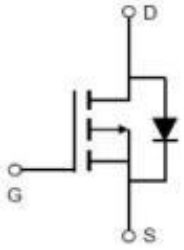
AP40P04G

P-Channel Enhancement Mosfet

DATA SHEET

Features

- -40V,-40A
  $R_{DS(ON)}$ <13mΩ @V_{GS}=-10V TYP: 10mΩ
  $R_{DS(ON)}$ <22mΩ @V_{GS}=-4.5V TYP:14mΩ
- Advanced Trench Technology
- Lead free product is acquired
- Excellent $R_{DS(ON)}$ and Low Gate Charge



Schematic Diagram

Applications

- PWM applications
- Load Switch
- Power management

Marking and pin Assignment

Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity (PCS)
40P04G	AP40P04G	PDFN5x6	-	-	5000

ABSOLUTE MAXIMUM RATINGS (T_J=25℃ unless otherwise noted)

Parameter	Symbol	Value	Unit
Drain-Source Voltage	V_{DS}	-40	V
Gate-Source Voltage	V_{GS}	±20	V
Continuous Drain Current (Tc=25℃)(1)	I_D	-40	A
Continuous Drain Current (Tc=100℃)(1)	I_D	-26	A
Pulsed Drain Current (2,3)	I_{DM}	-160	A
Singel Pulsed Avalanche Energy(6)	E_{AS}	144	mJ
Drain Power Dissipation(1)	P_D	41.6	W
Thermal Resistance from Junction to Case	$R_{\theta JC}$	3.6	℃/W
Thermal Resistance from Junction to Ambient	$R_{\theta JA}$	60	℃/W
Junction Temperature	T_J	-55~ +150	℃
Storage Temperature	T_{STG}	-55~ +150	℃

MOSFET ELECTRICAL CHARACTERISTICS(T_J=25℃ unless otherwise noted)

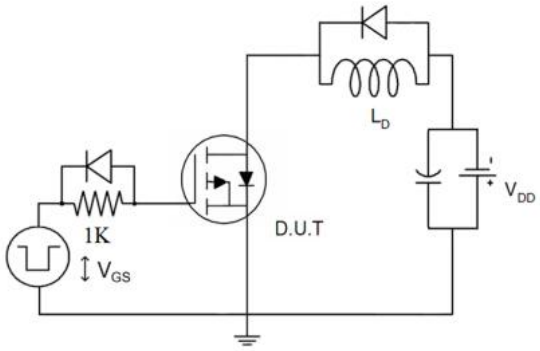
Parameter	Symbol	Test Condition	Min	Type	Max	Unit
Static Characteristics						
Drain-source breakdown voltage	$V_{(BR)DSS}$	V_{GS} = 0V, I_D =-250μA	-40	-	-	V
Zero gate voltage drain current	I_{DSS}	V_{DS} =-40V, V_{GS} = 0V	-	-	-1	μA
Gate-body leakage current	I_{GSS}	V_{GS} =±20V, V_{DS} = 0V	-	-	±100	nA
Gate threshold voltage(4)	$V_{GS(th)}$	V_{DS} =V_{GS}, I_D =-250μA	-1.0	-	-2.5	V
Drain-source on-resistance(4)	$R_{DS(on)}$	V_{GS} =-10V, I_D =-20A	-	10	13	mΩ
		V_{GS} =-4.5V, I_D =-10A	-	14	22	mΩ
Forward Transconductance	g_{FS}	V_{DS} =-5V, I_D =-10A	20	30	45	S
Dynamic characteristics(5)						
Input Capacitance	C_{iss}	V_{DS} =-20V, V_{GS}=0V, f=1MHz	-	3683	5525	pF
Output Capacitance	C_{oss}		-	266	400	
Reverse Transfer Capacitance	C_{rss}		-	296	444	
Switching characteristics(5)						
Turn-on delay time	$t_{d(on)}$	V_{DD}=-20V, I_D=-20A, R_G=2.5Ω, V_{GS}=-10V	-	12	18	nS
Turn-on rise time	t_r		-	28	42	
Turn-off delay time	$t_{d(off)}$		-	93	140	
Turn-off fall time	t_f		-	21	32	
Total Gate Charge	Qg	V_{DS}=-20V, I_D=-20A, V_{GS}=-10V	-	68	102	nC
Gate-Source Charge	Qgs		-	11	14	
Gate-Drain Charge	Qgd		-	13	20	
Source-Drain Diode characteristics						
Diode Forward voltage(4)	V_{SD}	T_J=25℃, V_{GS} =0V, I_S=-20A	-	-	-1.2	V
Diode Forward current	I_S	T_C=25℃	-	-	-40	A
Body Diode Reverse Recovery Time	t_{rr}	T_J=25℃, I_F=-20A, di/dt=100A/us	-	15	39	ns
Body Diode Reverse Recovery Charge	Q_{rr}	T_J=25℃, I_F=-20A, di/dt=100A/us	-	5	39	nC

