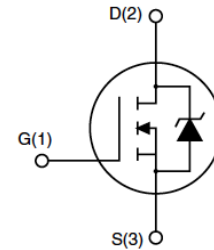


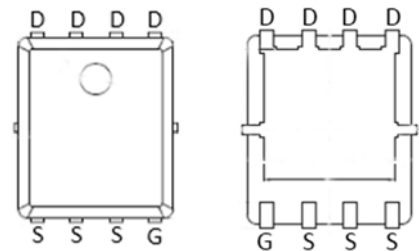
Feature

- 40V,160A
 $R_{DS(ON)} < 1.3m\Omega @ V_{GS}=10V$ (TYP:1.1m Ω)
 $R_{DS(ON)} < 2.1m\Omega @ V_{GS}=4.5V$ (TYP:1.6m Ω)
- Split Gate Trench Technology
- Lead free product is acquired
- Excellent $R_{DS(ON)}$ and Low Gate Charge
- $T_{jmax}=175^{\circ}C$
- AEC-Q101 qualified



Application

- PWM applications
- Load Switch
- Power management



PDFN5X6

Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity (PCS)
G013N04G	APG013N04G-AU	PDFN5X6	13 inch	-	5000

ABSOLUTE MAXIMUM RATINGS ($T_a=25^{\circ}C$ unless otherwise noted)

Parameter	Symbol	Value	Unit
Drain-Source Voltage	V_{DS}	40	V
Gate-Source Voltage	V_{GS}	± 20	V
Continuous Drain Current ($T_c=25^{\circ}C$)	I_D	160	A
Continuous Drain Current ($T_c=100^{\circ}C$)	I_D	100	A
Pulsed Drain Current ⁽¹⁾	I_{DM}	480	A
Single Pulsed Avalanche Energy ⁽²⁾	E_{AS}	473	mJ
Power Dissipation	P_D	78	W
Thermal Resistance from Junction to Case	$R_{\theta JC}$	1.9	$^{\circ}C/W$
Thermal Resistance- Junction to Ambient	$R_{\theta JA}$	46.4	$^{\circ}C/W$
Junction Temperature	T_J	175	$^{\circ}C$
Storage Temperature	T_{STG}	-55~ +175	$^{\circ}C$

MOSFET ELECTRICAL CHARACTERISTICS($T_a=25^{\circ}\text{C}$ unless otherwise noted)

