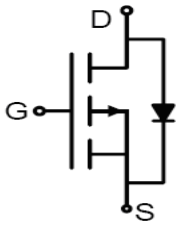
# AP85P04G

**P-Channel Enhancement Mosfet**

**DATA SHEET**

## Features

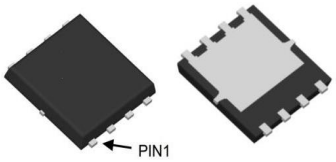
- -40V, -85A
  $R_{DS(ON)}$ <5.3mΩ @$V_{GS}$=-10V TYP:4.3mΩ
  $R_{DS(ON)}$ <7.6mΩ @$V_{GS}$=-4.5V TYP:5.9mΩ
- Advanced Trench Technology
- High Power and current handing capability
- Lead free product is acquired




**Schematic Diagram**

## Applications

- Load Switch
- PWM Application
- Power management




**PDFN5X6**

## Package Marking and Ordering Information

| Device Marking | Device | Device Package | Reel Size | Tape width | Quantity (PCS) |
|---|---|---|---|---|---|
| 85P04G | AP85P04G | PDFN5X6 | 13inch | - | 5000 |

## ABSOLUTE MAXIMUM RATINGS ($T_a$=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 ($T_C$ =25℃) | $I_D$ | -85 | A |
| Continuous Drain Current ($T_C$ =100℃) | $I_D$ | -60 | A |
| Pulsed Drain Current [1] | $I_{DM}$ | -340 | A |
| Single Pulsed Avalanche Energy [2] | $E_{AS}$ | 576 | mJ |
| Drain Power Dissipation | $P_D$ | 58 | W |
| Thermal Resistance from Junction to Case[2] | $R_{\theta JC}$ | 2.15 | ℃/W |
| Thermal Resistance from Junction to Ambient | $R_{\theta JA}$ | 60 | ℃/W |
| Junction Temperature | $T_J$ | 150 | ℃ |
| Storage Temperature | $T_{STG}$ | -55~ +150 | ℃ |

## MOSFET ELECTRICAL CHARACTERISTICS($T_a$=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 | $V_{GS(th)}$ | $V_{DS}$ =$V_{GS}$, $I_D$ =-250μA | -1.0 | -1.7 | -2.5 | V |
| Drain-source on-resistance(3) | $R_{DS(on)}$ | $V_{GS}$ =-10V, $I_D$ =-20A | - | 4.3 | 5.3 | mΩ |
| | | $V_{GS}$ =-4.5V, $I_D$ =-20A | | 5.9 | 7.6 | mΩ |
| **Dynamic characteristics** | | | | | | |
| Input Capacitance | $C_{iss}$ | $V_{DS}$ =-20V, $V_{GS}$ =0V, f =1.0MHz | - | 6638 | - | pF |
| Output Capacitance | $C_{oss}$ | | - | 545 | - | |
| Reverse Transfer Capacitance | $C_{rss}$ | | - | 345 | - | |
| Gate resistance | $R_g$ | $V_{DS}$ =0V, $V_{GS}$ =0V, f =1.0MHz | | 2.2 | | Ω |
| **Switching characteristics** | | | | | | |
| Turn-on delay time | $t_{d(on)}$ | $V_{DS}$=-20V, $I_D$=-20A, $R_G$=3Ω, $V_G$=-10V | - | 16 | - | ns |
| Turn-on rise time | $t_r$ | | - | 17 | - | |
| Turn-off delay time | $t_{d(off)}$ | | - | 68 | - | |
| Turn-off fall time | $t_f$ | | - | 31 | - | |
| Total Gate Charge | Qg | $V_{DS}$=-20V, $I_D$=-20A, $V_{GS}$=-10V | - | 118 | - | nC |
| Gate-Source Charge | Qgs | | - | 13 | - | |
| Gate-Drain Charge | Qgd | | - | 22 | - | |
| **Source-Drain Diode characteristics** | | | | | | |
| Diode Forward voltage(a) | $V_{SD}$ | $T_J$=25℃, $V_{GS}$ =0V, $I_S$=-20A | - | - | -1.2 | V |
| Diode Forward current | $I_S$ | $T_C$=25℃ | - | - | -85 | A |
| Body Diode Reverse Recovery Time | trr | $T_J$=25℃， IF=-20A,di/dt=100A/us | | 24 | | ns |
| Body Diode Reverse Recovery Charge | Qrr | $T_J$=25℃， IF=-20A,di/dt=100A/us | | 140 | | nc |

