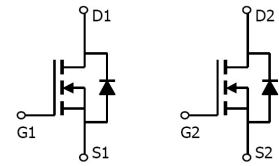


Feature

- 40V,20A
 $R_{DS(ON)} < 15m\Omega @ V_{GS}=10V$ TYP:13 m Ω
 $R_{DS(ON)} < 20m\Omega @ V_{GS}=4.5V$ TYP:17 m Ω
- Advanced Trench Technology
- Lead free product is acquired
- Excellent $R_{DS(ON)}$ and Low Gate Charge



Schematic diagram

Application

- PWM applications
- Load Switch
- Power management



Marking and pin assignment

Package Marking and Ordering Information

| Device Marking | Device | Device Package | Reel Size | Tape width | Quantity (PCS) |
|----------------|-----------|----------------|-----------|------------|----------------|
| 50N04QD | AP50N04QD | PDFN3X3 | 13 inch | - | 5000 |

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

| Parameter | Symbol | Value | Unit |
|---|-----------------|-----------|--------------|
| Drain-Source Voltage | V_{DS} | 40 | V |
| Gate-Source Voltage | V_{GS} | ± 20 | V |
| Continuous Drain Current ($T_a = 25^\circ C$) | I_D | 20 | A |
| Continuous Drain Current ($T_a = 100^\circ C$) | I_D | 14 | A |
| Pulsed Drain Current ⁽¹⁾ | I_{DM} | 60 | A |
| Singel Pulsed Avalanche Energy ⁽²⁾ | E_{AS} | 12.25 | mJ |
| Power Dissipation | P_D | 35 | W |
| Thermal Resistance from Junction to Case ⁽⁴⁾ | $R_{\theta JC}$ | 3.6 | $^\circ C/W$ |
| Junction Temperature | T_J | 150 | $^\circ C$ |
| Storage Temperature | T_{STG} | -55~ +150 | $^\circ C$ |

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

| Parameter | Symbol | Test Condition | Min | Type | Max | Unit |
|---|---------------|--|-----|------|-----------|------------|
| Static Characteristics | | | | | | |
| Drain-source breakdown voltage | $V_{(BR)DSS}$ | $V_{GS} = 0V, I_D = 250\mu A$ | 40 | - | - | V |
| Zero gate voltage drain current | I_{DSS} | $V_{DS} = 40V, V_{GS} = 0V$ | - | - | 1 | μA |
| Gate-body leakage current | I_{GSS} | $V_{GS} = \pm 20V, V_{DS} = 0V$ | - | - | ± 100 | nA |
| Gate threshold voltage ⁽³⁾ | $V_{GS(th)}$ | $V_{DS} = V_{GS}, I_D = 250\mu A$ | 1 | 1.5 | 2.5 | V |
| Drain-source on-resistance ⁽³⁾ | $R_{DS(on)}$ | $V_{GS} = 10V, I_D = 10A$ | - | 13 | 15 | m Ω |
| | | $V_{GS} = 4.5V, I_D = 8A$ | - | 17 | 20 | |
| Dynamic characteristics | | | | | | |
| Input Capacitance | C_{iss} | $V_{DS} = 20V, V_{GS} = 0V, f = 1MHz$ | - | 1250 | - | pF |
| Output Capacitance | C_{oss} | | - | 114 | - | |
| Reverse Transfer Capacitance | C_{rss} | | - | 85 | - | |
| Switching characteristics | | | | | | |
| Turn-on delay time | $t_{d(on)}$ | $V_{DD} = 20V, I_D = 1A, R_L = 6\Omega$ $V_{GS} = 10V, R_G = 1\Omega$ | - | 10 | - | ns |
| Turn-on rise time | t_r | | - | 9 | - | |
| Turn-off delay time | $t_{d(off)}$ | | - | 32 | - | |
| Turn-off fall time | t_f | | - | 16 | - | |
| Total Gate Charge | Q_g | $V_{DS} = 20V, I_D = 10A,$ $V_{GS} = 10V$ | - | 20 | - | nC |
| Gate-Source Charge | Q_{gs} | | - | 3.5 | - | |
| Gate-Drain Charge | Q_{gd} | | - | 4.2 | - | |
| Source-Drain Diode characteristics | | | | | | |
| Diode Forward voltage ⁽³⁾ | V_{DS} | $V_{GS} = 0V, I_S = 10A$ | - | - | 1.2 | V |
| Diode Forward current ⁽⁴⁾ | I_S | | - | - | 20 | A |

