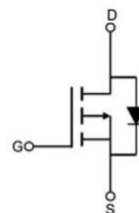
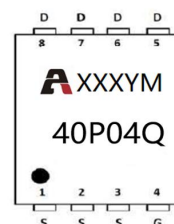


Features

- -40V,-30A
 $R_{DS(on)}$ (TYP:11mΩ)<13mΩ @ $V_{GS}=-10V$
 $R_{DS(on)}$ (TYP:14mΩ)<22mΩ @ $V_{GS}=-4.5V$
- Advanced Trench Technology
- Lead free product is acquired
- Excellent $R_{DS(on)}$ and Low Gate Charge



Schematic Diagram



Marking and pin Assignment

Applications

- PWM applications
- Load Switch
- Power management

Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity (PCS)
40P04Q	AP40P04Q	PDFN3X3	-	-	5000

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

Parameter	Symbol	Value	Unit
Drain-Source Voltage	V_{DS}	-40	V
Gate-Source Voltage	V_{GS}	± 20	V
Continuous Drain Current ($T_c=25^{\circ}C$) ⁽¹⁾	I_D	-30	A
Continuous Drain Current ($T_c=100^{\circ}C$)	I_D	-19	A
Pulsed Drain Current ⁽¹⁾	I_{DM}	-120	A
Drain Power Dissipation	P_D	20	W
Single Pulsed Avalanche Energy ⁽²⁾	E_{AS}	225	mJ
Thermal Resistance from Junction to Ambient ⁽³⁾	$R_{\theta JA}$	58	$^{\circ}C/W$
Thermal Resistance from Junction to Case	$R_{\theta JC}$	6.3	$^{\circ}C/W$
Junction Temperature	T_J	-55~ +150	$^{\circ}C$
Storage Temperature	T_{STG}	-55~ +150	$^{\circ}C$

Notes:

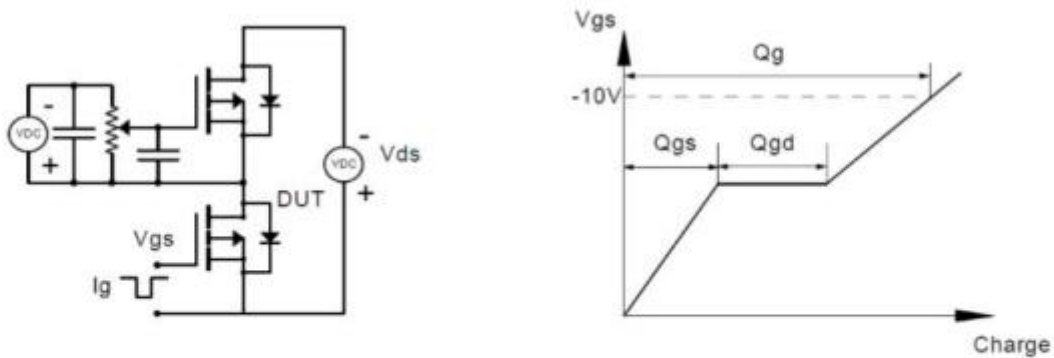
- 1) Repetitive Rating: pulse width limited by maximum junction temperature
- 2) EAS condition : $T_J=25^{\circ}C$, $V_{DD}=-20V$, $V_G=-10V$, $L=0.5mH$, $R_g=25\Omega$, $I_{AS}=-30A$
- 3) The value of $R_{\theta JA}$ Mounted on FR4 Board (25.4mm*25.4mm*t1.6mm) With 2oz Copper $T_A=25^{\circ}C$

