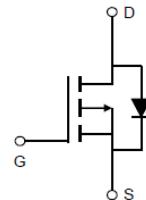


## Features

- -60V,-56A  
 $R_{DS(on)} < 15m\Omega @ V_{GS} = -10V$  TYP:11m $\Omega$   
 $R_{DS(on)} < 18m\Omega @ V_{GS} = -4.5V$  TYP:13.5m $\Omega$



- Surface-mounted package
- Low gate charge
- 100% UIS Tested, 100% DVDS Tested
- Lead free product is acquired

**Schematic Diagram**



**Marking and pin Assignment**

## Applications

- Load Switch

## Package Marking and Ordering Information

| Device Marking | Device   | Device Package | Reel Size | Tape width | Quantity (PCS) |
|----------------|----------|----------------|-----------|------------|----------------|
| 56P06G         | AP56P06G | PDFN5X6        | -         | -          | 5000           |

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

| Parameter   | Symbol          | Value    | Unit         |
|---|-----------------|----------|--------------|
| Drain-Source Voltage  | $V_{DS}$        | -60      | V            |
| Gate-Source Voltage   | $V_{GS}$        | $\pm 20$ | V            |
| Continuous Drain Current ( $T_c = 25^\circ C$ )                             | $I_D$           | -56      | A            |
| Continuous Drain Current ( $T_c = 100^\circ C$ )                            | $I_D$           | -40      | A            |
| Pulsed Drain Current <sup>(1)</sup>   | $I_{DM}$        | -224     | A            |
| Single Pulsed Avalanche Energy ( $V_{DD} = 40V, L = 0.5mH$ ) <sup>(2)</sup> | $E_{AS}$        | 484      | mJ           |
| Drain Power Dissipation   | $P_D$           | 107      | W            |
| Thermal Resistance from Junction to Case                                    | $R_{\theta JC}$ | 1.4      | $^\circ C/W$ |
| Thermal Resistance- Junction to Ambient                                     | $R_{\theta JA}$ | 56       | $^\circ C/W$ |
| Junction Temperature  | $T_J$           | 175      | $^\circ C$   |
| Storage Temperature   | $T_{STG}$       | -55~+175 | $^\circ C$   |

