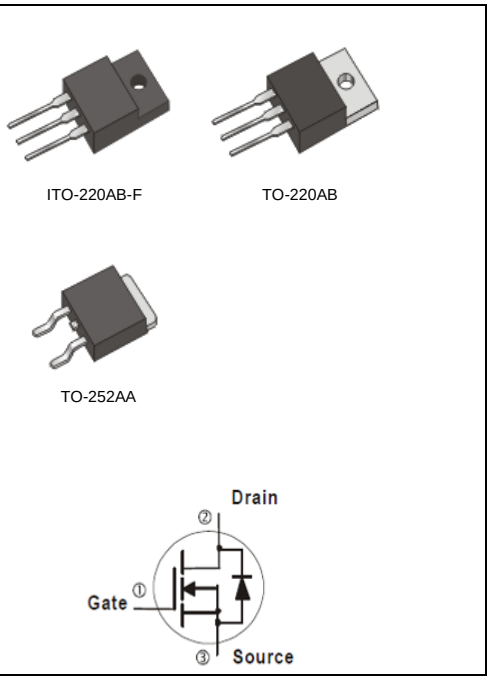
# PJD60R540E / PJP60R540E / PJF60R540E

## 600V N-Channel Super Junction MOSFET

| Voltage | 600 V | Current | 9 A |
|---|---|---|---|




### Features

- $R_{DS(ON)}$, $V_{GS}$@10V, $I_D$@2.8A<0.535Ω
- 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-252AA, TO-220AB, ITO-220AB-F
- Terminals : Solderable per MIL-STD-750, Method 2026
- 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-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 | $I_D$ | 9 | | | A |
| | $T_C$=100°C | | 5 | | | A |
| Pulsed Drain Current (Note 1) | | $I_{DM}$ | 18 | | | A |
| Power Dissipation (Note 3) | $T_C$=25°C | $P_D$ | 94 | 48 | 94 | W |
| | $T_C$=100°C | | 38 | 19 | 38 | W |
| Continuous Drain Current (Note 4) | $T_A$=25°C | $I_D$ | 1.3 | | | A |
| | $T_A$=70°C | | 1 | | | A |
| Power Dissipation | $T_A$=25°C | $P_D$ | 2 | 1.04 | 2 | W |
| | $T_A$=70°C | | 1.3 | 0.9 | 1.3 | W |
| Single Pulse Avalanche Energy (Note 6) | | $E_{AS}$ | 98 | | | mJ |
| Operating Junction and Storage Temperature Range | | $T_J$,$T_{STG}$ | -55~150 | | | °C |
| Typical Thermal Resistance (Note 4,5) | | $R_{\theta JC}$ | 1.33 | 2.6 | 1.33 | °C/W |
| | | $R_{\theta JA}$ | 62.5 | 120 | 62.5 | °C/W |