Notes:

1. Repetitive Rating: pulse width limited by maximum junction temperature
2. EAS Condition: $T_J = 25^{\circ}\text{C}, V_{DD} = 20V, R_G = 25\Omega, L = 0.5mH$
3. Pulse Test: pulse width $\leq 300\mu s$, duty cycle $\leq 2\%$
4. Surface Mounted on FR4 Board, $t \leq 10$ sec

Test Circuit

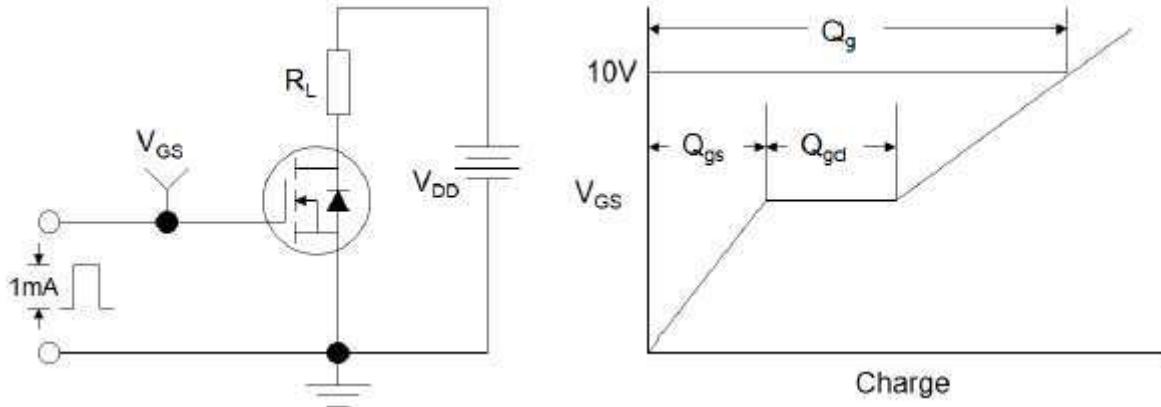


Figure 1: Gate Charge Test Circuit & Waveform

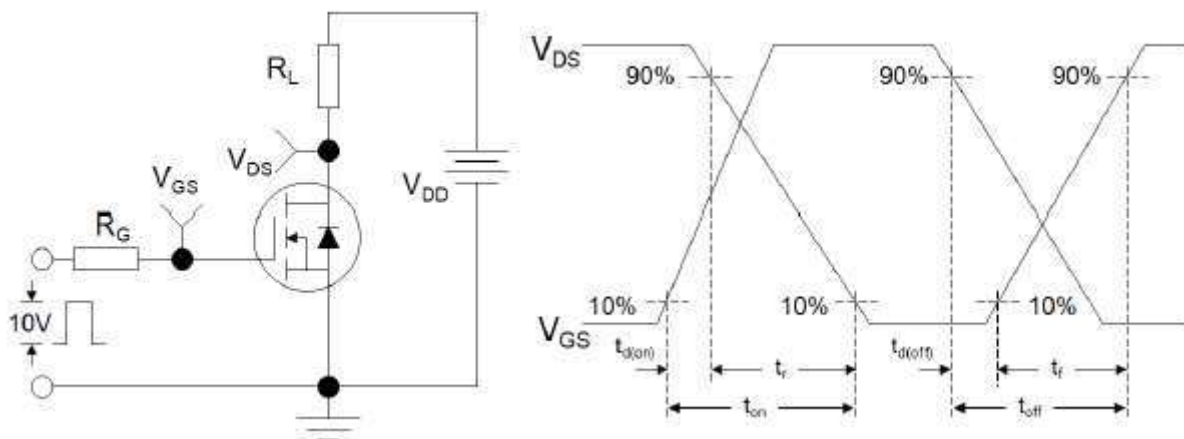


