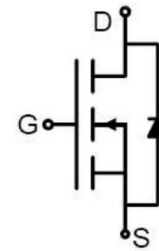


## Features

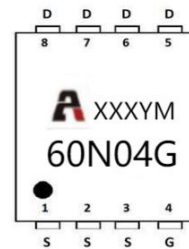
- 40V,40A  
 $R_{DS(on)} < 9.3m\Omega @ V_{GS}=10V$  TYP:7.4m $\Omega$   
 $R_{DS(on)} < 14.3m\Omega @ V_{GS}=4.5V$  TYP:10.4m $\Omega$
- Advanced Trench Technology
- Lead free product is acquired
- Excellent  $R_{DS(on)}$ , and Low Gate Charge

## Applications

- PWM applications
- Load Switch
- Power management



Schematic Diagram



Marking and pin Assignment

## Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity (PCS)
60N04G	AP60N04G	PDFN5X6	-	-	5000

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

Parameter	Symbol	Value	Unit
Drain-Source Voltage	$V_{DS}$	40	V
Gate-Source Voltage	$V_{GS}$	$\pm 20$	V
Continuous Drain Current ( $T_c=25^\circ\text{C}$ ) <sup>(1)</sup>	$I_D$	40	A
Continuous Drain Current ( $T_c=100^\circ\text{C}$ )	$I_D$	26	A
Pulsed Drain Current <sup>(1)</sup>	$I_{DM}$	120	A
Drain Power Dissipation	$P_D$	56	W
Single Pulsed Avalanche Energy <sup>(2)</sup>	$E_{AS}$	101	mJ
Thermal Resistance from Junction to Case	$R_{\theta JC}$	2.723	$^\circ\text{C/W}$
Junction Temperature	$T_J$	-55~ +150	$^\circ\text{C}$
Storage Temperature	$T_{STG}$	-55~ +150	$^\circ\text{C}$

### Notes:

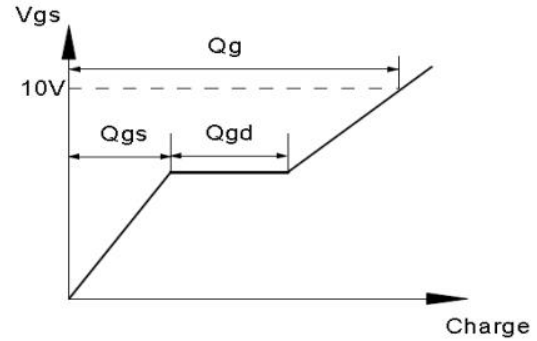
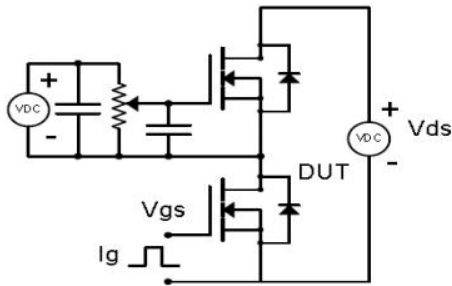
- 1) Repetitive Rating: pulse width limited by maximum junction temperature
- 2) EAS condition :  $T_J=25^\circ\text{C}$ ,  $V_{DD}=20\text{V}$ ,  $V_G=10\text{V}$ ,  $L=0.5\text{mH}$ ,  $R_g=25\Omega$ ,  $I_{AS}=20.1\text{A}$
- 3) The value of  $R_{\theta JA}$  Mounted on FR4 Board (25.4mm\*25.4mm\*t1.6mm) With 2oz Copper  $T_A=25^\circ\text{C}$