- Limited only By Maximum Junction Temperature

# PJD60R540E / PJP60R540E / PJF60R540E

## 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 | 2.98 | 4 | |
| Drain-Source On-State Resistance | $R_{DS(on)}$ | $V_{GS}$=10V, $I_D$=2.8A | - | 0.45 | 0.535 | 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 | $V_{SD}$ | $I_S$=9A, $V_{GS}$=0V | - | 0.98 | 1.5 | V |
| Transconductance | $G_{FS}$ | $V_{DS}$=10V, $I_D$=4.5A | - | 4.5 | - | S |
| **Dynamic** (Note 7) | | | | | | |
| Total Gate Charge | $Q_g$ | $V_{DS}$=300V, $I_D$=9A, $V_{GS}$=10V (Note 2,3) | - | 23.7 | - | nC |
| Gate-Source Charge | $Q_{gs}$ | | - | 3.5 | - | |
| Gate-Drain Charge | $Q_{gd}$ | | - | 13.3 | - | |
| Gate Input Resistance | $R_g$ | F = 1MHz | - | 10.1 | - | Ω |
| Input Capacitance | Ciss | $V_{DS}$=25V, $V_{GS}$=0V, f=1MHZ | - | 531 | - | pF |
| Output Capacitance | Coss | | - | 547 | - | |
| Reverse Transfer Capacitance | Crss | | - | 69 | - | |
| Turn-On Delay Time | $td_{(on)}$ | $V_{DD}$=300V, $I_D$=4.5A, $R_G$=10Ω (Note 2,3) | - | 11 | - | ns |
| Turn-On Rise Time | $t_r$ | | - | 26 | - | |
| Turn-Off Delay Time | $td_{(off)}$ | | - | 69 | - | |
| Turn-Off Fall Time | $t_f$ | | - | 26 | - | |
| **Drain-Source Diode** | | | | | | |
| Maximum Continuous Drain-Source Diode Forward Current | $I_S$ | --- | - | - | 9 | A |
| Maximum Pulsed Drain-Source Diode Forward Current | $I_{SM}$ | --- | - | - | 18 | |
| Reverse Recovery Time | trr | $V_{GS}$=0V, $I_S$=9A | - | 354 | - | ns |
| Reverse Recovery Charge | Qrr | $dI_F$/ dt=100A/us (Note 2) | - | 4.3 | - | 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 mounted on a 1 inch2 with 2oz.square pad of copper.
6. L=100mH, $I_{AS}$=1.4A, $V_{DD}$=50V, $R_G$=25 ohm, Starting $T_J$=25°C.
7. Guaranteed by design, not subject to production testing.