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

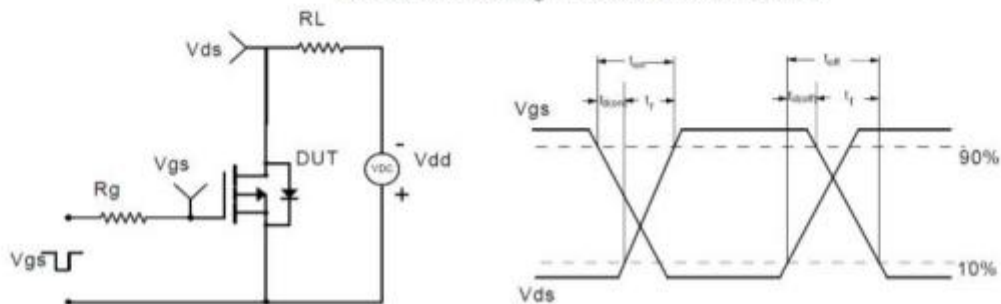
Parameter	Symbol	Test Condition	Min	Type	Max	Unit
Static Characteristics						
Drain-source breakdown voltage	V _{(BR)DSS}	V _{GS} =0V, I _D =-250μA	-40	-	-	V
Zero gate voltage drain current	I _{DSS}	V _{DS} =-40V, V _{GS} =0V	-	-	-1	μA
Gate-body leakage current	I _{GSS}	V _{GS} =±20V, V _{DS} =0V	-	-	±100	nA
Gate threshold voltage	V _{GS(th)}	V _{DS} =V _{GS} , I _D =-250μA	-1.0	-1.4	-2.5	V
Drain-source on-resistance	R _{DS(on)}	V _{GS} =-10V, I _D =-20A	-	11	13	mΩ
Drain-source on-resistance	R _{DS(on)}	V _{GS} =-4.5V, I _D =-10A	-	14	22	mΩ
Gate Resistance	R _g	V _{GS} =0V, V _{DS} =0V, f=1.0MHz	-	5.5	-	Ω
Dynamic characteristics						
Input Capacitance	C _{iss}	V _{DS} =-20V,V _{GS} =0V, f=1MHz	-	3290	-	pF
Output Capacitance	C _{oss}		-	250	-	
Reverse Transfer Capacitance	C _{rss}		-	230	-	
Switching characteristics						
Turn-on delay time	t _{d(on)}	V _{GS} =-10V,V _{DS} =-20V RG=3Ω, I _D =-20A	-	10	-	ns
Turn-on rise time	t _r		-	21	-	
Turn-off delay time	t _{d(off)}		-	53	-	
Turn-off fall time	t _f		-	29	-	
Total Gate Charge	Q _g	V _{DS} =-20V, I _D =-20A, V _{GS} =-10V	-	63	-	nC
Gate-Source Charge	Q _{gs}		-	9	-	
Gate-Drain Charge	Q _{gd}		-	12	-	
Gate Plateau	V _{plateau}		-	2.8	-	V
Source-Drain Diode characteristics						
Diode Forward voltage	V _{SD}	T _J =25℃, V _{GS} =0V, I _D =-20A	-	-	-1.2	V
Diode Forward current	I _s	T _J =25℃	-	-	-30	A

