

General Description

This series of power MOSFET use N channel Trench Super-Junction technology and design to provide better characteristics, such as fast switchingtime, low Ciss and Crss, low on resistance and excellent avalanche characteristics,making it especially suitable for applications which require superior power density and outstanding efficiency.

Features

- Low on-resistance
- Ultra low gate charge and input capacitance
- 100% avalanche tested
- Rohs compliant

Mechanical Data

- Case:TO-220,ITO-220,TO-263 Package

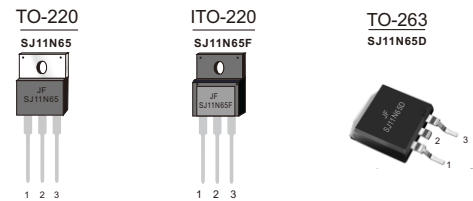
Application

- Switching applications

Ordering Information

| Part No. | Package Type | Package | Quality(box) |
|----------|--------------|-------------|--------------|
| SJ11N65 | TO-220 | Tube | 1000 |
| SJ11N65F | ITO-220 | Tube | 1000 |
| SJ11N65D | TO-263 | Tape & Reel | 800 |

| Product Summary | | | |
|-----------------|-----------------------------|--------------------|----------------------|
| V _{DS} | R _{DS(on)} (Ω) Typ | I _D (A) | Q _g (Typ) |
| 650V | 0.38 @ 10V | 11 | 32nc |



Block Diagram

Pin Definition:

1. Gate
2. Drain
3. Source

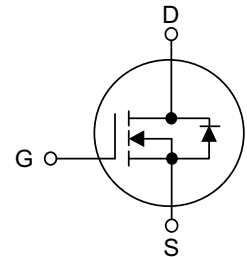


Table1 Absolute Maximum Ratings (T_c=25°C, unless otherwise specified)

| Parameter | Symbol | SJ11N65 | SJ11N65D | SJ11N65F | Unit |
|--|----------------------------------|-----------------------|----------|----------|------|
| Drain-Source Voltage | V _{DS} | 650 | | | V |
| Gate-Source Voltage | V _{GS} | ±30 | | | V |
| Continuous Drain Current | I _D | T _c =25°C | 11 | | A |
| | | T _c =100°C | 7 | | |
| Pulsed Drain Current (Note 1) | I _{DM} | 42 | | | A |
| Single Pulse Avalanche Energy(Note 2) | E _{AS} | 260 | | | mJ |
| Avalanche Current(Note 1) | I _{AR} | 2 | | | A |
| Repetitive Avalanche Energy(Note 1) | E _{AR} | 1 | | | mJ |
| Reverse Diode Recovery dv/dt(Note 3) | dv/dt | 15 | | | V/ns |
| Drain Source Voltage Slope (V _{DS} =480V) | dv/dt | 50 | | | V/ns |
| Power Dissipation T _c =25°C | P _D | 151 | | 35 | W |
| Operating Junction and Storage Temperature | T _J /T _{STG} | -55 ~ +150 | | | °C |

Table 2. Thermal Characteristics

| Parameter | Symbol | SJ11N65 SJ11N65D | SJ11N65F | Unit |
|--|------------------|---------------------|----------|------|
| Thermal resistance Junction to Ambient | R _{θJA} | 62 | 80 | °C/W |
| Thermal resistance Junction to Case | R _{θJC} | 1.2 | 4.1 | °C/W |

Table 3. Electrical Characteristics (T_J=25°C, unless otherwise specified)

| Parameter | Symbol | Test Conditions | Min | Typ | Max | Unit |
|--|---------------------|--|-----|------|------|------|
| Off Characteristics | | | | | | |
| Drain-Source Breakdown Voltage | BV _{DSS} | V _{GS} =0V, I _D =250μA | 650 | | | V |
| Drain-Source Leakage Current | I _{DSS} | V _{DS} =650V, V _{GS} =0V | | | 1 | μA |
| Gate- Source Leakage Current | Forward | I _{GSS} | | | 100 | nA |
| | Reverse | | | | -100 | nA |
| On Characteristics(Note 4) | | | | | | |
| Gate Threshold Voltage | V _{GS(TH)} | V _{DS} =V _{GS} , I _D =250μA | 2.5 | | 4.5 | V |
| Static Drain-Source On-State Resistance | R _{DS(ON)} | V _{GS} =10V, I _D =5.5A | | 0.38 | 0.42 | Ω |
| Dynamic Characteristics(Note 5) | | | | | | |
| Input Capacitance | C _{ISS} | V _{DS} =25V, V _{GS} =0V, f=1MHz | | 720 | | pF |
| Output Capacitance | C _{OSS} | | | 20 | | pF |
| Reverse Transfer Capacitance | C _{RSS} | | | 1.5 | | pF |
| Switching Characteristics (Note 5) | | | | | | |
| Turn-On Delay Time | t _{d(on)} | V _{DD} =400V, I _D =5.5A, R _G =20Ω | | 15 | | ns |
| Turn-On Rise Time | t _R | | | 10 | | ns |
| Turn-Off Delay Time | t _{d(off)} | | | 110 | | ns |
| Turn-Off Fall Time | t _F | | | 9 | | ns |
| Total Gate Charge | Q _G | V _{DS} =400V, I _D =5.5A, V _{GS} =10V | | 32 | | nC |
| Gate-Source Charge | Q _{GS} | | | 4 | | nC |
| Gate-Drain Charge | Q _{GD} | | | 16 | | nC |
| Drain-Source Diode Characteristics and Maximum Ratings | | | | | | |
| Drain-Source Diode Forward Voltage | V _{SD} | V _{GS} =0V, I _S =5.5A | | 0.9 | 1.5 | V |
| Maximum Continuous Drain-Source Diode Forward Current | I _S | | | | 9.2 | A |
| Maximum Pulsed Drain-Source Diode Forward Current | I _{SM} | | | | 30 | A |
| Reverse Recovery Time | t _{rr} | V _{GS} =0V, I _S =5.5A | | 280 | | ns |
| Reverse Recovery Charge | Q _{RR} | dI _F /dt=100A/μs (Note 1) | | 3300 | | nC |