**MOSFET ELECTRICAL CHARACTERISTICS(T<sub>J</sub>=25°C unless otherwise noted)**

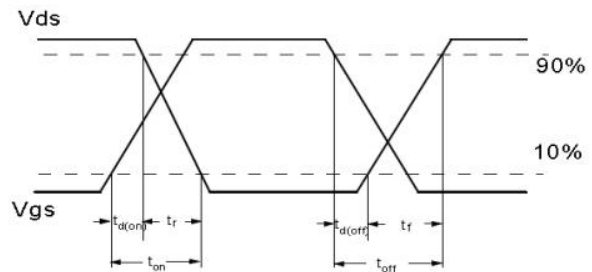
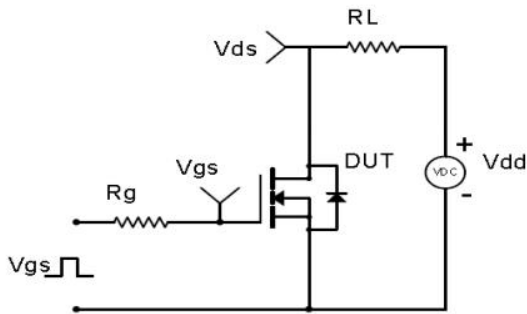
Parameter	Symbol	Test Condition	Min	Type	Max	Unit
<b>Static Characteristics</b>						
Drain-source breakdown voltage	V <sub>(BR)DSS</sub>	V <sub>GS</sub> = 0V, I <sub>D</sub> =250μA	40	-	-	V
Zero gate voltage drain current	I <sub>DSS</sub>	V <sub>DS</sub> =40V, V <sub>GS</sub> = 0V	-	-	1	μA
Gate-body leakage current	I <sub>GSS</sub>	V <sub>GS</sub> =±20V, V <sub>DS</sub> = 0V	-	-	±100	nA
Gate threshold voltage	V <sub>GS(th)</sub>	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250μA	1.0	1.6	2.5	V
Drain-source on-resistance	R <sub>DS(on)</sub>	V <sub>GS</sub> =10V, I <sub>D</sub> =30A	-	7.4	9.3	mΩ
		V <sub>GS</sub> =4.5V, I <sub>D</sub> =10A	-	10.4	14.3	
<b>Dynamic characteristics</b>						
Input Capacitance	C <sub>iss</sub>	V <sub>DS</sub> =20V, V <sub>GS</sub> =0V, f=1MHz	-	1570	-	pF
Output Capacitance	C <sub>oss</sub>		-	132	-	
Reverse Transfer Capacitance	C <sub>rss</sub>		-	115	-	
<b>Switching characteristics</b>						
Turn-on delay time	t <sub>d(on)</sub>	V <sub>DD</sub> =20V, I <sub>D</sub> =25A, R <sub>L</sub> =4.7Ω, V <sub>GS</sub> =10V, R <sub>G</sub> =1Ω	-	3.6	-	nS
Turn-on rise time	t <sub>r</sub>		-	9.6	-	
Turn-off delay time	t <sub>d(off)</sub>		-	24	-	
Turn-off fall time	t <sub>f</sub>		-	9.6	-	
Total Gate Charge	Q <sub>g</sub>	V <sub>DS</sub> =20V, I <sub>D</sub> =25A, V <sub>GS</sub> =10V	-	32.5	-	nC
Gate-Source Charge	Q <sub>gs</sub>		-	4.5	-	
Gate-Drain Charge	Q <sub>gd</sub>		-	5.6	-	
<b>Source-Drain Diode characteristics</b>						
Diode Forward voltage	V <sub>SD</sub>	T <sub>J</sub> =25°C, V <sub>GS</sub> =0V, I <sub>S</sub> =10A	-	0.8	1.2	V
Diode Forward current	I <sub>S</sub>	T <sub>C</sub> =25°C	-	-	30	A
Body Diode Reverse Recovery Time	t <sub>rr</sub>	T <sub>J</sub> =25°C, I <sub>F</sub> =30A, di/dt=100A/us	-	11	-	nS
Body Diode Reverse Recovery Charge	Q <sub>rr</sub>		-	6	-	nC