# PJD60R540E / PJP60R540E / PJF60R540E

## TYPICAL CHARACTERISTIC CURVES

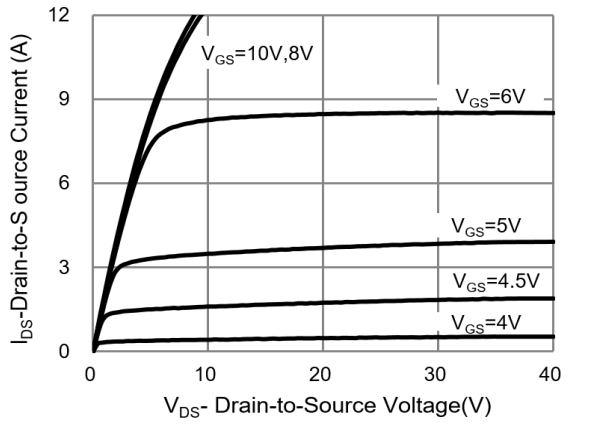



Fig.1 Output Characteristics

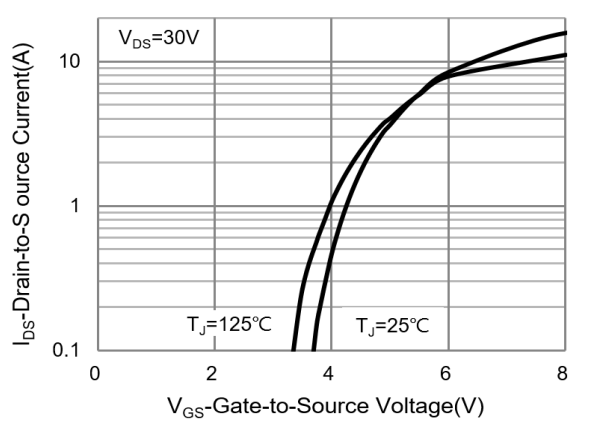



Fig.2 Transfer Characteristics

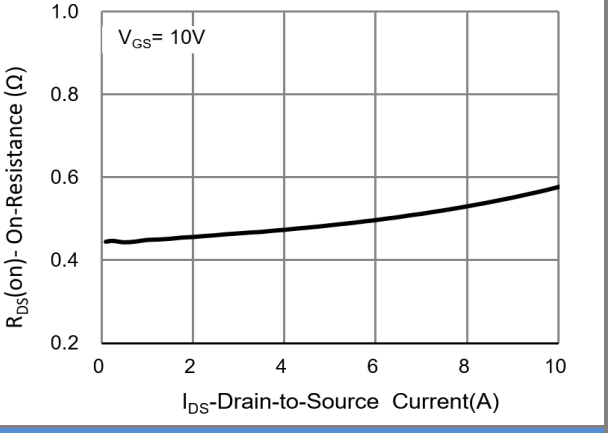



Fig.3 On-Resistance vs. Drain Current

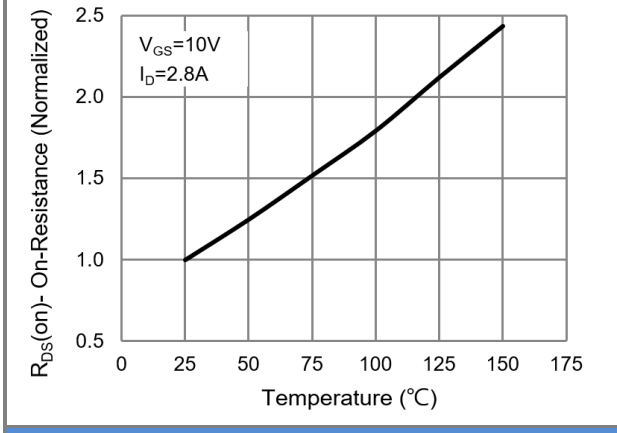



Fig.4 On-Resistance vs. Junction Temperature

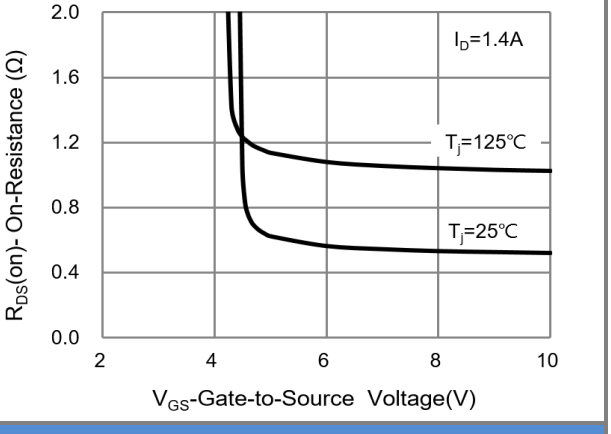



Fig.5 On-Resistance Variation with $V_{GS}$