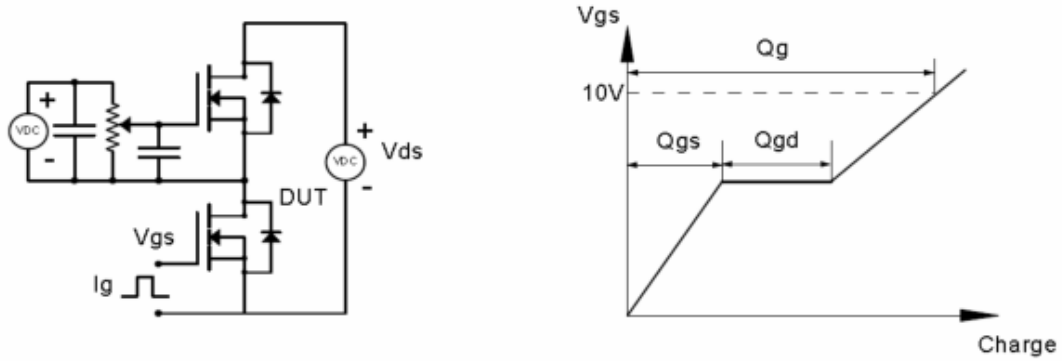
Parameter	Symbol	Test Condition	Min	Type	Max	Unit
Static Characteristics						
Drain-source breakdown voltage	$V_{(BR)DSS}$	$V_{GS} = 0V, I_D = 250\mu A$	40	-	-	V
Zero gate voltage drain current	I_{DSS}	$V_{DS} = 40V, V_{GS} = 0V$	-	-	1	μA
Gate-body leakage current	I_{GSS}	$V_{GS} = \pm 20V, V_{DS} = 0V$	-	-	± 100	nA
Gate threshold voltage ⁽³⁾	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\mu A$	1.0	1.6	2.0	V
Drain-source on-resistance ⁽³⁾	$R_{DS(on)}$	$V_{GS} = 10V, I_D = 25A$	-	1.1	1.3	m Ω
		$V_{GS} = 4.5V, I_D = 25A$	-	1.6	2.1	
Forward Threshold Voltage	g_{fs}	$V_{DS} = 2V, I_D = 25A$	90	-	-	S
Gate Resistance	R_g	$V_{DS} = V_{GS} = 0V, f = 1MHz$	-	2	-	Ω
Dynamic characteristics						
Input Capacitance	C_{iss}	$V_{DS} = 25V, V_{GS} = 0V, f = 1MHz$	-	3876	-	pF
Output Capacitance	C_{oss}		-	1169	-	
Reverse Transfer Capacitance	C_{rss}		-	29	-	
Switching characteristics						
Turn-on delay time	$t_{d(on)}$	$V_{DD} = 20V, I_D = 25A,$ $V_{GS} = 10V, R_G = 4.7\Omega$	-	12	-	ns
Turn-on rise time	t_r		-	30	-	
Turn-off delay time	$t_{d(off)}$		-	79	-	
Turn-off fall time	t_f		-	38	-	
Total Gate Charge	Q_g	$V_{DS} = 20V, I_D = 55A,$ $V_{GS} = 4.5V$	-	30	-	nC
Gate-Source Charge	Q_{gs}		-	10	-	
Gate-Drain Charge	Q_{gd}		-	12	-	
Reverse Recovery Charge	Q_{rr}	$I_F = 50A, di/dt = 100A/us$		47		nC
Reverse Recovery Time	T_{rr}	$I_F = 50A, di/dt = 100A/us$		50		ns
Source-Drain Diode characteristics						
Diode Forward voltage ⁽³⁾	V_{DS}	$V_{GS} = 0V, I_S = 50A$	-	-	1.2	V
Diode Forward current ⁽⁴⁾	I_S		-	-	160	A

Notes:

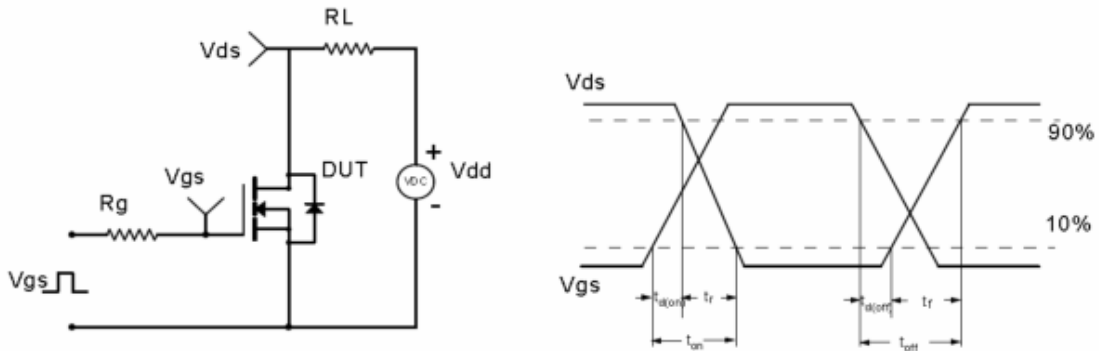
1. Repetitive Rating: pulse width limited by maximum junction temperature
2. EAS Condition: $T_J = 25^{\circ}\text{C}, V_{DD} = 15V, R_G = 25\Omega, L = 0.5mH$
3. Pulse Test: pulse width $\leq 300\mu s$, duty cycle $\leq 2\%$
4. Surface Mounted on FR4 Board, $t \leq 10$ sec