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

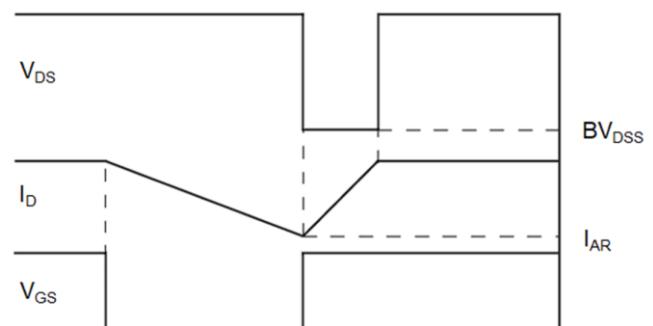
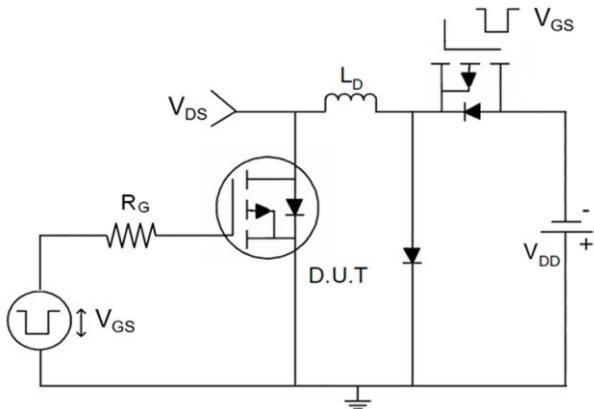
| Parameter                                 | Symbol                      | Test Condition  | Min | Type | Max       | Unit             |
|---|-----------------------------|---|-----|------|-----------|------------------|
| <b>Static Characteristics</b>             |                             |   |     |      |           |                  |
| Drain-source breakdown voltage            | $V_{(\text{BR})\text{DSS}}$ | $V_{\text{GS}} = 0\text{V}, I_D = -250\mu\text{A}$  | -60 | -    | -         | V                |
| Zero gate voltage drain current           | $I_{\text{DSS}}$            | $V_{\text{DS}} = -60\text{V}, V_{\text{GS}} = 0\text{V}$  | -   | -    | 1         | $\mu\text{A}$    |
| Gate-body leakage current                 | $I_{\text{GSS}}$            | $V_{\text{GS}} = \pm 20\text{V}, V_{\text{DS}} = 0\text{V}$   | -   | -    | $\pm 100$ | nA               |
| Gate threshold voltage                    | $V_{\text{GS}(\text{th})}$  | $V_{\text{DS}} = V_{\text{GS}}, I_D = -250\mu\text{A}$  | -1  | -1.8 | -2.5      | V                |
| Drain-source on-resistance                | $R_{\text{DS}(\text{on})}$  | $V_{\text{GS}} = -10\text{V}, I_D = -15\text{A}$  | -   | 11   | 15        | $\text{m}\Omega$ |
|   |                             | $V_{\text{GS}} = -4.5\text{V}, I_D = -10\text{A}$   |     | 13.5 | 18        | $\text{m}\Omega$ |
| <b>Dynamic characteristics</b>            |                             |   |     |      |           |                  |
| Input Capacitance                         | $C_{\text{iss}}$            | $V_{\text{DS}} = -25\text{V}, V_{\text{GS}} = 0\text{V}, f = 1.0\text{MHz}$                           | -   | 8700 | -         | pF               |
| Output Capacitance                        | $C_{\text{oss}}$            |   | -   | 290  | -         |                  |
| Reverse Transfer Capacitance              | $C_{\text{rss}}$            |   | -   | 210  | -         |                  |
| <b>Switching characteristics</b>          |                             |   |     |      |           |                  |
| Turn-on delay time                        | $t_{\text{d}(\text{on})}$   | $V_{\text{DD}} = -30\text{V}, I_b = -15\text{A}, R_G = 3.0\Omega, R_L = 1.5\Omega, V_G = -10\text{V}$ | -   | 26   | -         | ns               |
| Turn-on rise time                         | $t_r$                       |   | -   | 21   | -         |                  |
| Turn-off delay time                       | $t_{\text{d}(\text{off})}$  |   | -   | 138  | -         |                  |
| Turn-off fall time                        | $t_f$                       |   | -   | 30   | -         |                  |
| Total Gate Charge                         | $Q_g$                       | $V_{\text{DS}} = -30\text{V}, I_D = -20\text{A}, V_{\text{GS}} = -10\text{V}$                         | -   | 140  | -         | nC               |
| Gate-Source Charge                        | $Q_{gs}$                    |   | -   | 19   | -         |                  |
| Gate-Drain Charge                         | $Q_{gd}$                    |   | -   | 28   | -         |                  |
| <b>Source-Drain Diode characteristics</b> |                             |   |     |      |           |                  |
| Diode Forward voltage                     | $V_{\text{SD}}$             | $T_J = 25^\circ\text{C}, V_{\text{GS}} = 0\text{V}, I_s = -20\text{A}$                                | -   | -    | -1.2      | V                |
| Diode Forward current                     | $I_s$                       | $T_c = 25^\circ\text{C}$  | -   | -    | -56       | A                |
| Body Diode Reverse Recovery Time          | $\text{trr}$                | $T_J = 25^\circ\text{C}, IF = -20\text{A}, di/dt = 100\text{A/us}$                                    |     | 56   |           | ns               |
| Body Diode Reverse Recovery Charge        | $Q_{rr}$                    | $T_J = 25^\circ\text{C}, IF = -20\text{A}, di/dt = 100\text{A/us}$                                    |     | 63   |           | nc               |