**Test Circuit & Waveform**

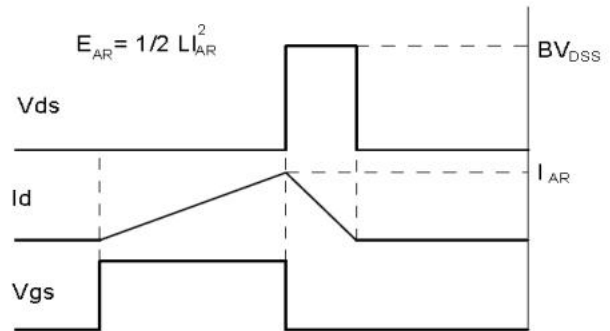
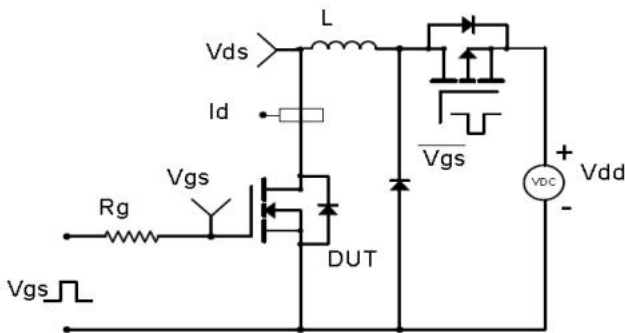
Gate Charge Test Circuit & Waveform



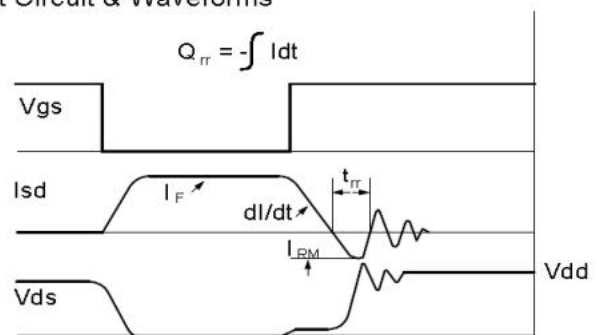
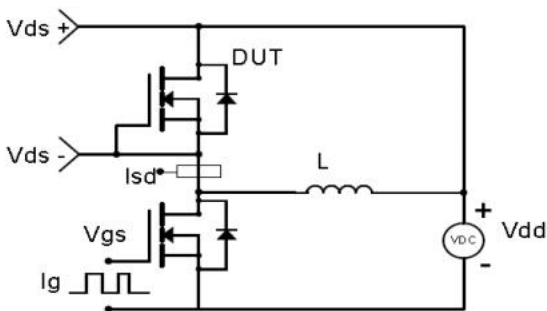
Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms



## Typical Characteristics

Fig.1 Power Dissipation Derating Curve

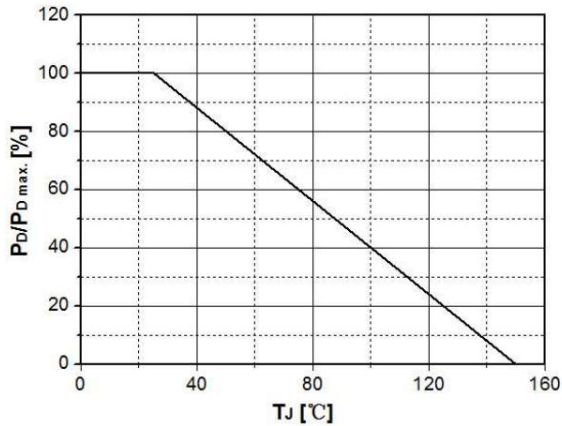


Fig.2 Avalanche Energy Derating Curve vs. Junction Temperature

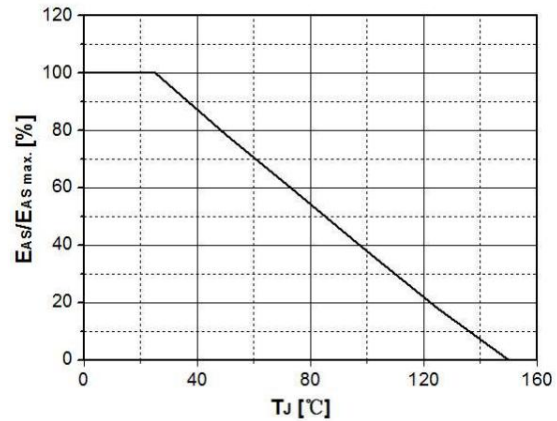


Fig.3 Typical Output Characteristics

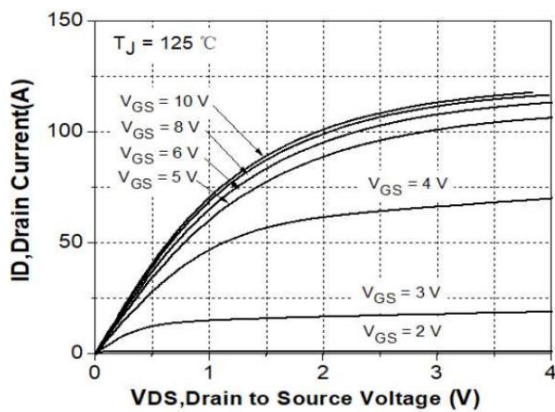


Fig. 4 Transconductance vs. Drain Current

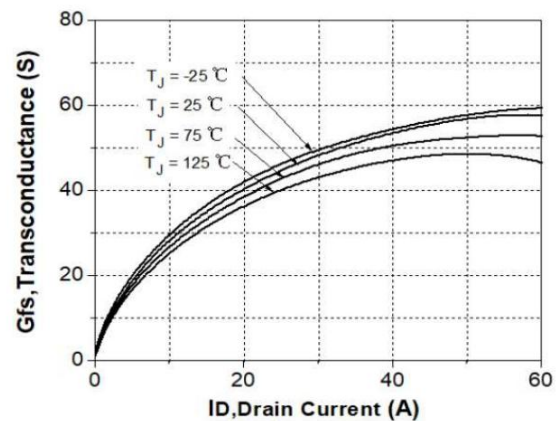


Fig.5 Typical Transfer Characteristics

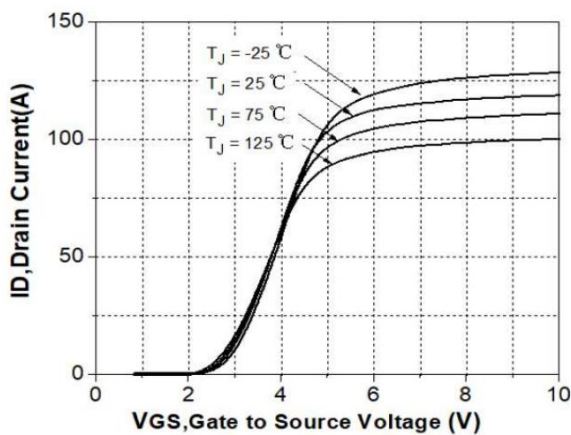
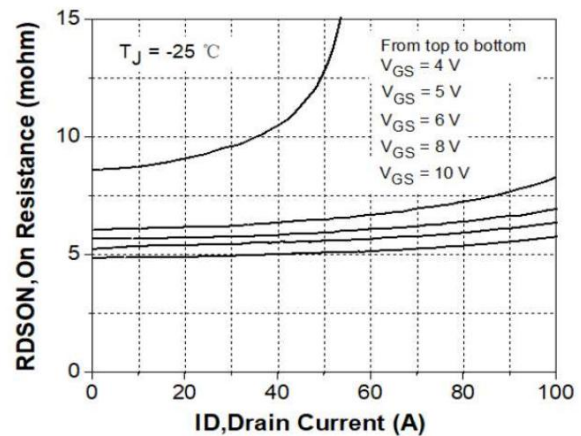


