

-60V P-Channel Enhancement Mode MOSFET

Description

The AP3P06BI uses advanced trench technology to provide excellent $R_{DS(ON)}$, low gate charge and operation with gate voltages as low as 4.5V. This device is suitable for use as a Battery protection or in other Switching application.

General Features

$V_{DS} = -60V$ $I_D = -2.8A$

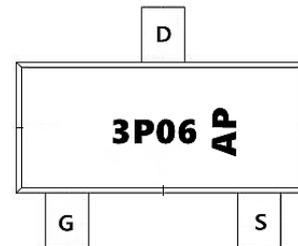
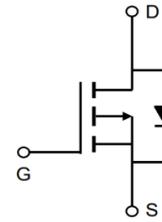
$R_{DS(ON)} < 200m\Omega$ @ $V_{GS} = -10V$ (Type: 165m Ω)

Application

Battery protection

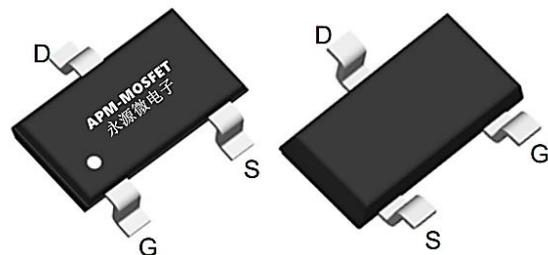
Load switch

Uninterruptible power supply



Top View

Bottom View



Package Marking and Ordering Information

| Product ID | Pack | Marking | Qty(PCS) |
|------------|--------|---------|----------|
| AP3P06BI | SOT23L | 3P06-AP | 3000 |

Absolute Maximum Ratings ($T_C=25^\circ\text{C}$ unless otherwise noted)

| Symbol | Parameter | Rating | Units |
|------------------------------|--|------------|--------------------|
| V_{DS} | Drain-Source Voltage | -60 | V |
| V_{GS} | Gate-Source Voltage | ± 20 | V |
| $I_D @ T_A=25^\circ\text{C}$ | Continuous Drain Current, $V_{GS} @ -10V^1$ | -2.8 | A |
| $I_D @ T_A=70^\circ\text{C}$ | Continuous Drain Current, $V_{GS} @ -10V^1$ | -1.8 | A |
| I_{DM} | Pulsed Drain Current ² | -8.4 | A |
| $P_D @ T_A=25^\circ\text{C}$ | Total Power Dissipation ³ | 1.5 | W |
| T_{STG} | Storage Temperature Range | -55 to 150 | $^\circ\text{C}$ |
| T_J | Operating Junction Temperature Range | -55 to 150 | $^\circ\text{C}$ |
| $R_{\theta JA}$ | Thermal Resistance Junction-Ambient ¹ | 125 | $^\circ\text{C/W}$ |
| $R_{\theta JC}$ | Thermal Resistance Junction-Case ¹ | 80 | $^\circ\text{C/W}$ |

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Electrical Characteristics ($T_c=25^\circ\text{C}$ unless otherwise noted)