Notes : 1 Repetitive Rating: Pulse width limited by maximum junction temperature

2 L=60mH, I_{AS}=3A, V_{DD}=150V, Starting T_J=25°C

3 I_{SD}≤4.5A, di/dt≤200A/μs, V_{DD}≤BV_{DSS}, starting T_J=25°C

4 Pulse Test: Pulse width ≤300μs, Duty cycle≤2%

5 Guaranteed by design, not subject to production

Typical Characteristics Diagrams

Fig1. Power Dissipation
TO-220, TO-263

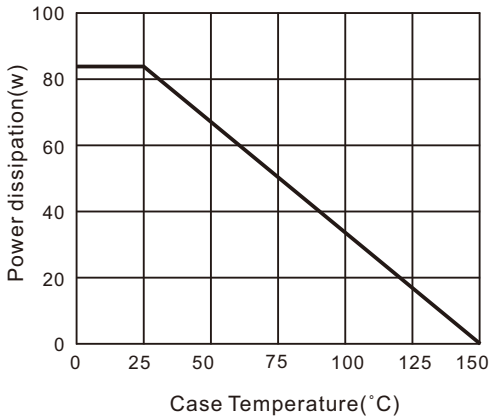


Fig2. Power Dissipation
ITO-220

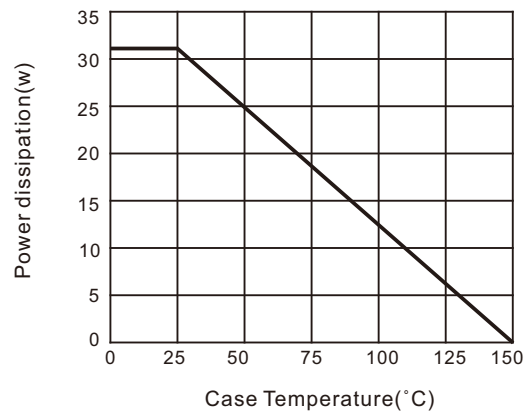


Fig3. Maximum Effective Thermal Impedance

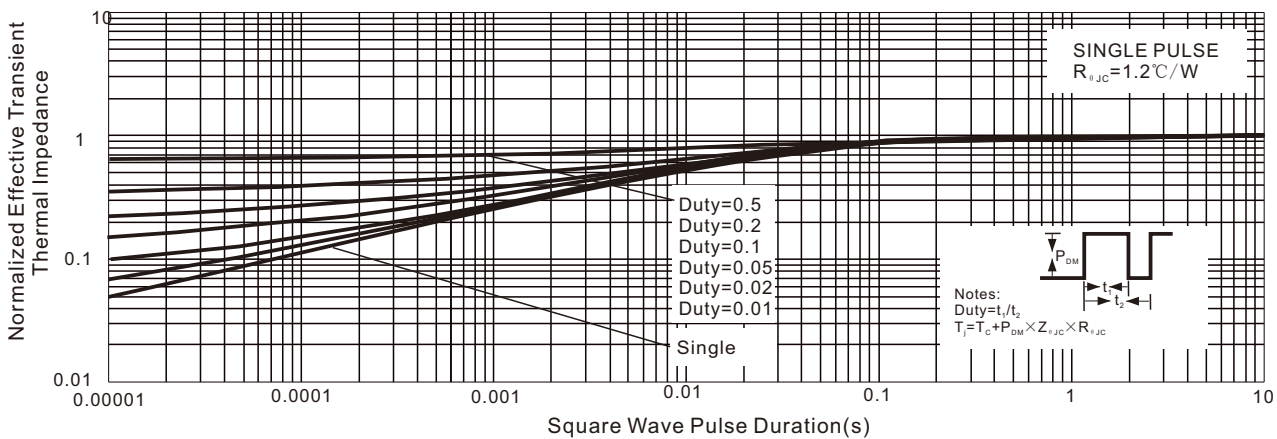


Fig4. Safe Operation Area
TO-220, TO-263

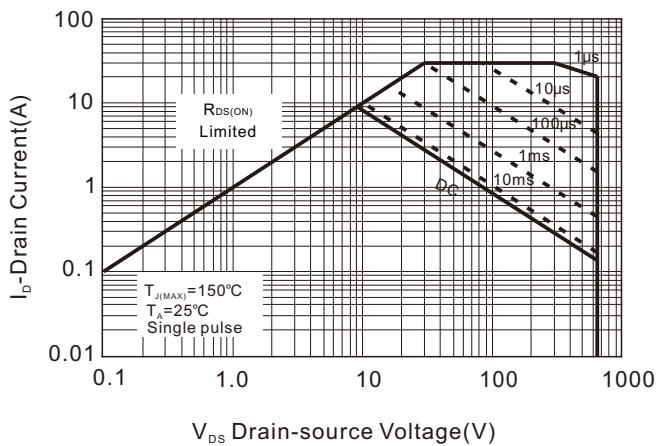
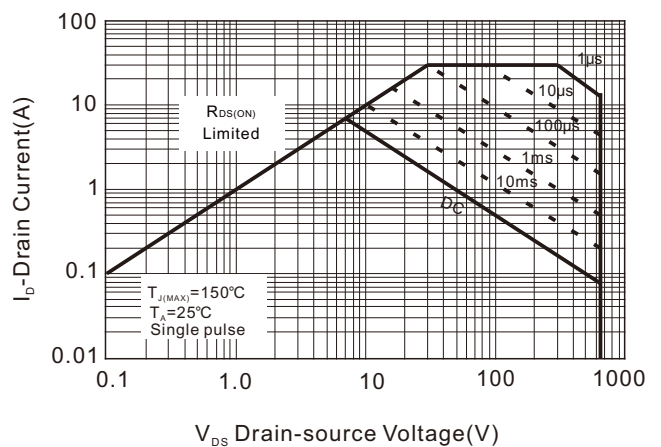