**Notes:**

a) Repetitive Rating: Pulse Width Limited by Maximum Junction Temperature

b) EAS condition: TJ=25℃, VDD=-15V, VG=-10V, RG=25Ω, L=0.5mH

c) Pulse Test: Pulse Width≤300μs, Duty Cycle≤0.5%

## Typical Electrical And Thermal Characteristics (Curves)

**Figure 1. Output Characteristics**

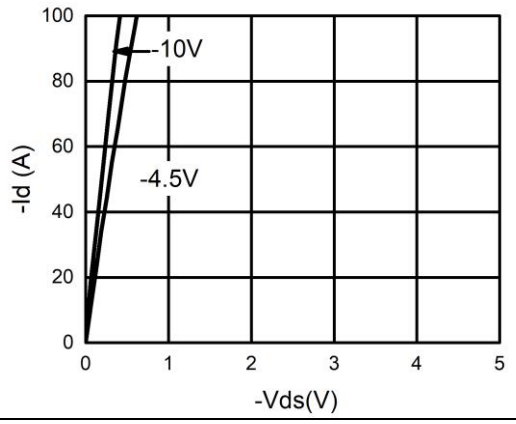



**Figure 2. Transfer Characteristics**

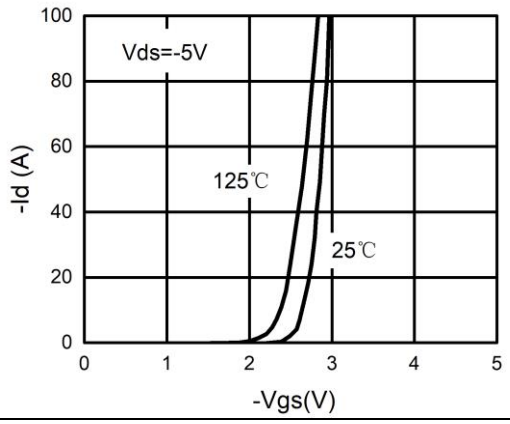



**Figure 3. Power Dissipation**

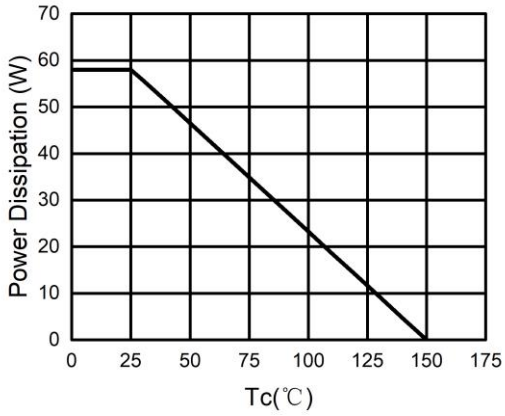



**Figure 4. Drain Current**

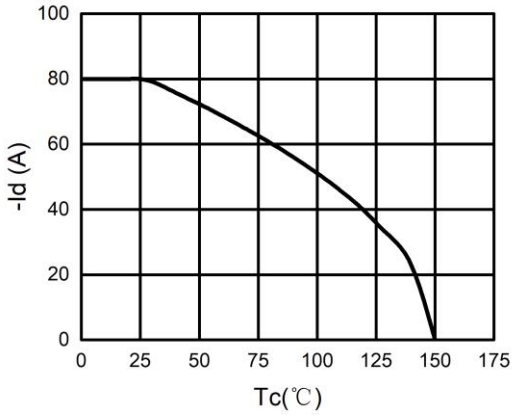



**Figure 5. $BV_{DSS}$ vs Junction Temperature**

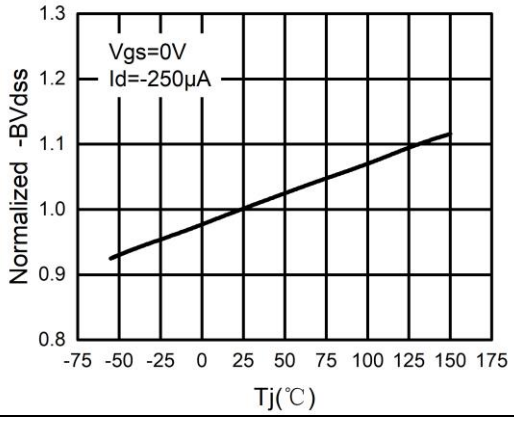
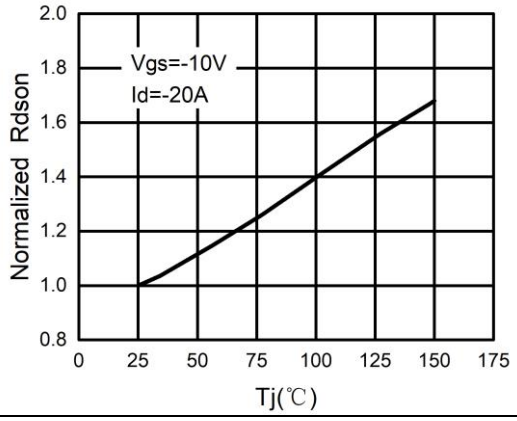