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit |
|------------------------------|--|---|------|--------|-----------|----------------------|
| BV_{DSS} | Drain-Source Breakdown Voltage | $V_{GS}=0V, I_D=-250\mu A$ | -60 | -67 | --- | V |
| $\Delta BV_{DSS}/\Delta T_J$ | BV_{DSS} Temperature Coefficient | Reference to 25°C , $I_D=-1\text{mA}$ | --- | -0.021 | --- | V/ $^\circ\text{C}$ |
| $R_{DS(ON)}$ | Static Drain-Source On-Resistance ² | $V_{GS}=-10V, I_D=-1.5A$ | --- | 165 | 200 | m Ω |
| | | $V_{GS}=-4.5V, I_D=-1A$ | --- | 200 | 250 | |
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{GS}=V_{DS}, I_D=-250\mu A$ | -1.0 | 1.7 | -2.5 | V |
| $\Delta V_{GS(th)}$ | $V_{GS(th)}$ Temperature Coefficient | | --- | 4.08 | --- | mV/ $^\circ\text{C}$ |
| I_{DSS} | Drain-Source Leakage Current | $V_{DS}=-48V, V_{GS}=0V, T_J=25^\circ\text{C}$ | --- | --- | 1 | uA |
| | | $V_{DS}=-48V, V_{GS}=0V, T_J=55^\circ\text{C}$ | --- | --- | 5 | |
| I_{GSS} | Gate-Source Leakage Current | $V_{GS}=\pm 20V, V_{DS}=0V$ | --- | --- | ± 100 | nA |
| g_{fs} | Forward Transconductance | $V_{DS}=-5V, I_D=-1.5A$ | --- | 5.9 | --- | S |
| Q_g | Total Gate Charge (-4.5V) | $V_{DS}=-20V, V_{GS}=-4.5V, I_D=-1.5A$ | --- | 4.6 | --- | nC |
| Q_{gs} | Gate-Source Charge | | --- | 1.4 | --- | |
| Q_{gd} | Gate-Drain Charge | | --- | 1.62 | --- | |
| $T_{d(on)}$ | Turn-On Delay Time | $V_{DS}=-15V, V_{GS}=-10V, R_G=3.3\Omega, I_D=-1A$ | --- | 17.4 | --- | ns |
| T_r | Rise Time | | --- | 5.4 | --- | |
| $T_{d(off)}$ | Turn-Off Delay Time | | --- | 37.2 | --- | |
| T_f | Fall Time | | --- | 2.4 | --- | |
| C_{iss} | Input Capacitance | $V_{DS}=-15V, V_{GS}=0V, f=1\text{MHz}$ | --- | 453 | --- | pF |
| C_{oss} | Output Capacitance | | --- | 59 | --- | |
| C_{rss} | Reverse Transfer Capacitance | | --- | 38 | --- | |
| I_S | Continuous Source Current ^{1,4} | $V_G=V_D=0V$, Force Current | --- | --- | -1.7 | A |
| I_{SM} | Pulsed Source Current ^{2,4} | | --- | --- | -7 | A |
| V_{SD} | Diode Forward Voltage ² | $V_{GS}=0V, I_S=-1A, T_J=25^\circ\text{C}$ | --- | --- | -1.2 | V |

Note :

- 1、The data tested by surface mounted on a 1 inch² FR-4 board with 2OZ copper.
- 2、The data tested by pulsed , pulse width $\leq 300\mu s$, duty cycle $\leq 2\%$
- 3、The power dissipation is limited by 150°C junction temperature
- 4、The data is theoretically the same as I_D and I_{DM} , in real applications , should be limited by total power dissipation.