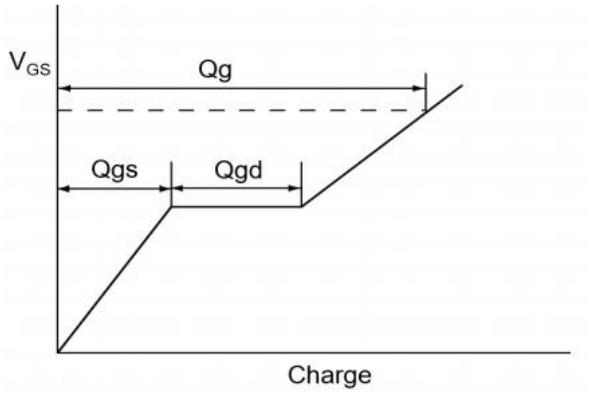
Notes:

1) Surface Mounted on 1 in² pad area, t ≤ 10 sec
2) Pulse width ≤ 10μs, duty cycle ≤ 1 %
3) Limited by bonding wire
4) Pulse width ≤ 300 μs, duty cycle ≤ 2%
5) Guaranteed by design, not subject to production testing
6) EAS Condition: L=0.5mH, VDD=-20V, RG =25Ω, Starting T_J = 25℃

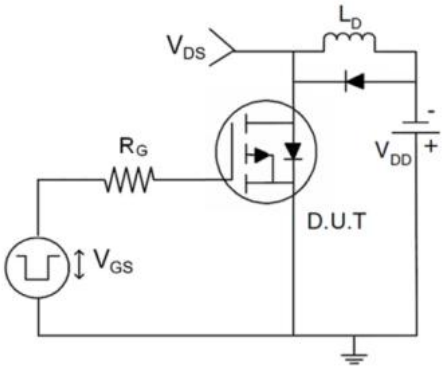
Test Circuit

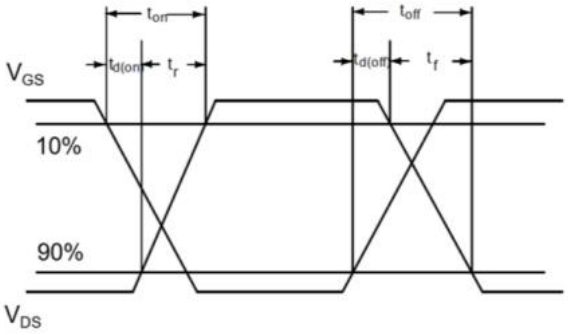
