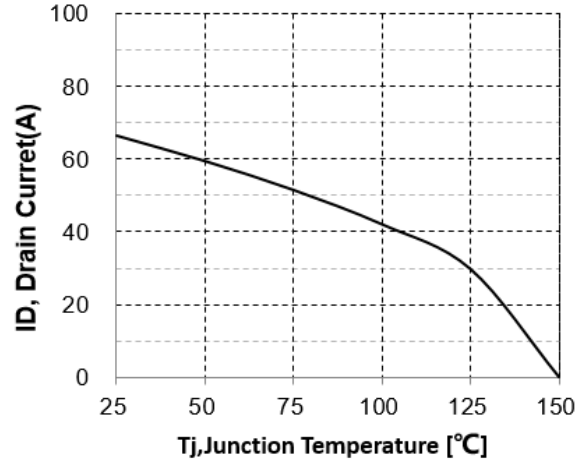


Fig.15 Body Diode Forward Voltage Vs Reverse Drain Current

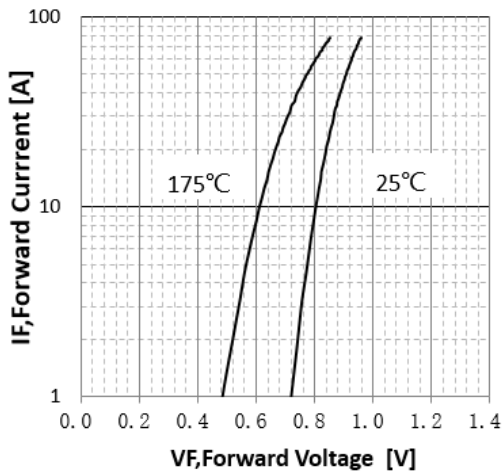


Fig.16 Safe Operating Area

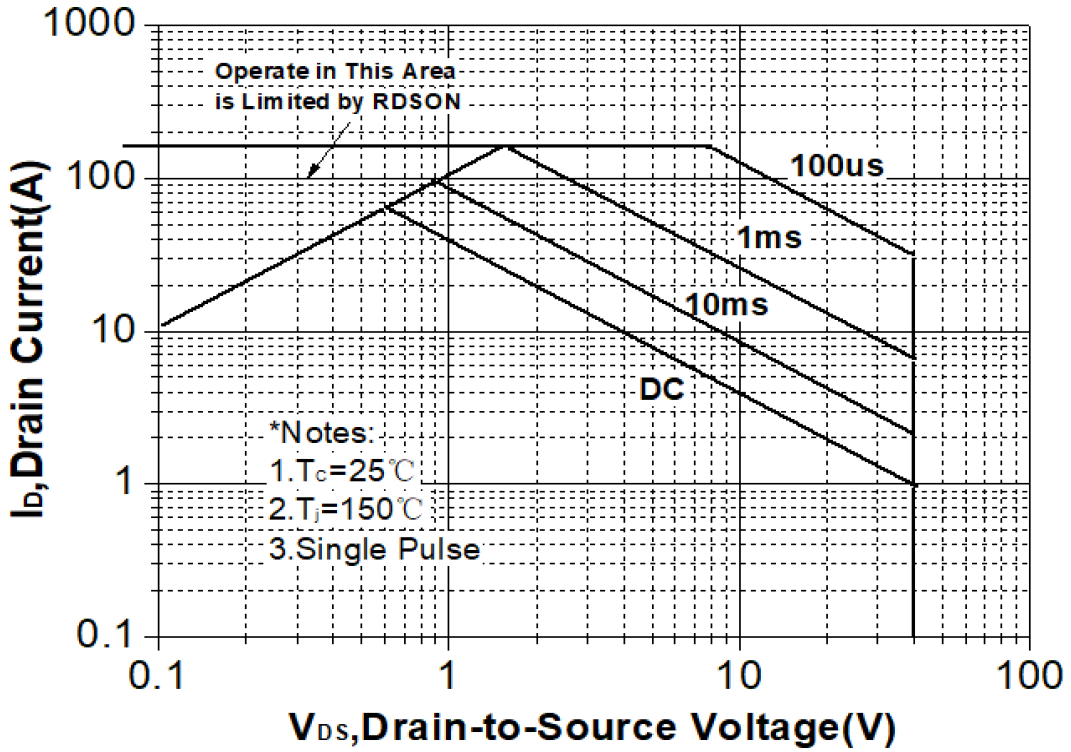
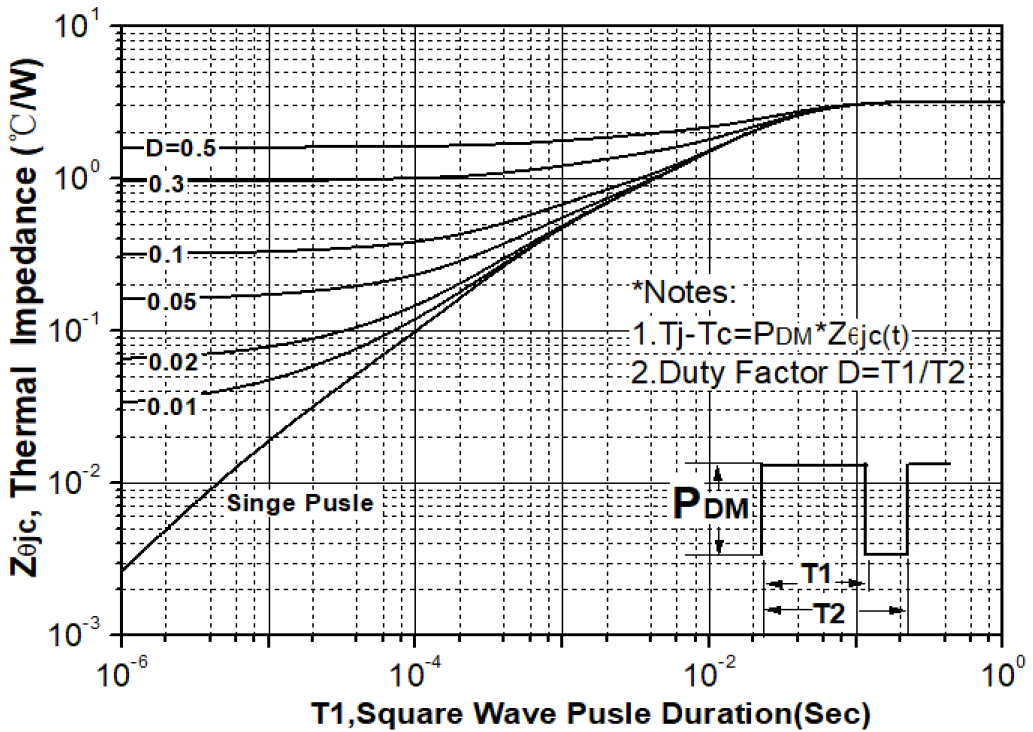
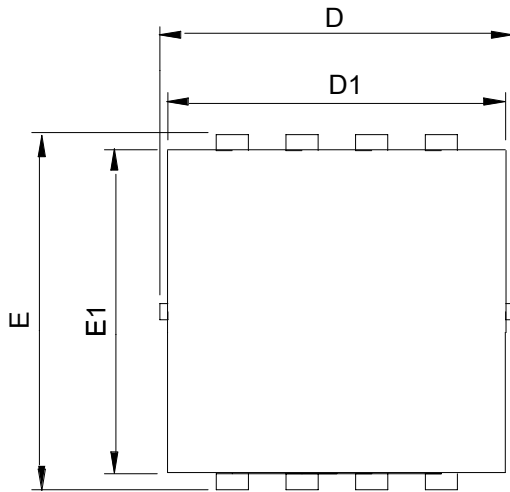