Fig5. Safe Operation Area
ITO-220



Typical Characteristics Diagrams

Fig6. Output Characteristics

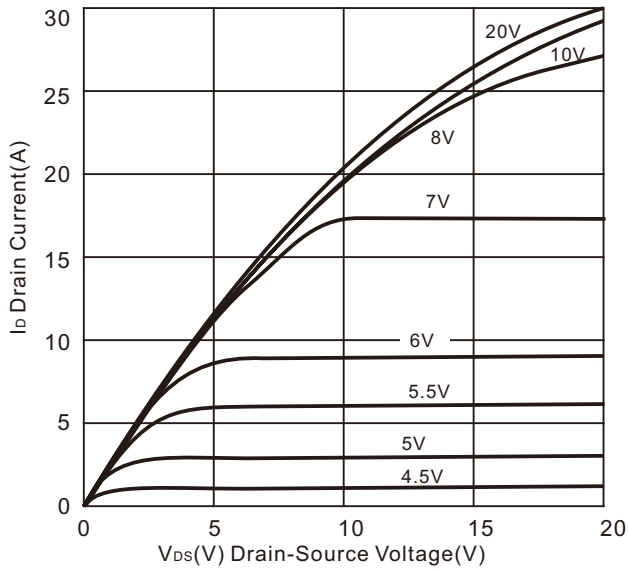


Fig7. Drain-Source on Resistance

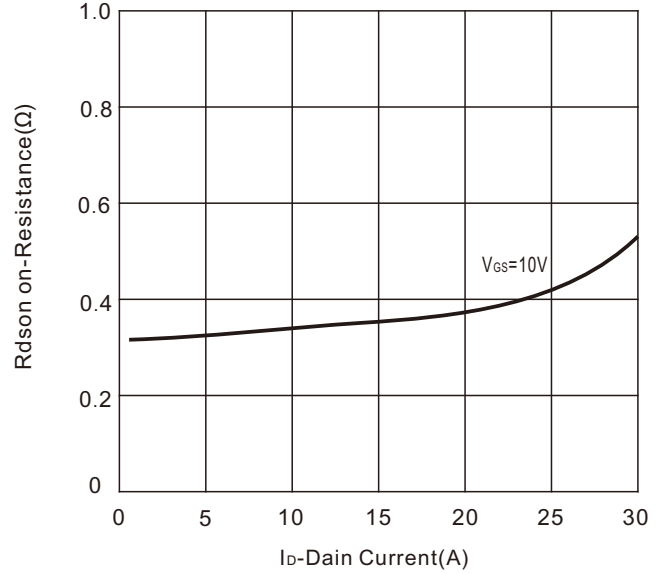


Fig8. Drain-Source on Resistance