**Notes:**

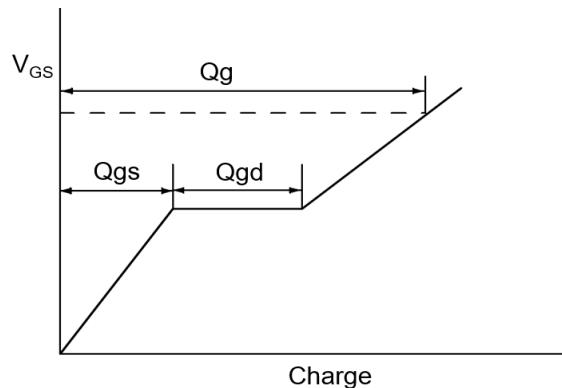
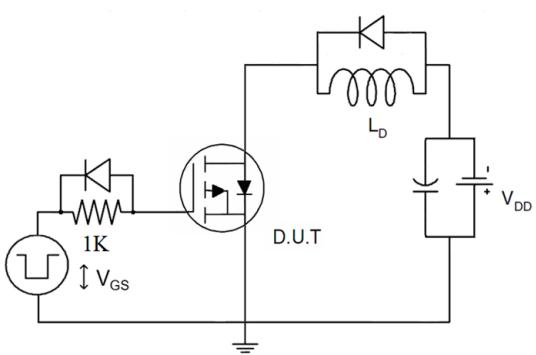
- 1.Repetitive Rating: Pulse width limited by maximum junction temperature
- 2.EAS condition:  $T_J = 25^\circ\text{C}, V_{\text{DD}} = 40\text{V}, V_{\text{G}} = -10\text{V}, R_g = 25\Omega, L = 0.5\text{mH}$ .
- 3.Repetitive Rating: Pulse width limited by maximum junction temperature.

## Test Circuit

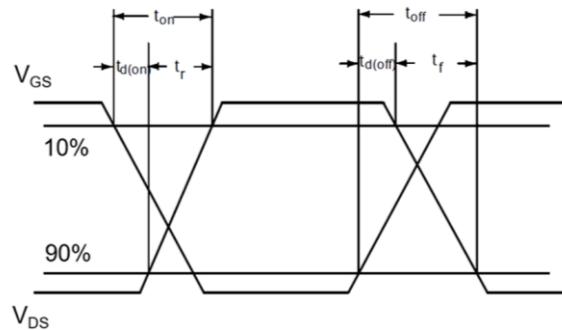
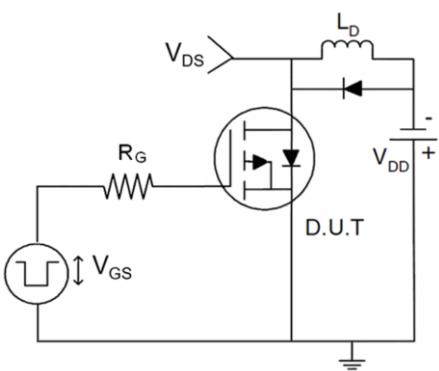
### 1) $E_{AS}$ Test Circuits



