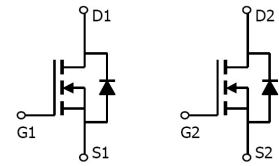
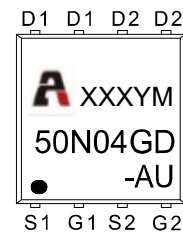


## Feature

- 40V,30A  
 $R_{DS(ON)} < 15m\Omega @ V_{GS}=10V$  TYP:13 m $\Omega$   
 $R_{DS(ON)} < 20m\Omega @ V_{GS}=4.5V$  TYP:17 m $\Omega$
- Advanced Trench Technology
- Lead free product is acquired
- Excellent  $R_{DS(ON)}$  and Low Gate Charge
- $T_{jmax}=175^{\circ}C$
- AEC-Q101 qualified



Schematic diagram



Marking and pin assignment

## Application

- PWM applications
- Load Switch
- Power management

## Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity (PCS)
50N04GD-AU	AP50N04GD-AU	PDFN5X6-D	13 inch	-	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	$V_{GS}$	$\pm 20$	V
Continuous Drain Current ( $T_c=25^{\circ}C$ )	$I_D$	30	A
Continuous Drain Current ( $T_c=100^{\circ}C$ )	$I_D$	20	A
Pulsed Drain Current <sup>(1)</sup>	$I_{DM}$	90	A
Single Pulsed Avalanche Energy <sup>(2)</sup>	$E_{AS}$	12.25	mJ
Power Dissipation	$P_D$	50	W
Thermal Resistance from Junction to Case <sup>(4)</sup>	$R_{\theta JC}$	3.0	$^{\circ}C/W$
Junction Temperature	$T_J$	175	$^{\circ}C$
Storage Temperature	$T_{STG}$	-55~ +175	$^{\circ}C$

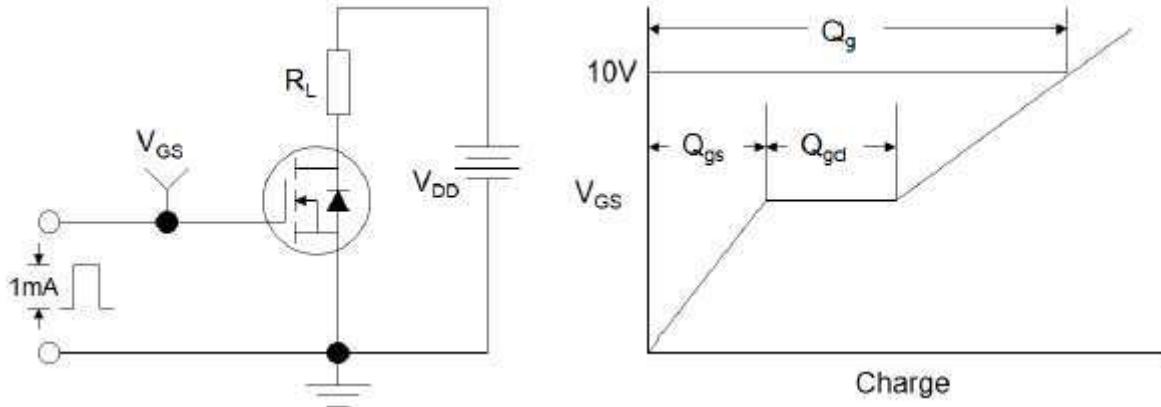
**MOSFET ELECTRICAL CHARACTERISTICS(T<sub>J</sub>=25°C unless otherwise noted)**

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 <sup>(3)</sup>	V <sub>GS(th)</sub>	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250μA	1	1.5	2.5	V
Drain-source on-resistance <sup>(3)</sup>	R <sub>DS(on)</sub>	V <sub>GS</sub> =10V, I <sub>D</sub> =10A	-	13	15	mΩ
		V <sub>GS</sub> =4.5V, I <sub>D</sub> =8A	-	17	20	
<b>Dynamic characteristics</b>						
Input Capacitance	C <sub>iss</sub>	V <sub>DS</sub> =20V, V <sub>GS</sub> =0V, f =1MHz	-	1250	-	pF
Output Capacitance	C <sub>oss</sub>		-	114	-	
Reverse Transfer Capacitance	C <sub>rss</sub>		-	85	-	
<b>Switching characteristics</b>						
Turn-on delay time	t <sub>d(on)</sub>	V <sub>DD</sub> =20V, I <sub>D</sub> =1A, R <sub>L</sub> =6Ω V <sub>GS</sub> =10V, R <sub>G</sub> =1Ω	-	10	-	ns
Turn-on rise time	t <sub>r</sub>		-	9	-	
Turn-off delay time	t <sub>d(off)</sub>		-	32	-	
Turn-off fall time	t <sub>f</sub>		-	16	-	
Total Gate Charge	Q <sub>g</sub>	V <sub>DS</sub> =20V, I <sub>D</sub> =10A, V <sub>GS</sub> =10V	-	20	-	nC
Gate-Source Charge	Q <sub>gs</sub>		-	3.5	-	
Gate-Drain Charge	Q <sub>gd</sub>		-	4.2	-	
<b>Source-Drain Diode characteristics</b>						
Diode Forward voltage <sup>(3)</sup>	V <sub>DS</sub>	V <sub>GS</sub> =0V, I <sub>S</sub> =10A	-	-	1.2	V
Diode Forward current <sup>(4)</sup>	I <sub>S</sub>		-	-	30	A