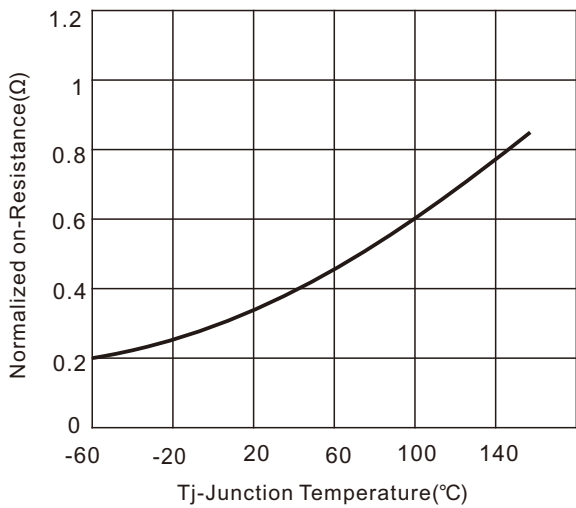


Fig9. Transfer Characteristics

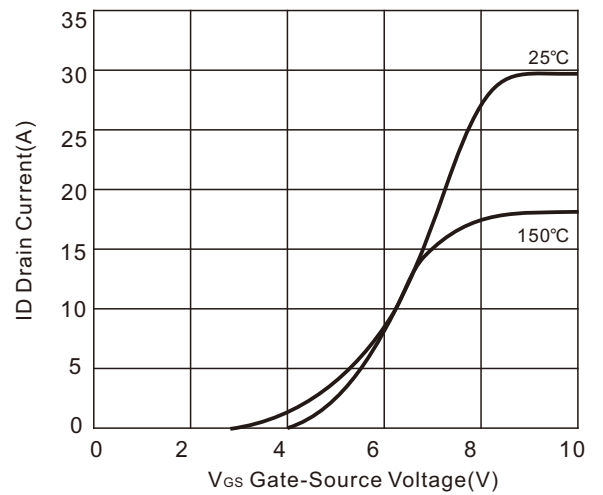


Fig10. Coss stored energy

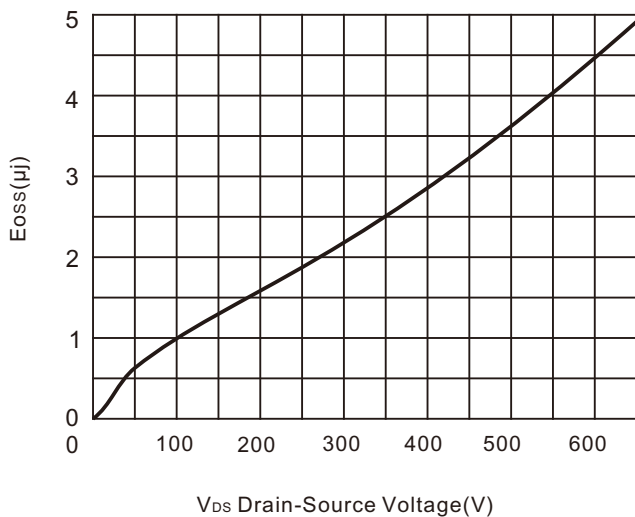
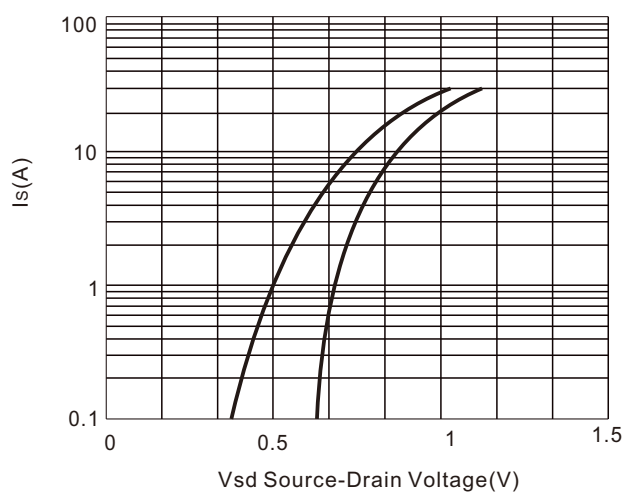