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Typical Characteristics

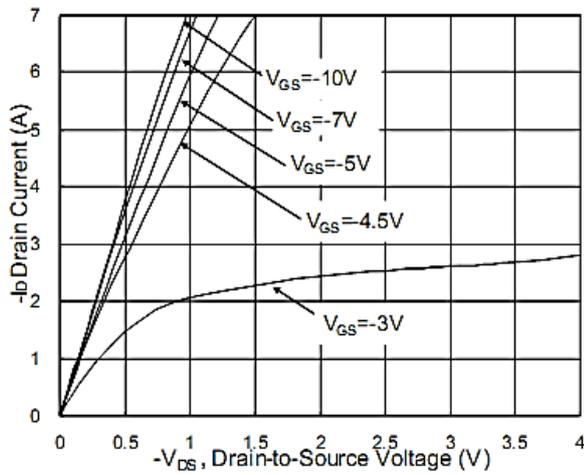


Fig.1 Typical Output Characteristics

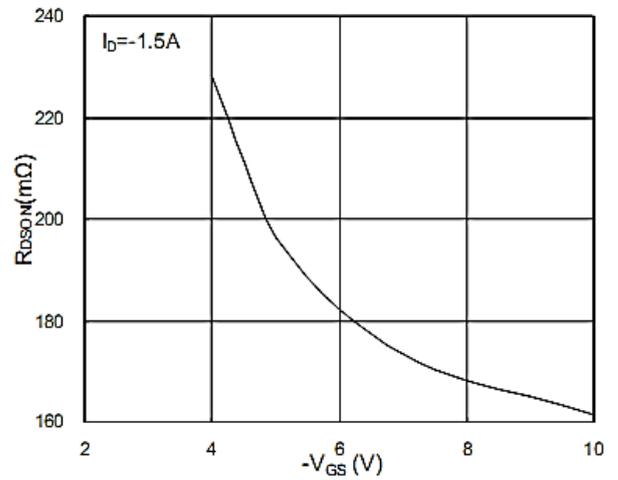


Fig.2 On-Resistance v.s Gate-Source

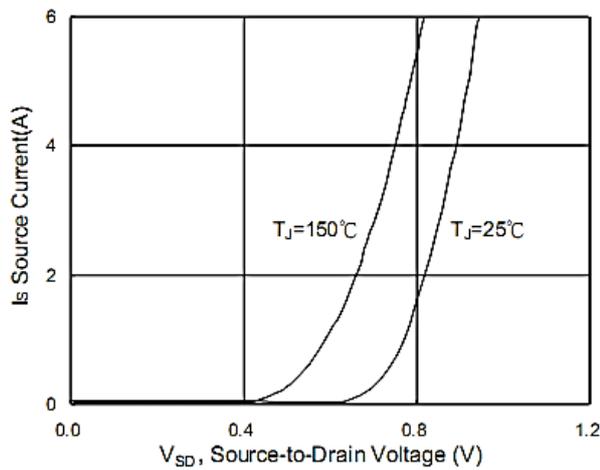


Fig.3 Forward Characteristics Of Reverse

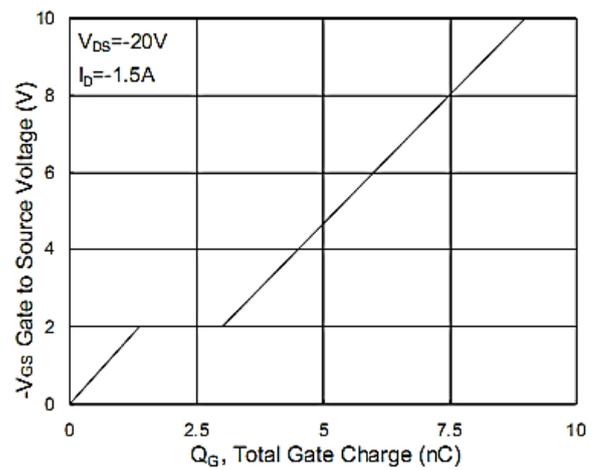


Fig.4 Gate-Charge Characteristics

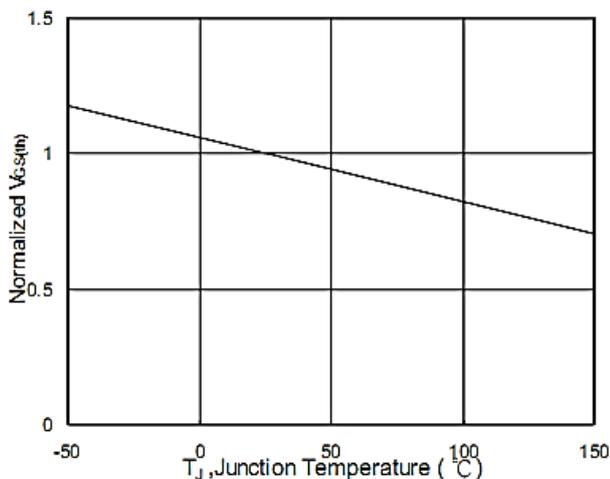


Fig.5 Normalized $V_{GS(th)}$ v.s T_J

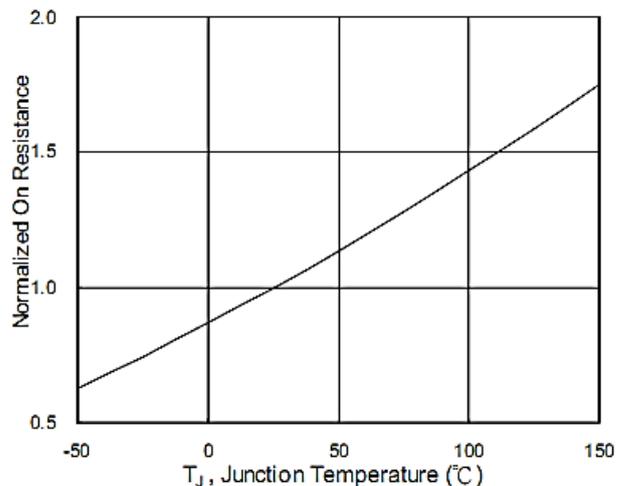


Fig.6 Normalized $R_{DS(on)}$ v.s T_J

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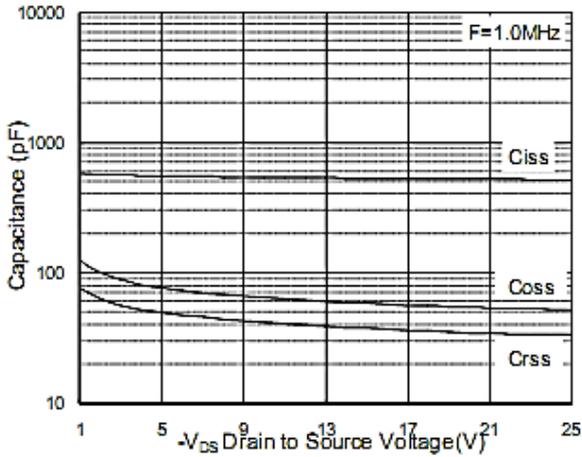