Gate Charge Test Circuit



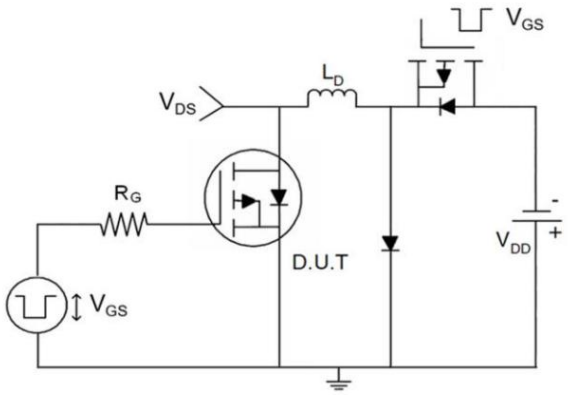


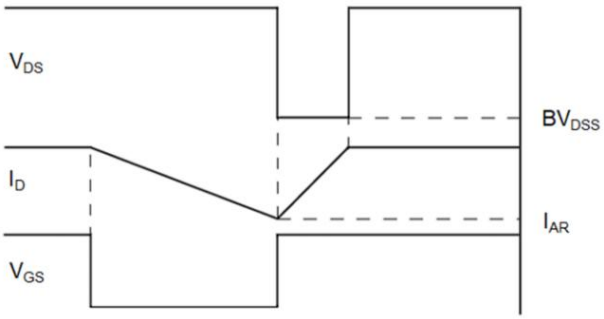
Switch Time Test Circuit





Unclamped Inductive Switching (UIS) Test Circuit





Typical Characteristics

Fig1. Typical Output Characteristics@Tj= 25℃

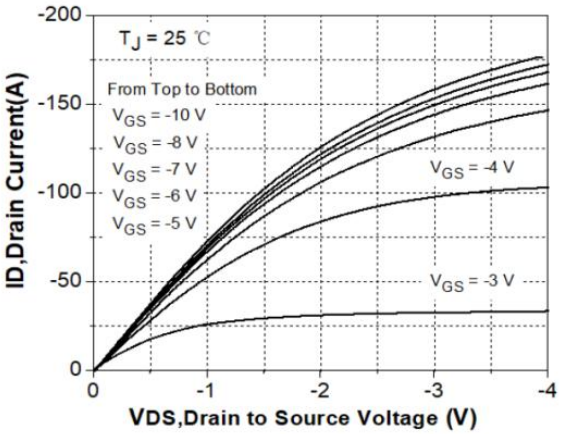


Fig2. Typical Output Characteristics@Tj= 125℃

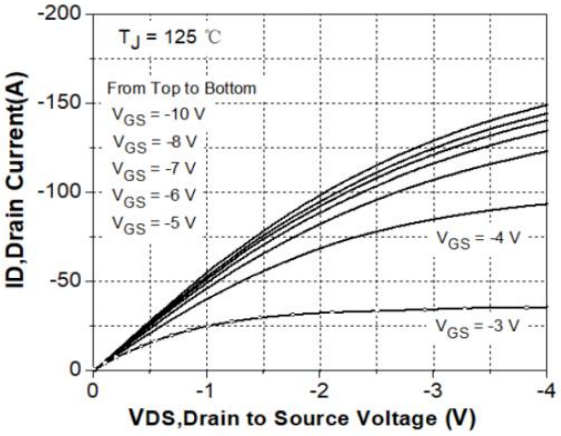


Fig3. Transconductance vs. Drain Current @Tj= -25/25/75/125℃