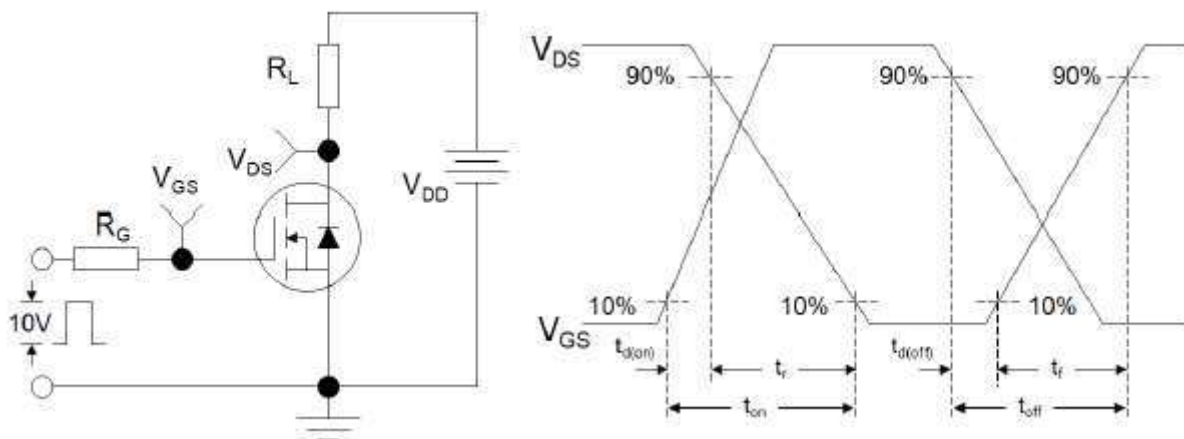
**Notes:**

1. Repetitive Rating: pulse width limited by maximum junction temperature
2. EAS Condition: T<sub>J</sub>=25°C, V<sub>DD</sub>=20V, R<sub>G</sub>=25 Ω, L=0.5mH
3. Pulse Test: pulse width≤300μs, duty cycle≤2%
4. Surface Mounted on FR4 Board, t≤10 sec