Figure 2: Resistive Switching Test Circuit & Waveforms

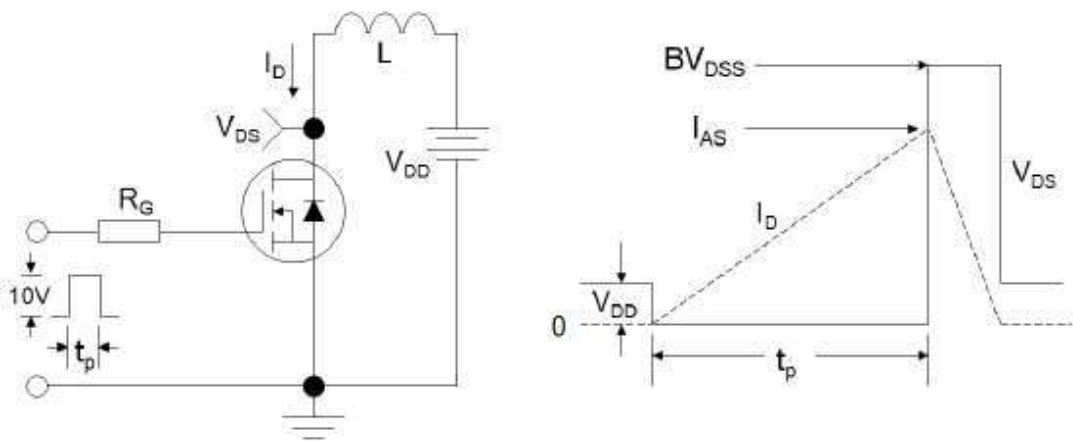


Figure 3: Unclamped Inductive Switching Test Circuit & Waveforms

Typical Performance Characteristics

Figure 1: Output Characteristics

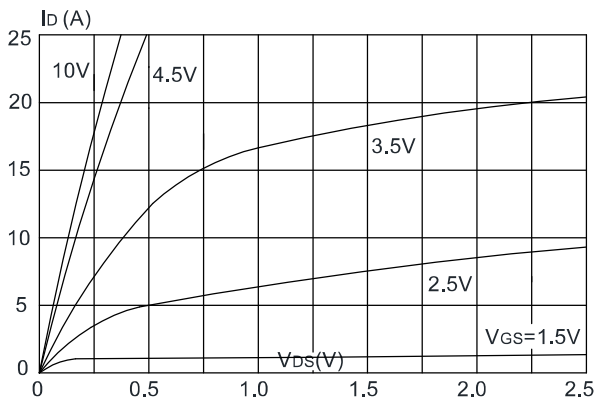


Figure 2: Typical Transfer Characteristics

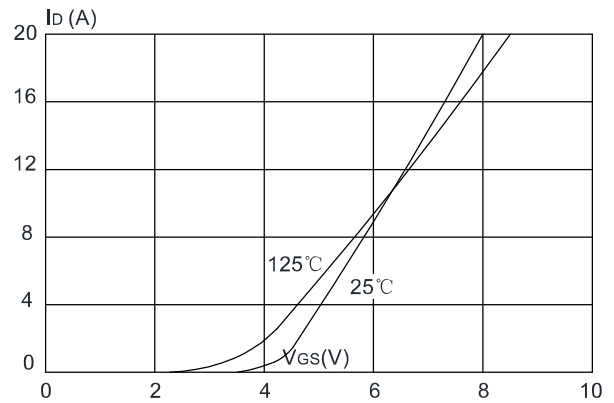


Figure 3: On-resistance vs. Drain Current

