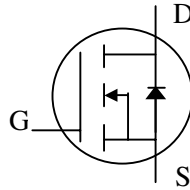




N-channel Enhancement-mode Power MOSFET

- Simple Drive Requirement**
- SO-8 Compatible with Heatsink**
- Low On-resistance**
- RoHS-compliant, halogen-free**

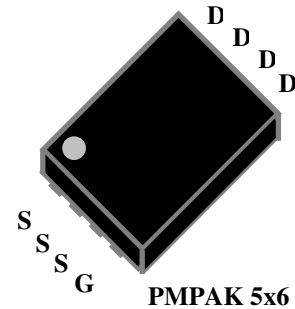


| | |
|--------------|-------|
| BV_{DSS} | 40V |
| $R_{DS(ON)}$ | 3.6mΩ |
| I_D | 120A |

Description

Advanced Power MOSFETs from APEC provide the designer with the best combination of fast switching, ruggedized device design, low on-resistance and cost-effectiveness.

The PMPAK 5x6 package is specially designed for DC-DC converter applications, with a foot print that is compatible with the popular SO-8 and offers a backside heat sink and lower package profile.



Absolute Maximum Ratings

| Symbol | Parameter | Rating | Units |
|---------------------------|--|------------|-------|
| V_{DS} | Drain-Source Voltage | 40 | V |
| V_{GS} | Gate-Source Voltage | ±20 | V |
| I_D at $T_C=25^\circ C$ | Continuous Drain Current (Chip) | 120 | A |
| I_D at $T_A=25^\circ C$ | Continuous Drain Current ³ | 29 | A |
| I_D at $T_A=70^\circ C$ | Continuous Drain Current ³ | 23 | A |
| I_{DM} | Pulsed Drain Current ¹ | 250 | A |
| P_D at $T_C=25^\circ C$ | Total Power Dissipation | 83.3 | W |
| P_D at $T_A=25^\circ C$ | Total Power Dissipation | 5 | W |
| E_{AS} | Single Pulse Avalanche Energy ⁴ | 28.8 | mJ |
| T_{STG} | Storage Temperature Range | -55 to 150 | °C |
| T_J | Operating Junction Temperature Range | -55 to 150 | °C |

Thermal Data

| Symbol | Parameter | Value | Units |
|--------|---|-------|-------|
| Rthj-c | Maximum Thermal Resistance, Junction-case | 1.5 | °C/W |
| Rthj-a | Maximum Thermal Resistance, Junction-ambient ³ | 25 | °C/W |

Ordering Information

AP3R604GMT-HF-3TR

RoHS-compliant halogen-free PMPAK5x6, shipped on tape and reel (3000pcs/reel)



Electrical Specifications at $T_j=25^\circ\text{C}$ (unless otherwise specified)

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Units |
|--------------|--|-------------------------------|------|------|-----------|------------|
| BV_{DSS} | Drain-Source Breakdown Voltage | $V_{GS}=0V, I_D=250\mu A$ | 40 | - | - | V |
| $R_{DS(ON)}$ | Static Drain-Source On-Resistance ² | $V_{GS}=10V, I_D=30A$ | - | - | 3.6 | m Ω |
| | | $V_{GS}=4.5V, I_D=20A$ | - | - | 5 | m Ω |
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{DS}=V_{GS}, I_D=250\mu A$ | 1 | - | 3 | V |
| g_{fs} | Forward Transconductance | $V_{DS}=10V, I_D=20A$ | - | 80 | - | S |
| I_{DSS} | Drain-Source Leakage Current | $V_{DS}=40V, V_{GS}=0V$ | - | - | 10 | μA |
| I_{GSS} | Gate-Source Leakage | $V_{GS}=\pm 20V$ | - | - | ± 100 | nA |
| Q_g | Total Gate Charge ² | $I_D=20A$ | - | 26 | 42 | nC |
| Q_{gs} | Gate-Source Charge | $V_{DS}=20V$ | - | 6 | | nC |
| Q_{gd} | Gate-Drain ("Miller") Charge | $V_{GS}=4.5V$ | - | 14 | | nC |
| $t_{d(on)}$ | Turn-on Delay Time ² | $V_{DS}=20V$ | - | 10.5 | - | ns |
| t_r | Rise Time | $I_D=1A$ | - | 8 | - | ns |
| $t_{d(off)}$ | Turn-off Delay Time | $R_G=3.3\Omega, V_{GS}=10V$ | - | 27 | - | ns |
| t_f | Fall Time | $R_D=20\Omega$ | - | 52 | - | ns |
| C_{iss} | Input Capacitance | $V_{GS}=0V$ | - | 2800 | 4500 | pF |
| C_{oss} | Output Capacitance | $V_{DS}=25V$ | - | 615 | - | pF |
| C_{rss} | Reverse Transfer Capacitance | $f=1.0\text{MHz}$ | - | 190 | - | pF |
| R_g | Gate Resistance | $f=1.0\text{MHz}$ | - | 1.6 | 2.4 | Ω |

