# 800V 7A Super Junction Power MOSFET

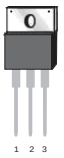
Product Summary

| $V_{DS}$ | $R_{DS(on)}$ (Ω) Typ | $I_D$ (A) | Qg (Typ) |
|---|---|---|---|
| 800V | 0. 75@ 10V | 7 | 25nc |

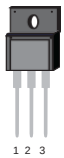
## Features:

- $R_{DS(ON)}$<0.85Ω@$V_{GS}$=10V
- 100% avalanche tested
- RoHS compliant

TO-220 KWSJ7N80



ITO-220 KWSJ7N80F



TO-263 KWSJ7N80D

## Mechanical Data:

- Case:TO-220,ITO-220,TO-251,TO-252,TO-263 package

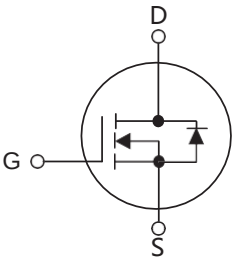
TO-251 KWSJ7N80N

TO-252 KWSJ7N80M

## Ordering Information

| Part No. | Package Type | Package | Quality(box) |
|---|---|---|---|
| KWSJ7N80 | TO-220 | Tube | 1000 |
| KWSJ7N80F | ITO-220 | Tube | 1000 |
| KWSJ7N80E | TO-263 | Tape & Reel | 800 |
| KWSJ7N80M | TO-252 | Tape & Reel | 3000 |
| KWSJ7N80N | TO-251 | Tube | 1000 |

## Block Diagram




Pin Definition:

1. Gate
2. Drain
3. Source

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

| Parameter | | Symbol | TO-220/TO-263 TO-251/TO-252 | ITO-220 | Unit |
|---|---|---|---|---|---|
| Drain-Source Voltage | | $V_{DS}$ | 800 | | V |
| Gate-Source Voltage | | $V_{GS}$ | ±30 | | V |
| Continuous Drain Current | $T_C$=25°C | $I_D$ | 7 | | A |
| | $T_C$=100°C | | 5.5 | | |
| Pulsed Drain Current (Note 1) | | $I_{DM}$ | 15 | | A |
| Single Pulse Avalanche Energy(Note 2) | | $E_{AS}$ | 60 | | mJ |
| Avalanche Current(Note 1) | | $I_{AR}$ | 2 | | A |
| Repetitive Avalanche Energy(Note 1) | | $E_{AR}$ | 0.3 | | mJ |
| Peak Diode Recovery dv/dt(Note 3) | | dv/dt | 15 | | V/ns |
| Drain Source voltage slope(Vds=480V) | | dVds/dt | 50 | | V/ns |
| Power Dissipation $T_C$=25°C | | $P_D$ | 37 | 26 | W |
| Operating Junction and Storage Temperature | | $T_J$/$T_{STG}$ | -55 ~ +150 | | °C |
| Maximum Temperature for soldering | | $T_L$ | 300 | | °C |

Table 2.Thermal Characteristics

| Parameter | Symbol | TO-220/TO-263 | ITO-220 | Unit |
|---|---|---|---|---|
| Thermal resistance Junction to Ambient | $R_{\theta JA}$ | 62 | 62 | °C/W |
| Thermal resistance Junction to Case | $R_{\theta JC}$ | 0. 82 | 3. 57 | °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 | 800 | -- | -- | V |
| Drain-Source Leakage Current | | $I_{DSS}$ | $V_{DS}$=800V,$V_{GS}$=0V | -- | -- | 1 | μA |
| Gate- Source Leakage Current | Forward | $I_{GSS}$ | $V_{GS}$=30V,$V_{DS}$=0V | -- | -- | 100 | nA |
| | Reverse | | $V_{GS}$=-30V,$V_{DS}$=0V | -- | -- | -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,$I_D$=3.5A | -- | 0.75 | 0.85 | Ω |
| Dynamic Characteristics(Note 5) | | | | | | | |
| Input Capacitance | | $C_{ISS}$ | $V_{DS}$=25V,$V_{GS}$=0V,f=1MHz | -- | 380 | -- | pF |
| Output Capacitance | | $C_{OSS}$ | | -- | 110 | -- | pF |
| Reverse Transfer Capacitance | | $C_{RSS}$ | | -- | 7 | -- | pF |
| Switching Characteristics (Note 5) | | | | | | | |
| Turn-On Delay Time | | td(on) | $V_{DD}$=400V,$I_D$=3.5A, $R_G$=20Ω | -- | 13 | -- | ns |
| Turn-On Rise Time | | $t_R$ | | -- | 10 | -- | ns |
| Turn-Off Delay Time | | td(off) | | -- | 85 | -- | ns |
| Turn-Off Fall Time | | tf | | -- | 14 | -- | ns |
| Total Gate Charge | | $Q_G$ | $V_{DS}$=480V,$I_D$=3.5A, $V_{GS}$=10V | -- | 25 | -- | nC |
| Gate-Source Charge | | $Q_{GS}$ | | -- | 2.0 | -- | nC |
| Gate-Drain Charge | | $Q_{GD}$ | | -- | 2.7 | -- | nC |
| Drain-Source Diode Characteristics and Maximum Ratings | | | | | | | |
| Drain-Source Diode Forward Voltage | | $V_{SD}$ | $V_{GS}$=0V, $I_S$=3. 5A | -- | -- | 1.5 | V |
| Maximum Continuous Drain-Source Diode Forward Current | | $I_S$ | | -- | -- | 7 | A |
| Reverse Recovery Time | | trr | $V_{GS}$=0V, $I_F$=3. 5A dI$_F$/dt=100A/μs (Note 1) | -- | 190 | -- | ns |
| Reverse Recovery Charge | | $Q_{RR}$ | | -- | 2300 | -- | nC |