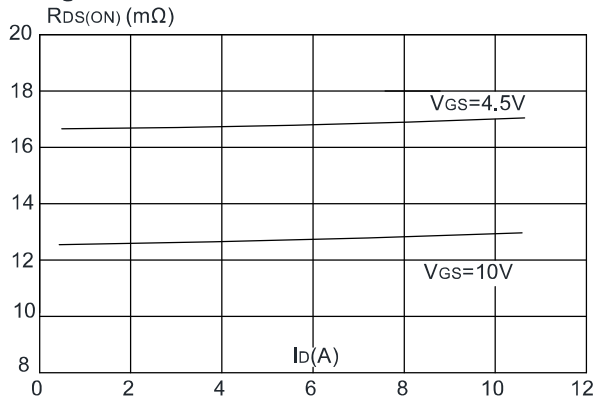


Figure 4: Body Diode Characteristics

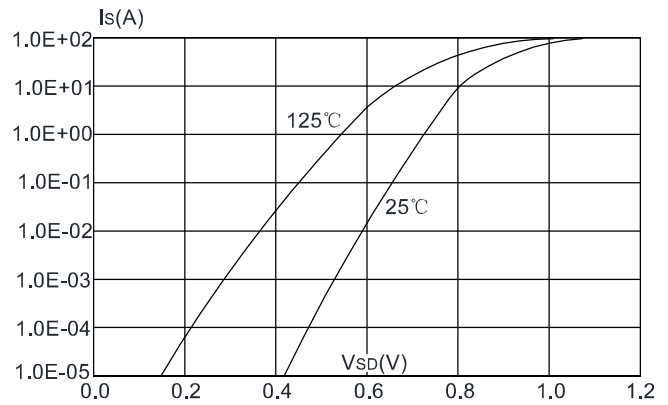


Figure 5: Gate Charge Characteristics

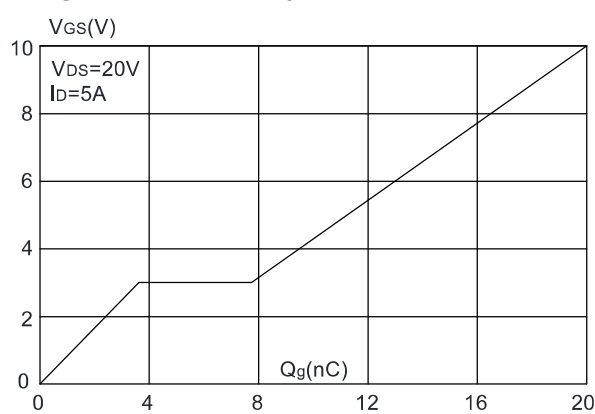


Figure 6: Capacitance Characteristics

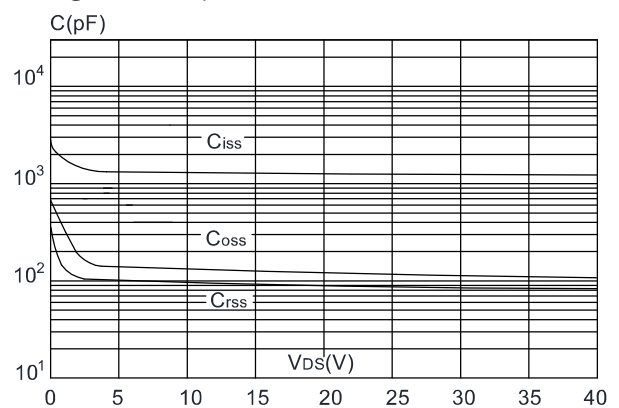


Figure 7: Normalized Breakdown Voltage vs. Junction Temperature

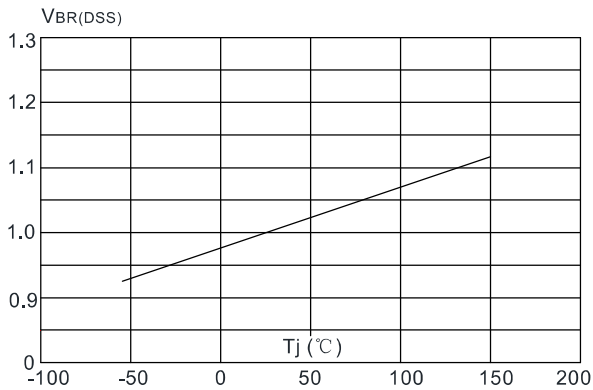


Figure 8: Normalized on Resistance vs. Junction Temperature

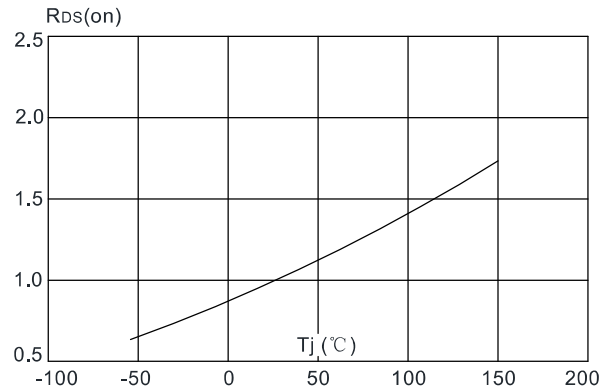


Figure 9: Maximum Safe Operating Area

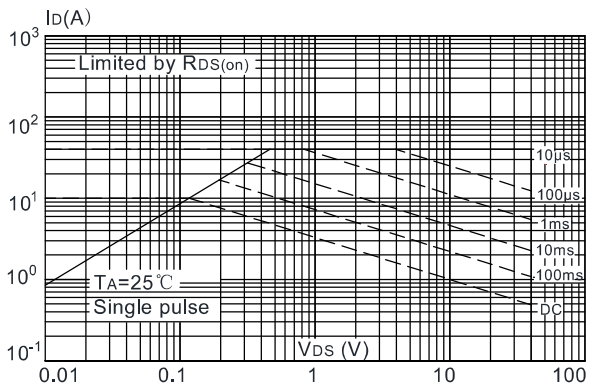


Figure 10: Maximum Continuous Drain Current vs. Ambient Temperature

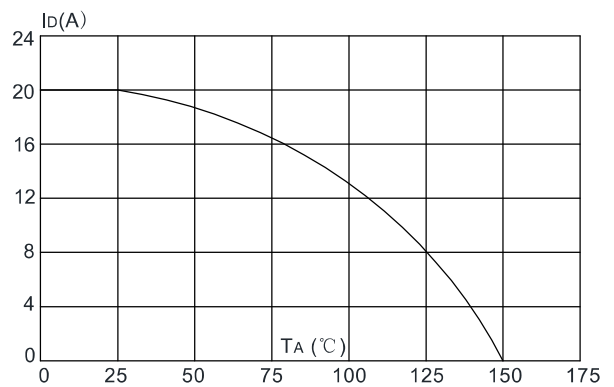
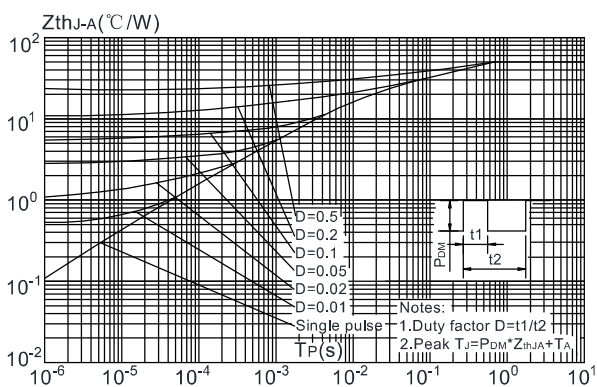


Figure.11: Maximum Effective Transient Thermal Impedance, Junction-to-Ambient



PDFN3X3 Package Information