Fig11. Forward Characteristics of Reverse diode



Typical Characteristics Diagrams

Fig12. Capacitance Characteristics

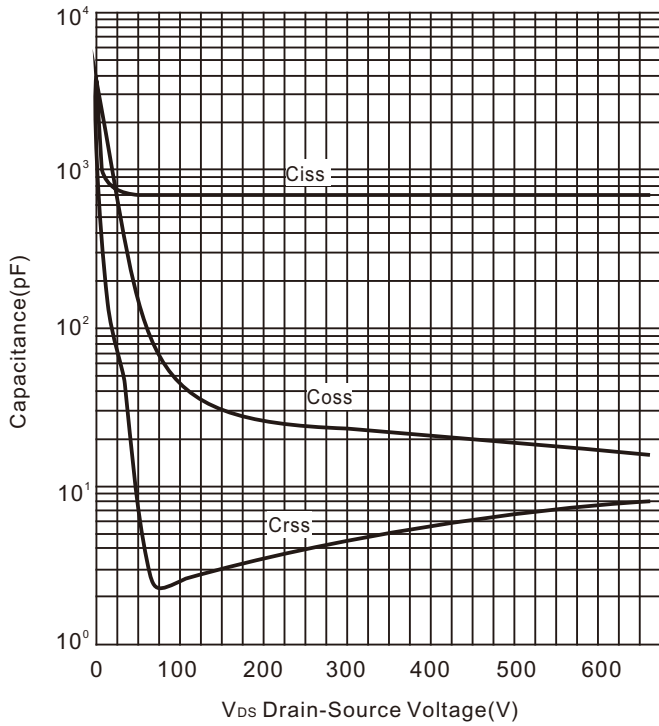


Fig13. Gate Charge

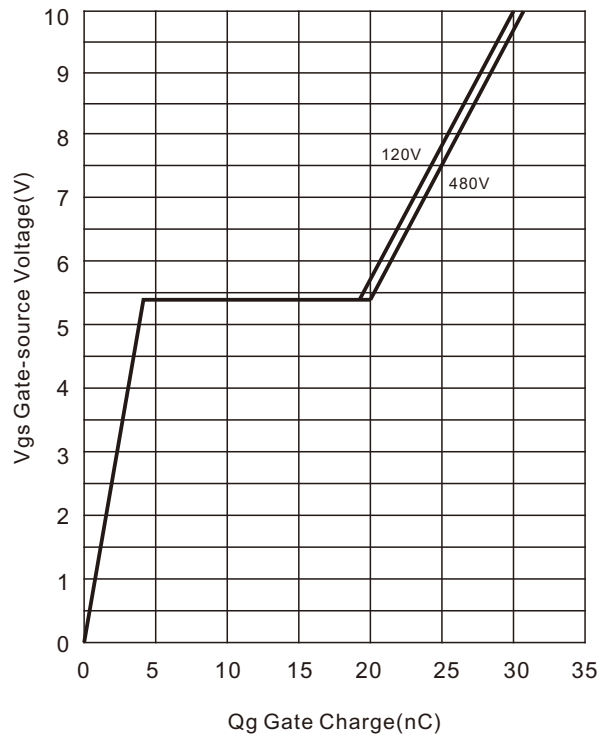


Fig14. Avalanche energy

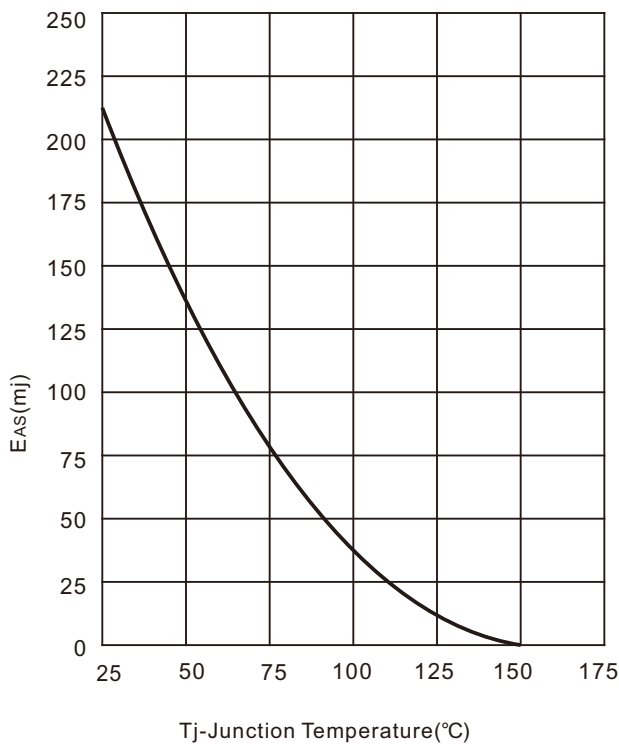
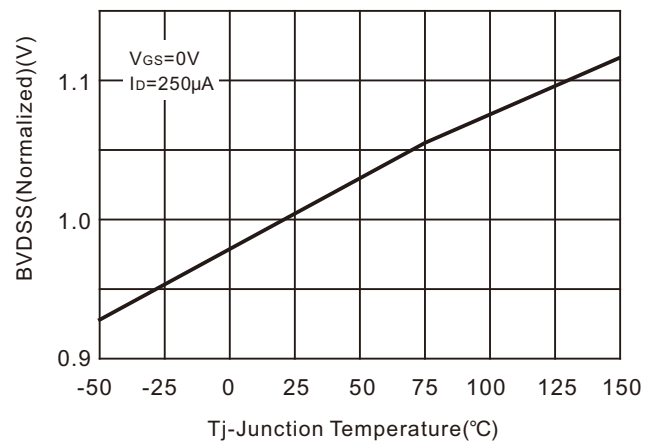