Fig. 6 State Resistance vs. Drain Current @-25°C



## Typical Characteristics

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

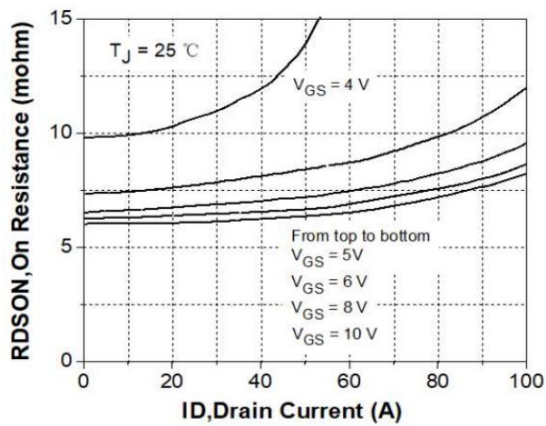


Fig.9 Typical Capacitance vs. Drain Source Voltage

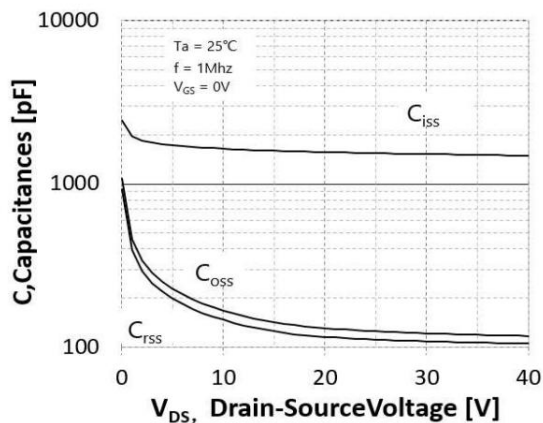


Fig.11 Breakdown Voltage vs. Junction Temperature

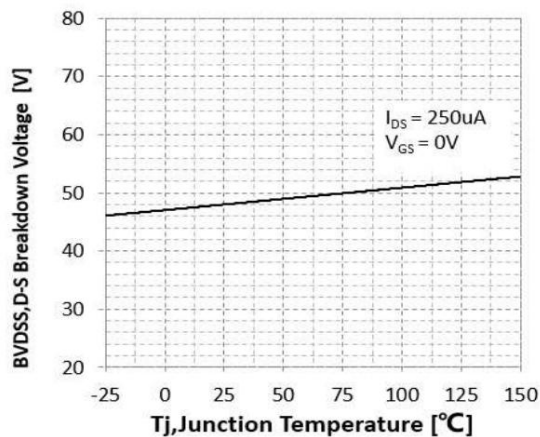


Fig. 8 State Resistance vs. Drain Current @125°C

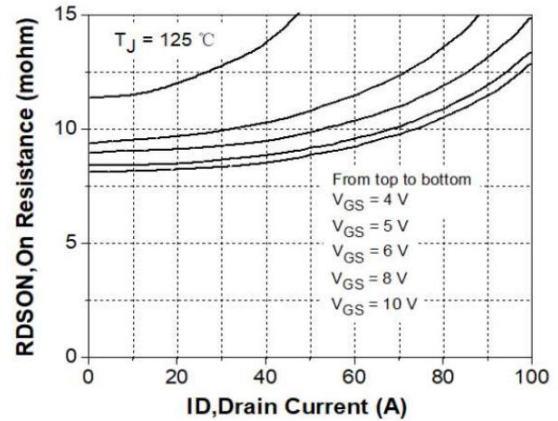


Fig.10 Dynamic Input Characteristics

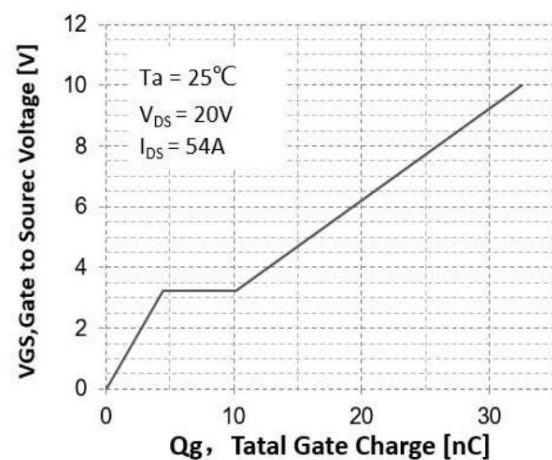
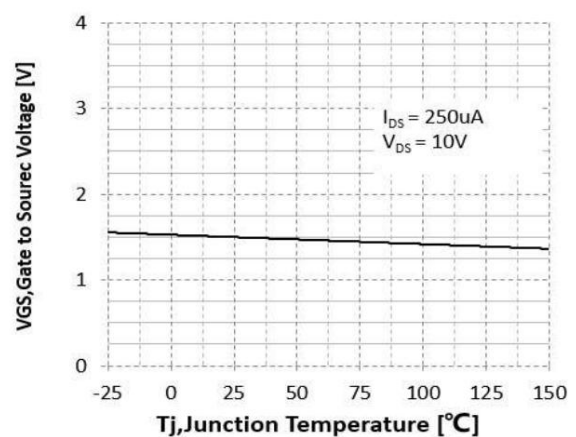