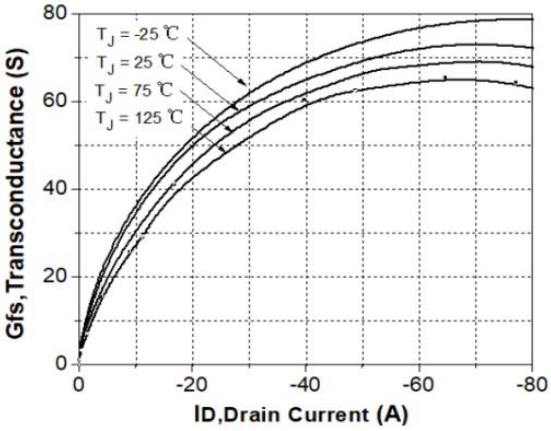


Fig4. Typical Transfer Characteristics @Tj= -25/25/75/125℃

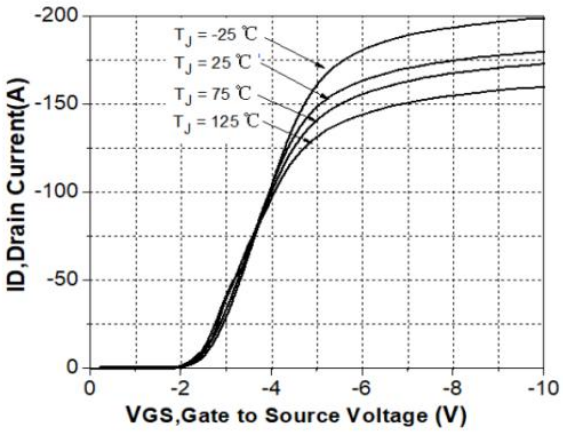


Fig5. Static Drain - Source On - State Resistance vs. Drain Current @Tj= -25℃

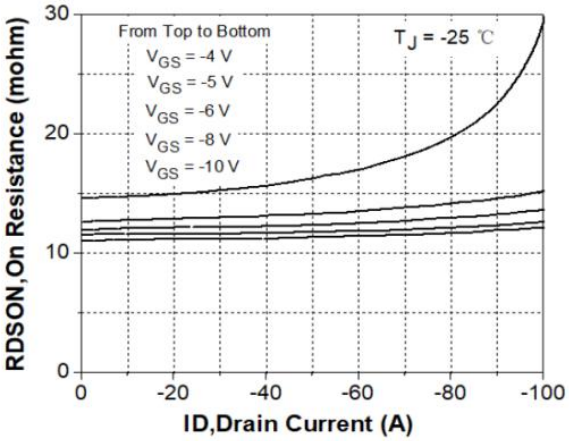
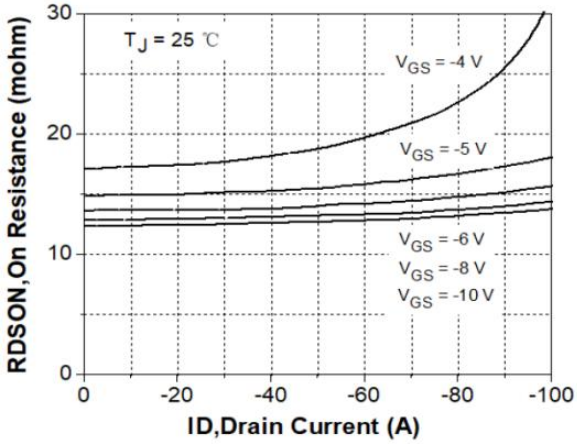


Fig6. Static Drain - Source On - State Resistance vs. Drain Current @Tj= 25℃



Typical Characteristics (cont.)