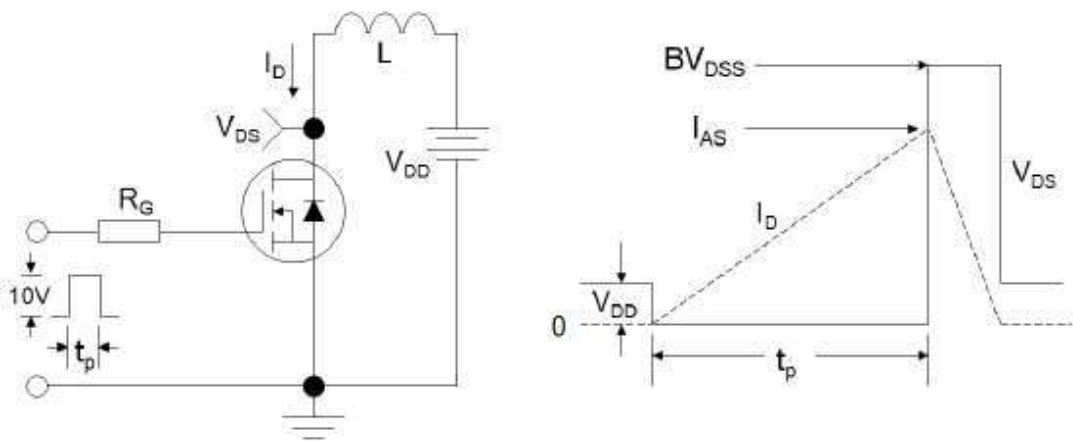
**Test Circuit**



**Figure 1: Gate Charge Test Circuit & Waveform**



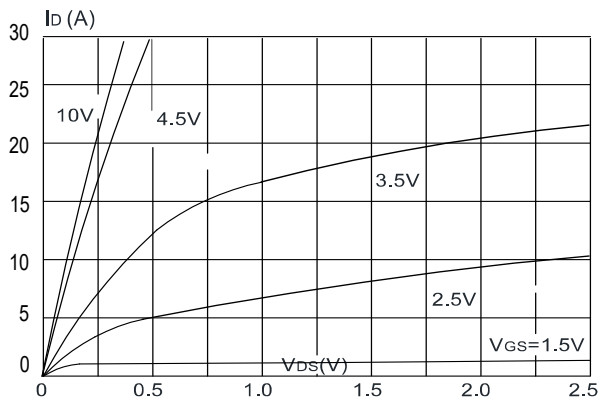
**Figure 2: Resistive Switching Test Circuit & Waveforms**



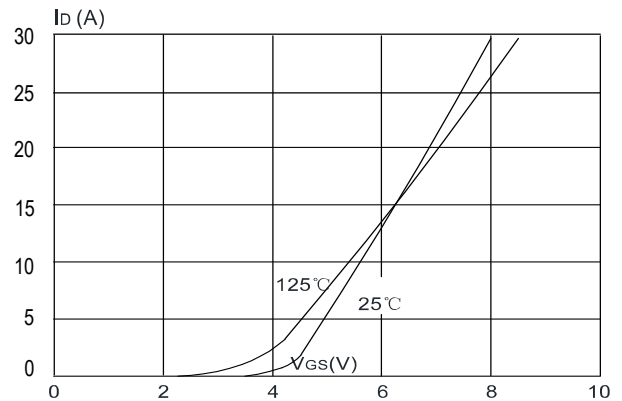
**Figure 3: Unclamped Inductive Switching Test Circuit & Waveforms**

**Typical Performance Characteristics**

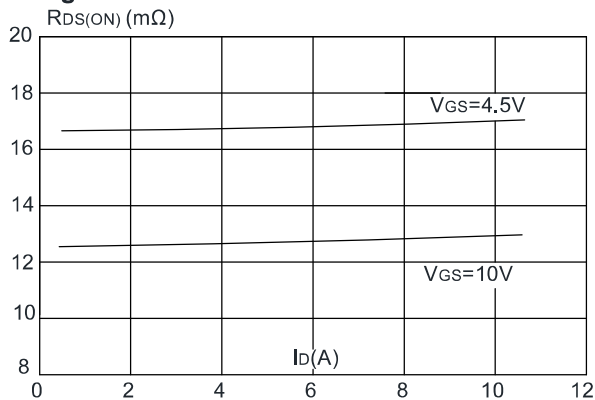
**Figure 1: Output Characteristics**



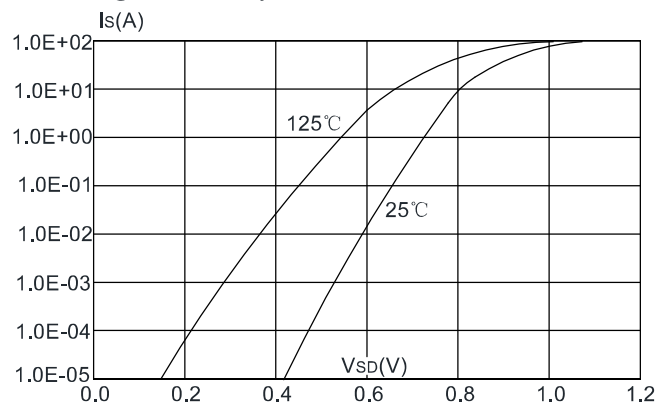
**Figure 2: Typical Transfer Characteristics**



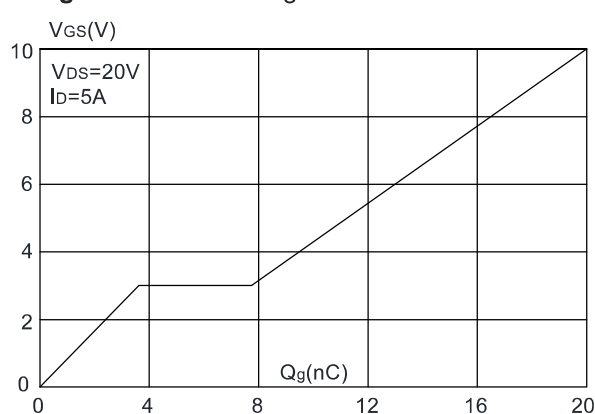
**Figure 3: On-resistance vs. Drain Current**