Test Circuit

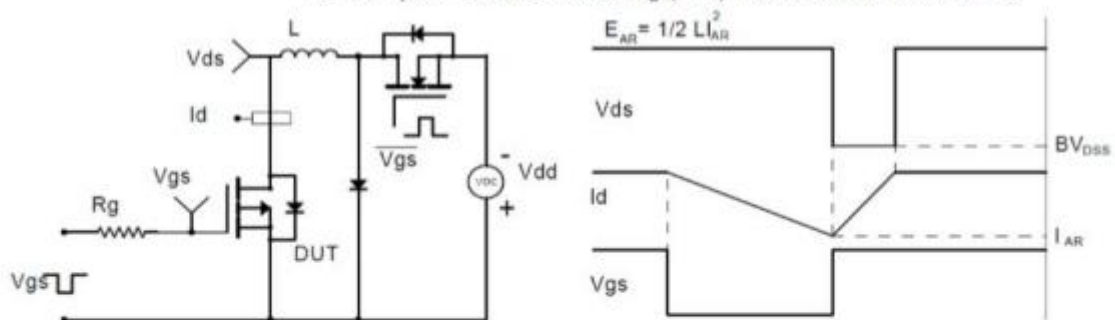
Gate Charge Test Circuit & Waveform



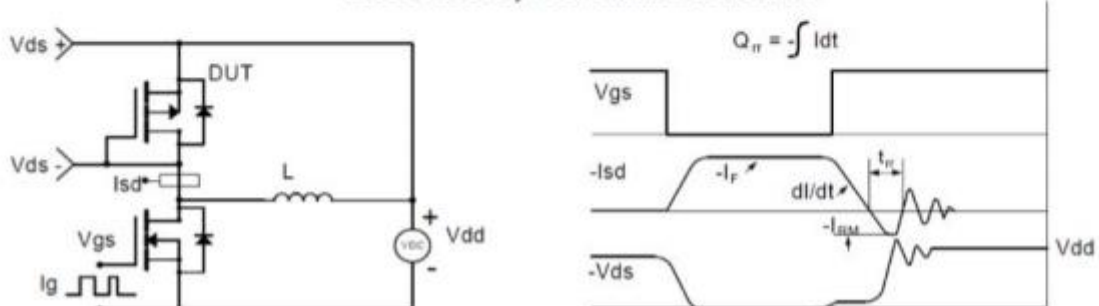
Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms



Typical Characteristics

Figure 1. Output Characteristics

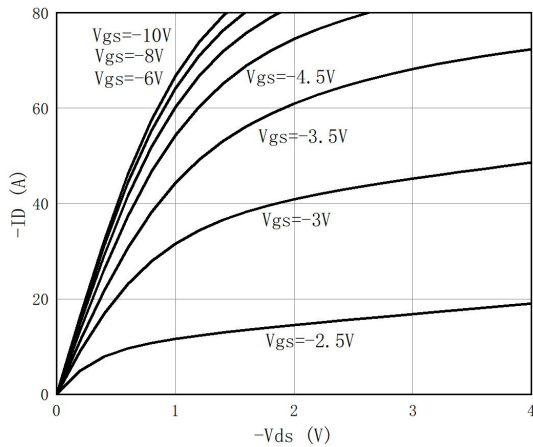


Figure 2. Transfer Characteristics

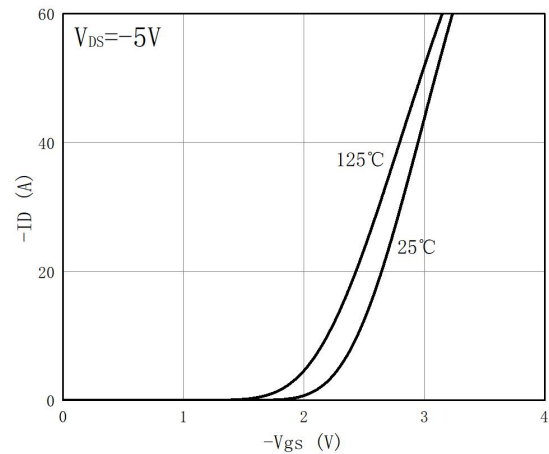


Figure 3. Source Drain Forward Characteristics

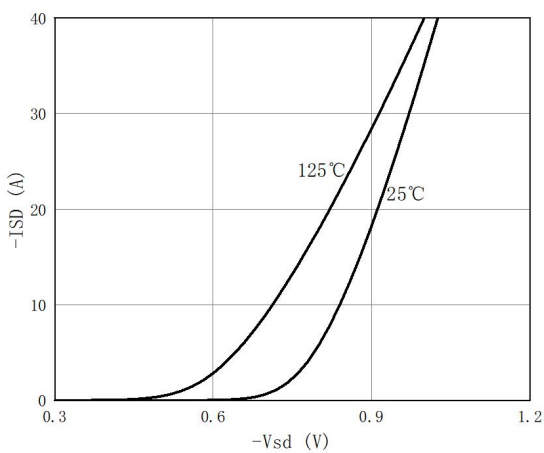


Figure 4. Gate-Charge Characteristics

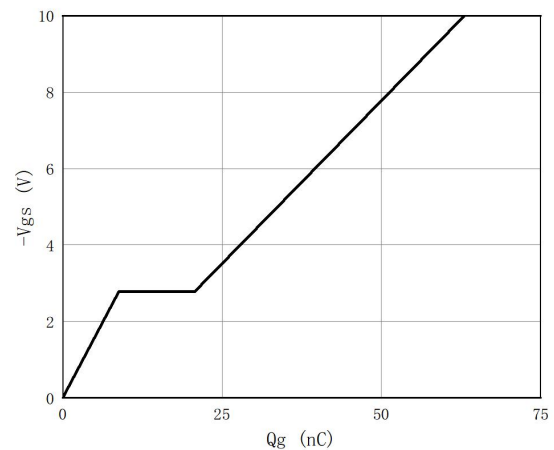


Figure 5. On-Resistance vs. Drain Current and Gate Voltage

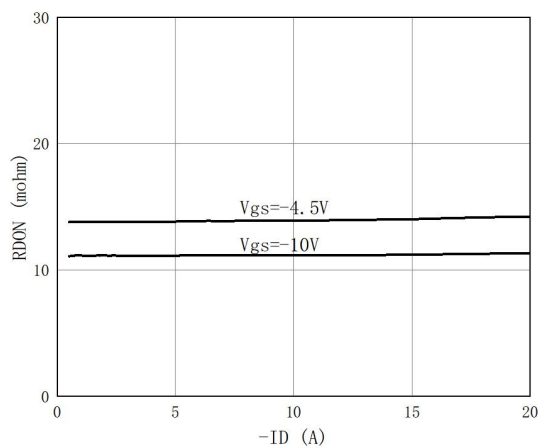
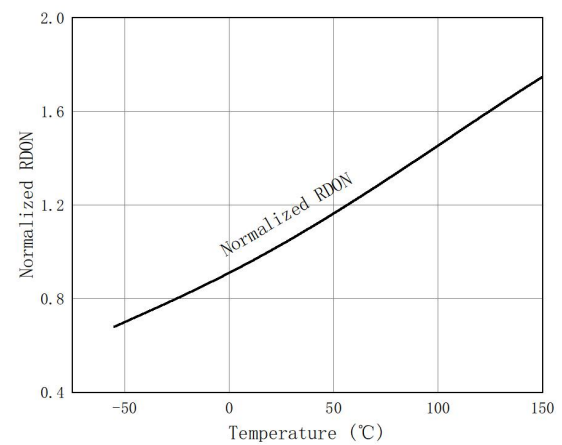