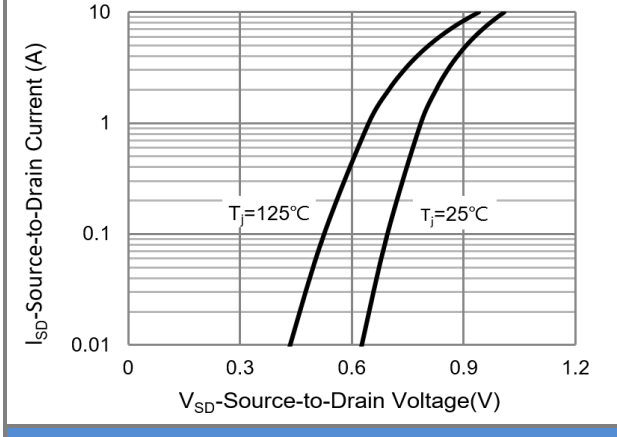



Fig.6 Source-Drain Diode Forward Voltage

# PJD60R540E / PJP60R540E / PJF60R540E

## TYPICAL CHARACTERISTIC CURVES

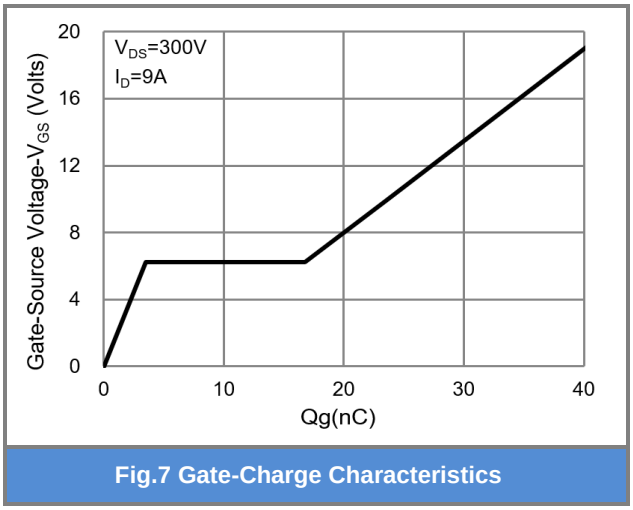



Fig.7 Gate-Charge Characteristics

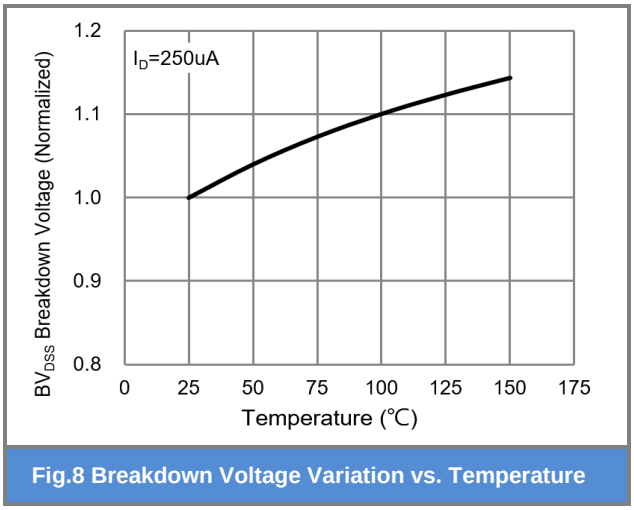



Fig.8 Breakdown Voltage Variation vs. Temperature

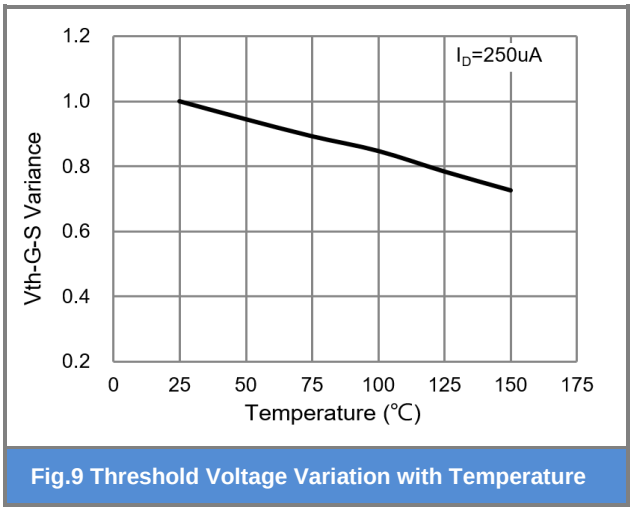



Fig.9 Threshold Voltage Variation with Temperature

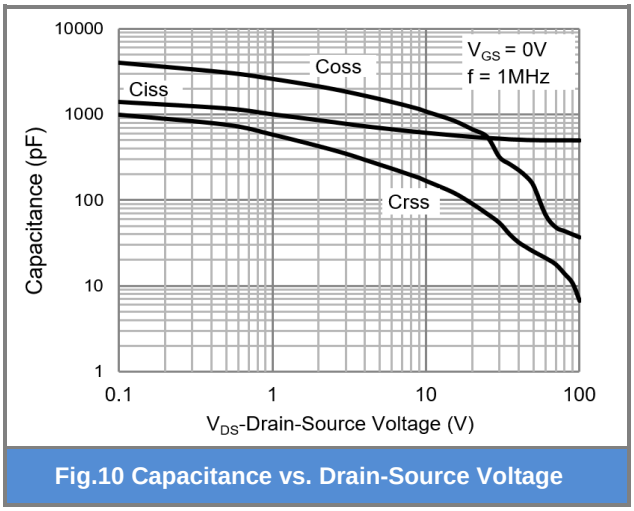



Fig.10 Capacitance vs. Drain-Source Voltage