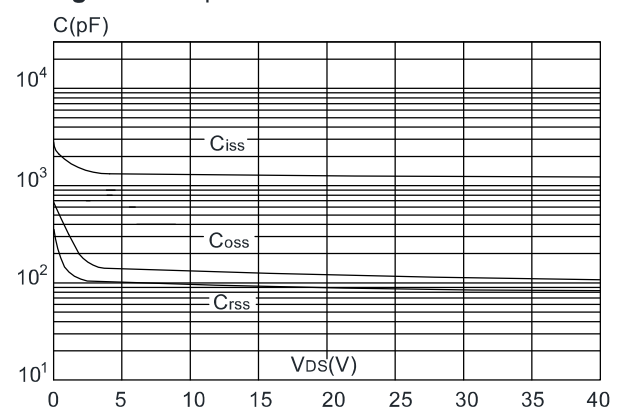
**Figure 4: Body Diode Characteristics**



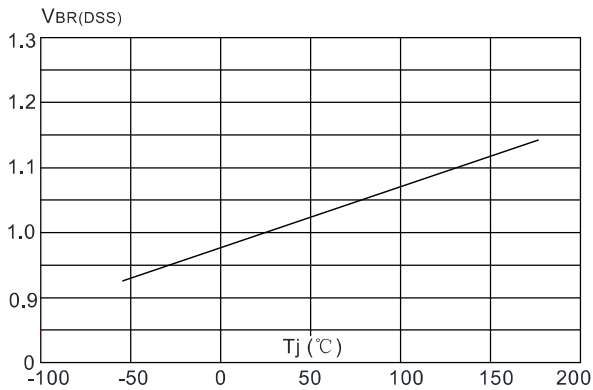
**Figure 5: Gate Charge Characteristics**



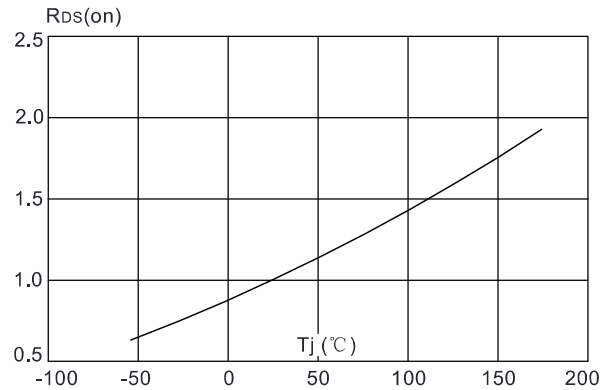
**Figure 6: Capacitance Characteristics**



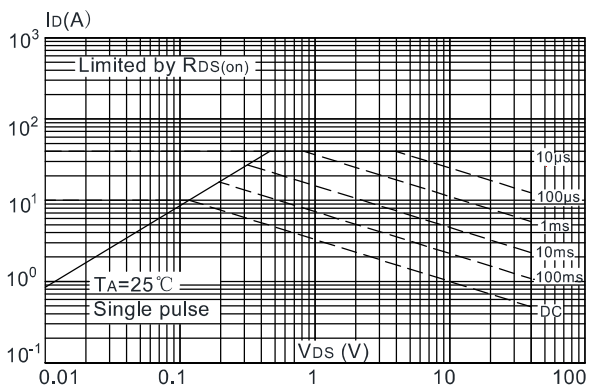
**Figure 7:** Normalized Breakdown Voltage vs. Junction Temperature



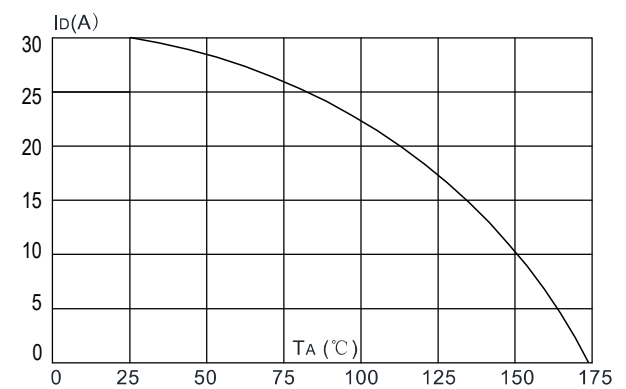
**Figure 8:** Normalized on Resistance vs. Junction Temperature