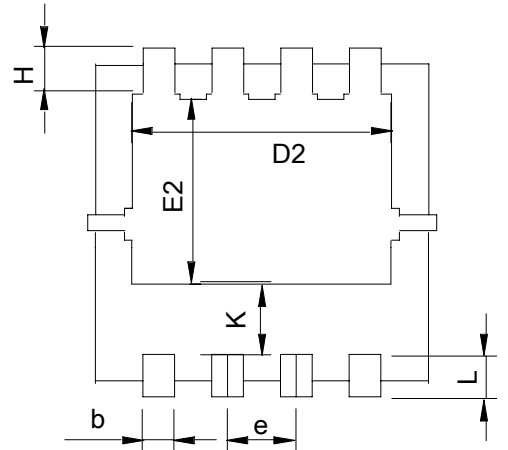
Fig. 17 Transient Thermal Response Curve



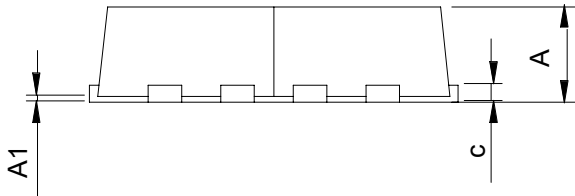
Package Information : PDFN3.3x3.3-8L



Top View



Bottom View



SYMBOL	PDFN3.3x3.3-8L			
	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
A	0.70	1.00	0.028	0.039
A1	0.00	0.05	0.000	0.002
b	0.25	0.35	0.010	0.014
c	0.14	0.20	0.006	0.008
D	3.10	3.50	0.122	0.138
D1	3.05	3.25	0.120	0.128
D2	2.35	2.55	0.093	0.100
E	3.10	3.50	0.122	0.138
E1	2.90	3.10	0.114	0.122
E2	1.64	1.84	0.065	0.072
e	0.65 BSC		0.026 BSC	
H	0.32	0.52	0.013	0.020
K	0.59	0.79	0.023	0.031
L	0.25	0.55	0.010	0.022