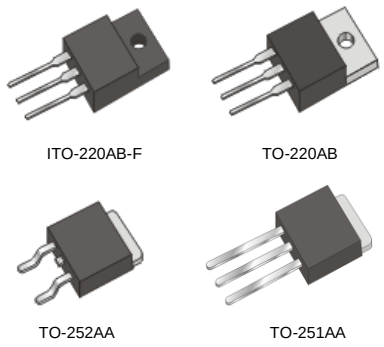
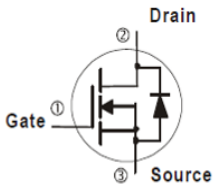
# PJU60R980E / PJD60R980E / PJP60R980E / PJF60R980E

## 600V N-Channel Super Junction MOSFET

| Voltage | 600 V | Current | 4 A |
|---|---|---|---|




### Features

- $R_{DS(ON)}$, $V_{GS}$@10V, $I_D$@1.5A<0.98Ω
- Fast switching speed
- Low on-resistance
- Low Noise
- Lead free in compliance with EU RoHS 2.0
- Green molding compound as per IEC 61249 standard

### Mechanical Data

- Case : TO-251AA, TO-252AA, TO-220AB, ITO-220AB-F
- Terminals : Solderable per MIL-STD-750, Method 2026
- TO-251AA Approx. Weight : 0.0104 ounces, 0.297grams
- TO-252AA Approx. Weight : 0.0104 ounces, 0.297grams
- TO-220AB Approx. Weight : 0.067 ounces, 1.89 grams
- ITO-220AB-F Approx. Weight : 0.068 ounces, 2 grams

### Maximum Ratings and Thermal Characteristics ($T_A$=25°C unless otherwise noted)

| PARAMETER | | SYMBOL | TO-251AA | TO-220AB | ITO-220AB-F | TO-252AA | UNITS |
|---|---|---|---|---|---|---|---|
| Drain-Source Voltage | | $V_{DS}$ | 600 | | | | V |
| Gate-Source Voltage | | $V_{GS}$ | ±20 | | | | V |
| Continuous Drain Current (Note 4) | $T_C$=25°C | $I_D$ | 4 | | | | A |
| | $T_C$=100°C | | 2.2 | | | | A |
| Pulsed Drain Current (Note 1) | | $I_{DM}$ | 8 | | | | A |
| Power Dissipation (Note 3) | $T_C$=25°C | $P_D$ | 58 | 58 | 40 | 58 | W |
| | $T_C$=100°C | | 23 | 23 | 16 | 23 | W |
| Continuous Drain Current (Note 4) | $T_A$=25°C | $I_D$ | 0.8 | | | | A |
| | $T_A$=70°C | | 0.65 | | | | A |
| Power Dissipation | $T_A$=25°C | $P_D$ | 2 | 2 | 1.04 | 2 | W |
| | $T_A$=70°C | | 1.3 | 1.3 | 0.9 | 1.3 | W |
| Single Pulse Avalanche Energy (Note 6) | | $E_{AS}$ | 32 | | | | mJ |
| Operating Junction and Storage Temperature Range | | $T_J$,$T_{STG}$ | -55~150 | | | | °C |
| Typical Thermal Resistance (Note 4,5) | | $R_{\theta JC}$ | 2.16 | 2.16 | 3.13 | 2.16 | °C/W |
| | | $R_{\theta JA}$ | 62.5 | 62.5 | 120 | 62.5 | °C/W |

- Limited only By Maximum Junction Temperature

# PJU60R980E / PJD60R980E / PJP60R980E / PJF60R980E

## Electrical Characteristics ($T_A$=25°C unless otherwise noted)

| PARAMETER | SYMBOL | TEST CONDITION | MIN. | TYP. | MAX. | UNITS |
|---|---|---|---|---|---|---|
| **Static** | | | | | | |
| Drain-Source Breakdown Voltage | $BV_{DSS}$ | $V_{GS}$=0V, $I_D$=250uA | 600 | - | - | V |
| Gate Threshold Voltage | $V_{GS(th)}$ | $V_{DS}$=$V_{GS}$, $I_D$=250uA | 2 | 3.3 | 4 | |
| Drain-Source On-State Resistance | $R_{DS(on)}$ | $V_{GS}$=10V, $I_D$=1.5A | - | 0.89 | 0.98 | Ω |
| Zero Gate Voltage Drain Current | $I_{DSS}$ | $V_{DS}$=600V, $V_{GS}$=0V | - | - | 1 | uA |
| Gate-Source Leakage Current | $I_{GSS}$ | $V_{GS}$=±20V, $V_{DS}$=0V | - | - | ±100 | nA |
| Diode Forward Voltage | $V_{SD}$ | $I_S$=4A, $V_{GS}$=0V | - | 0.92 | 1.5 | V |
| Transconductance | $G_{FS}$ | $V_{DS}$=10V, $I_D$=2A | - | 3 | - | S |
| **Dynamic** (Note 7) | | | | | | |
| Total Gate Charge | $Q_g$ | $V_{DS}$=300V, $I_D$=4A, $V_{GS}$=10V (Note 2,3) | - | 14.4 | - | nC |
| Gate-Source Charge | $Q_{gs}$ | | - | 2.1 | - | |
| Gate-Drain Charge | $Q_{gd}$ | | - | 7.8 | - | |
| Gate Input Resistance | $R_g$ | F = 1MHz | - | 16.7 | - | Ω |
| Input Capacitance | Ciss | $V_{DS}$=25V, $V_{GS}$=0V, f=1MHZ | - | 300 | - | pF |
| Output Capacitance | Coss | | - | 311 | - | |
| Reverse Transfer Capacitance | Crss | | - | 41.7 | - | |
| Turn-On Delay Time | $td_{(on)}$ | $V_{DD}$=300V, $I_D$=2A, $R_G$=10Ω (Note 2,3) | - | 9 | - | ns |
| Turn-On Rise Time | $t_r$ | | - | 24 | - | |
| Turn-Off Delay Time | $td_{(off)}$ | | - | 52 | - | |
| Turn-Off Fall Time | $t_f$ | | - | 26 | - | |
| **Drain-Source Diode** | | | | | | |
| Maximum Continuous Drain-Source Diode Forward Current | $I_S$ | --- | - | - | 4 | A |
| Maximum Pulsed Drain-Source Diode Forward Current | $I_{SM}$ | --- | - | - | 8 | |
| Reverse Recovery Time | trr | $V_{GS}$=0V, $I_S$=4A $dI_F$/ dt=100A/us (Note 2) | - | 266 | - | ns |
| Reverse Recovery Charge | Qrr | | - | 2.05 | - | uC |

NOTES :

1. Pulse width≤300us, Duty cycle≤2%.
2. Essentially independent of operating temperature typical characteristics.
3. Repetitive rating, pulse width limited by junction temperature $T_{J(MAX)}$=150°C. Ratings are based on low frequency and duty cycles to keep initial $T_J$ =25°C.
4. The maximum current rating is package limited.
5. TO-252AA and TO-251AA mounted on a 1 inch2 with 2oz.square pad of copper.
6. L=100mH, $I_{AS}$=0.8A, $V_{DD}$=50V, $R_G$=25ohm, Starting $T_J$=25°C.
7. Guaranteed by design, not subject to production testing.

# PJU60R980E / PJD60R980E / PJP60R980E / PJF60R980E

## TYPICAL CHARACTERISTIC CURVES

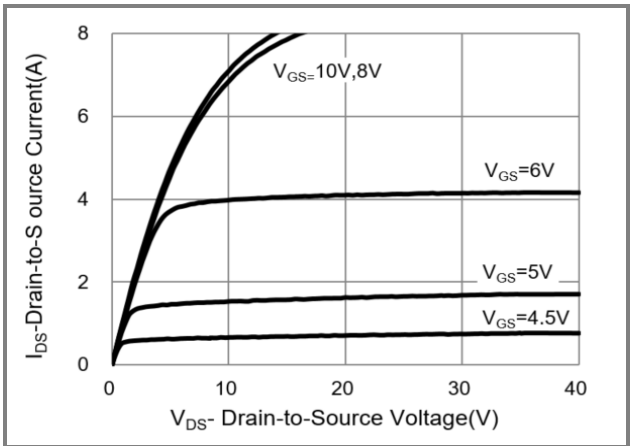



Fig.1 Output Characteristics

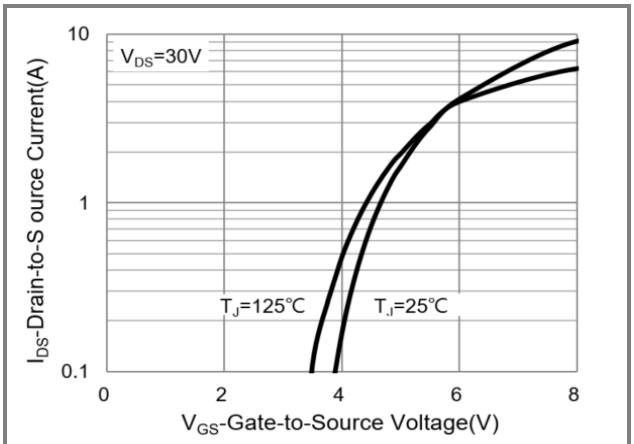



Fig.2 Transfer Characteristics

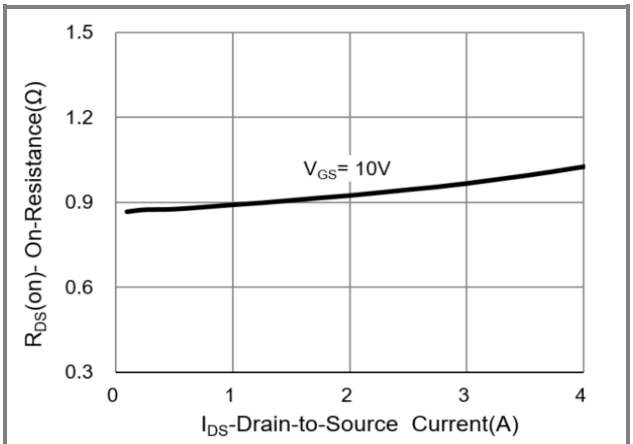



Fig.3 On-Resistance vs. Drain Current

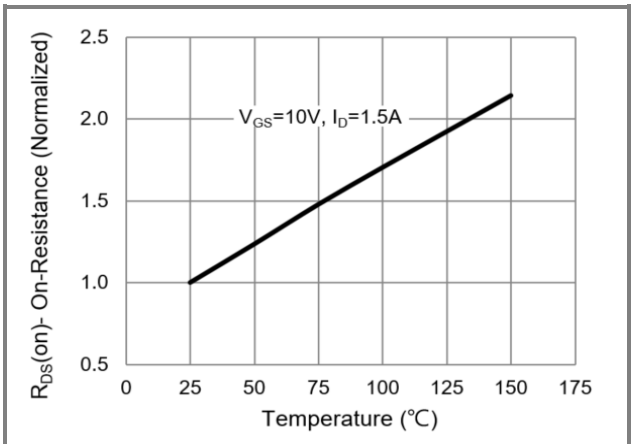



Fig.4 On-Resistance vs. Junction Temperature

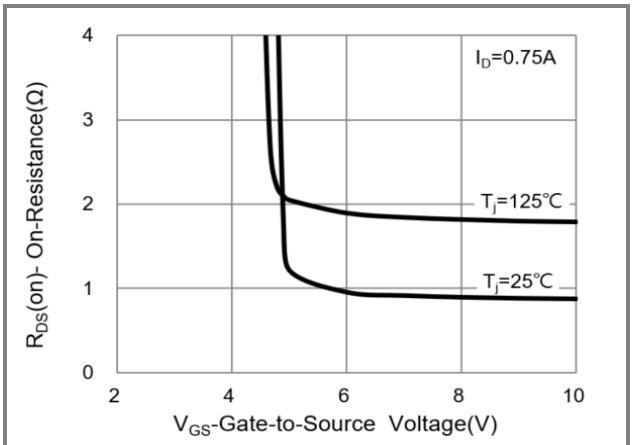



Fig.5 On-Resistance Variation with $V_{GS}$

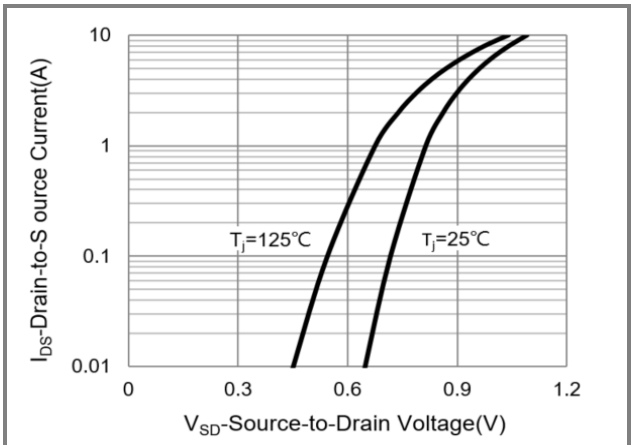



Fig.6 Source-Drain Diode Forward Voltage

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## TYPICAL CHARACTERISTIC CURVES

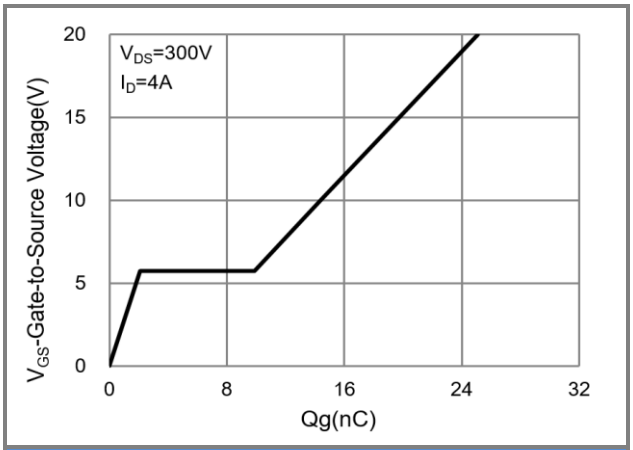



Fig.7 Gate-Charge Characteristics

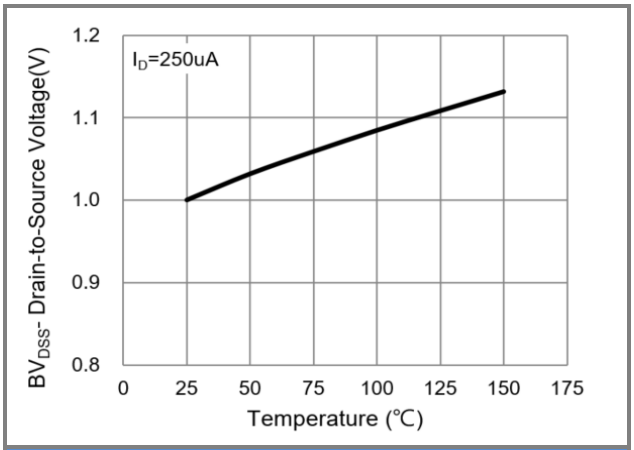



Fig.8 Breakdown Voltage Variation vs. Temperature

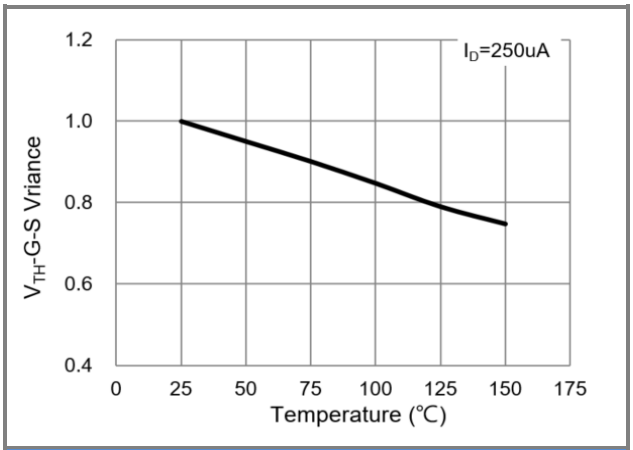



Fig.9 Threshold Voltage Variation with Temperature

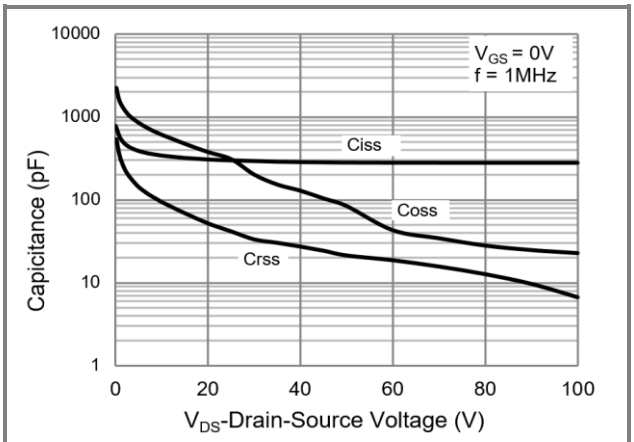



Fig.10 Capacitance vs. Drain-Source Voltage

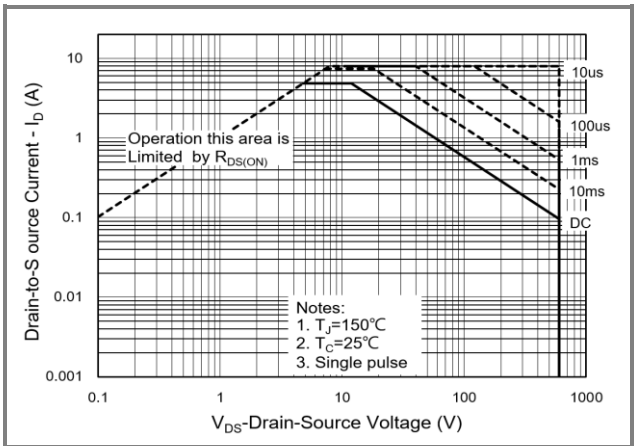



Fig.11 PJU/PJD Maximum Safe Operating Area

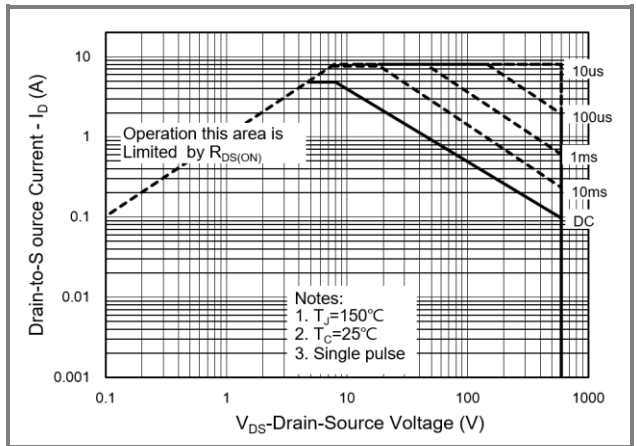



Fig.12 PJP Maximum Safe Operating Area

# PJU60R980E / PJD60R980E / PJP60R980E / PJF60R980E

## TYPICAL CHARACTERISTIC CURVES

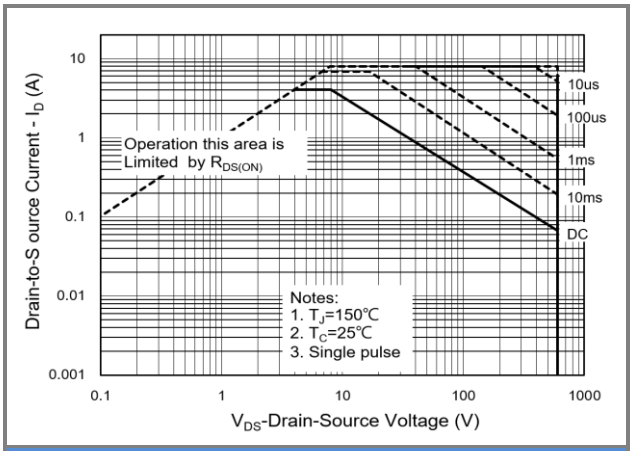



Fig.13 PJF Maximum Safe Operating Area

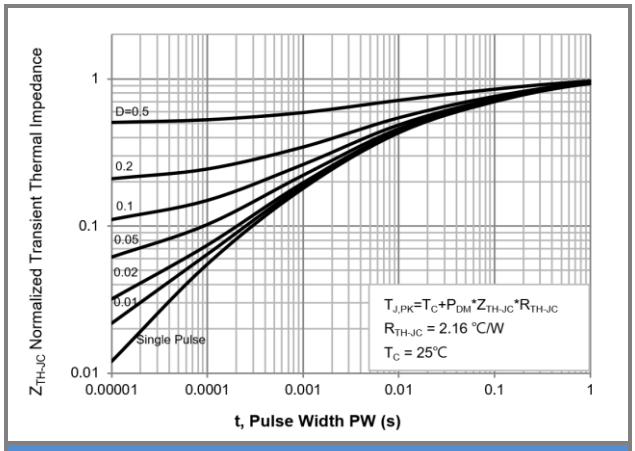



Fig.14 PJU/D Normalized Transient Thermal Impedance

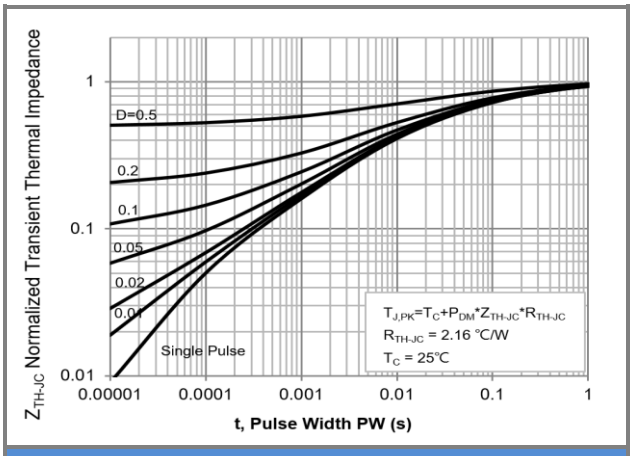



Fig.15 PJP Normalized Transient Thermal Impedance

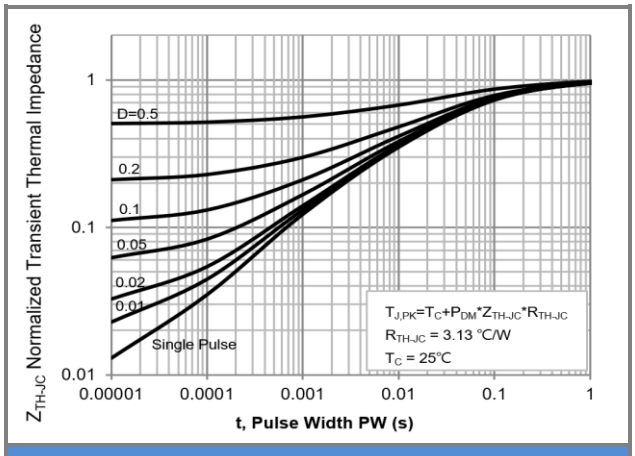



Fig.16 PJF Normalized Transient Thermal Impedance

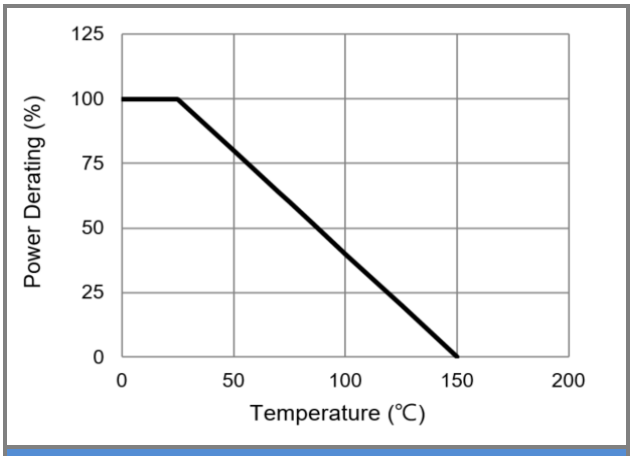


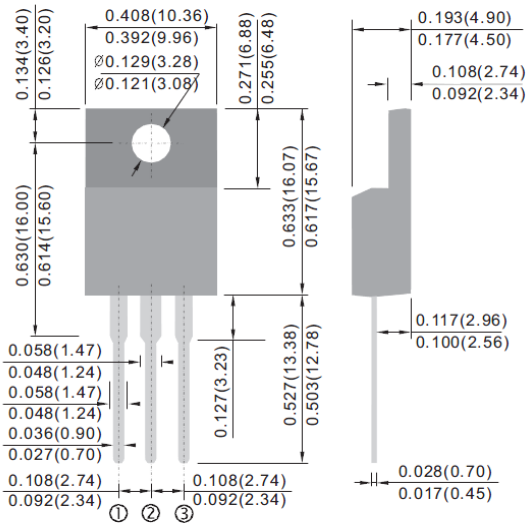

Fig.17 Total Power Dissipation

# PJU60R980E / PJD60R980E / PJP60R980E / PJF60R980E

## Packaging Information

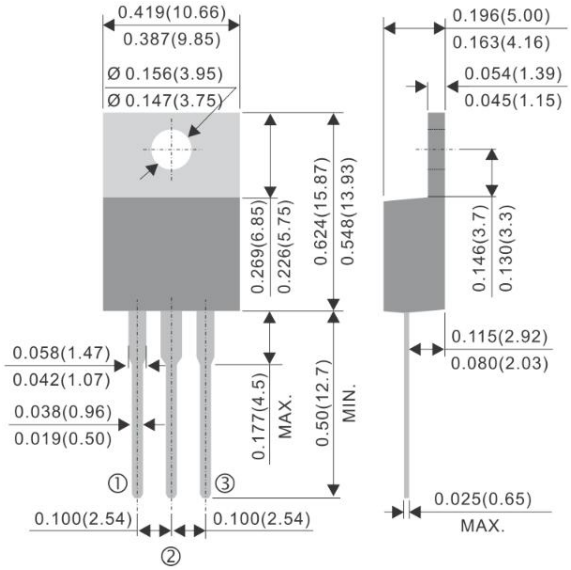
### ITO-220AB-F Dimension

Unit: inch(mm)



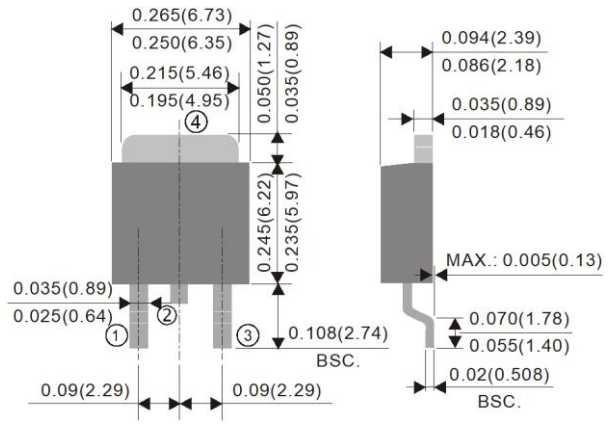

### TO-220AB Dimension

Unit: inch(mm)



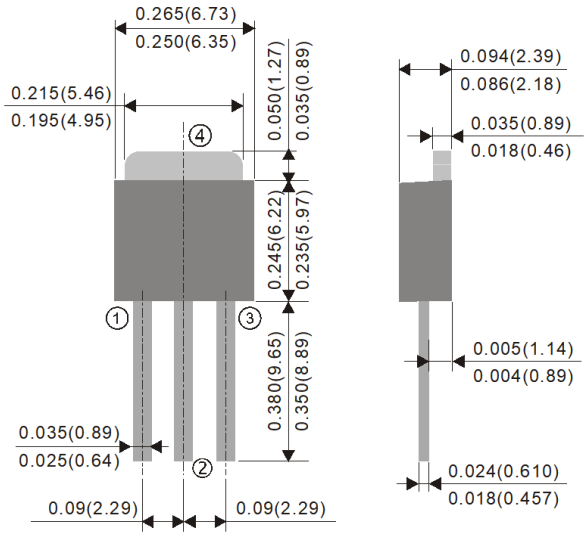

### TO-252AA Dimension

Unit: inch(mm)




### TO-251AA Dimension

Unit: inch(mm)



# PJU60R980E / PJD60R980E / PJP60R980E / PJF60R980E

## Part No Packing Code Version

| Part No Packing Code | Package Type | Packing Type | Marking | Version |
|---|---|---|---|---|
| PJU60R980E_T0_00001 | TO-251AA | 80pcs / Tube | 60R980E | Halogen free |
| PJD60R980E_L2_00001 | TO-252AA | 3,000pcs / 13” reel | 60R980E | Halogen free |
| PJP60R980E_T0_00001 | TO-220AB | 50pcs / Tube | 60R980E | Halogen free |
| PJF60R980E_T0_00001 | ITO-220AB-F | 50pcs / Tube | 60R980E | Halogen free |

# PJU60R980E / PJD60R980E / PJP60R980E / PJF60R980E

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