Fig15. Drain-source breakdown voltage



Typical Test Circuit

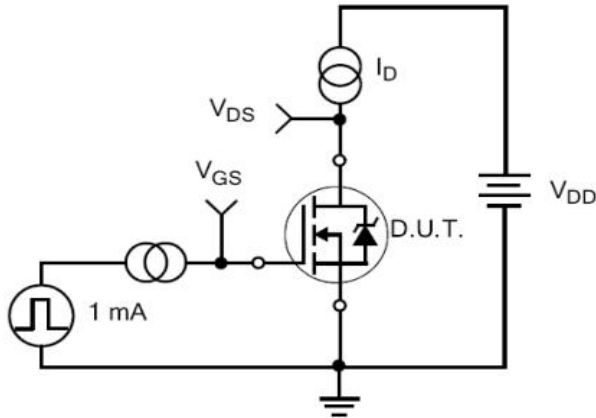


Figure 17. Gate Charge Test Circuit

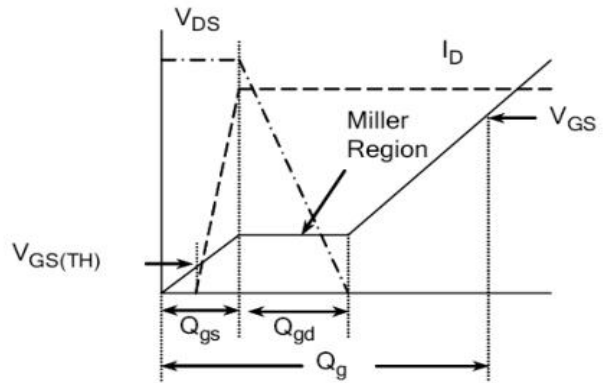


Figure 18. Gate Charge Waveform

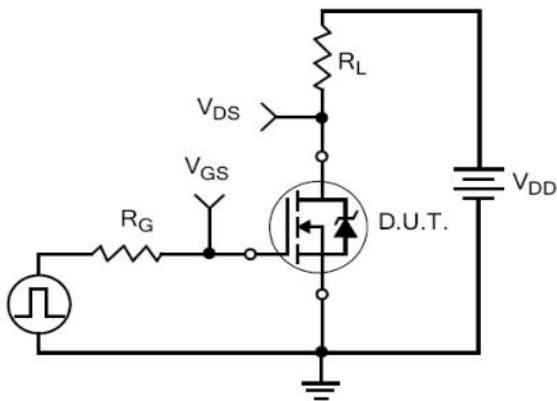


Figure 19. Resistive Switching Test Circuit

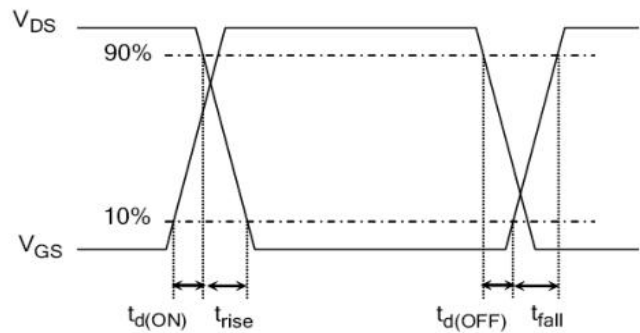


Figure 20. Resistive Switching Waveforms

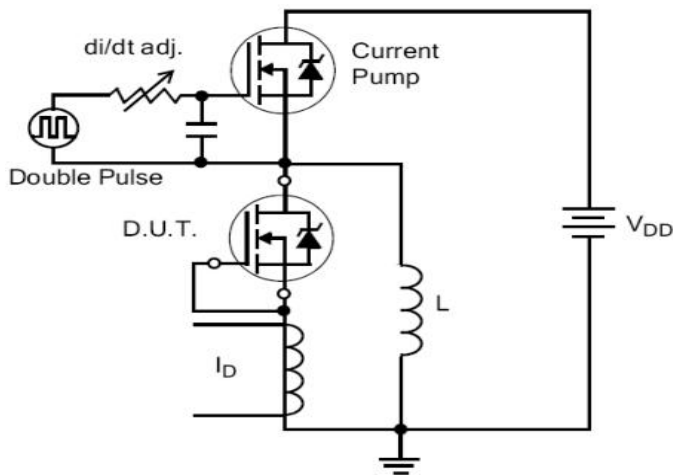


Figure 21. Diode Reverse Recovery Test Circuit

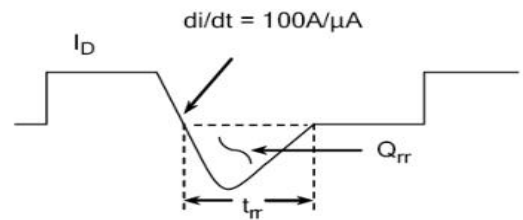


Figure 22. Diode Reverse Recovery Waveform

Typical Test Circuit And Waveform(continues)