### 2) Gate Charge Test Circuit

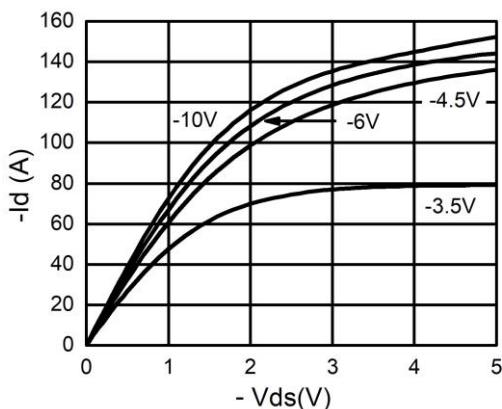


### 3) Switch Time Test Circuit

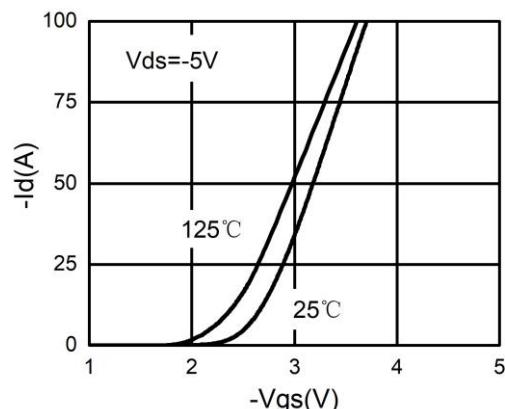


## Typical Characteristics (Cont.)

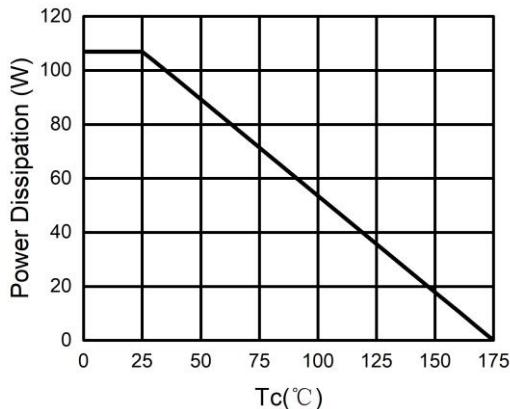
**Figure 1. Output Characteristics**



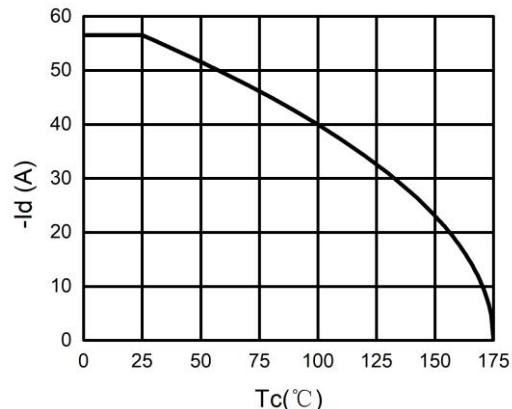
**Figure 2. Transfer Characteristics**



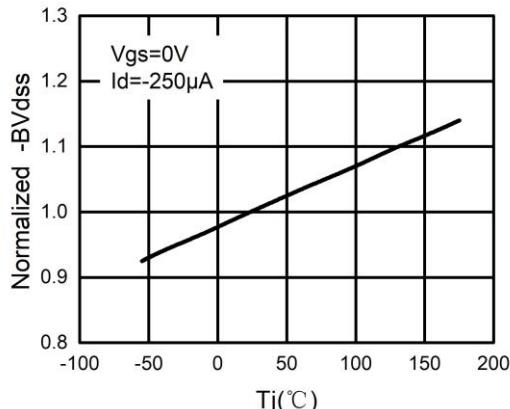
**Figure 3. Power Dissipation**



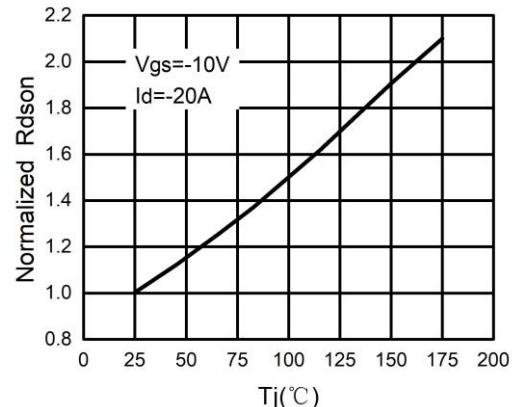
**Figure 4. Drain Current**



**Figure 5. BV<sub>DSS</sub> vs Junction Temperature**

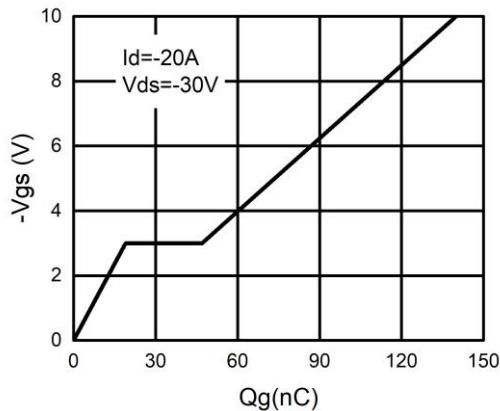


**Figure 6. R<sub>DS(ON)</sub> vs Junction Temperature**

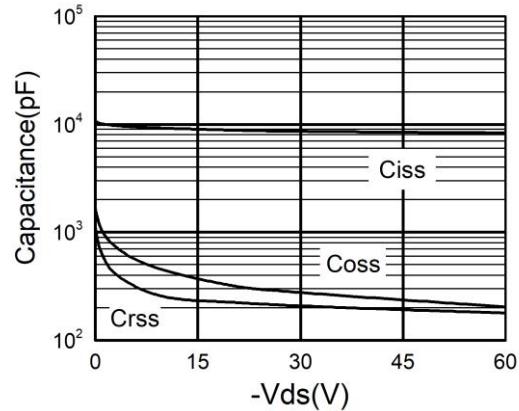


## Typical Characteristics (Cont.)

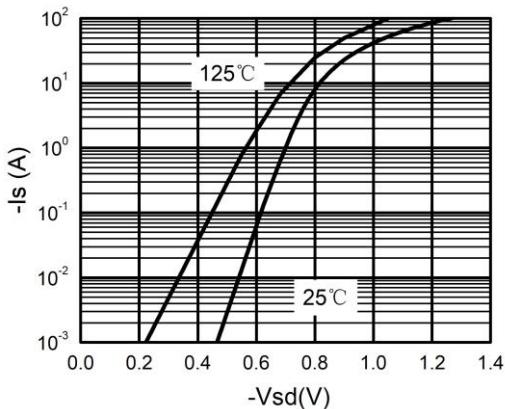
**Figure 7. Gate Charge Waveforms**



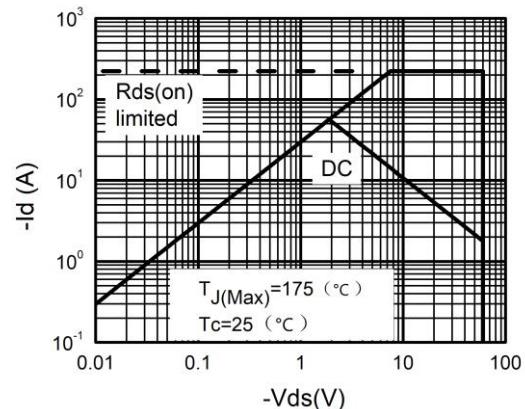
**Figure 8. Capacitance**



**Figure 9. Body-Diode Characteristics**



**Figure 10. Maximum Safe Operating Area**



## Package Dimensions

PDFN5X6

Unit:mm

The technical drawing illustrates the physical dimensions of the PD FN5X6 package. It includes three views: a top view showing the overall footprint and lead locations, a side view showing the height and lead spacing, and a cross-sectional view showing internal features like the lead frame and bond wires. Dimension labels include A (height), B (width), C (lead pitch), L (lead thickness), L1 (lead spacing), L2 (lead spacing), L4 (lead spacing), P (lead pitch), a (lead width), b (lead thickness), B1 (lead pitch), L6 (lead thickness), L7 (lead thickness), l (lead thickness), theta (lead angle), and phi (lead angle).