Figure 6. $R_{DS(on)}$ vs Junction Temperature



Typical Characteristics

Figure 7: V_{th} vs Junction Temperature

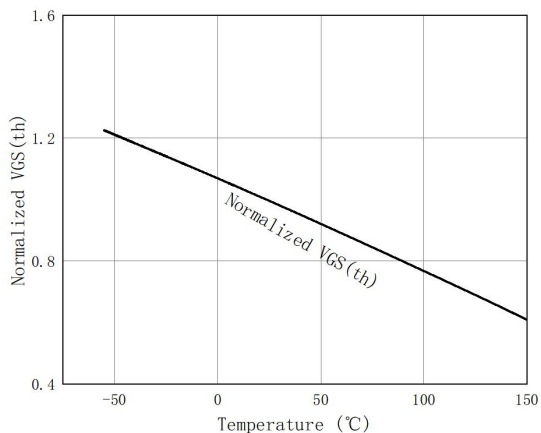


Figure 8: $BVDSS$ vs. Junction Temperature

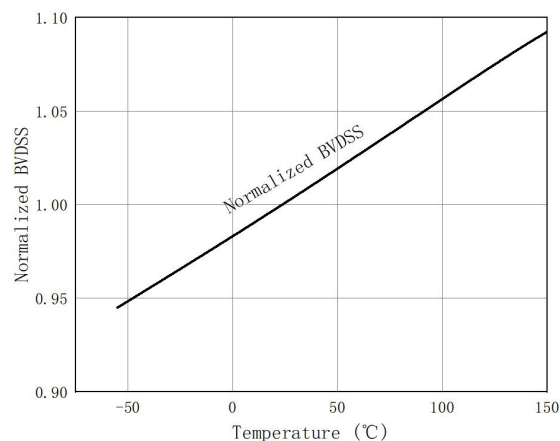


Figure 9. Capacitance

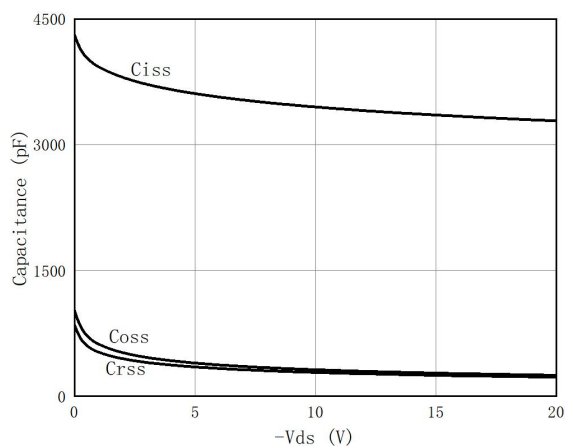


Figure 10. On-Resistance vs. Gate-Source Voltage

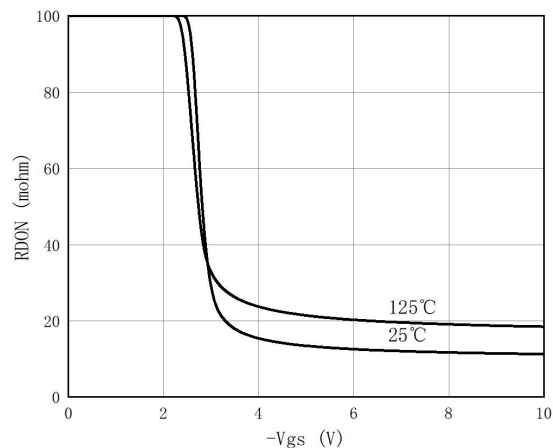


Figure 11. Current De-rating

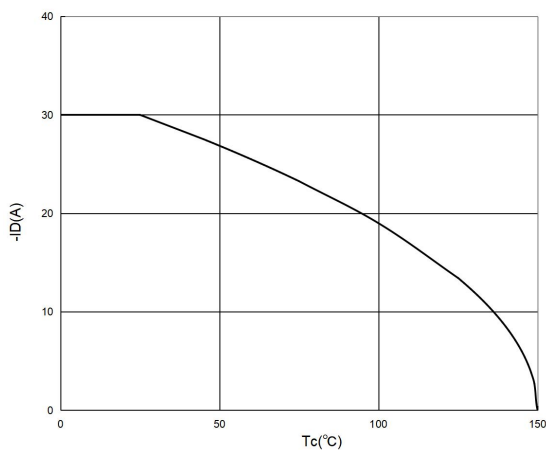
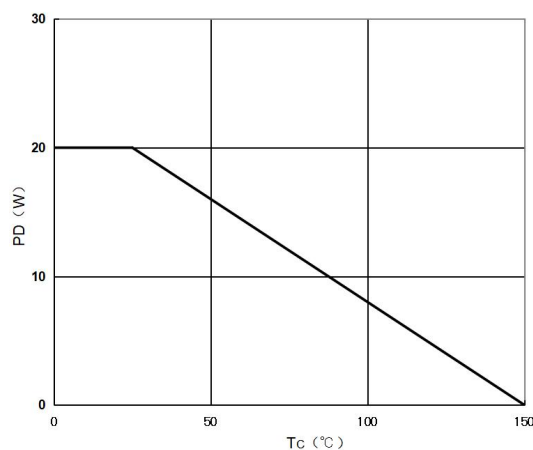


