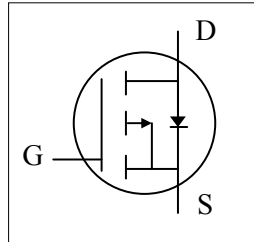
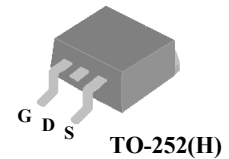




- ▼ Lower Gate Charge
- ▼ Simple Drive Requirement
- ▼ Fast Switching Characteristic
- ▼ RoHS Compliant & Halogen-Free



| | |
|--------------|--------------|
| BV_{DSS} | -40V |
| $R_{DS(ON)}$ | 40m Ω |
| I_D | -19.6A |



Description

AP4P040 series are from Advanced Power innovated design and silicon process technology to achieve the lowest possible on-resistance and fast switching performance. It provides the designer with an extreme efficient device for use in a wide range of power applications.

The TO-252 package is widely preferred for all commercial-industrial surface mount applications using infrared reflow technique and suited for high current application due to the low connection resistance.

Absolute Maximum Ratings@ $T_j=25^\circ\text{C}$ (unless otherwise specified)

| Symbol | Parameter | Rating | Units |
|-----------------------------|--|------------|------------------|
| V_{DS} | Drain-Source Voltage | -40 | V |
| V_{GS} | Gate-Source Voltage | +20 | V |
| $I_D@T_C=25^\circ\text{C}$ | Drain Current, V_{GS} @ 10V | -19.6 | A |
| $I_D@T_C=100^\circ\text{C}$ | Drain Current, V_{GS} @ 10V | -12.4 | A |
| I_{DM} | Pulsed Drain Current ¹ | -80 | A |
| $P_D@T_C=25^\circ\text{C}$ | Total Power Dissipation | 25 | W |
| $P_D@T_A=25^\circ\text{C}$ | Total Power Dissipation ⁴ | 2 | W |
| E_{AS} | Single Pulse Avalanche Energy ³ | 16.2 | mJ |
| T_{STG} | Storage Temperature Range | -55 to 150 | $^\circ\text{C}$ |
| T_J | Operating Junction Temperature Range | -55 to 150 | $^\circ\text{C}$ |

Thermal Data

| Symbol | Parameter | Value | Units |
|-------------|---|-------|---------------------------|
| R_{thj-c} | Maximum Thermal Resistance Junction-case | 5 | $^\circ\text{C}/\text{W}$ |
| R_{thj-a} | Maximum Thermal Resistance, Junction-ambient (PCB mount) ³ | 62.5 | $^\circ\text{C}/\text{W}$ |



AP4P040H

Electrical Characteristics@T_j=25°C(unless otherwise specified)

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Units |
|---------------------|--|---|------|------|------|-------|
| BV _{DSS} | Drain-Source Breakdown Voltage | V _{GS} =0V, I _D =-250uA | -40 | - | - | V |
| R _{DS(ON)} | Static Drain-Source On-Resistance ² | V _{GS} =-10V, I _D =-10A | - | - | 40 | mΩ |
| | | V _{GS} =-4.5V, I _D =-6A | - | - | 60 | mΩ |
| V _{GS(th)} | Gate Threshold Voltage | V _{DS} =V _{GS} , I _D =-250uA | -1 | - | -3 | V |
| g _{fs} | Forward Transconductance | V _{DS} =-10V, I _D =-10A | - | 17 | - | S |
| I _{DSS} | Drain-Source Leakage Current | V _{DS} =-32V, V _{GS} =0V | - | - | -1 | uA |
| I _{GSS} | Gate-Source Leakage | V _{GS} = ±20V, V _{DS} =0V | - | - | ±100 | nA |
| Q _g | Total Gate Charge | I _D =-6A | - | 12 | 19.2 | nC |
| Q _{gs} | Gate-Source Charge | V _{DS} =-32V | - | 4.5 | - | nC |
| Q _{gd} | Gate-Drain ("Miller") Charge | V _{GS} =-4.5V | - | 4.5 | - | nC |
| t _{d(on)} | Turn-on Delay Time | V _{DS} =-20V | - | 10 | - | ns |
| t _r | Rise Time | I _D =-10A | - | 26 | - | ns |
| t _{d(off)} | Turn-off Delay Time | R _G =3.3Ω | - | 37 | - | ns |
| t _f | Fall Time | V _{GS} =-10V | - | 38 | - | ns |
| C _{iss} | Input Capacitance | V _{GS} =0V | - | 1340 | 2144 | pF |
| C _{oss} | Output Capacitance | V _{DS} =-20V | - | 120 | - | pF |
| C _{rss} | Reverse Transfer Capacitance | f=1.0MHz | - | 80 | - | pF |
| R _g | Gate Resistance | f=1.0MHz | - | 8.5 | 17 | Ω |