Notes：1 Repetitive Rating:Pulse width limited by maximum junction temperature 2
$I_{AS}$=1.7A,$V_{DD}$=50V,Starting $T_J$=25°C
3 $I_{SD}$≤$I_D$,di/dt≤200A/μs,$V_{DD}$≤BVDSS,Starting TJ=25°C
4 Pulse Test: Pulse width ≤300μS, Duty cycle≤2%
5 Guaranteed by design,not subject to production

## Typical characteristics Diagrams

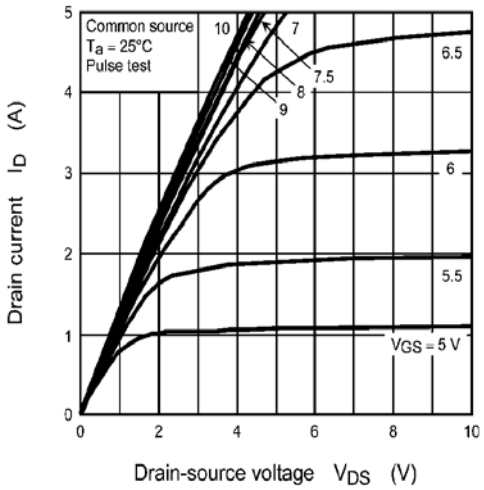



Figure 1: On-Region Characteristics@25°C

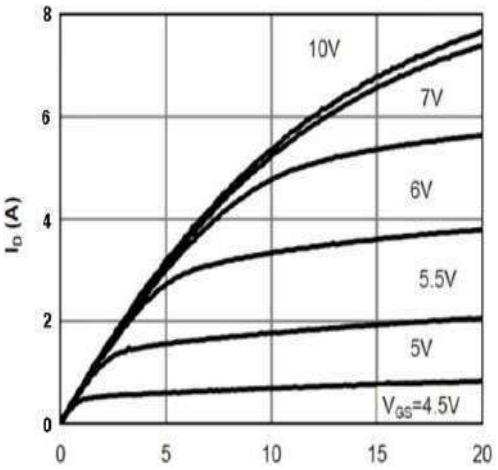



Figure 2: On-Region Characteristics@125°C

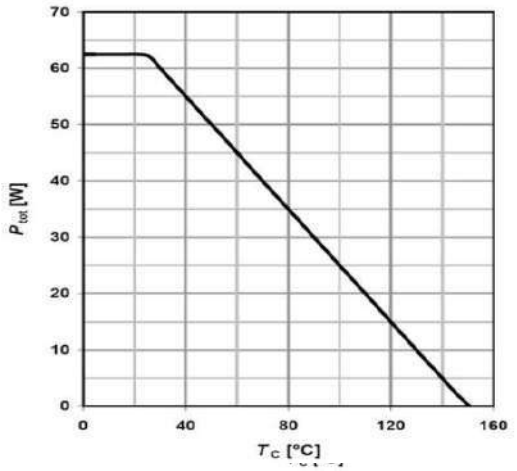



Figure 3:Power Dissipation
TO-252 , TO-251

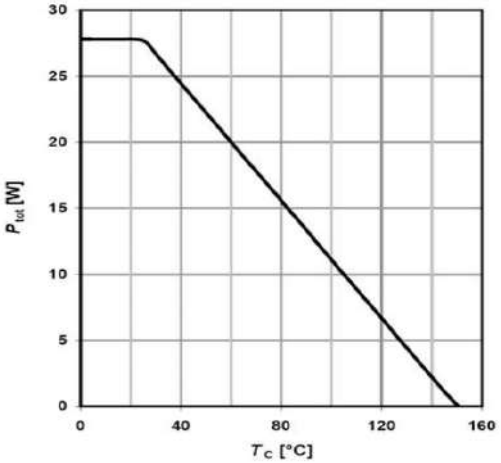



Figure 4 : Power dissipation
TO-220FullPAK