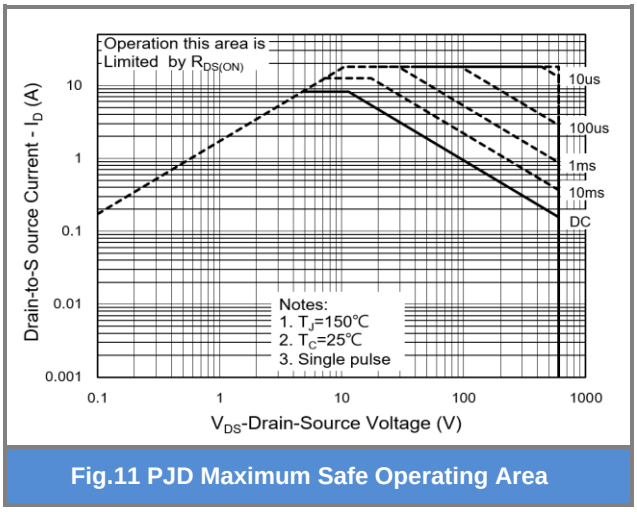



Fig.11 PJD Maximum Safe Operating Area

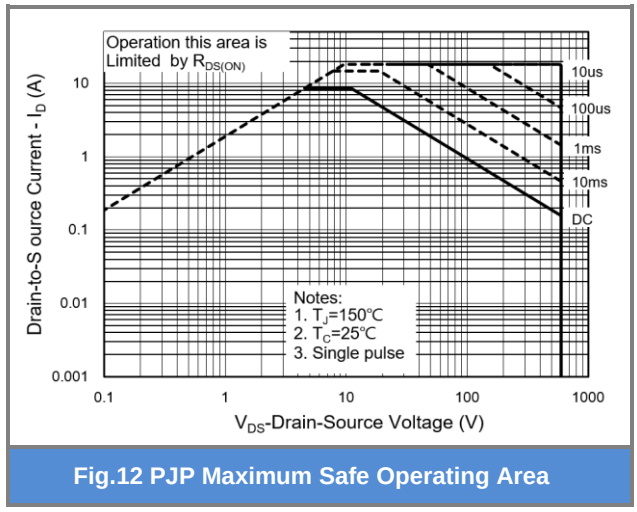



Fig.12 PJP Maximum Safe Operating Area

# PJD60R540E / PJP60R540E / PJF60R540E

## TYPICAL CHARACTERISTIC CURVES

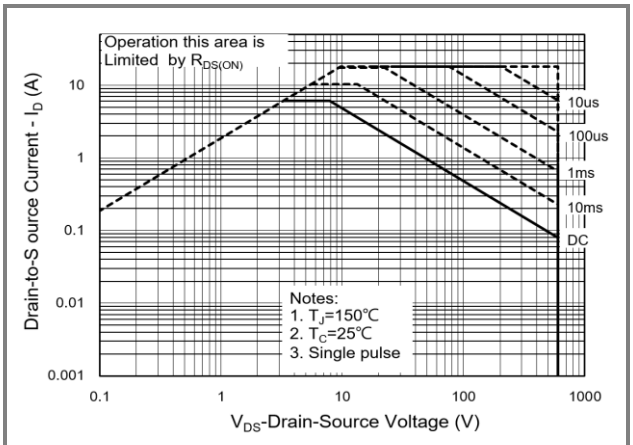



Fig.13 PJF Maximum Safe Operating Area

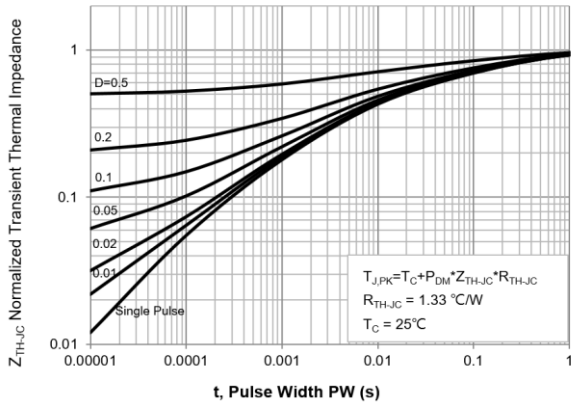



Fig.14 PJD Normalized Transient Thermal Impedance

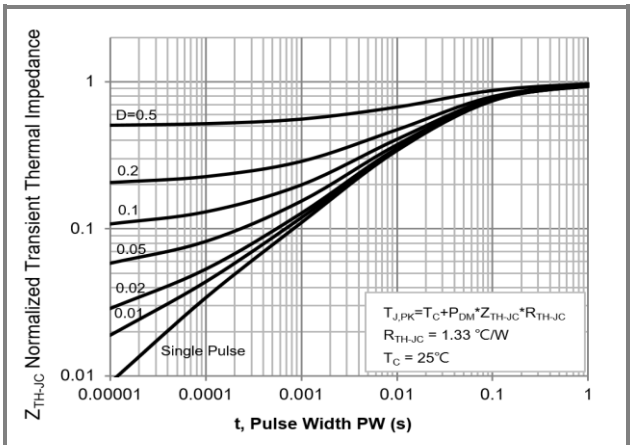



Fig.15 PJP Normalized Transient Thermal Impedance