Fig7. Static Drain - Source On - State Resistance vs. Drain Current @Tj= 75℃

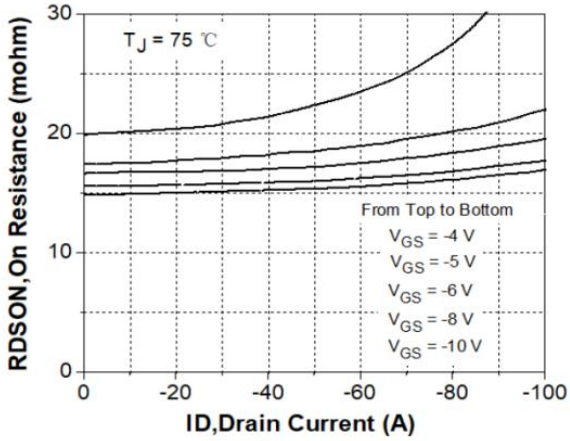


Fig8. Static Drain - Source On - State Resistance vs. Drain Current @Tj= 125℃

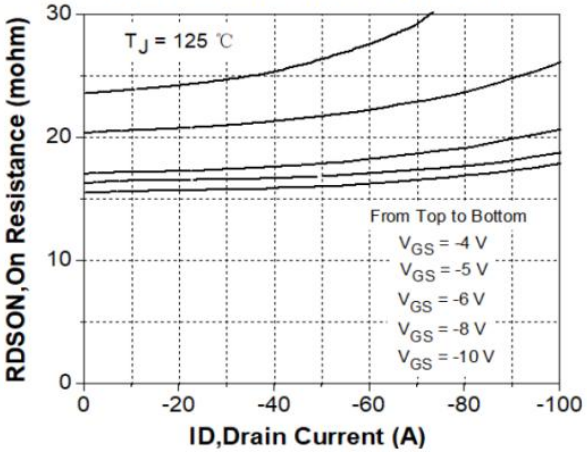


Fig9. Breakdown Voltage vs. Junction Temperature

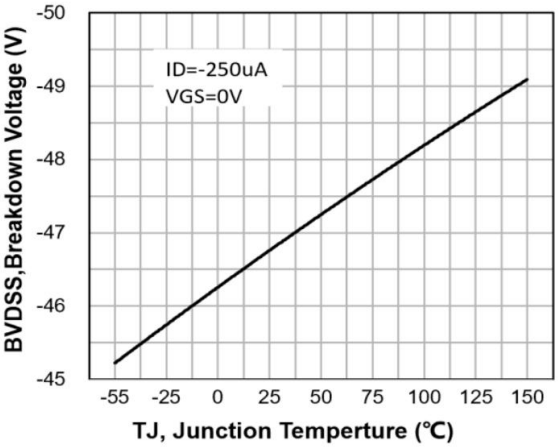


Fig10. Gate Threshold Voltage vs. Junction Temperature

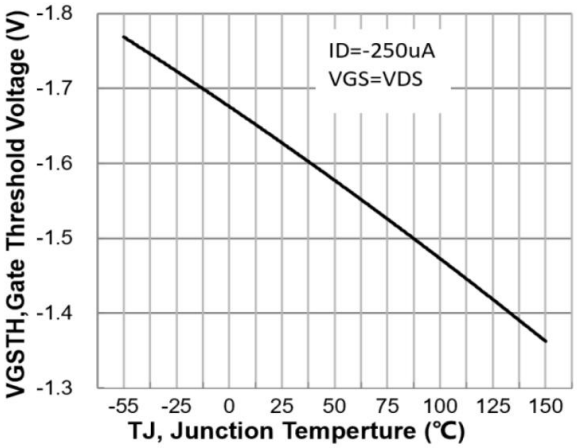


Fig11. On-Resistance Variation vs. Junction

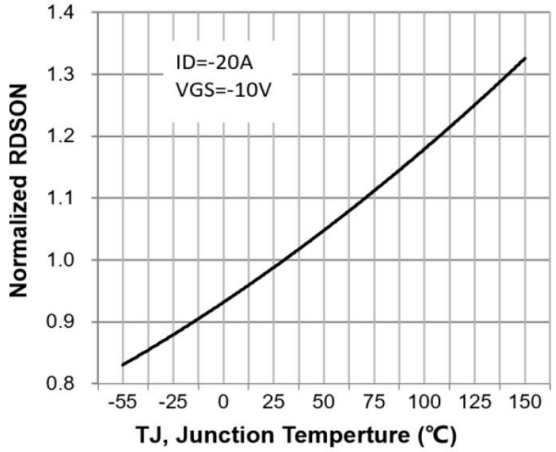
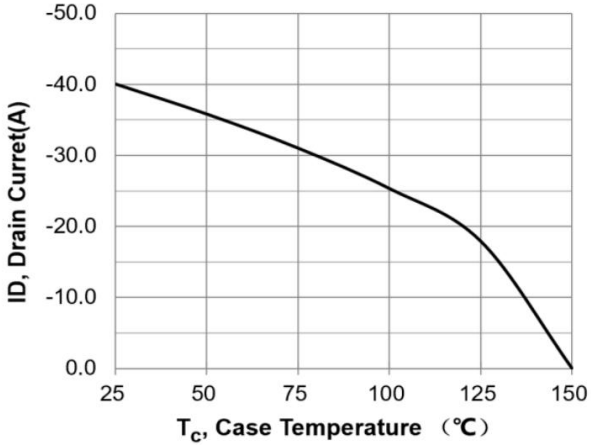


Fig12. Maximum Drain Current vs. Case Temperature



Typical Characteristics (cont.)