Test Circuit & Waveform

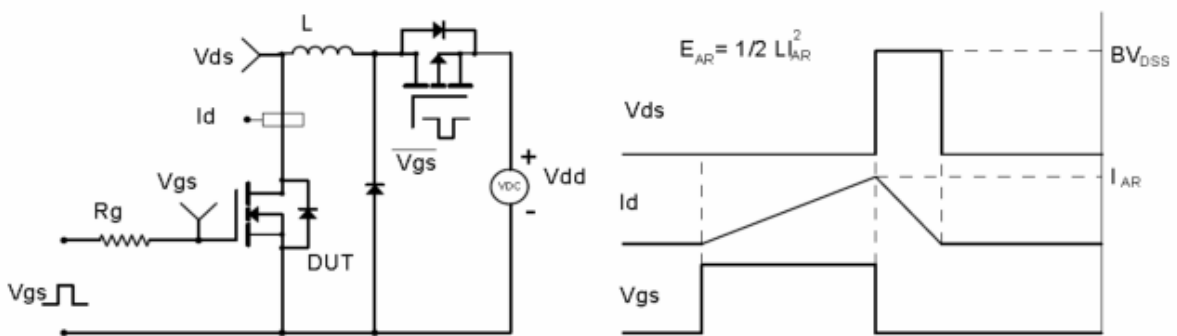
Gate Charge Test Circuit & Waveform



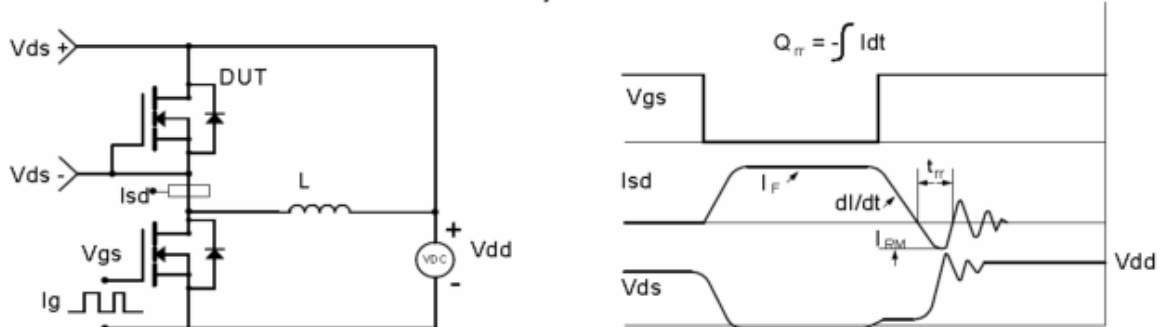
Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms



Typical Performance Characteristics

Fig.1 Power Dissipation Derating Curve

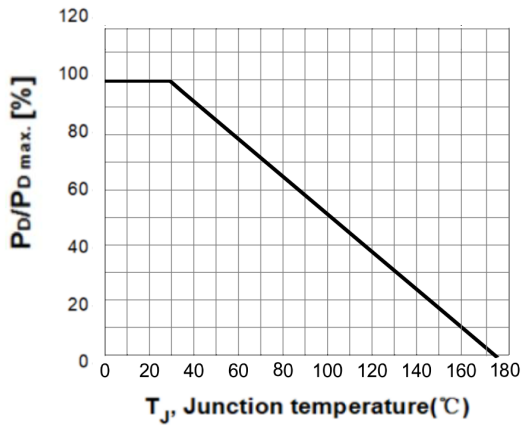


Fig.2 Avalanche Energy Derating Curve vs. Junction Temperature

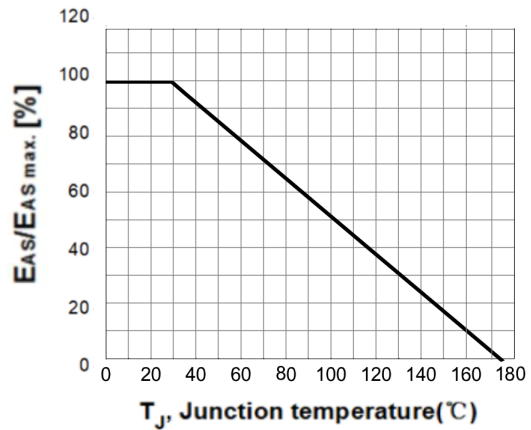


Fig.3 Typical Output Characteristics

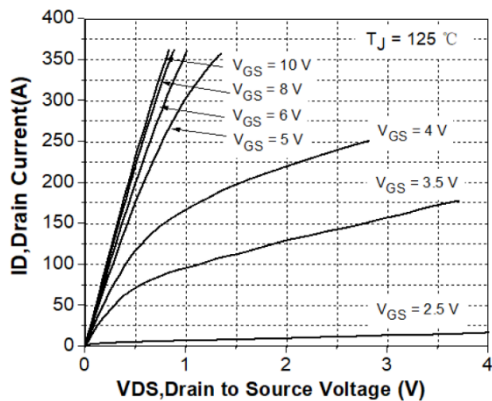


Fig. 4 Transconductance vs. Drain Current

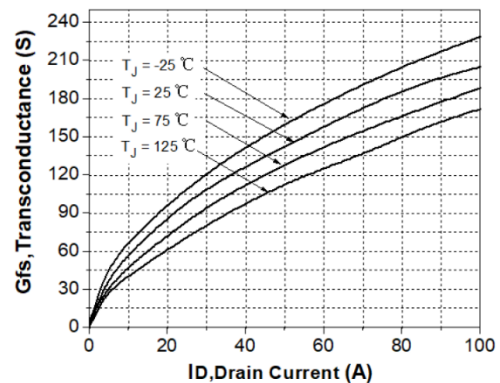


Fig.5 Typical Transfer Characteristics

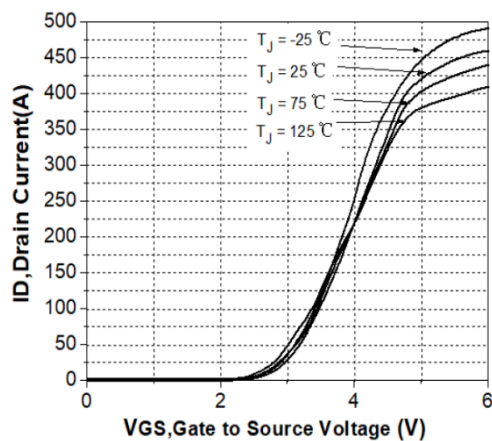