Fig. 12 Gate Threshold Voltage vs. Junction Temperature



## Typical Characteristics

Fig.13 On-Resistance Variation vs. Junction Temperature

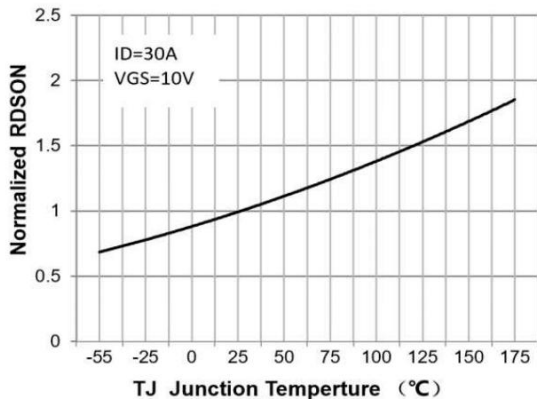


Fig.14 Maximum Drain Current vs. Case Temperature

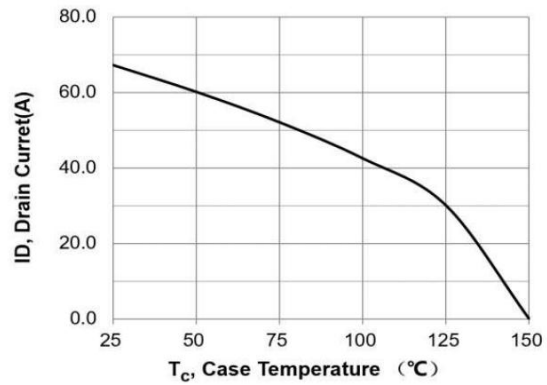
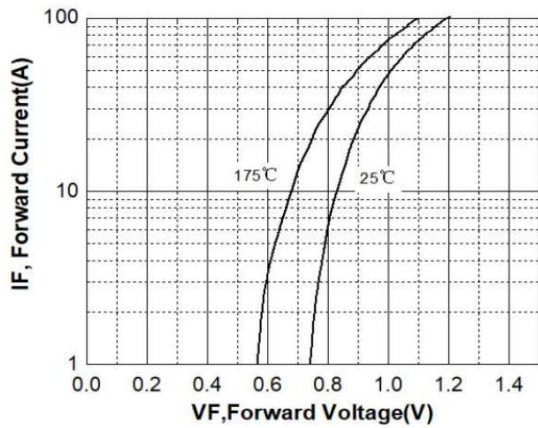