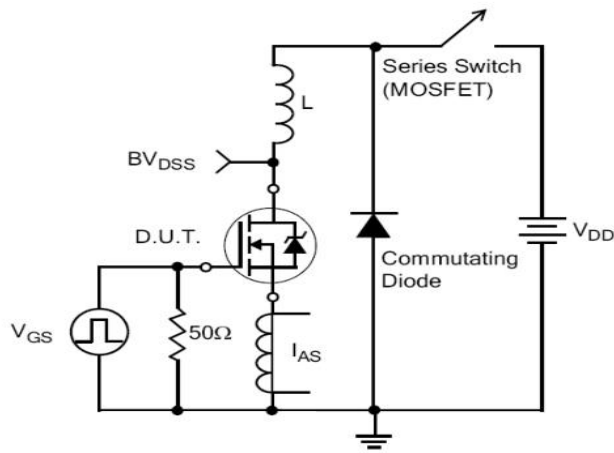


Figure 23. Unclamped Inductive Switching Test Circuit

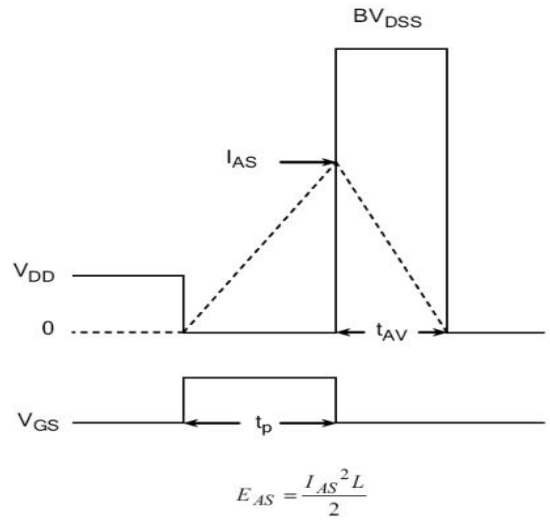
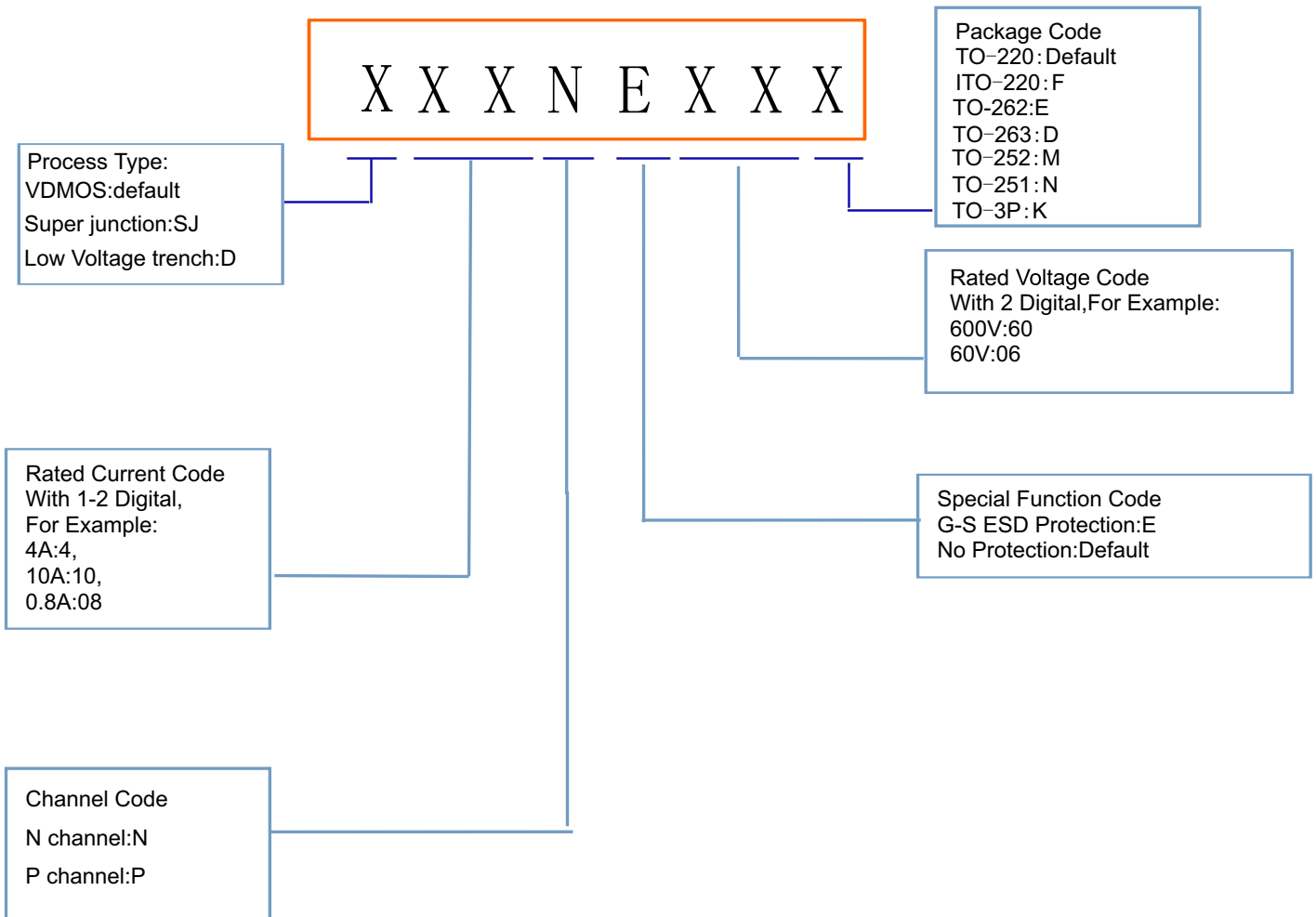


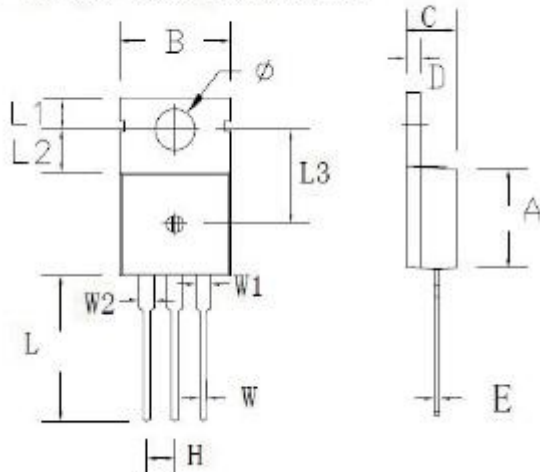
Figure 24. Unclamped Inductive Switching Waveforms