Fig. 6 ON- Resistance vs. Drain Current

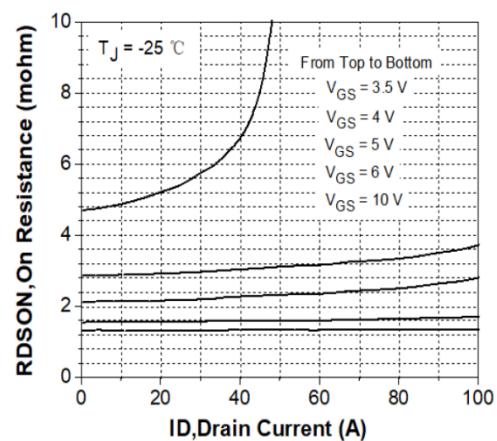


Fig.7 ON- Resistance vs. Drain Current @25°C

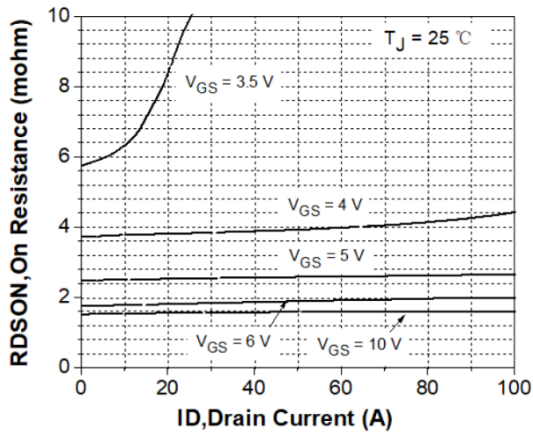


Fig. 8 ON- Resistance vs. Drain Current @125°C

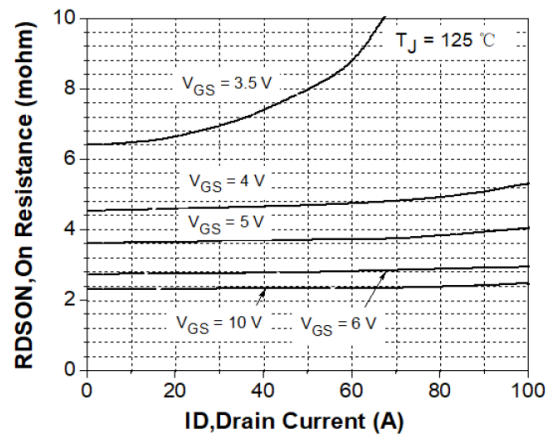


Fig.9 Typical Capacitance vs. Drain Source Voltage

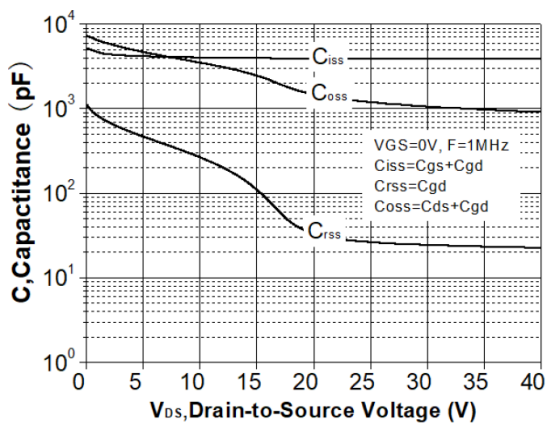


Fig.10 Dynamic Input Characteristics

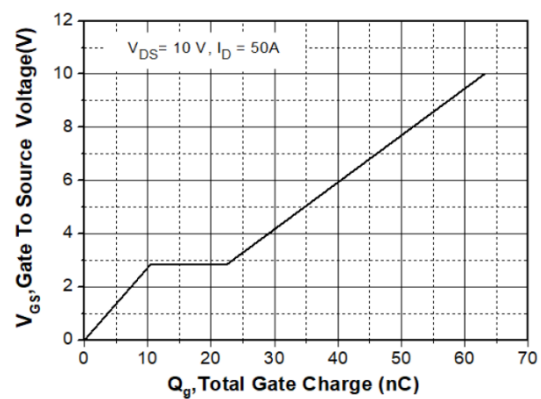


Fig.11 Breakdown Voltage vs. Junction Temperature