Fig.15 Body Diode Forward Voltage Vs Reverse Drain Current



## Typical Characteristics

Fig.16 Safe Operating Area

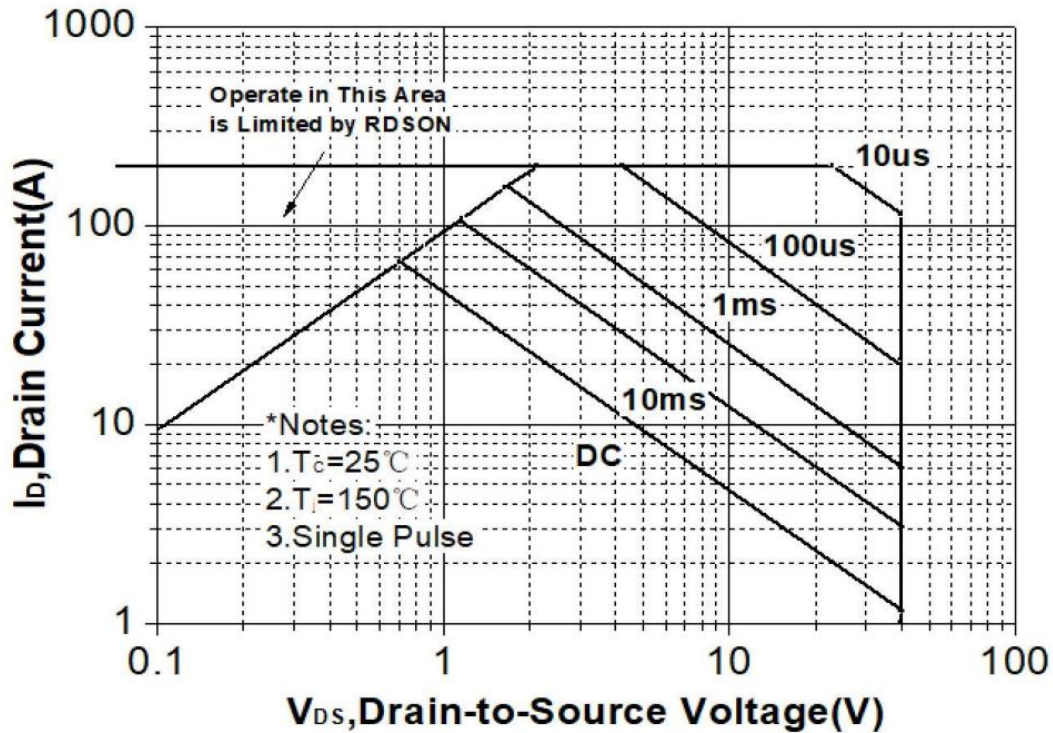
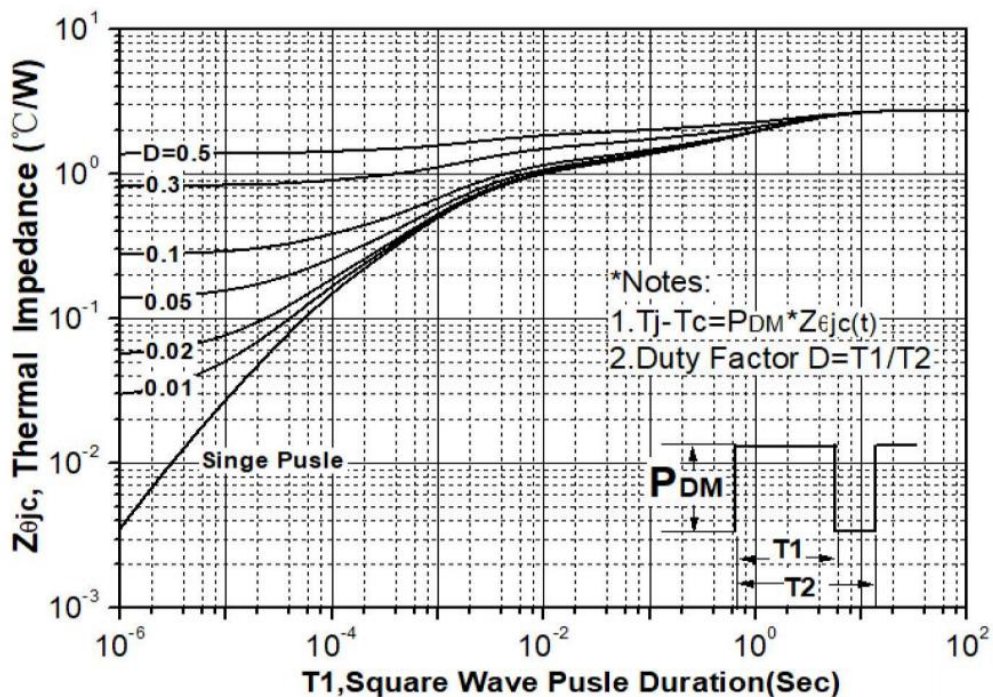
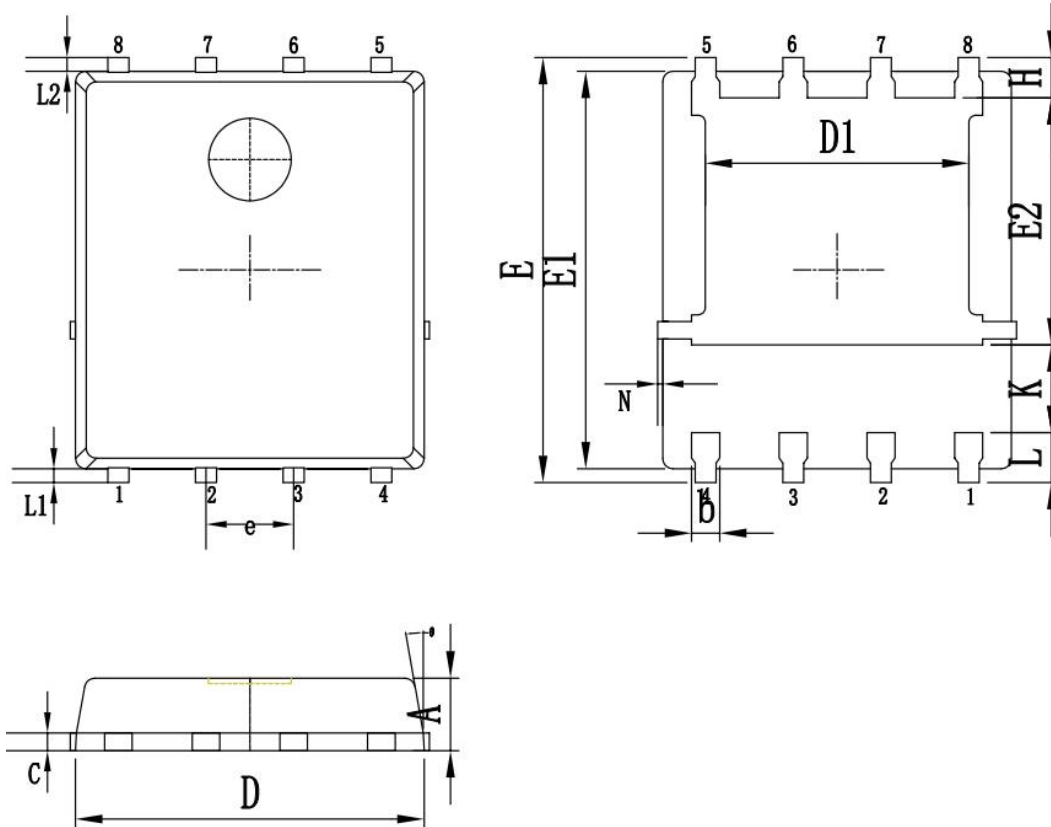