Source-Drain Diode

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Units |
|-----------------|---------------------------------|--|------|------|------|-------|
| V _{SD} | Forward On Voltage ² | I _S =-10A, V _{GS} =0V | - | - | -1.2 | V |
| t _{rr} | Reverse Recovery Time | I _S =-10A, V _{GS} =0V, | - | 12 | - | ns |
| Q _{rr} | Reverse Recovery Charge | di/dt=-100A/μs | - | 6 | - | nC |

Notes:

- 1.Pulse width limited by Max. junction temperature.
- 2.Pulse test
- 3.Starting T_j=25°C , V_{DD}=-30V , L=0.1mH , R_G=25Ω , V_{GS}=-10V
- 4.Surface mounted on 1 in² copper pad of FR4 board

THIS PRODUCT IS SENSITIVE TO ELECTROSTATIC DISCHARGE, PLEASE HANDLE WITH CAUTION.

USE OF THIS PRODUCT AS A CRITICAL COMPONENT IN LIFE SUPPORT, AUTOMOTIVE OR OTHER SIMILAR SYSTEMS IS NOT AUTHORIZED.

APEC DOES NOT ASSUME ANY LIABILITY ARISING OUT OF THE APPLICATION OR USE OF ANY PRODUCT OR CIRCUIT DESCRIBED HEREIN; NEITHER DOES IT CONVEY ANY LICENSE UNDER ITS PATENT RIGHTS, NOR THE RIGHTS OF OTHERS.

APEC RESERVES THE RIGHT TO MAKE CHANGES WITHOUT FURTHER NOTICE TO ANY PRODUCTS HEREIN TO IMPROVE RELIABILITY, FUNCTION OR DESIGN.