Fig.7 Capacitance

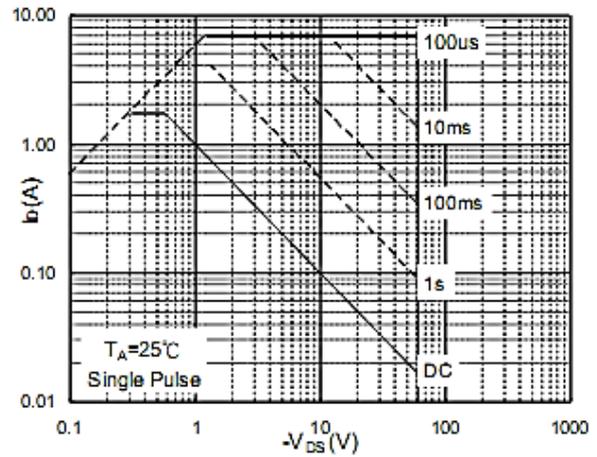


Fig.8 Safe Operating Area

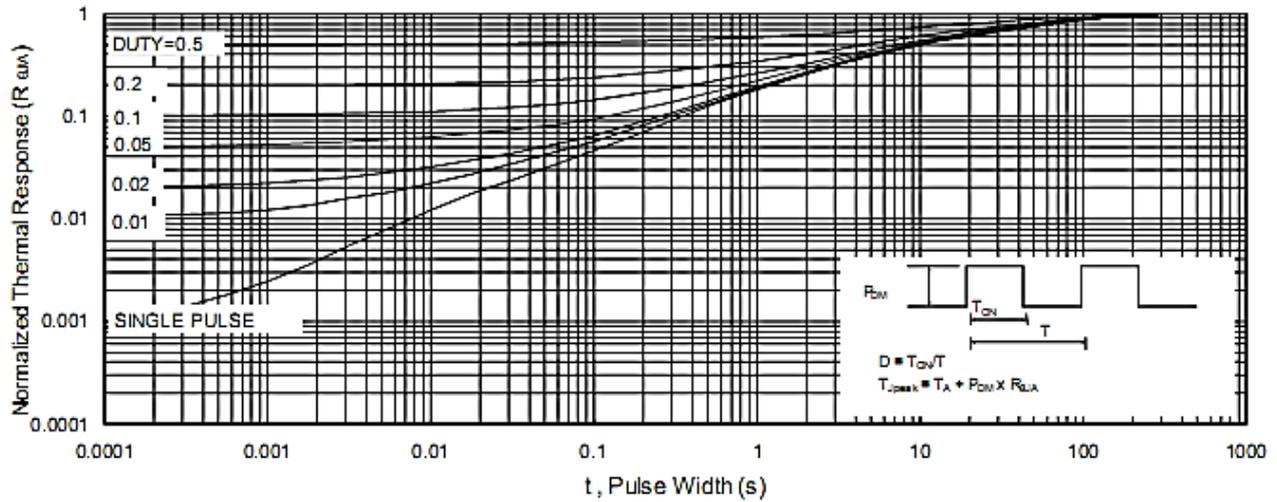


Fig.9 Normalized Maximum Transient Thermal Impedance

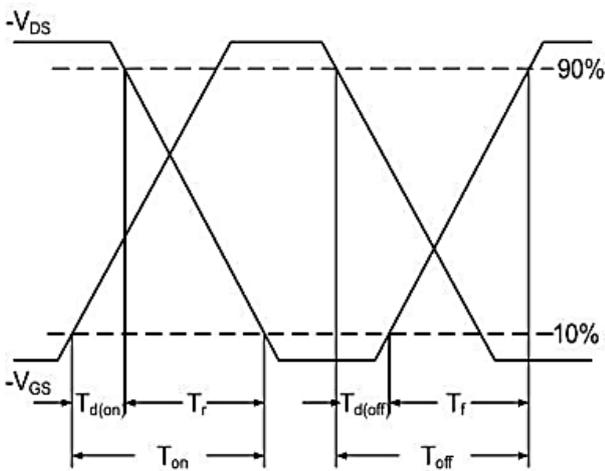


Fig.10 Switching Time Waveform

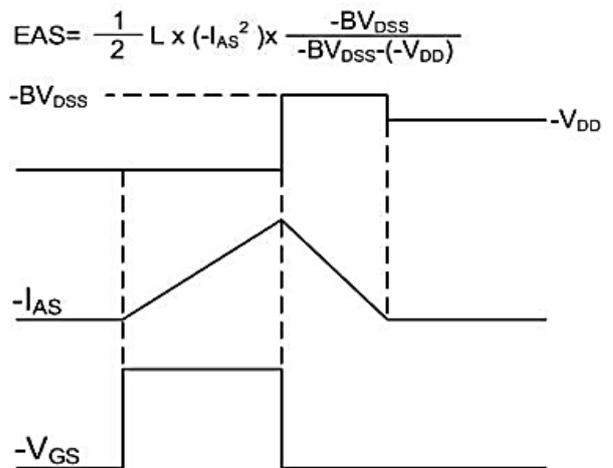
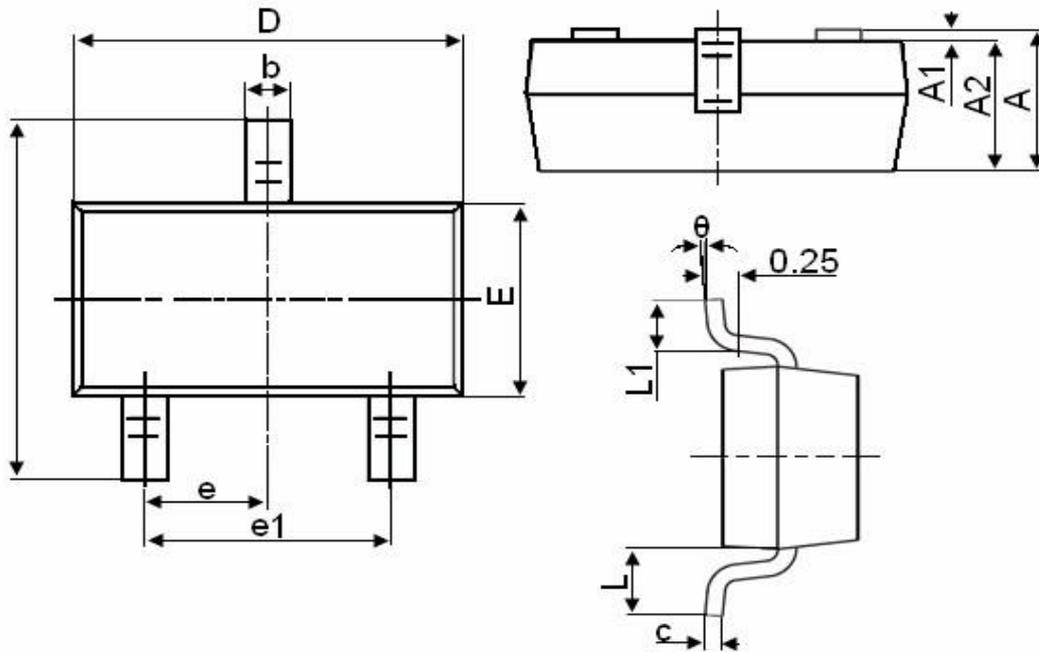


Fig.11 Unclamped Inductive Waveform

Package Mechanical Data-SOT23-XC-Single



| Symbol | Dimensions in Millimeters | |
|----------|---------------------------|-------|
| | MIN. | MAX. |
| A | 0.900 | 1.150 |
| A1 | 0.000 | 0.100 |
| A2 | 0.900 | 1.050 |
| b | 0.300 | 0.500 |
| c | 0.080 | 0.150 |
| D | 2.800 | 3.000 |
| E | 1.200 | 1.400 |
| E1 | 2.250 | 2.550 |
| e | 0.950TYP | |
| e1 | 1.800 | 2.000 |
| L | 0.550REF | |
| L1 | 0.300 | 0.500 |
| θ | 0° | 8° |

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| Edition | Date | Change |
|---------|----------|-----------------|
| RVE1.0 | 2021/3/1 | Initial release |

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