Product Names Rules



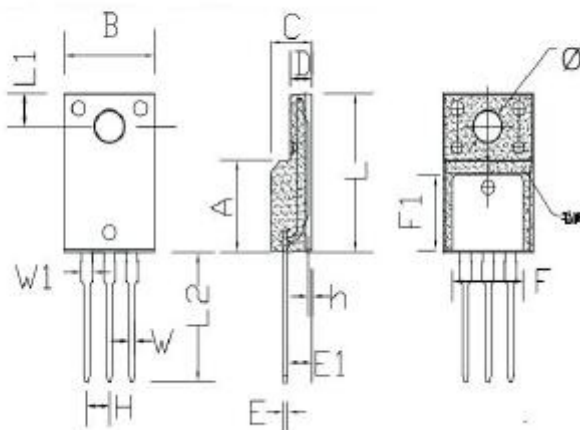
Dimensions

TO-220 PACKAGE OUTLINE DIMENSIONS



| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|--------|---------------------------|-------|----------------------|-------|
| | min. | max. | min. | max. |
| A | 8.80 | 9.30 | 0.346 | 0.366 |
| B | 9.70 | 10.30 | 0.382 | 0.406 |
| C | 4.25 | 4.75 | 0.167 | 0.187 |
| D | 1.20 | 1.45 | 0.047 | 0.057 |
| E | 0.40 | 0.60 | 0.016 | 0.024 |
| H | 2.54 TYP | | 0.100 TYP | |
| W | 0.60 | 0.95 | 0.024 | 0.037 |
| W1 | 1.05 | 1.45 | 0.041 | 0.057 |
| W2 | 1.20 | 1.60 | 0.047 | 0.063 |
| L | 12.60 | 13.40 | 0.496 | 0.528 |
| L1 | 2.45 | 2.95 | 0.096 | 0.116 |
| L2 | 3.45 | 3.95 | 0.136 | 0.156 |
| L3 | 8.15 | 8.65 | 0.321 | 0.341 |
| ϕ | 3.50 | 3.90 | 0.138 | 0.154 |

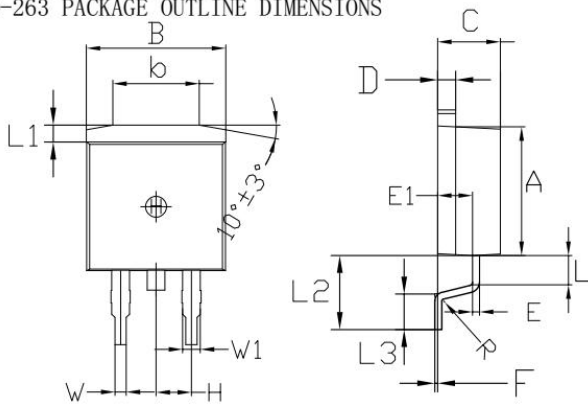
ITO-220 PACKAGE OUTLINE DIMENSIONS



| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|--------|---------------------------|-------|----------------------|-------|
| | min. | max. | min. | max. |
| A | 8.80 | 9.30 | 0.346 | 0.366 |
| B | 10.00 | 10.50 | 0.394 | 0.413 |
| C | 4.30 | 4.90 | 0.169 | 0.193 |
| D | 2.30 | 2.70 | 0.091 | 0.106 |
| L | 15.55 | 16.15 | 0.612 | 0.636 |
| h | 0.40 | 0.60 | 0.016 | 0.024 |
| L1 | 3.15 | 3.55 | 0.124 | 0.140 |
| L2 | 12.65 | 13.35 | 0.498 | 0.526 |
| W | 0.70 | 0.90 | 0.028 | 0.035 |
| W1 | 1.15 | 1.55 | 0.045 | 0.061 |
| H | 2.54 TYP | | 0.100 TYP | |
| E | 0.48 | 0.53 | 0.019 | 0.021 |
| ϕ | 2.90 | 3.40 | 0.114 | 0.134 |
| E1 | 2.40 | 2.90 | 0.094 | 0.114 |
| F | 7.75 | 8.25 | 0.305 | 0.325 |
| F1 | 7.35 | 7.85 | 0.289 | 0.309 |

Dimensions

TO-263 PACKAGE OUTLINE DIMENSIONS



| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|--------|---------------------------|-------|----------------------|--------|
| | min. | max. | min. | max. |
| A | 8.80 | 9.30 | 0.346 | 0.366 |
| B | 9.70 | 10.30 | 0.382 | 0.406 |
| C | 4.25 | 4.75 | 0.167 | 0.187 |
| D | 1.20 | 1.45 | 0.047 | 0.057 |
| E | 0.40 | 0.60 | 0.016 | 0.024 |
| L | 1.90 | 2.30 | 0.075 | 0.091 |
| L1 | 1.15 | 1.45 | 0.045 | 0.057 |
| R | 0.24 | 0.26 | 0.0095 | 0.0102 |
| W | 0.80 | 0.82 | 0.0315 | 0.0323 |
| W1 | 1.20 | 1.30 | 0.047 | 0.051 |
| H | 2.54 TYP | | 0.200 TYP | |
| b | 5.50 | 6.50 | 0.216 | 0.256 |
| E1 | 2.4 | 2.6 | 0.0946 | 0.1024 |
| L2 | 5.20 | 5.80 | 0.205 | 0.228 |
| L3 | 2.20 | 3.20 | 0.087 | 0.126 |
| F | 0.03 | 0.23 | 0.0012 | 0.0091 |