Fig. 17 Transient Thermal Response Curve



**PDFN5X6 Package Information**



Symbols	Millimeters		
	MTN.	NOM.	MAX.
A	0.90	1.05	1.20
b	0.20	0.40	0.50
C	0.20	0.25	0.35
D	4.80	5.05	5.20
D1	3.80	3.90	4.10
E	5.90	6.00	6.20
E1	5.60	5.75	5.90
E2	3.40	3.50	3.60
e	1.27 BSC.		
H	0.40	0.60	0.70
K	1.17	1.27	1.37
L	0.50	0.74	0.84
L1/L2	0.10	0.16	0.20
θ	8°	10°	12°
N	0	-	0.15



## Revision History

Revision	Release	Remark
V1.1	2024/07/01	Format update

## Disclaimer

The information given in this document describes the independent performance of the product, but similar performance is not guaranteed under other working conditions, and cannot be guaranteed when installed with other products or equipment. To achieve the required performance of the product in actual scenarios, the customer should conduct a complete application test to assess the functionality of the product.

Allpower assumes no responsibility for equipment failures result from using products at values that exceed the ratings, operating conditions, or other parameters listed in the product specifications.

The product described in this specification is not applicable for aerospace or other applications which requires high reliability. Customers using or selling these products for use in medical, life-saving, or life-sustaining applications do so at their own risk and agree to fully indemnify.

Due to product or technical improvements, the information described or contained herein may be changed without prior notice.