Source-Drain Diode

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Units |
|----------|------------------------------------|-----------------------|------|------|------|-------|
| V_{SD} | Forward On Voltage ² | $I_S=30A, V_{GS}=0V$ | - | - | 1.2 | V |
| t_{rr} | Reverse Recovery Time ² | $I_S=10A, V_{GS}=0V,$ | - | 41 | - | ns |
| Q_{rr} | Reverse Recovery Charge | $di/dt=100A/\mu s$ | - | 49 | - | nC |

Notes:

1. Pulse width limited by maximum junction temperature
2. Pulse test
3. Surface mounted on 1 in² copper pad of FR4 board, $t \leq 10\text{sec}$, 60°C/W at steady state.
4. Starting $T_j=25^\circ\text{C}$, $V_{DD}=25V$, $L=0.1\text{mH}$, $R_G=25\Omega$, $I_{AS}=24A$.

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

USE OF THIS PRODUCT AS A CRITICAL COMPONENT IN LIFE SUPPORT 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.



Typical Electrical Characteristics

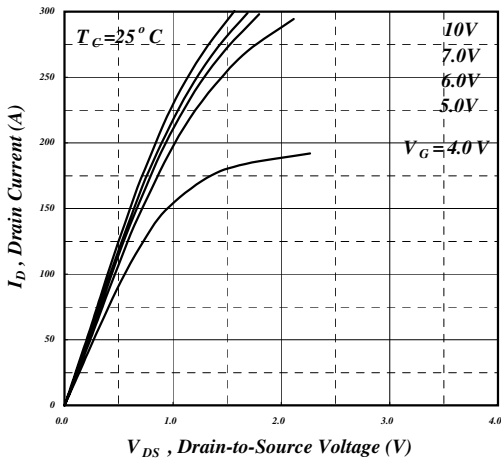


Fig 1. Typical Output Characteristics

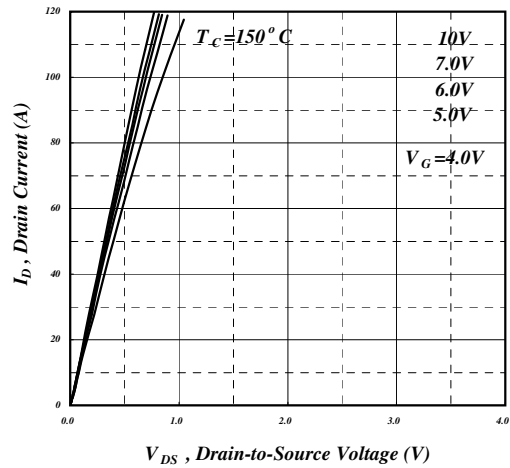


Fig 2. Typical Output Characteristics

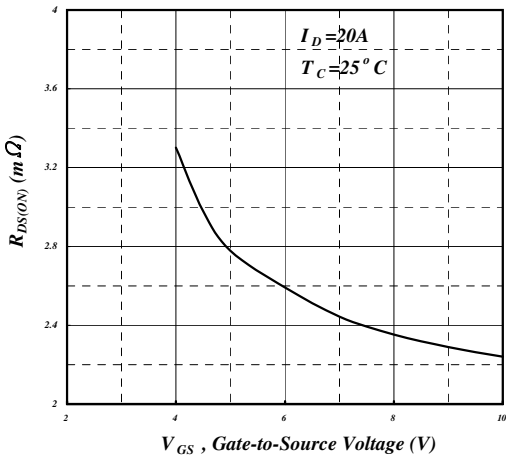


Fig 3. On-Resistance vs. Gate Voltage

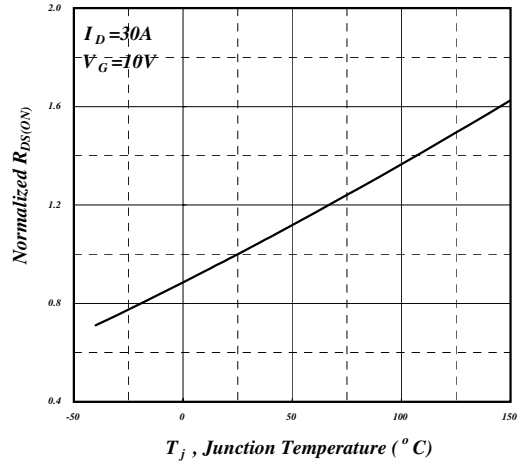


Fig 4. Normalized On-Resistance vs. Junction Temperature

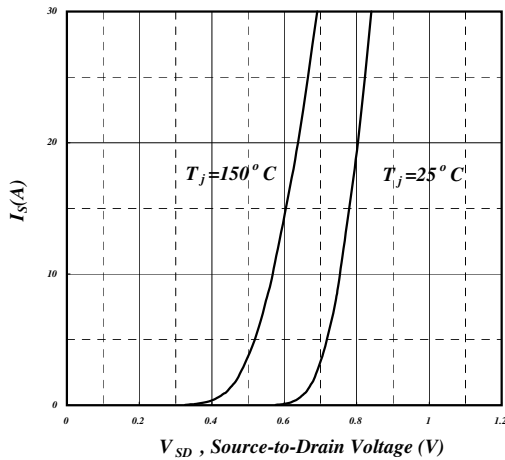


Fig 5. Forward Characteristic of Reverse Diode

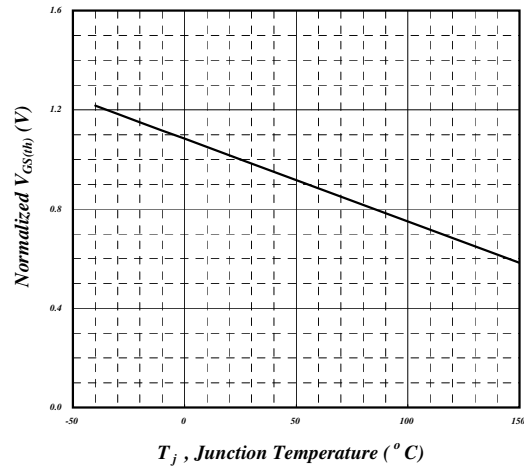


Fig 6. Gate Threshold Voltage vs. Junction Temperature



Typical Electrical Characteristics (cont.)