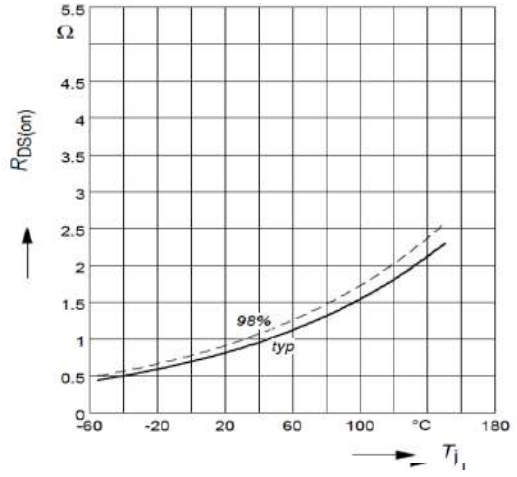



Figure 5: On-Resistance vs. Junction Temperature

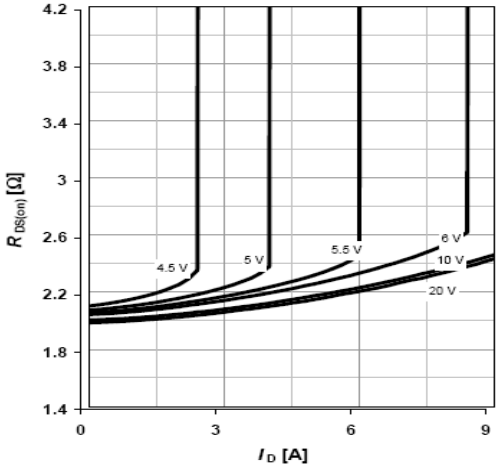



Figure 6: On-Resistance vs. Drain Current, Tj=150°C

## Typical characteristics Diagrams

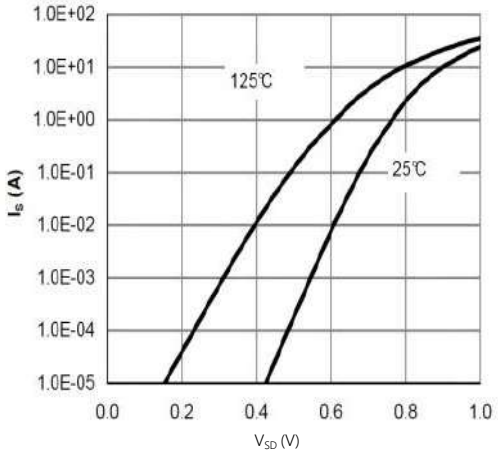



Figure 7: Body-Diode Characteristics

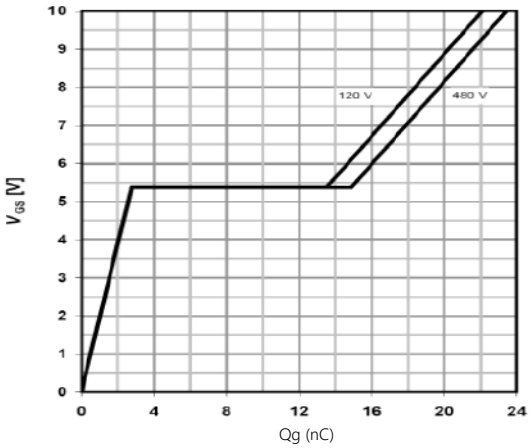



Figure 8: Gate-Charge Characteristics

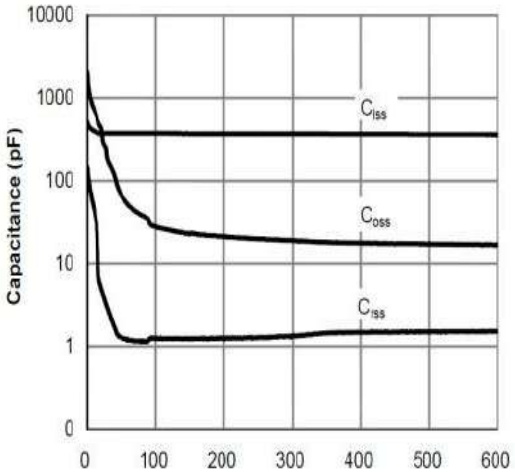



Figure 9: Capacitance Characteristics

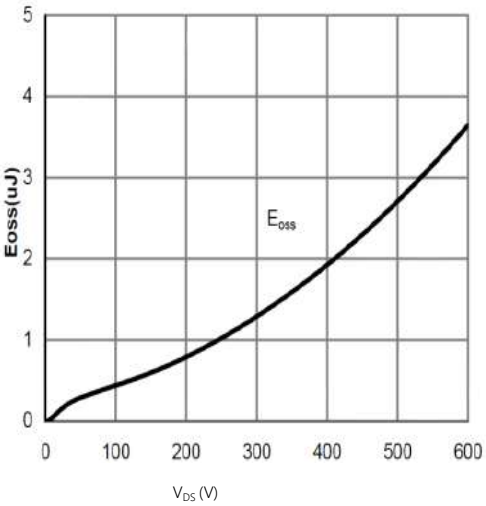



Figure 10: $C_{oss}$ stored Energy

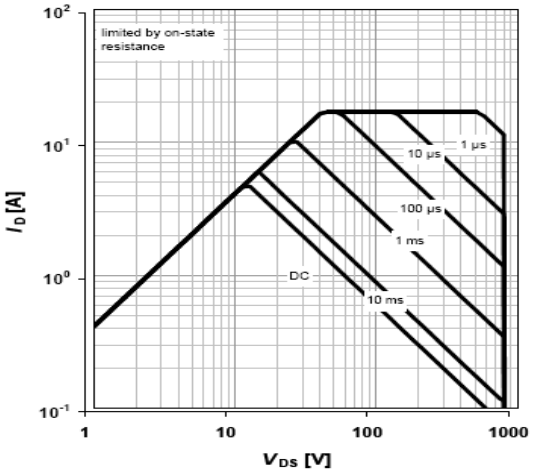



Figure 11: Maximum Forward Biased Safe Operating Area
Tc=25°C (TO-252 , TO-251)

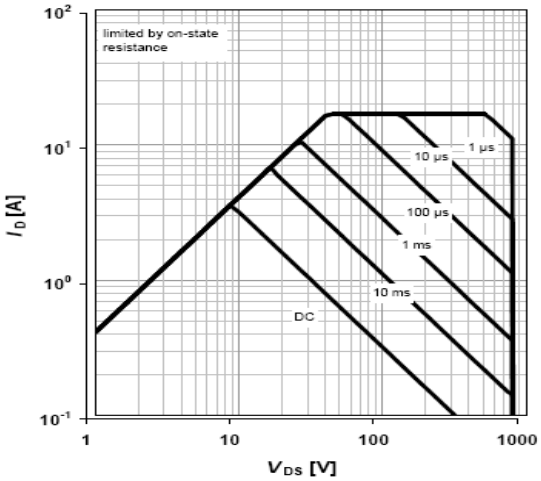



Figure 12: Maximum Forward Biased Safe Operating Area
Tc=25°C (ITO-220 )

## Typical characteristics Diagrams

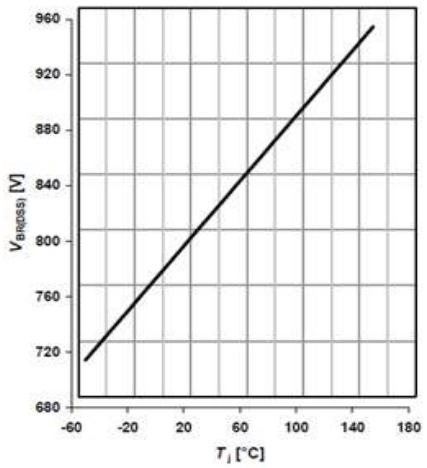



Figure 13: Drain-Source breakdown voltage

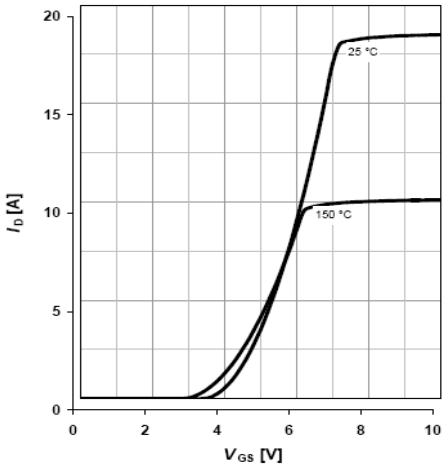



Figure 14: Typical transfer characteristics

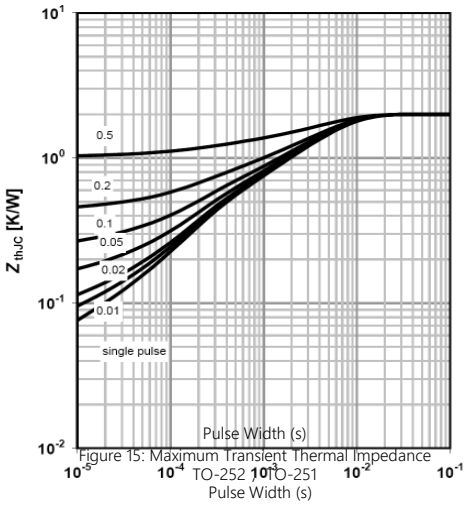



Figure 15: Maximum Transient Thermal Impedance
TO-252 ,TO-251

Pulse Width (s)

Figure 15: Maximum Transient Thermal Impedance

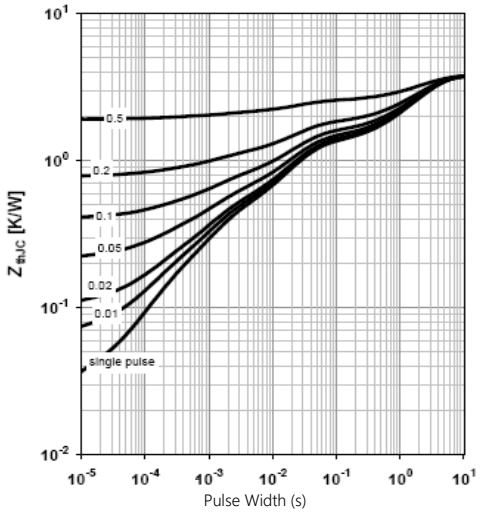



Figure 16: Maximum Transient Thermal Impedance

ITO-220

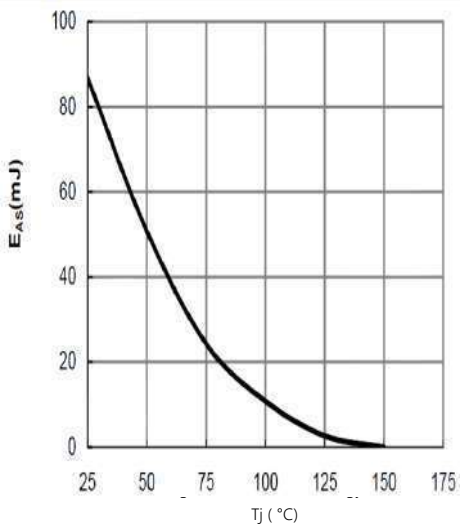
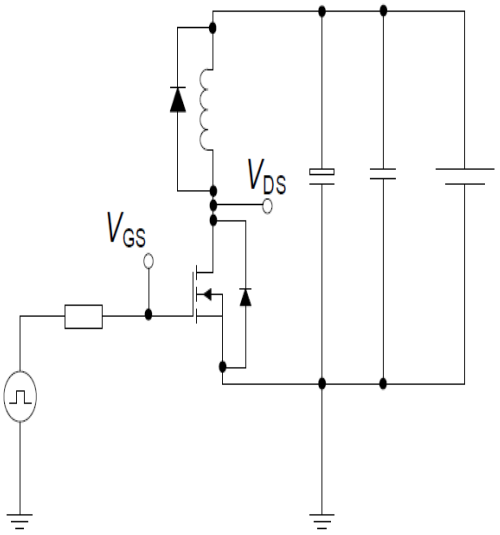



Figure 17: Avalanche energy

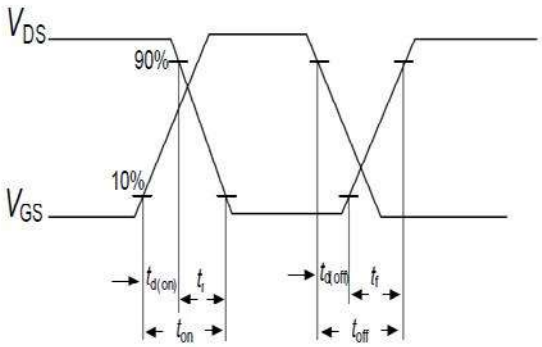
## Test circuits

Switching times test circuit and waveform for inductive load

Switching times test circuit for inductive load

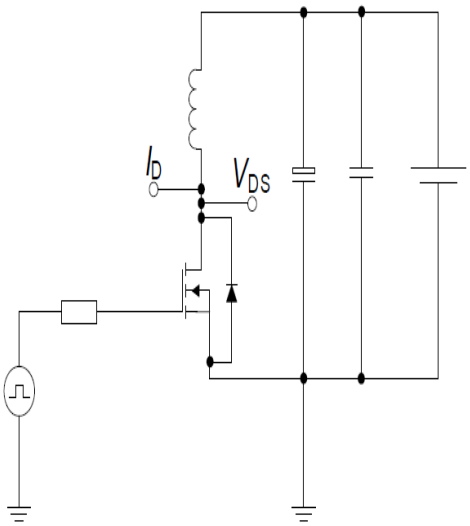



Switching time waveform

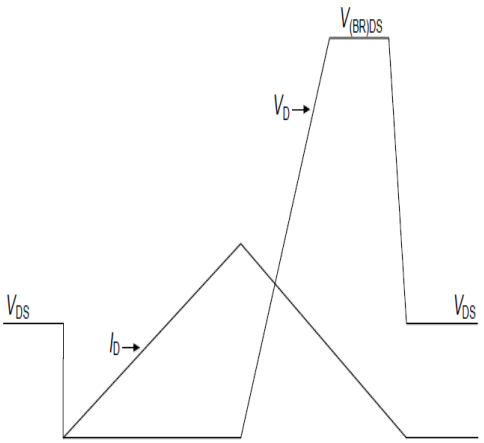



Unclamped inductive load test circuit and waveform

Unclamped inductive load test circuit

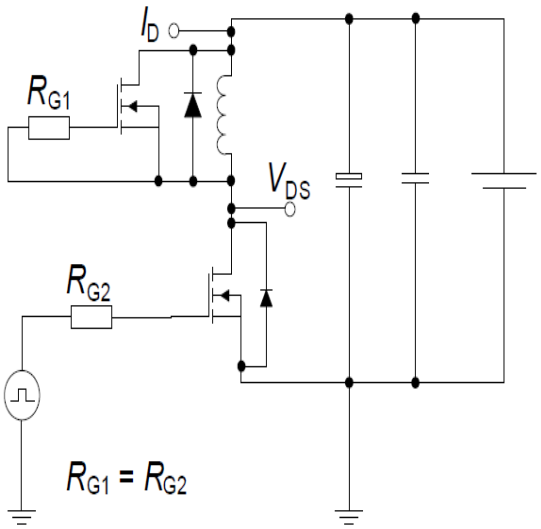



Unclamped inductive waveform

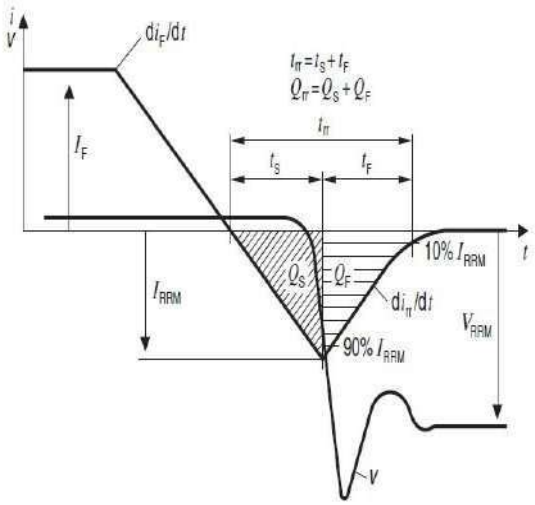


Test circuit and waveform for diode characteristics

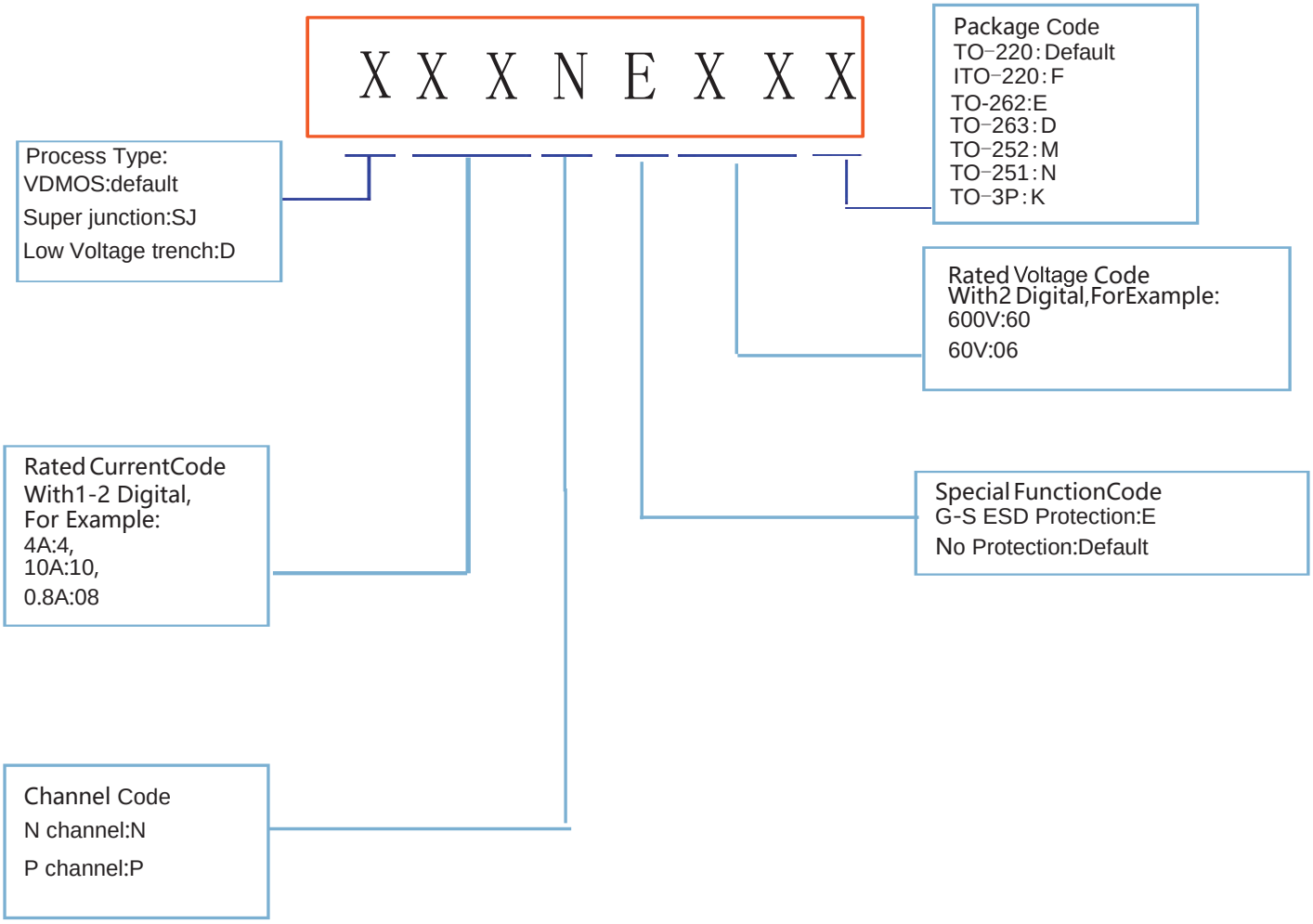
Test circuit for diode characteristics




Diode recovery waveform

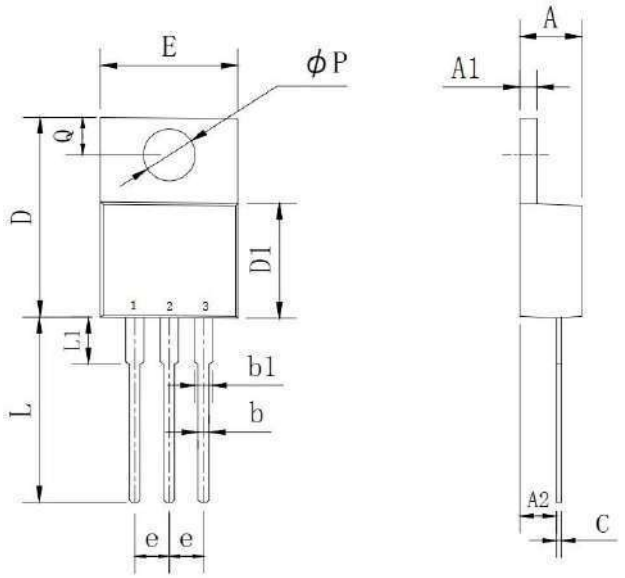


## Product Names Rules



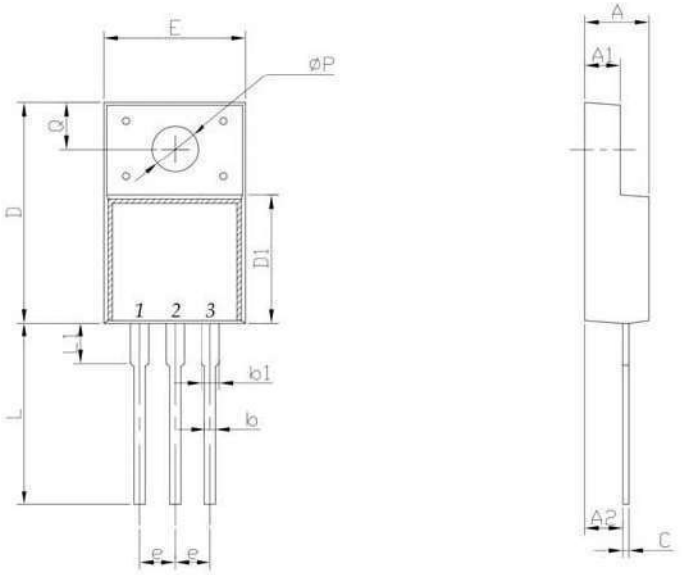
## Dimensions

### TO-220 PACKAGE OUTLINE DIMENSIONS




| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|---|---|---|---|---|
| | MIN | MAX | MIN | MAX |
| A | 4.25 | 4.87 | 0.167 | 0.192 |
| A1 | 1.07 | 1.47 | 0.042 | 0.058 |
| A2 | 2.03 | 2.92 | 0.080 | 0.115 |
| b | 0.51 | 1.11 | 0.020 | 0.044 |
| b1 | 0.97 | 1.6 | 0.038 | 0.063 |
| C | 0.3 | 0.7 | 0.012 | 0.028 |
| D | 14.6 | 15.9 | 0.575 | 0.626 |
| D1 | 8.04 | 9.3 | 0.317 | 0.366 |
| E | 9.57 | 10.57 | 0.377 | 0.416 |
| e | 2.34 | 2.74 | 0.092 | 0.108 |
| L | 12.58 | 14.3 | 0.495 | 0.563 |
| L1 | 2.8 | 4.2 | 0.110 | 0.165 |
| P | 3.4 | 4.14 | 0.134 | 0.163 |
| Q | 2.45 | 3 | 0.096 | 0.118 |

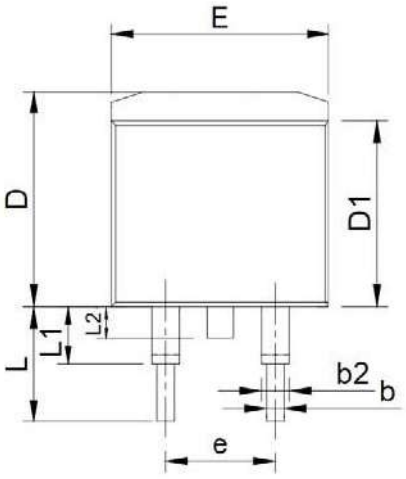
### ITO-220 PACKAGE OUTLINE DIMENSIONS

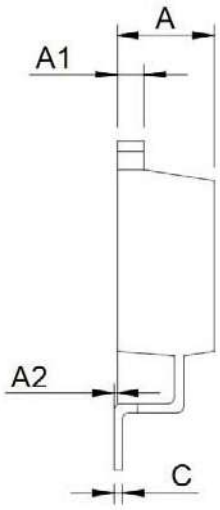



| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|---|---|---|---|---|
| | MIN | MAX | MIN | MAX |
| A | 4.24 | 4.9 | 0.167 | 0.193 |
| A1 | 2.3 | 2.92 | 0.091 | 0.115 |
| A2 | 2.61 | 2.81 | 0.103 | 0.111 |
| b | 0.3 | 1 | 0.012 | 0.039 |
| b1 | 0.9 | 1.55 | 0.035 | 0.061 |
| C | 0.3 | 0.7 | 0.012 | 0.028 |
| D | 14.5 | 16.36 | 0.571 | 0.644 |
| D1 | 8.8 | 9.41 | 0.346 | 0.370 |
| E | 9.5 | 10.5 | 0.374 | 0.413 |
| e | 2.3 | 2.75 | 0.091 | 0.108 |
| L | 12.6 | 14 | 0.496 | 0.551 |
| L1 | 2.45 | 4.3 | 0.096 | 0.169 |
| P | 2.9 | 3.8 | 0.114 | 0.150 |
| Q | 2.5 | 3.55 | 0.098 | 0.140 |

## Dimensions

TO-263 PACKAGE OUTLINE DIMENSIONS

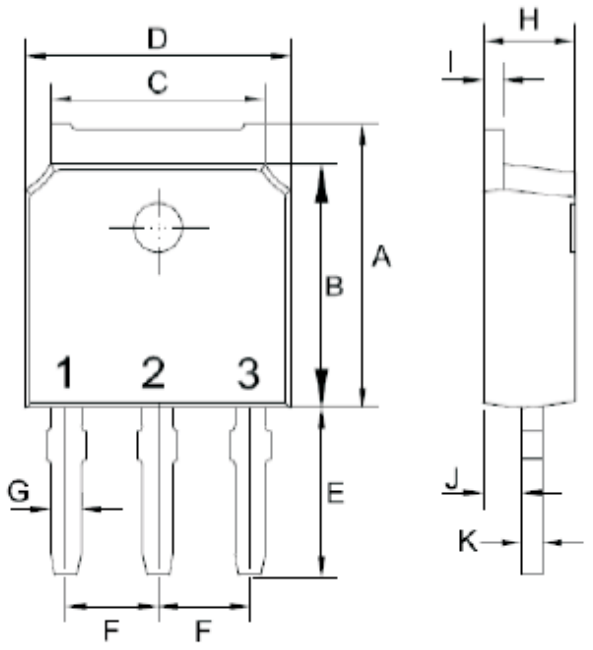



| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|---|---|---|---|---|
| | MIN | MAX | MIN | MAX |
| A | 4.25 | 4.87 | 0.167 | 0.192 |
| A1 | 1.07 | 1.47 | 0.042 | 0.058 |
| A2 | 0 | 0.25 | 0.000 | 0.010 |
| b | 0.61 | 1.01 | 0.024 | 0.040 |
| b1 | 1.2 | 1.34 | 0.047 | 0.053 |
| C | 0.3 | 0.6 | 0.012 | 0.024 |
| D | 9.48 | 10.84 | 0.373 | 0.427 |
| D1 | 8.49 | 9.3 | 0.334 | 0.366 |
| E | 9.7 | 10.31 | 0.382 | 0.406 |
| e | 4.88 | 5.28 | 0.192 | 0.208 |
| L | 4.46 | 5.85 | 0.176 | 0.230 |
| L1 | 1.33 | 2.33 | 0.052 | 0.092 |
| L2 | 0 | 2.2 | 0.000 | 0.087 |

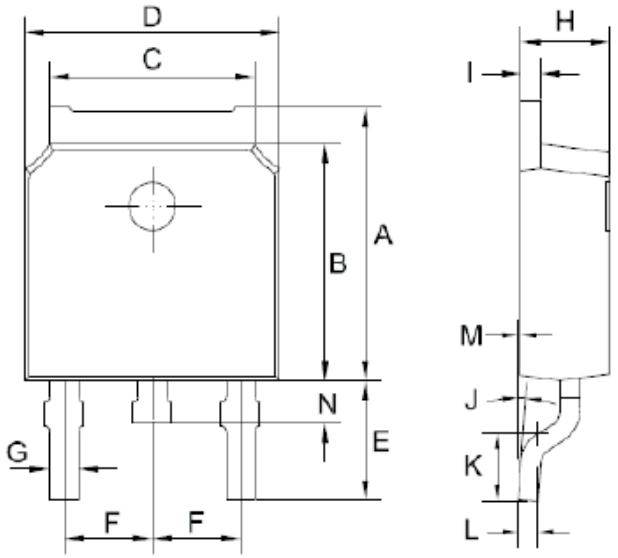
## Dimensions

### TO-251 PACKAGE OUTLINE DIMENSIONS




| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|---|---|---|---|---|
| | MIN | MAX | MIN | MAX |
| A | 6.85 | 7.25 | 0.270 | 0.285 |
| B | 5.8 | 6.3 | 0.228 | 0.248 |
| C | 5 | 5.53 | 0.197 | 0.218 |
| D | 6.3 | 6.8 | 0.248 | 0.268 |
| E | 3.5 | 4.35 | 0.138 | 0.171 |
| F | 2.19 | 2.39 | 0.086 | 0.094 |
| G | 0.45 | 0.85 | 0.018 | 0.033 |
| H | 2.2 | 2.4 | 0.087 | 0.094 |
| I | 0.41 | 0.61 | 0.016 | 0.024 |
| J | 0.71 | 1.31 | 0.028 | 0.052 |
| K | 0.41 | 0.61 | 0.016 | 0.024 |

### TO-252 PACKAGE OUTLINE DIMENSIONS




| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|---|---|---|---|---|
| | MIN | MAX | MIN | MAX |
| A | 6.85 | 7.25 | 0.270 | 0.285 |
| B | 5.8 | 6.3 | 0.228 | 0.248 |
| C | 5 | 5.53 | 0.197 | 0.218 |
| D | 6.3 | 6.8 | 0.248 | 0.268 |
| E | 2.6 | 3.3 | 0.102 | 0.130 |
| F | 2.19 | 2.39 | 0.086 | 0.094 |
| G | 0.45 | 0.85 | 0.018 | 0.033 |
| H | 2.2 | 2.4 | 0.087 | 0.094 |
| I | 0.41 | 0.61 | 0.016 | 0.024 |
| J | 0 | 8 | 0 | 8 |
| K | 1.45 | 1.85 | 0.057 | 0.073 |
| L | 0.41 | 0.61 | 0.016 | 0.024 |
| M | 0 | 0.12 | 0.000 | 0.005 |
| N | 0.6 | 1 | 0.024 | 0.039 |