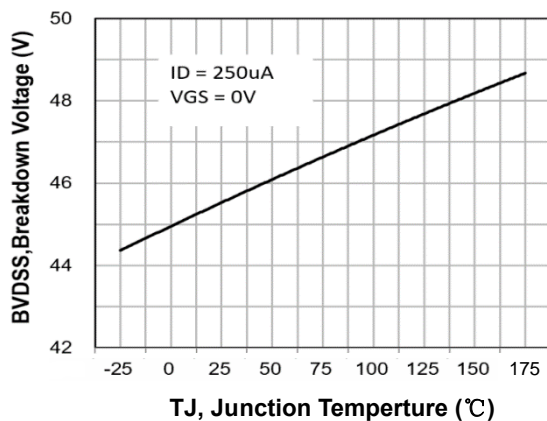


Fig. 12 Gate Threshold Voltage vs. Junction Temperature

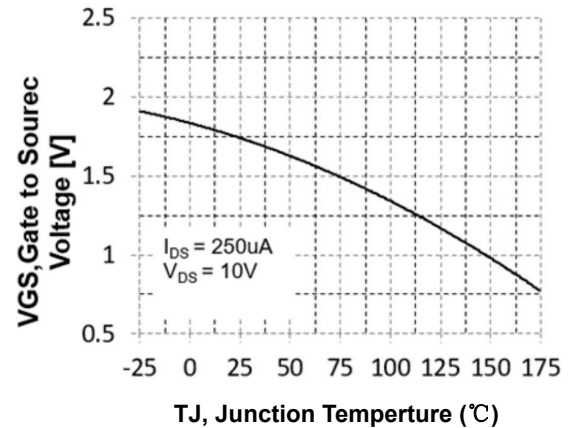


Fig.13 On-Resistance Variation vs. Junction

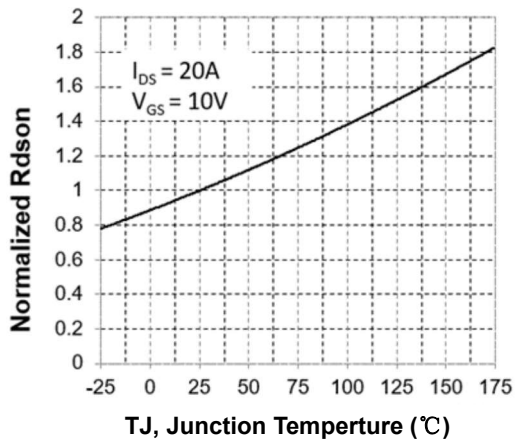


Fig.14 Maximum Drain Current vs. Case Temperature

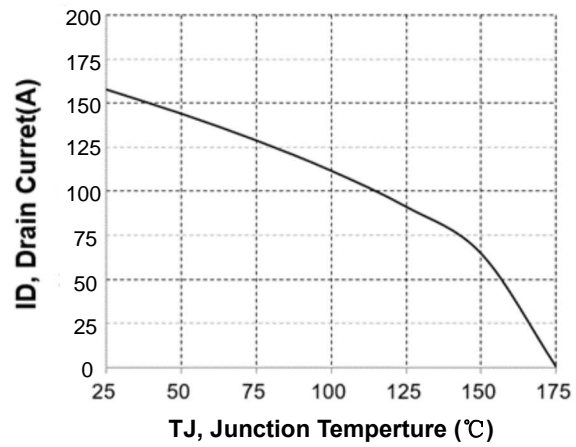


Fig.15 Body Diode Forward Voltage vs. Reverse Drain Current

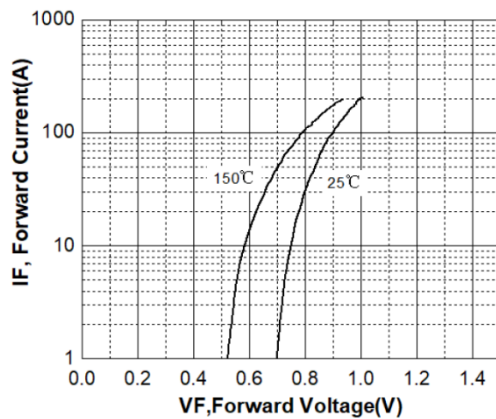


Fig.16 Safe Operating Area