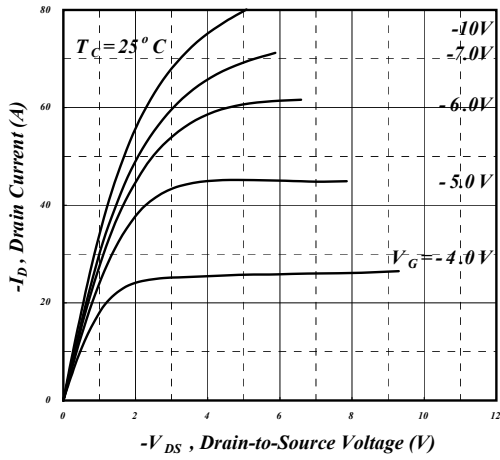


Fig 1. Typical Output Characteristics

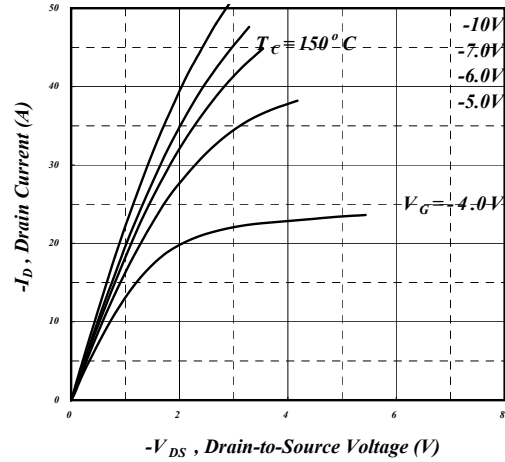


Fig 2. Typical Output Characteristics

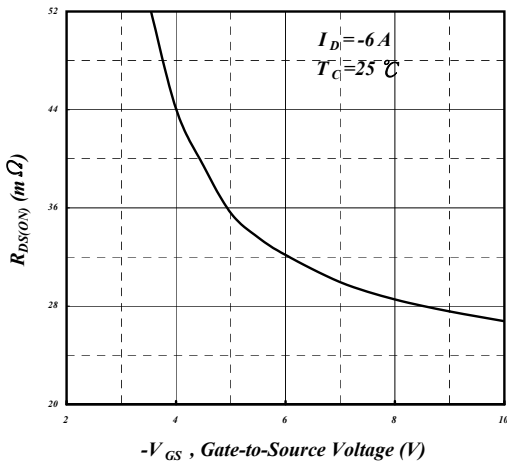


Fig 3. On-Resistance v.s. Gate Voltage

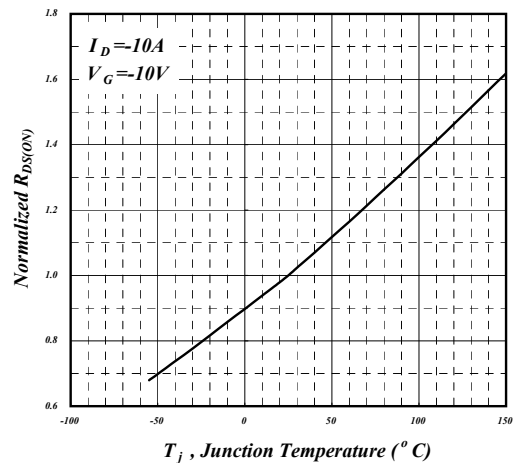


Fig 4. Normalized On-Resistance v.s. Junction Temperature

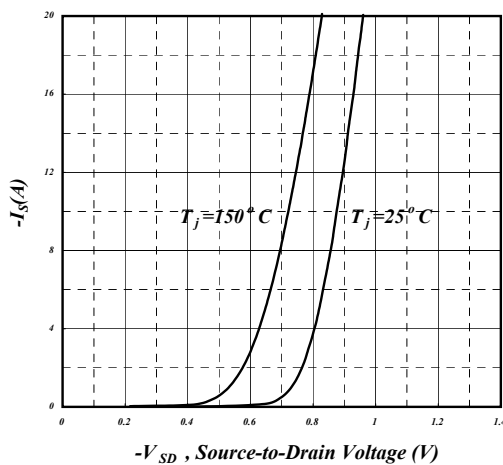


Fig 5. Forward Characteristic of Reverse Diode

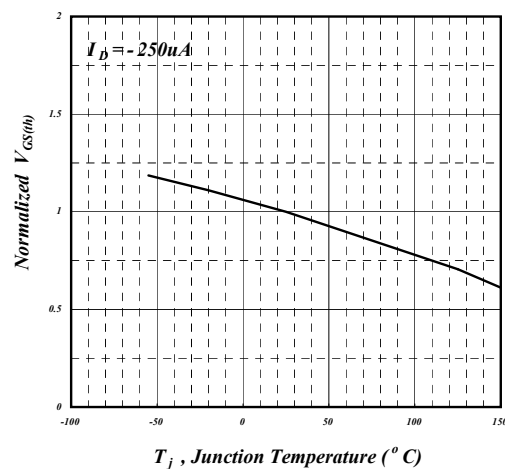


Fig 6. Gate Threshold Voltage v.s. Junction Temperature

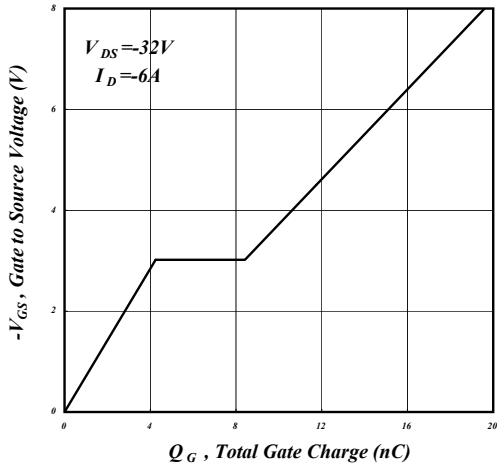


Fig 7. Gate Charge Characteristics

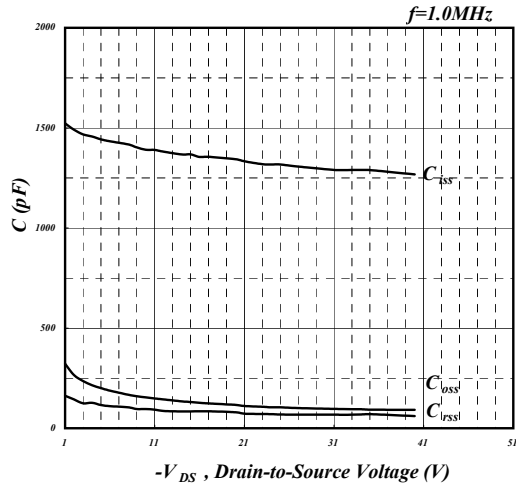


Fig 8. Typical Capacitance Characteristics

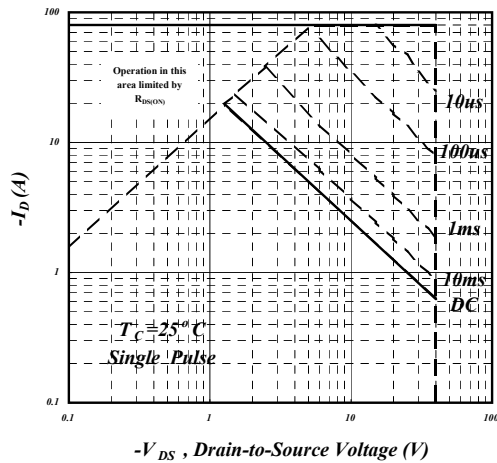