Figure 12. Power De-rating



Typical Characteristics

Figure 13. Safe Operating Area

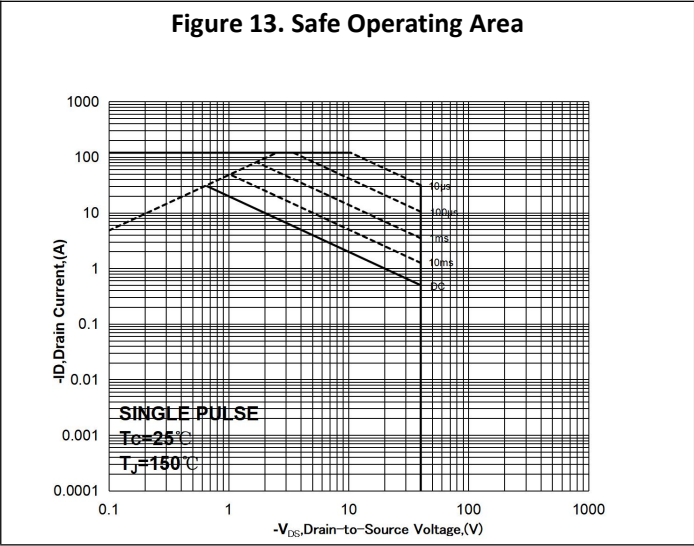
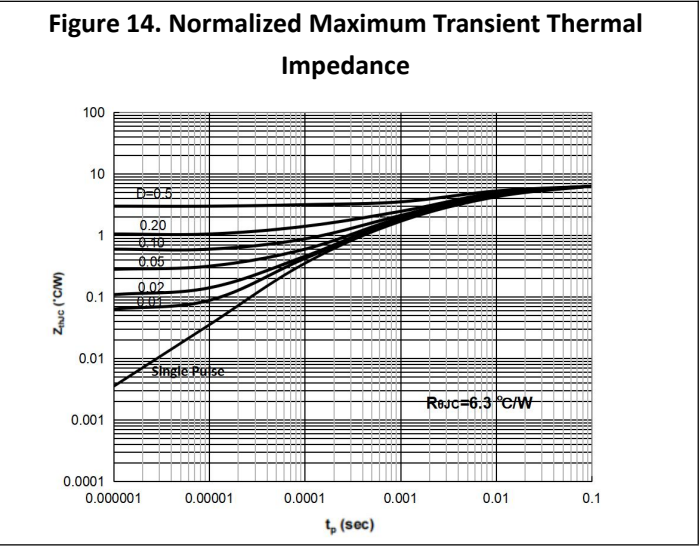
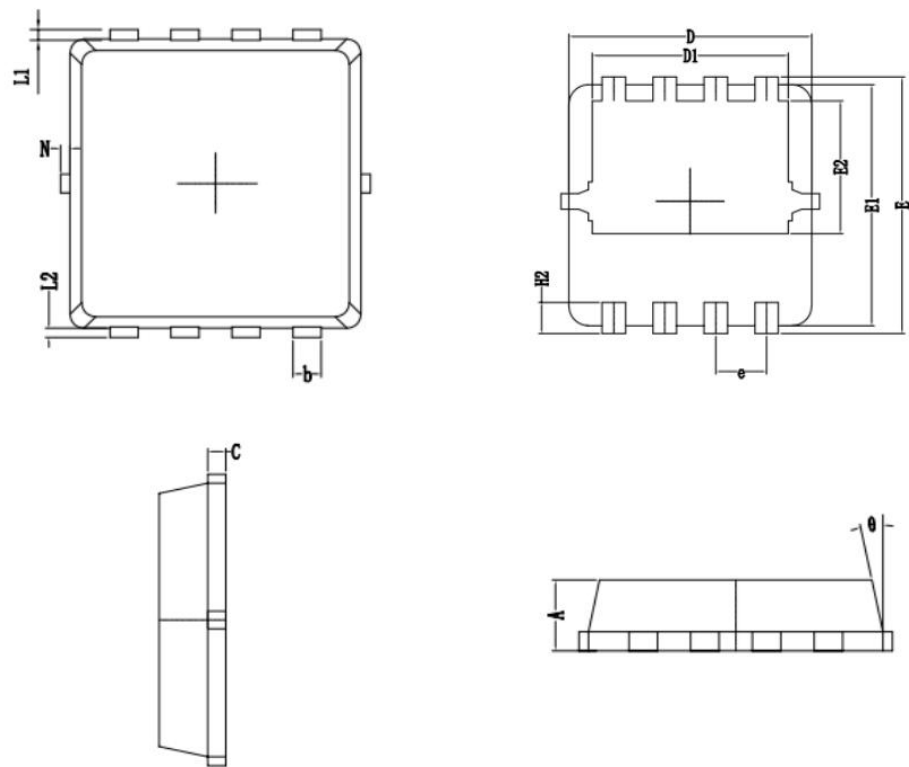


Figure 14. Normalized Maximum Transient Thermal Impedance



PDFN3X3 Package Information



Symbols	Millimeters		
	MIN.	NOM.	MAX.
A	0.70	0.80	0.90
b	0.25	0.30	0.35
C	0.14	0.15	0.16
D	3.00	3.10	3.20
L1/L2	0.10 REF.		
D1	2.35	2.50	2.60
N	0	-	0.10
E	3.20	3.30	3.40
E1	3.00	3.10	3.20
E2	1.72	1.82	1.92
e	0.65 BSC.		
θ	11°	12°	13°
H2	0.30	0.40	0.50

Revision History

Revision	Release	Remark
V1.0	2024/10/22	Initial Release

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.