Fig13. Power Dissipation Derating Curve

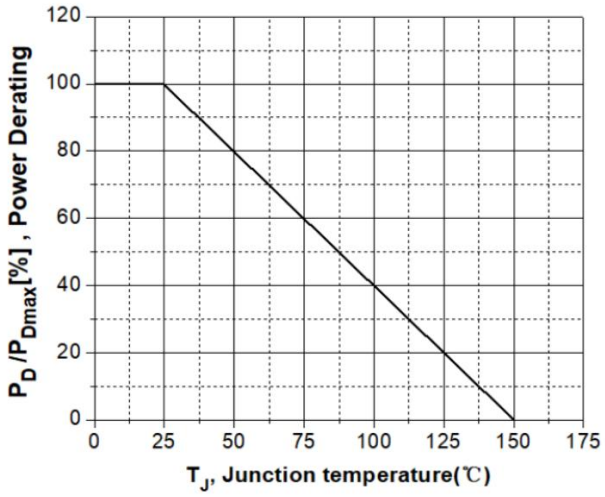


Fig14. Avalanche Energy Derating Curve vs. Junction Temperature

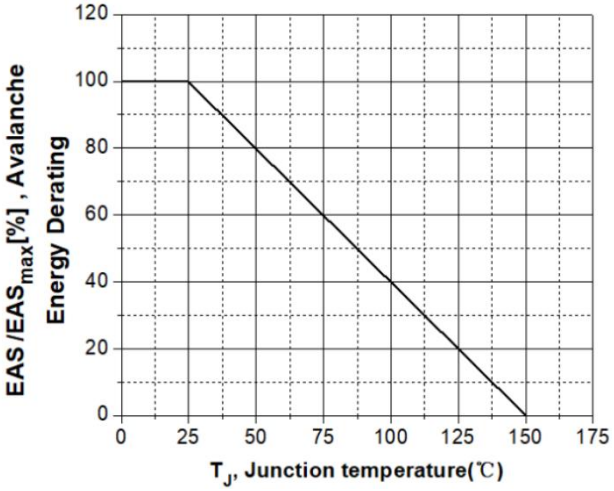


Fig15. Gate Charge Characteristics

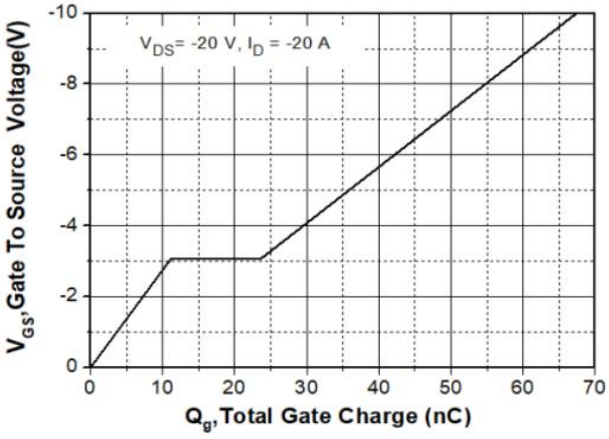
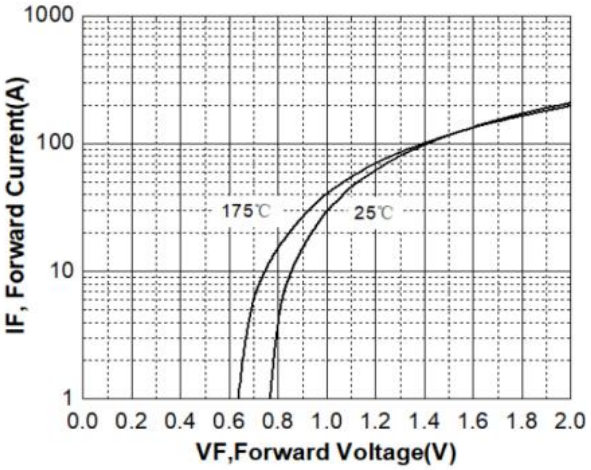