Fig 9. Maximum Safe Operating Area

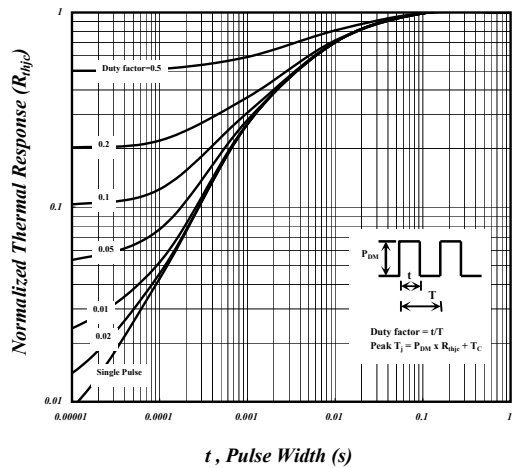


Fig 10. Effective Transient Thermal Impedance

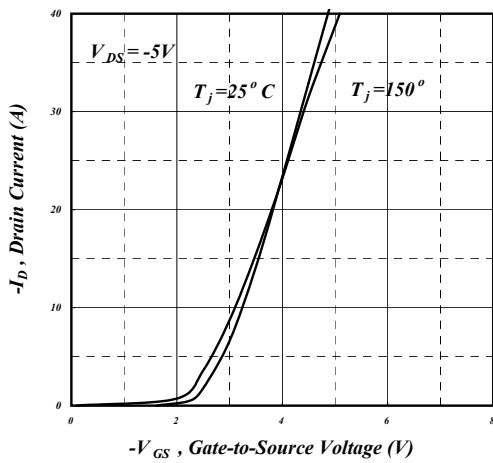


Fig 11. Transfer Characteristics

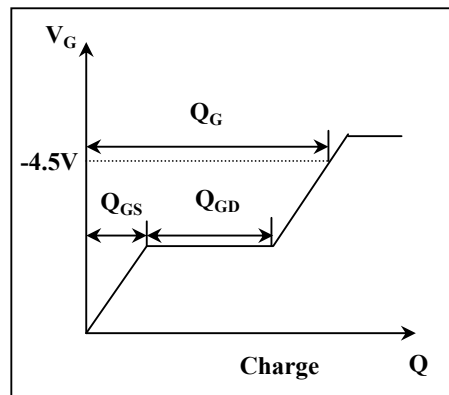


Fig 12. Gate Charge Waveform

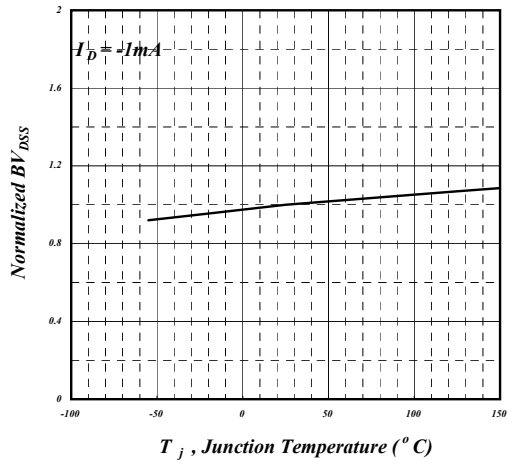


Fig 13. Normalized BV_{DSS} v.s. Junction Temperature

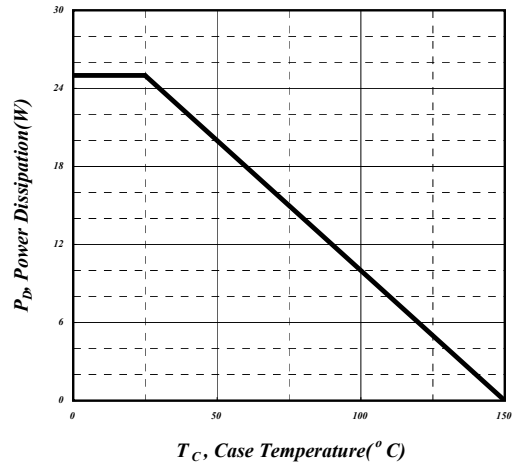


Fig 14. Total Power Dissipation

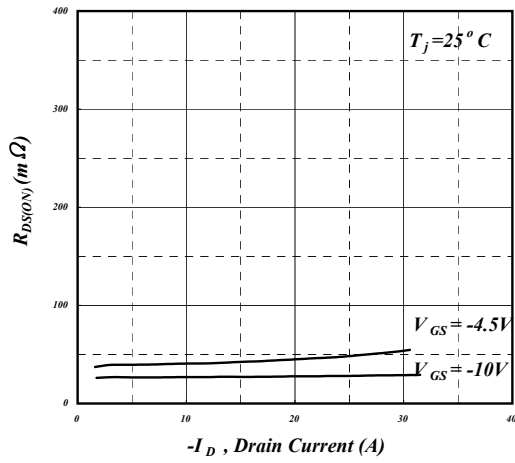


Fig 15. Typ. Drain-Source on State Resistance

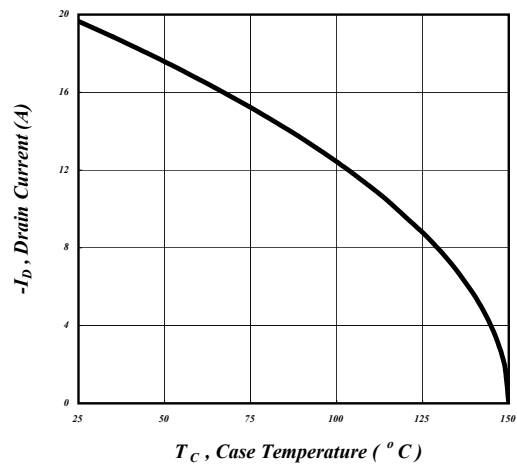
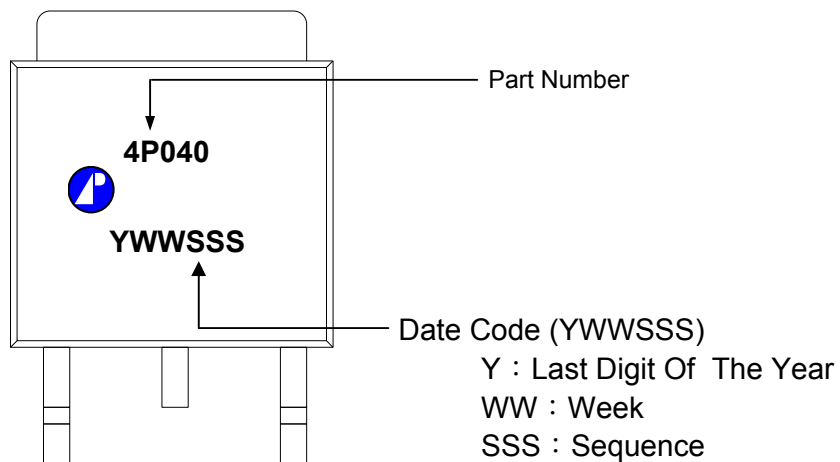


Fig 16. Drain Current v.s. Case Temperature



MARKING INFORMATION





Package Outline : TO-252



| SYMBOLS | Millimeters | | |
|---------|-------------|-------|------|
| | MIN | NOM | MAX |
| A2 | 2.18 | 2.30 | 2.40 |
| A3 | 0.40 | 0.50 | 0.65 |
| B | 0.40 | 0.70 | 1.00 |
| B1 | 0.50 | 0.85 | 1.20 |
| D | 6.00 | 6.50 | 6.80 |
| D1 | 4.80 | 5.35 | 5.90 |
| E3 | 4.00 (ref.) | | |
| F | 2.00 | 2.63 | 3.05 |
| F1 | 0.50 | 0.85 | 1.20 |
| E1 | 5.00 | 5.70 | 6.30 |
| E2 | 0.50 | 1.10 | 1.80 |
| e | 2.3 (ref) | | |
| C | 0.35 | 0.525 | 0.70 |
| A1 | 0.00 | — | 0.25 |
| B2 | — | — | 1.25 |
| L | 0.90 | 1.34 | 1.78 |



1. All Dimensions Are in Millimeters.
2. Dimension Does Not Include Mold Protrusions.
3. Thermal PAD, Body and Pin contour is for reference, it may has little difference by option.



TO-252 FOOTPRINT :