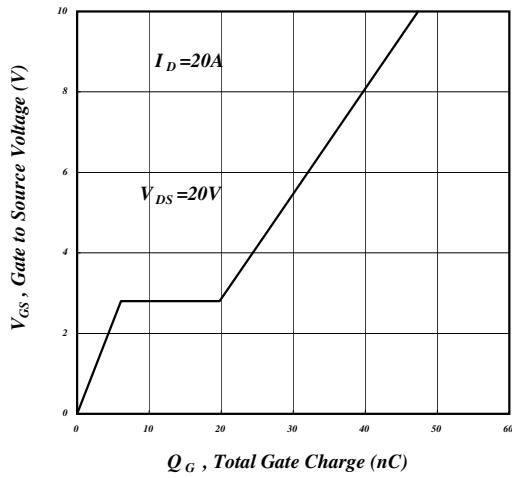


Fig 7. Gate Charge Characteristics

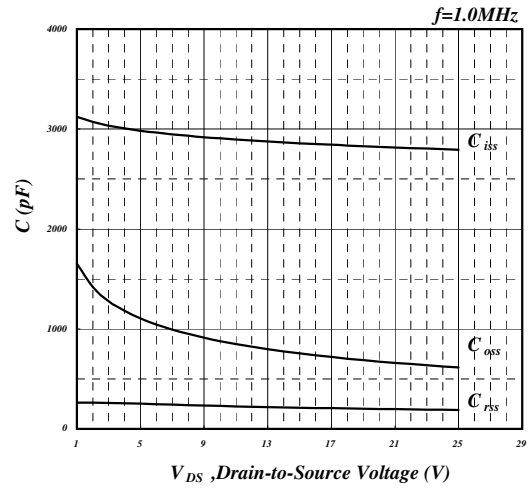


Fig 8. Typical Capacitance Characteristics

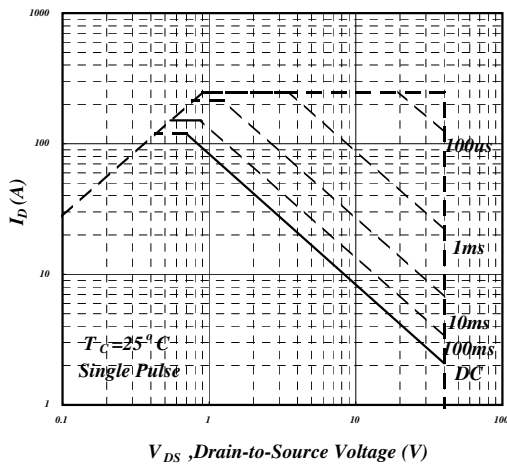


Fig 9. Maximum Safe Operating Area

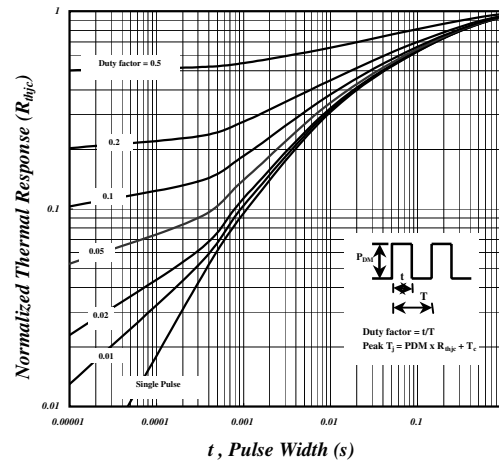


Fig 10. Effective Transient Thermal Impedance

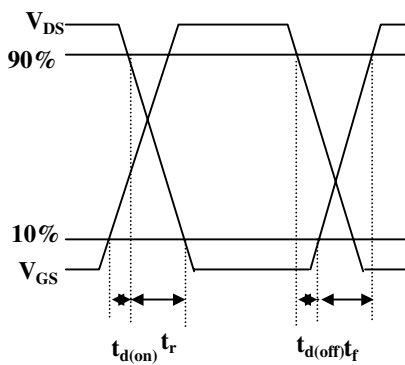


Fig 11. Switching Time Waveforms

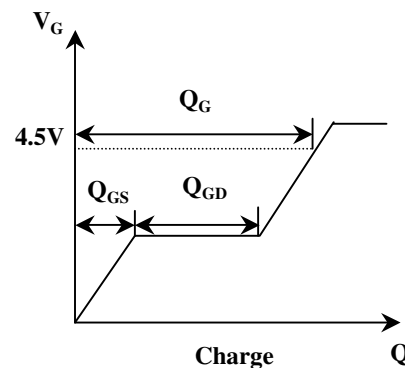
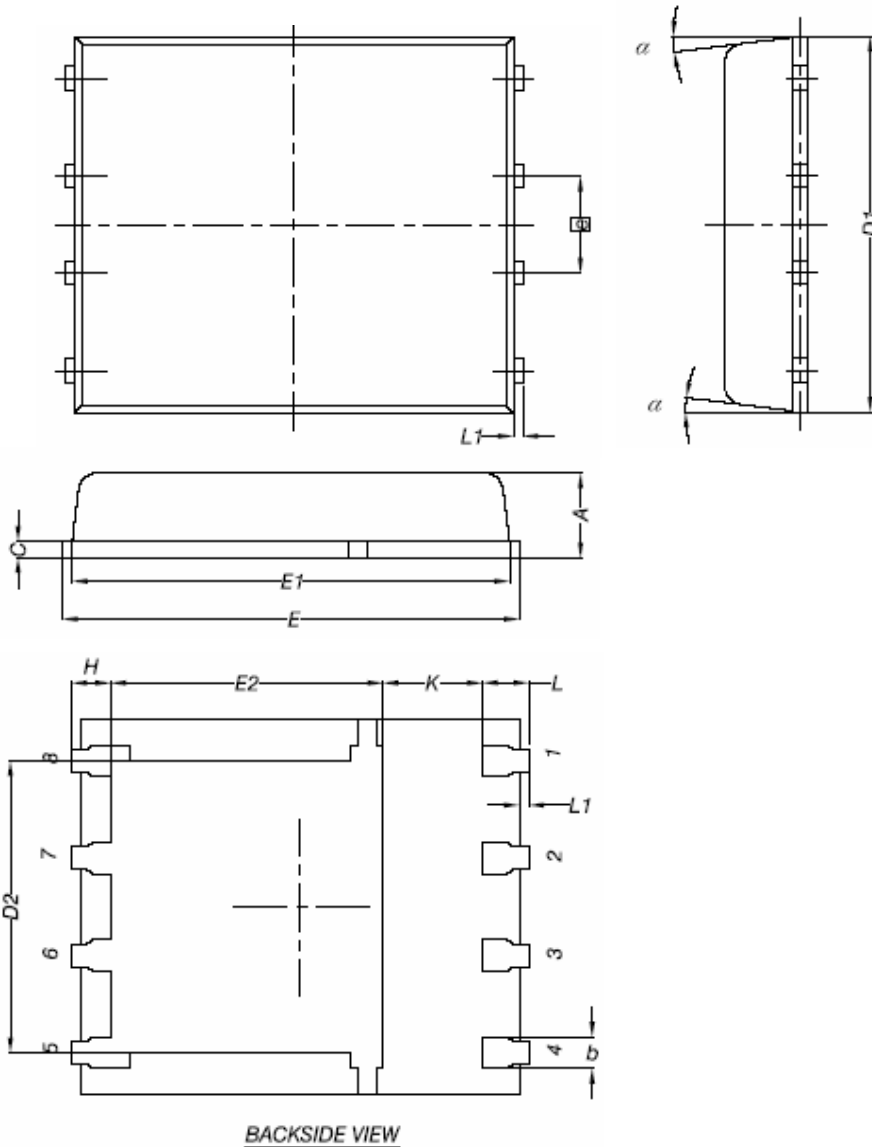


Fig 12. Gate Charge Waveform



Package Dimensions: PMPAK5x6



| SYMBOLS | Millimeters | | |
|----------------------|-------------|------|------|
| | MIN | NOM | MAX |
| A | 0.90 | 1.00 | 1.10 |
| b | 0.33 | 0.41 | 0.51 |
| C | 0.20 | - | - |
| D1 | 4.80 | 4.90 | 5.10 |
| D2 | - | - | 4.20 |
| E | 5.90 | 6.00 | 6.10 |
| E1 (Reference) | 5.70 | 5.75 | 5.80 |
| E2 (Reference) | 3.38 | 3.58 | 3.78 |
| e | 1.27 BSC | | |
| H | - | - | 0.62 |
| K (Reference) | 0.70 | - | - |
| L | 0.51 | 0.61 | 0.71 |
| L1 | - | - | 0.20 |
| α (Reference) | 0° | - | 12° |

1. All dimensions are in millimeters.
2. Dimensions do not include mold protrusions.

Marking Information:

