

N-Channel Power MOSFET

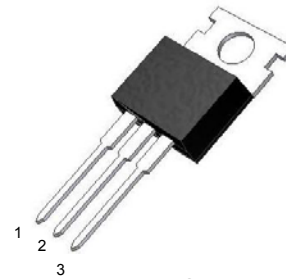
5.5A, 400V, 0.95Ω

General Description

The N-Channel MOSFET is used an advanced termination scheme to provide enhanced voltage-blocking capability without degrading performance over time. This advanced technology has been especially tailored to minimize on-state resistance, provide superior switching performance. This device is well suited for high efficiency switched mode power suppliers, active power factor correction, electronic lamp ballasts based half bridge topology.

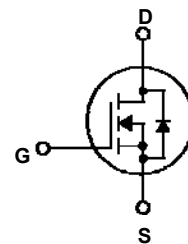
Features

- Robust high voltage termination
- Avalanche energy specified
- Diode is characterized for use in bridge circuits
- Source to Drain diode recovery time comparable to a discrete fast recovery diode.



1 = Gate
2 = Drain
3 = Source

TO-220AB



DEVICE MARKING DESIGNATION:

Line 1 = TC Brand
Line 2 = Device Type

ABSOLUTE MAXIMUM RATINGS (T_C=25°C, unless otherwise noted)

| Symbol | Parameter | Value | Units |
|------------------|---|--------------|-------|
| V _{DSS} | Drain- Source Voltage | 400 | V |
| V _{GSS} | Gate-Source Voltage | ±30 | V |
| I _D | Drain Current | 5.5 | A |
| I _{DM} | Drain Current Pulsed | 32 | A |
| P _D | Power Dissipation (Note 2) | 87.5 | W |
| | Derating factor above 25°C | 0.7 | W/°C |
| E _{AS} | Single Pulsed Avalanche Energy (Note 1) | 303 | mJ |
| E _{AR} | Repetitive Avalanche Energy (Note 2) | 7.3 | mJ |
| T _J | Operating Junction Temperature | 150 | °C |
| T _{stg} | Storage Temperature Range | - 55 to +150 | °C |

Notes:

1. L=16.5mH, I_{AS}=5.7A, V_{DD}=55V, R_G=25Ω, Starting T_J=25°C
2. Repetitive Rating: Pulse width limited by maximum junction temperature.

THERMAL CHARACTERISTICS

| Symbol | Parameter | Value | Unit |
|------------------|---|-------|------|
| R _{θJC} | Thermal Resistance, Junction-to-Case | 1.43 | °C/W |
| R _{θJA} | Thermal Resistance, Junction-to-Ambient | 62.5 | °C/W |

ELECTRICAL CHARACTERISTICS
Off Characteristics ($T_A = 25^\circ\text{C}$ unless otherwise noted)

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|------------|------------------------------------|-------------------------------|------|------|------|---------|
| BV_{DSS} | Drain-Source Breakdown Voltage | $V_{GS} = 0V, I_D = 250\mu A$ | 400 | -- | -- | V |
| I_{DSS} | Zero Gate Voltage Drain Current | $V_{DS} = 400V, V_{GS} = 0V$ | -- | -- | 10 | μA |
| I_{GSSF} | Gate-Body Leakage Current, Forward | $V_{GS} = 30V, V_{DS} = 0V$ | -- | -- | 100 | nA |
| I_{GSSR} | Gate-Body Leakage Current, Reverse | $V_{GS} = -30V, V_{DS} = 0V$ | -- | -- | -100 | nA |

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

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|--------------|------------------------|-----------------------------------|------|------|------|----------|
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{DS} = V_{GS}, I_D = 250\mu A$ | 2.0 | -- | 4.0 | V |
| $R_{DS(on)}$ | On-Resistance | $V_{GS} = 10V, I_D = 3A$ | -- | 0.9 | 0.95 | Ω |

Dynamic Characteristics

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|-----------|------------------------------|---|------|------|------|------|
| C_{iss} | Input Capacitance | $V_{DS} = 25V, V_{GS} = 0V,$ $f = 1.0\text{MHz}$ | -- | 546 | -- | pF |
| C_{oss} | Output Capacitance | | -- | 69 | -- | pF |
| C_{rss} | Reverse Transfer Capacitance | | -- | 6 | -- | pF |

Switching Characteristics

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|--------------|---------------------|--|------|------|------|------|
| $t_{d(on)}$ | Turn-On Delay Time | $V_{DD} = 200V, I_D = 5.5A,$ $R_G = 12\Omega$ (Note 3 & 4) | -- | 16 | -- | nS |
| t_r | Turn-On Rise Time | | -- | 16 | -- | nS |
| $t_{d(off)}$ | Turn-Off Delay Time | | -- | 106 | -- | nS |
| t_f | Turn-Off Fall Time | | -- | 18 | -- | nS |
| Q_g | Total Gate Charge | $V_{DS} = 320V, I_D = 5.5A,$ $V_{GS} = 10V$ (Note 3 & 4) | -- | 15.5 | -- | nC |
| Q_{gs} | Gate-Source Charge | | -- | 3 | -- | nC |
| Q_{gd} | Gate-Drain Charge | | -- | 6.1 | -- | nC |

Drain-Source Diode Characteristics and Maximum Ratings

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|----------|---|--|------|------|------|---------|
| I_S | Maximum Continuous Drain-Source Diode Forward Current | | -- | -- | 8.0 | A |
| I_{SM} | Maximum Pulsed Drain-Source Diode Forward Current | | -- | -- | 32 | A |
| V_{SD} | Drain-Source Diode Forward Voltage | $V_{GS} = 0V, I_S = 5.5A$ | -- | -- | 1.5 | V |
| T_{rr} | Reverse Recovery Time | $V_{GS} = 0V, I_S = 5.5A,$ $di_F / dt = 100A/\mu S$ (Note 3) | -- | 220 | -- | nS |
| Q_{rr} | Reverse Recovery Charge | | -- | 2.0 | -- | μC |

Notes:

- Pulse Test: Pulse width < 300 μs , Duty cycle $\leq 2\%$.
- Basically not affected by working temperature.

TYPICAL CHARACTERISTICS

图1、导通特性

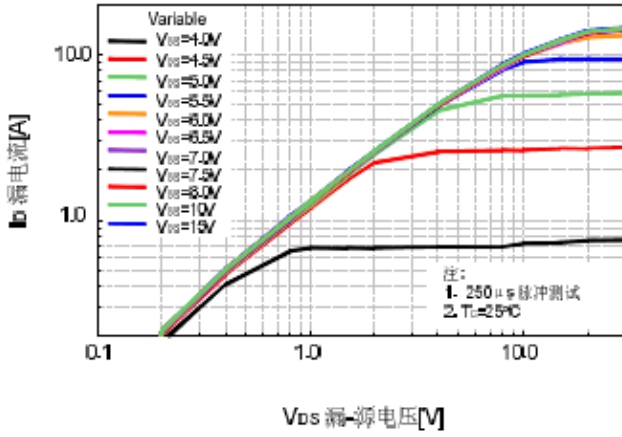


图2、传输特性

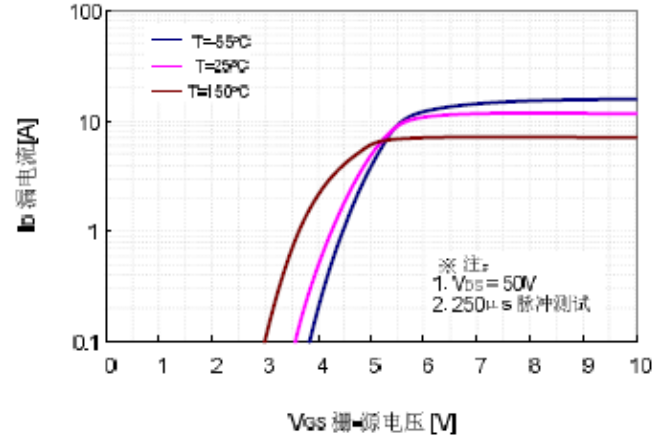


图3、导通电阻 vs. 漏电流和栅极电压

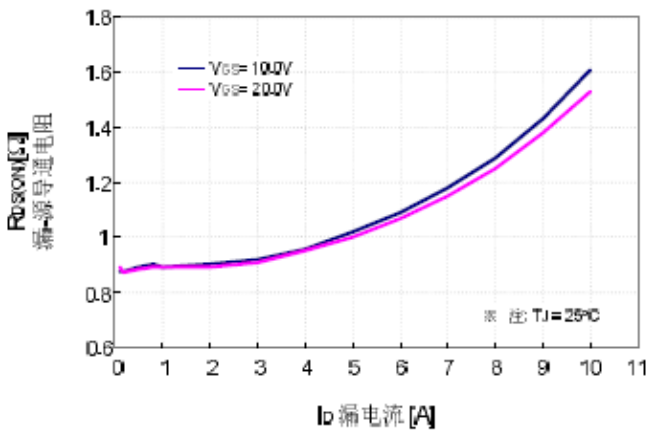


图4、体二极管正向压降 vs. 源电流和温度

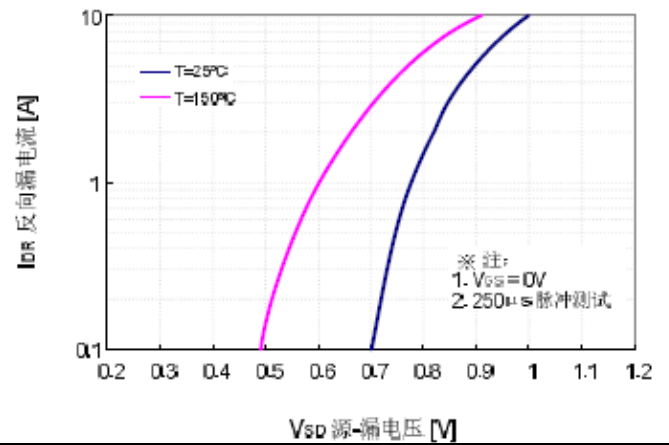


图5、电容特性

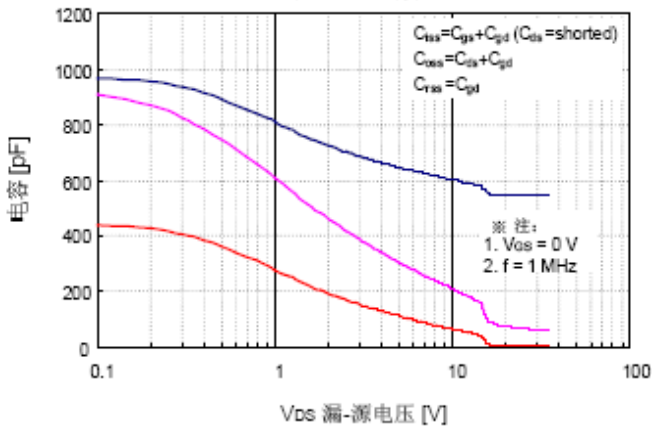


图6、栅极电荷特性

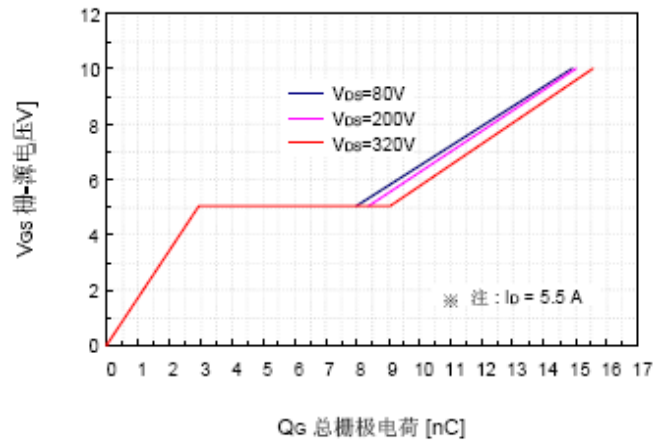


图7、击穿电压vs.温度

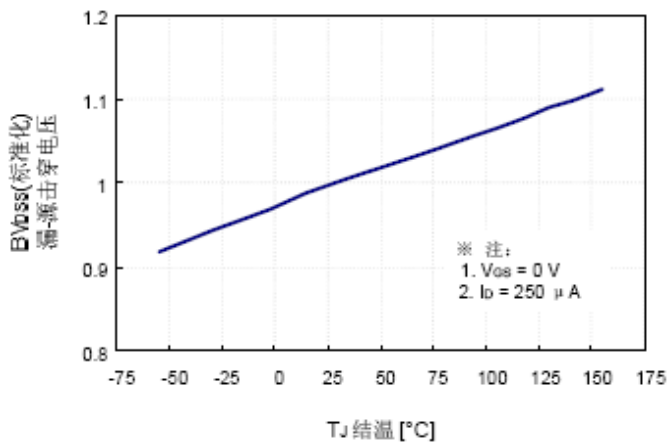
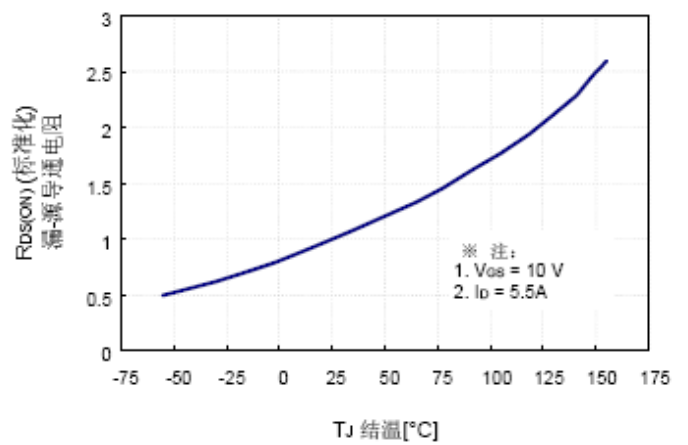
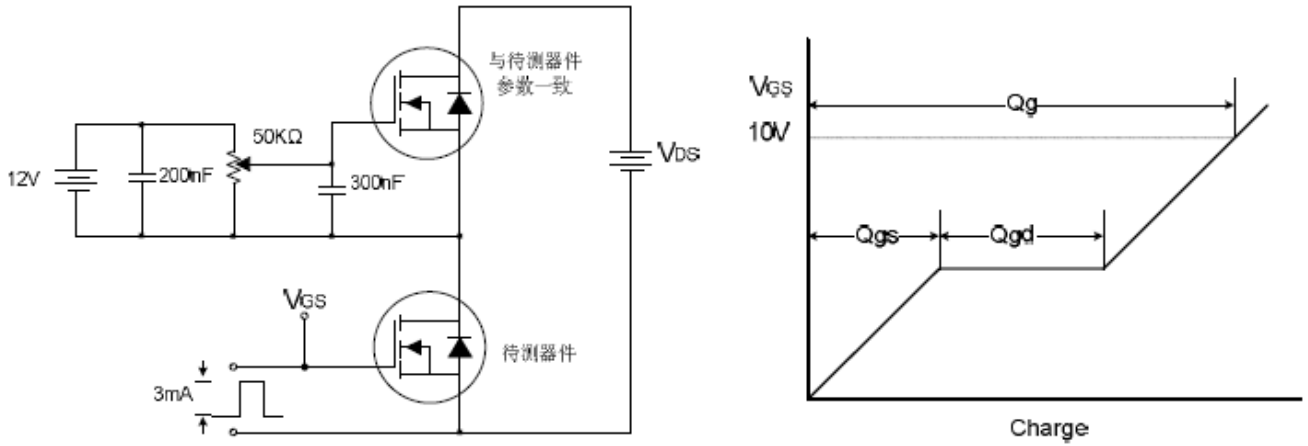


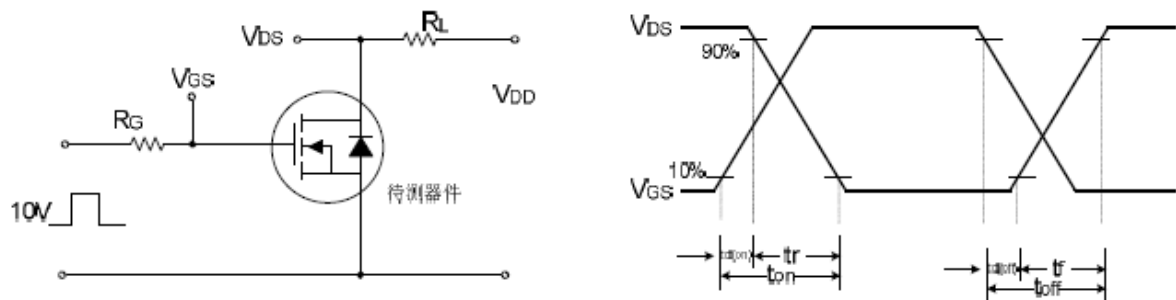
图8、导通电阻vs.温度



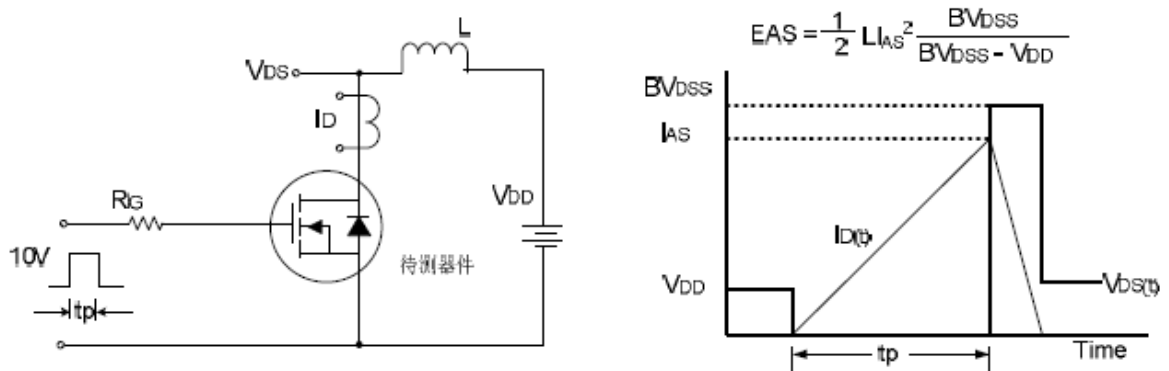
栅极电荷量测试电路及波形图



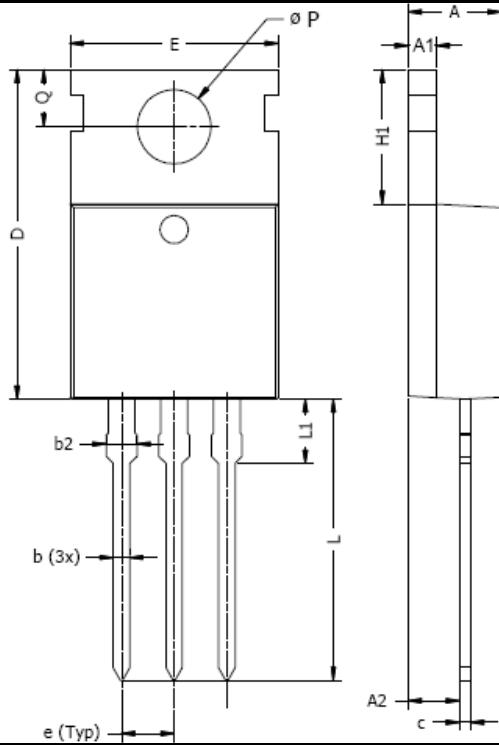
开关时间测试电路及波形图



EAS测试电路及波形图



TO220AB PACKAGE OUTLINE



| DIM | MILLIMETERS | | INCHES | |
|-----|-------------|------|--------|-------|
| | MIN | MAX | MIN | MAX |
| A | 3.6 | 4.8 | 0.142 | 0.189 |
| A1 | 1.2 | 1.4 | 0.047 | 0.055 |
| A2 | 2.0 | 2.9 | 0.079 | 0.114 |
| b | 0.4 | 1.0 | 0.016 | 0.039 |
| b2 | 1.2 | 1.8 | 0.047 | 0.071 |
| c | 0.36 | 0.6 | 0.014 | 0.024 |
| D | 14.2 | 16.5 | 0.559 | 0.650 |
| e | 2.34 | 2.74 | 0.092 | 0.108 |
| E | 9.7 | 10.6 | 0.382 | 0.417 |
| H1 | 5.8 | 6.85 | 0.228 | 0.270 |
| L | 12.7 | 14.7 | 0.500 | 0.579 |
| L1 | 2.7 | 3.3 | 0.106 | 0.130 |
| ØP | 3.5 | 4.0 | 0.138 | 0.157 |
| Q | 2.54 | 3.4 | 0.100 | 0.134 |

NOTE: Above package outline conforms to JEDEC TO-220AB

NOTICE

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