Fig16. Body Diode Forward Voltage vs. Reverse Drain Current



Typical Characteristics (cont.)

Fig17. Safe Operating Area

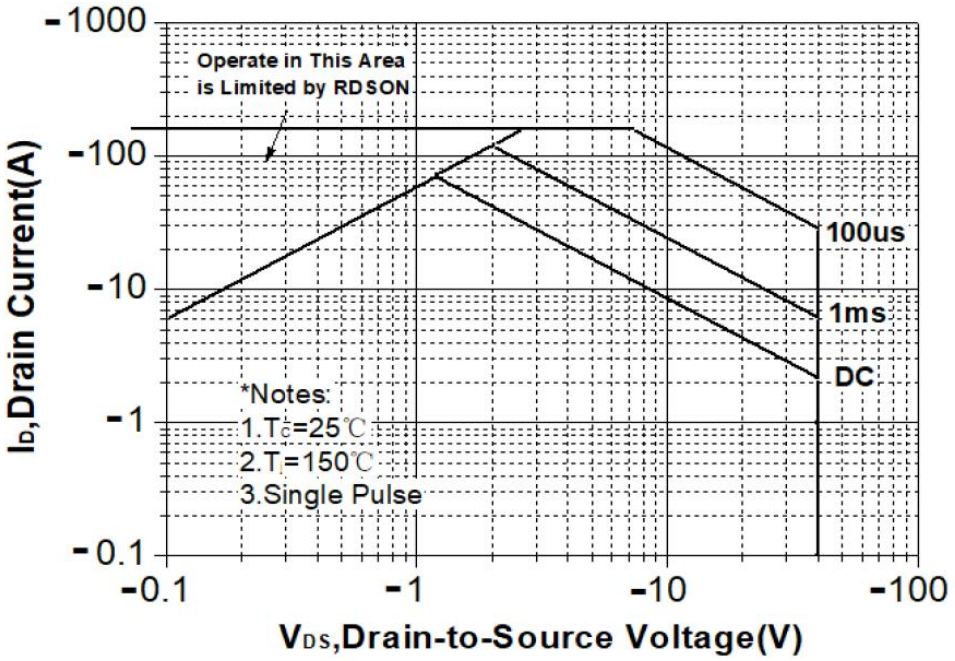
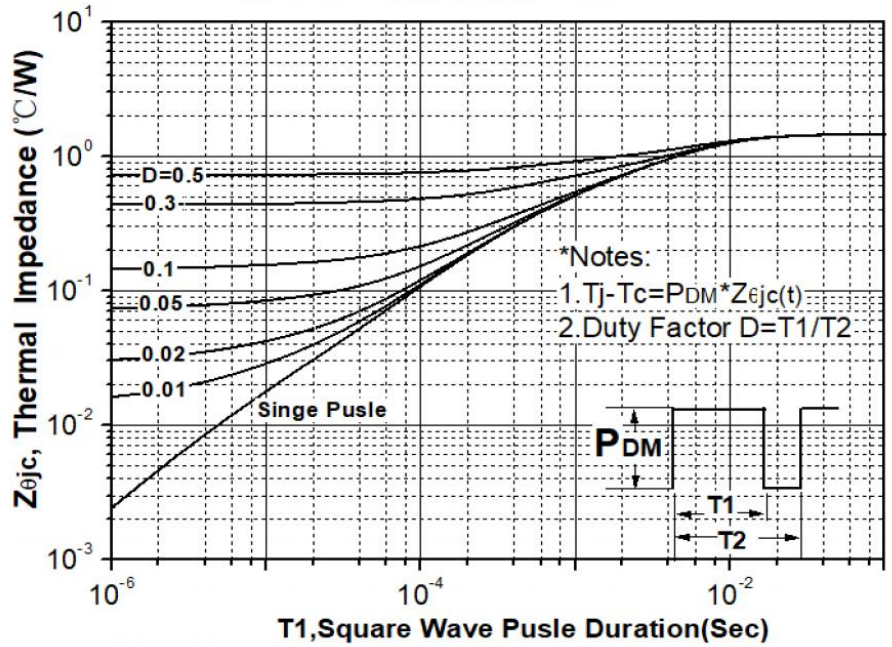
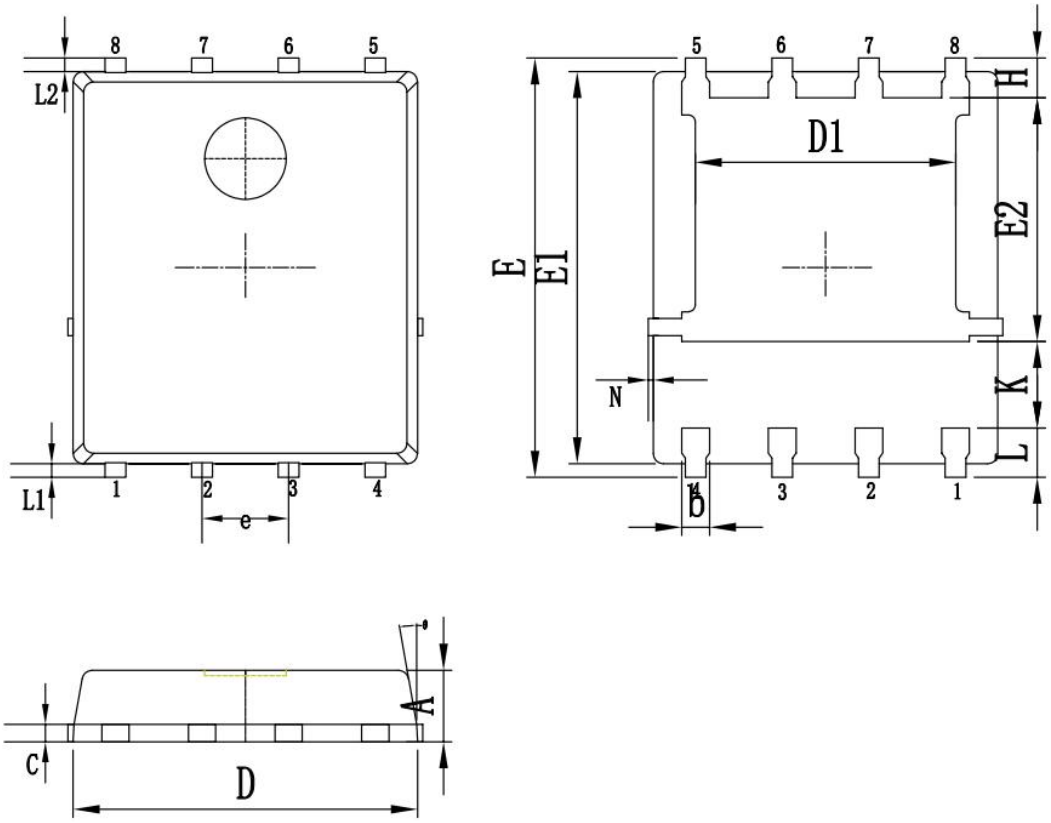


Fig18. Transient Thermal Response Curve



PDFN5X6 Package Information



Symbols	Millimeters		
	MIN.	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
V1.0	2024/01/19	Initial Release
V1.1	2024/08/10	Update POD

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.