| Dimensions In Millimeterer |      |      |      |
|----------------------------|------|------|------|
| Symbol                     | MIN  | TYP  | MAX  |
| A                          | 5.90 | 6.00 | 6.10 |
| a                          | 3.91 | 4.01 | 4.11 |
| A2                         | 5.70 | 5.75 | 5.80 |
| B                          | 4.90 | 5.00 | 5.10 |
| b                          | 3.37 | 3.47 | 3.57 |
| B1                         | 4.80 | 4.90 | 5.00 |
| C                          | 0.90 | 0.95 | 1.00 |
| L                          | 0.35 | 0.40 | 0.45 |
| l                          | 0.06 | 0.13 | 0.20 |
| L1                         | 1.10 | -    | -    |
| L2                         | 1.17 | 1.27 | 1.37 |
| L4                         | 0.21 | 0.26 | 0.34 |
| L6                         | 0.51 | 0.61 | 0.71 |
| L7                         | 0.51 | 0.61 | 0.71 |
| P                          | 1.00 | 1.10 | 1.20 |
| θ                          | 8°   | 10°  | 12°  |
| ϕ                          | 1.10 | 1.20 | 1.30 |

Rev.00 201812

## Revision History

| Revision | Release    | Remark          |
|----------|------------|-----------------|
| V1.0     | 2023/09/20 | 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.