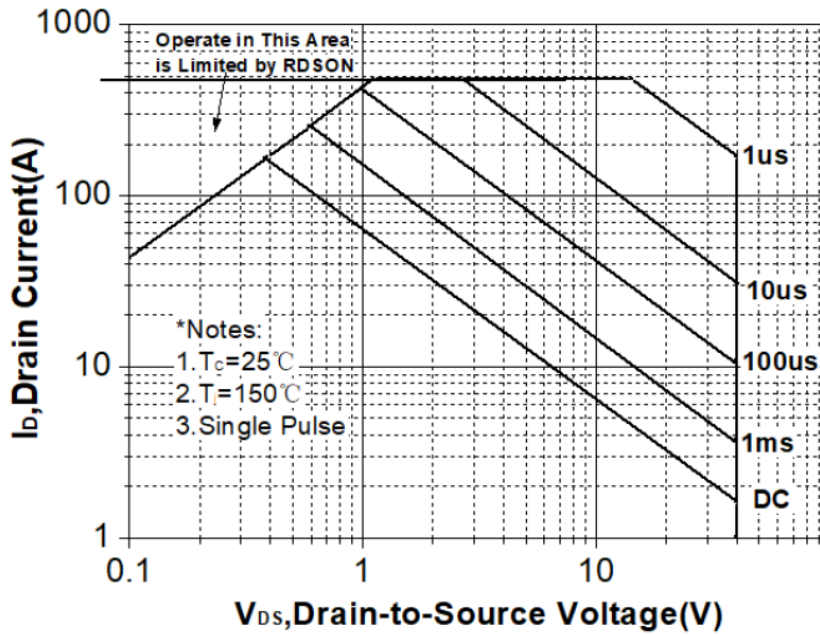
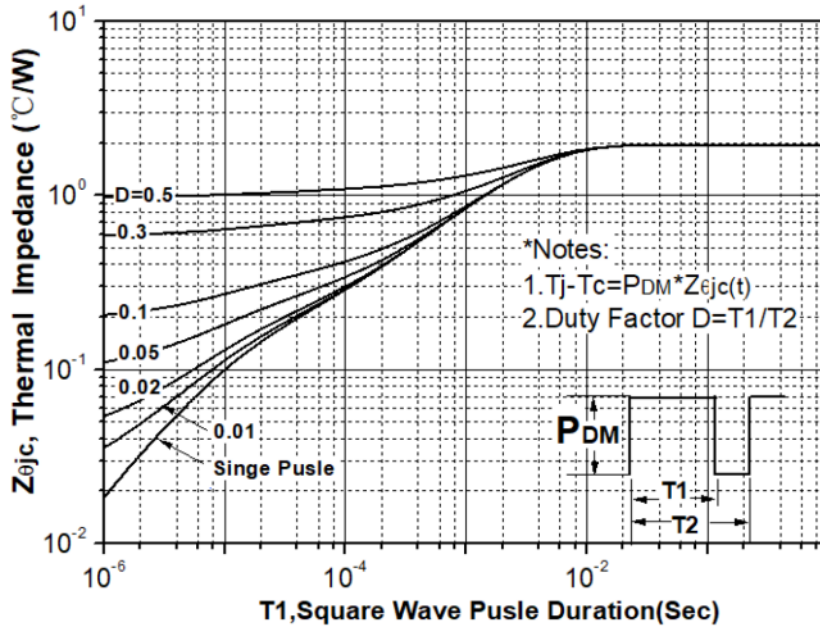
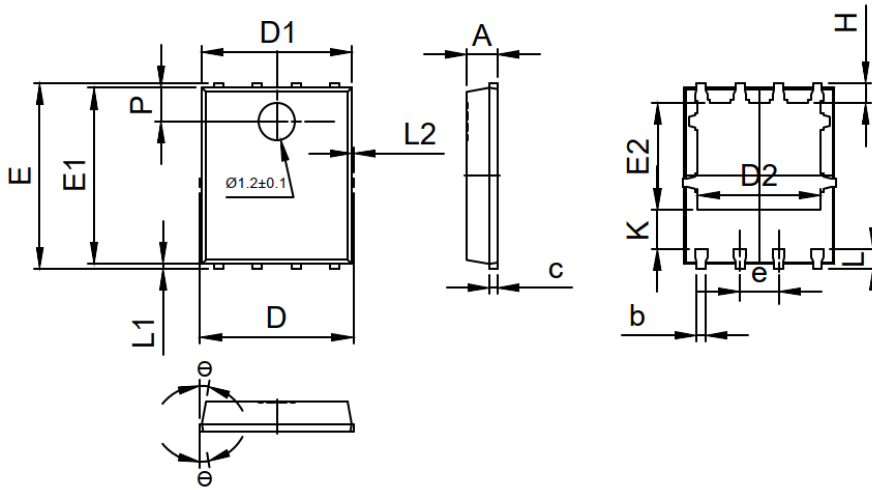


Fig. 17 Transient Thermal Response Curve



PDFN5X6 Package Information



SYMBOL	MIN	NOM	MAX
A	0.90	1.00	1.10
b	0.25	0.30	0.35
c	0.21	0.25	0.34
D	-	-	5.10
D1	4.80	4.90	5.00
D2	3.91	4.01	4.11
e	1.27 BSC		
E	5.90	6.00	6.10
E1	5.70	5.75	5.80
E2	3.375	3.475	3.575
H	0.55	0.65	0.75
K	1.20	-	-
L	0.55	0.65	0.75
L1	0.05	0.15	0.25
L2	-	-	0.12
θ	8°	10°	12°
P	1.00	1.10	1.20