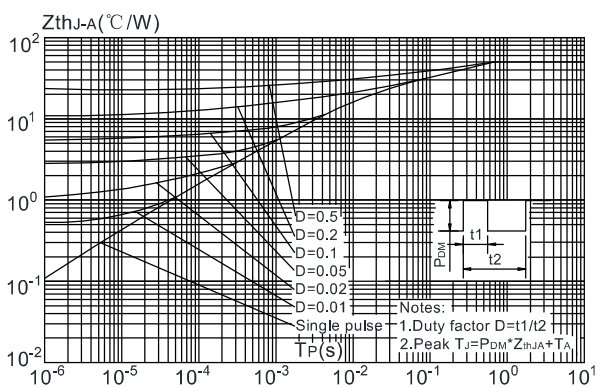
**Figure 9:** Maximum Safe Operating Area



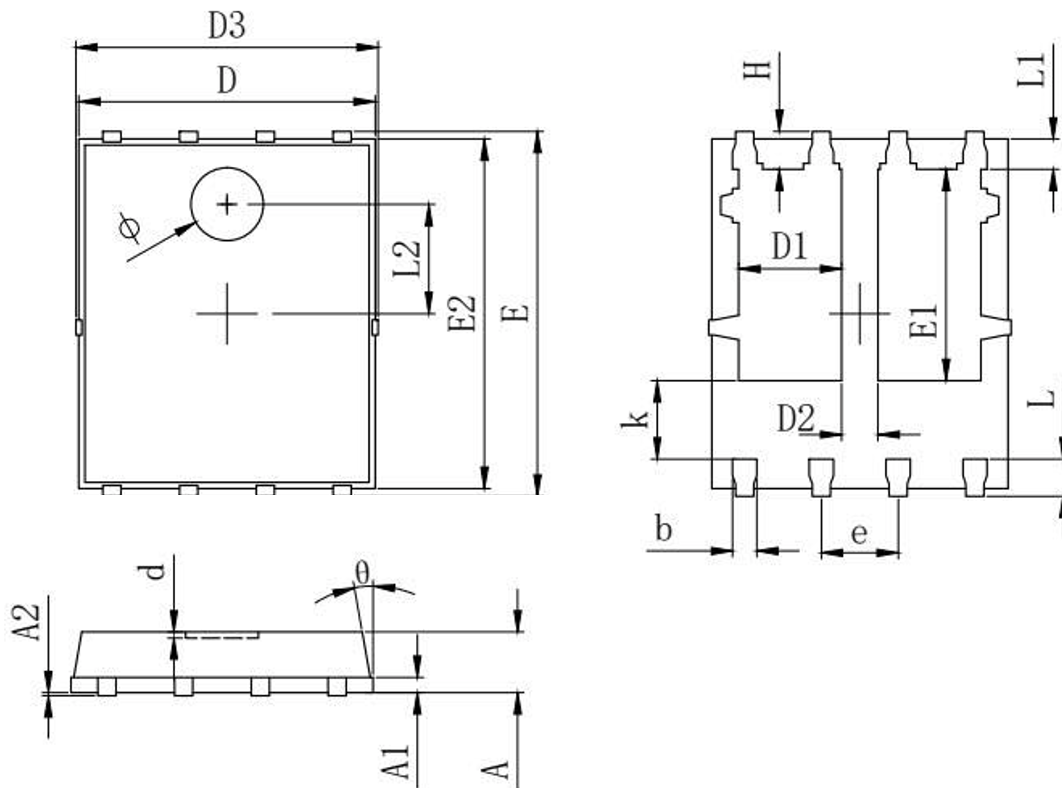
**Figure 10:** Maximum Continuous Drain Current vs. Ambient Temperature



**Figure.11:** Maximum Effective Transient Thermal Impedance, Junction-to-Ambient



**PDFN5X6 Package Information**



SYMBOL	MILLIMETER		
	MIN	Typ.	MAX
A	0.900	1.000	1.100
A1	0.254 REF.		
A2	0 <sup>~</sup> 0.05		
D	4.824	4.900	4.976
D1	1.605	1.705	1.805
D2	0.500	0.600	0.700
D3	4.924	5.000	5.076
E	5.924	6.000	6.076
E1	3.375	3.475	3.575
E2	5.674	5.750	5.826
b	0.350	0.400	0.450
e	1.270 TYP.		
L	0.534	0.610	0.686
L1	0.424	0.500	0.576
L2	1.800 REF.		
k	1.190	1.290	1.390
H	0.549	0.625	0.701
$\theta$	8°	10°	12°
$\phi$	1.100	1.200	1.300
d			0.100

## Revision History

Revision	Release	Remark
V1.0	2023/01/20	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.