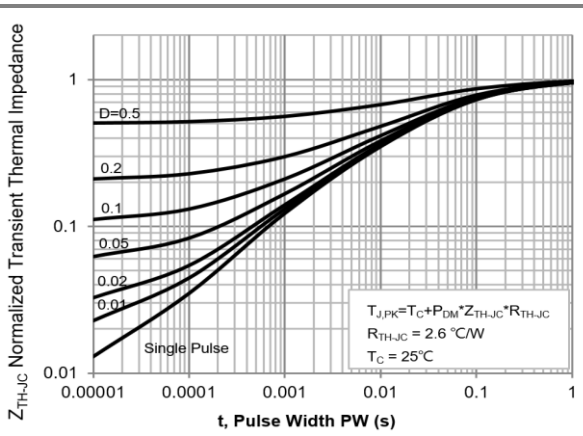



Fig.16 PJF Normalized Transient Thermal Impedance

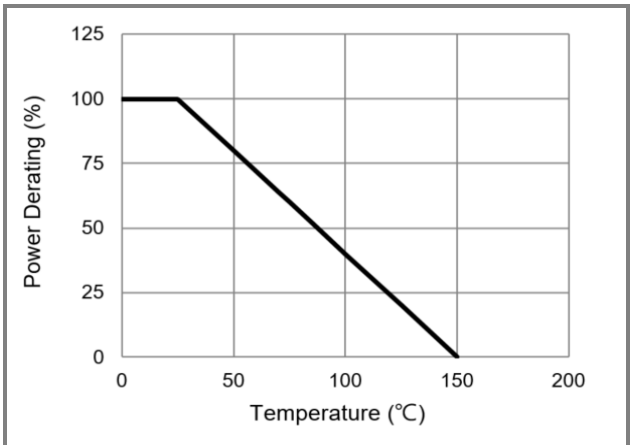


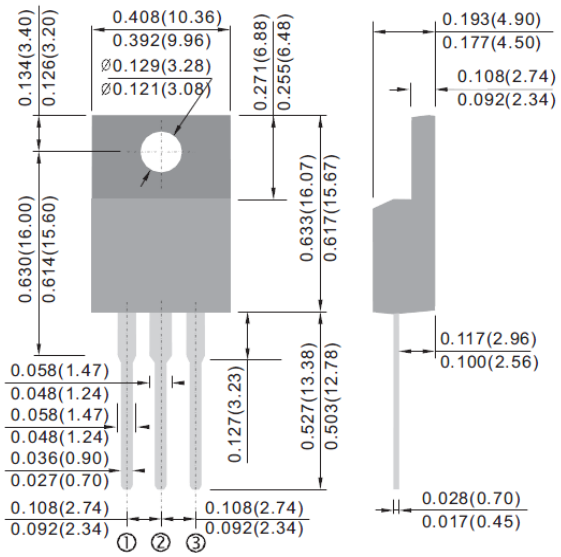

Fig.17 Total Power Dissipation

# PJD60R540E / PJP60R540E / PJF60R540E

## Packaging Information

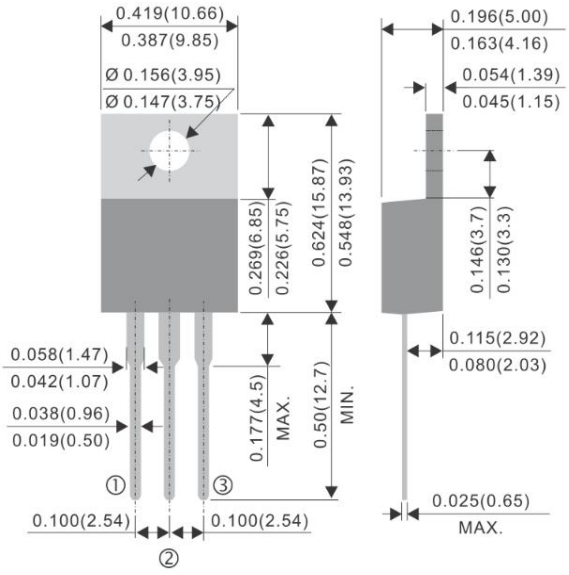
### ITO-220AB-F Dimension

Unit: inch(mm)



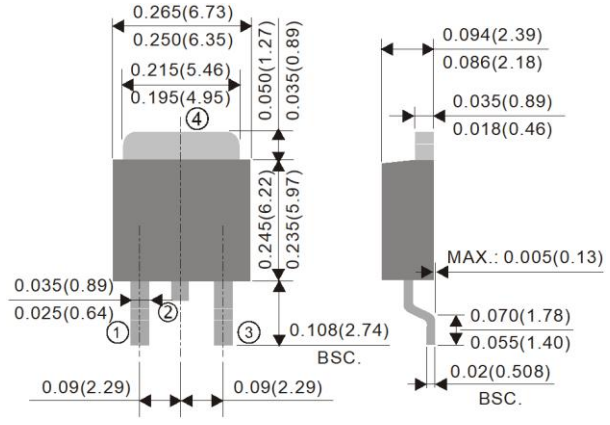

### TO-220AB Dimension

Unit: inch(mm)




### TO-252AA Dimension

Unit: inch(mm)



# PJD60R540E / PJP60R540E / PJF60R540E

## Part No Packing Code Version

| Part No Packing Code | Package Type | Packing Type | Marking | Version |
|---|---|---|---|---|
| PJD60R540E_L2_00001 | TO-252AA | 3,000pcs / 13” reel | 60R540E | Halogen free |
| PJP60R540E_T0_00001 | TO-220AB | 50pcs / Tube | 60R540E | Halogen free |
| PJF60R540E_T0_00001 | ITO-220AB-F | 50pcs / Tube | 60R540E | Halogen free |

# PJD60R540E / PJP60R540E / PJF60R540E

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