**Figure 6. $R_{DS(ON)}$ vs Junction Temperature**



## Typical Electrical And Thermal Characteristics (Curves)

**Figure 7. Gate Charge Waveforms**

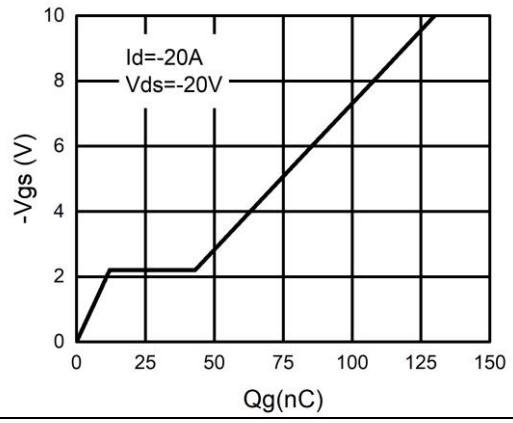



**Figure 8. Capacitance**

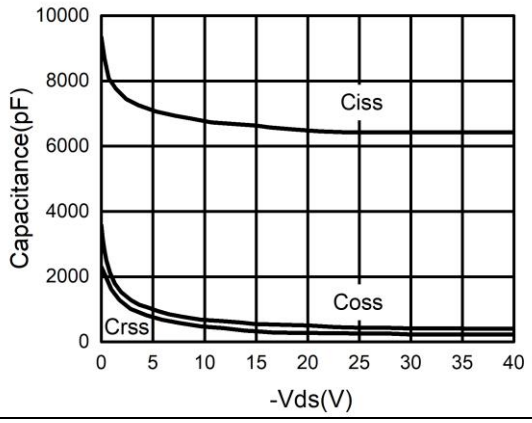



**Figure 9. Body-Diode Characteristics**

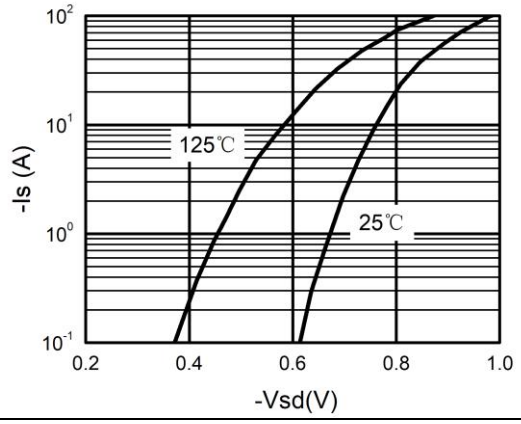
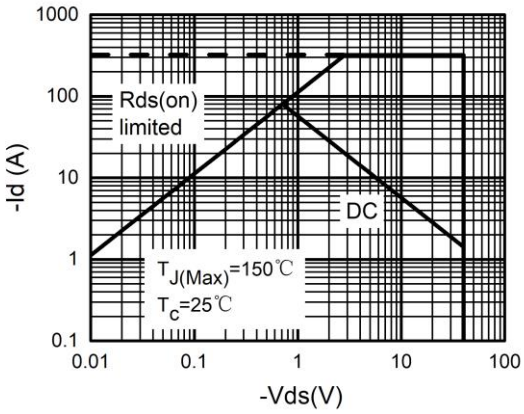
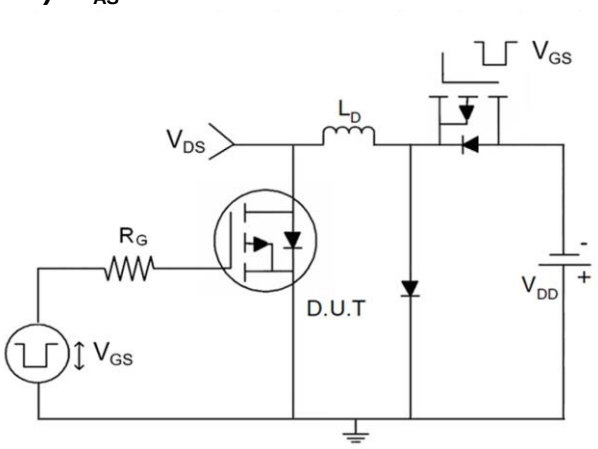


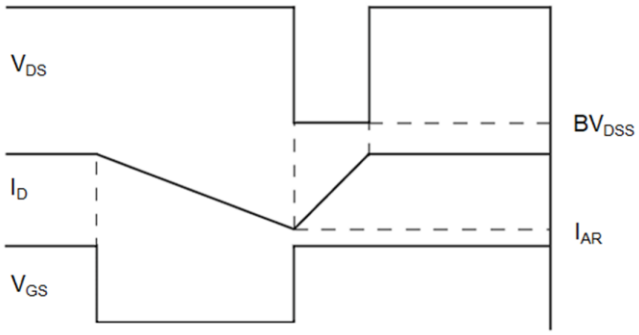

**Figure 10. Maximum Safe Operating Area**



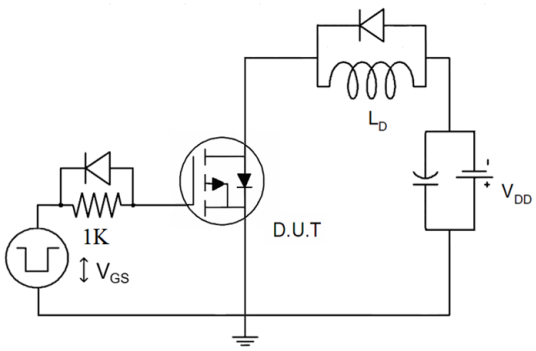
## Test Circuit

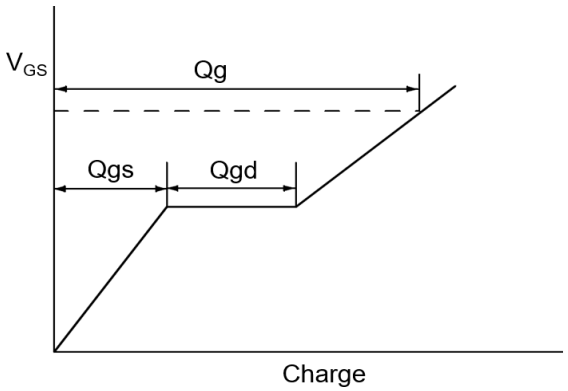
### 1) $E_{AS}$ Test Circuits



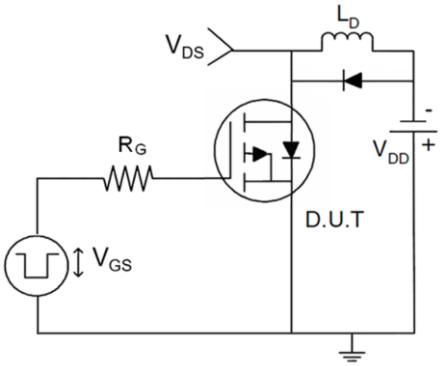



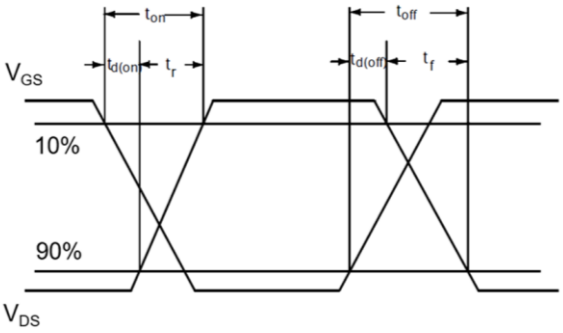

### 2) Gate Charge Test Circuit



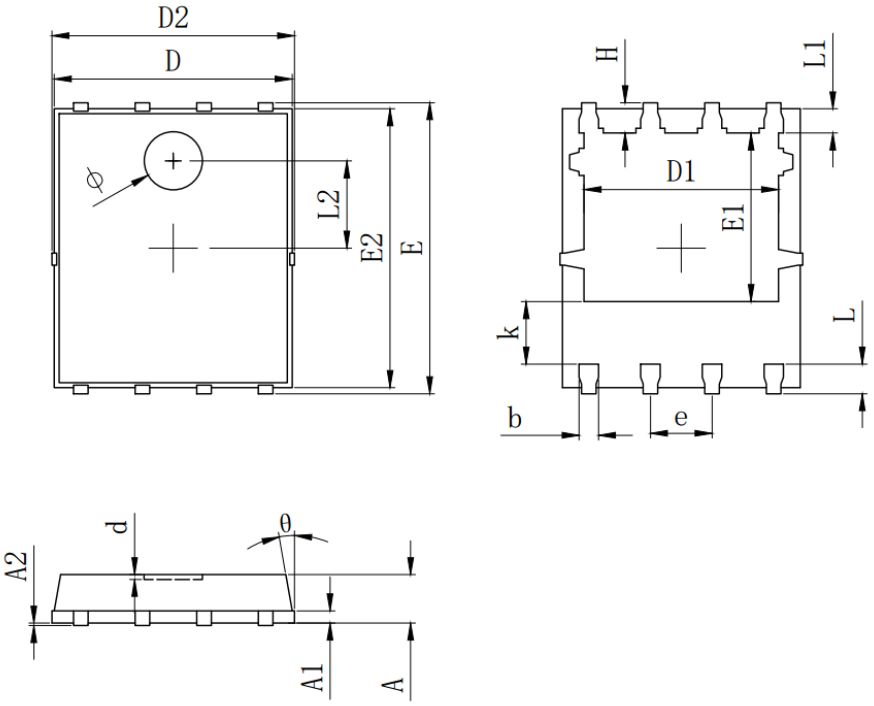




### 3) Switch Time Test Circuit



## PDFN5X6 Package Information




| SYMBOL | MILLIMETER | | |
|---|---|---|---|
| | MIN | Typ. | MAX |
| A | 0.900 | 1.000 | 1.100 |
| A1 | 0.254 REF. | | |
| A2 | 0~0.05 | | |
| D | 4.824 | 4.900 | 4.976 |
| D1 | 3.910 | 4.010 | 4.110 |
| D2 | 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 |
| θ | 8° | 10° | 12° |
| Φ | 1.100 | 1.200 | 1.300 |
| d | | | 0.100 |