

# PJU4NA65 / PJD4NA65 / PJP4NA65 / PJF4NA65

## 650V N-Channel MOSFET

**Voltage**

**650 V**

**Current**

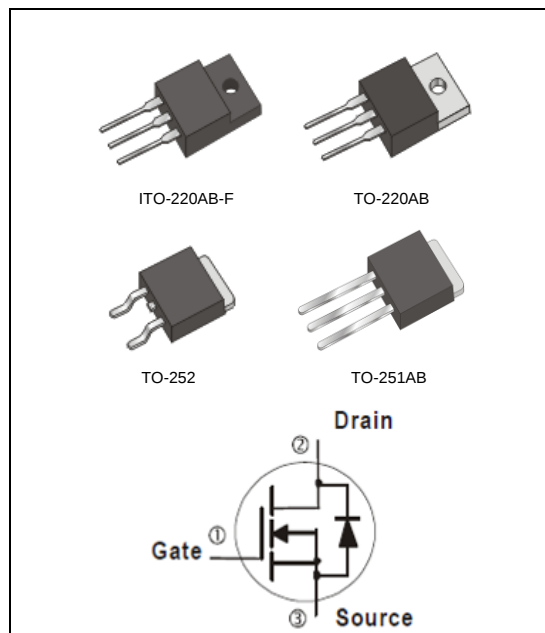
**4 A**

### Features

- $R_{DS(ON)}$ ,  $V_{GS}@10V$ ,  $I_D@2A < 2.7\Omega$
- High switching speed
- Improved dv/dt capability
- Low Gate Charge
- Low reverse transfer capacitance
- Lead free in compliance with EU RoHS 2011/65/EU directive.
- Green molding compound as per IEC61249 Std.  
(Halogen Free)

### Mechanical Data

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



### Maximum Ratings and Thermal Characteristics ( $T_A=25^\circ\text{C}$ unless otherwise noted)

| PARAMETER                                         |                                 | SYMBOL          | TO-251AB | TO-220AB | ITO-220AB-F | TO-252 | UNITS               |
|---------------------------------------------------|---------------------------------|-----------------|----------|----------|-------------|--------|---------------------|
| Drain-Source Voltage                              |                                 | $V_{DS}$        | 650      |          |             |        | V                   |
| Gate-Source Voltage                               |                                 | $V_{GS}$        | $\pm 30$ |          |             |        | V                   |
| Continuous Drain Current                          |                                 | $I_D$           | 4        |          |             |        | A                   |
| Pulsed Drain Current                              |                                 | $I_{DM}$        | 16       |          |             |        | A                   |
| Single Pulse Avalanche Energy <sup>(Note 1)</sup> |                                 | $E_{AS}$        | 202      |          |             |        | mJ                  |
| Power Dissipation                                 | $T_C=25^\circ\text{C}$          | $P_D$           | 77       | 100      | 33          | 77     | W                   |
|                                                   | Derate above $25^\circ\text{C}$ |                 | 0.62     | 0.8      | 0.26        | 0.62   | W/ $^\circ\text{C}$ |
| Operating Junction and Storage Temperature Range  |                                 | $T_J, T_{STG}$  | -55~150  |          |             |        | $^\circ\text{C}$    |
| Typical Thermal resistance                        |                                 |                 |          |          |             |        |                     |
| - Junction to Case                                |                                 | $R_{\theta JC}$ | 1.62     | 1.25     | 3.79        | 1.62   | $^\circ\text{C/W}$  |
| - Junction to Ambient                             |                                 | $R_{\theta JA}$ | 110      | 62.5     | 120         | 110    |                     |

- Limited only By Maximum Junction Temperature



## PJU4NA65 / PJD4NA65 / PJP4NA65 / PJF4NA65

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

| PARAMETER                                             | SYMBOL              | TEST CONDITION                                                                | MIN. | TYP. | MAX. | UNITS |
|-------------------------------------------------------|---------------------|-------------------------------------------------------------------------------|------|------|------|-------|
| Static                                                |                     |                                                                               |      |      |      |       |
| Drain-Source Breakdown Voltage                        | BV <sub>DSS</sub>   | V <sub>GS</sub> =0V, I <sub>D</sub> =250uA                                    | 650  | -    | -    | V     |
| Gate Threshold Voltage                                | V <sub>GS(th)</sub> | V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250uA                      | 2    | 3.4  | 4    | V     |
| Drain-Source On-State Resistance                      | R <sub>DS(on)</sub> | V <sub>GS</sub> =10V, I <sub>D</sub> =2A                                      | -    | 2.44 | 2.7  | Ω     |
| Zero Gate Voltage Drain Current                       | I <sub>DSS</sub>    | V <sub>DS</sub> =650V, V <sub>GS</sub> =0V                                    | -    | 0.03 | 1.0  | uA    |
| Gate-Source Leakage Current                           | I <sub>GSS</sub>    | V <sub>GS</sub> =±30V, V <sub>DS</sub> =0V                                    | -    | ±10  | ±100 | nA    |
| Diode Forward Voltage                                 | V <sub>SD</sub>     | I <sub>S</sub> =4A, V <sub>GS</sub> =0V                                       | -    | 0.87 | 1.4  | V     |
| Dynamic (Note 4)                                      |                     |                                                                               |      |      |      |       |
| Total Gate Charge                                     | Q <sub>g</sub>      | V <sub>DS</sub> =520V, I <sub>D</sub> =4A,<br>V <sub>GS</sub> =10V (Note 2,3) | -    | 11.4 | -    | nC    |
| Gate-Source Charge                                    | Q <sub>gs</sub>     |                                                                               | -    | 3    | -    |       |
| Gate-Drain Charge                                     | Q <sub>gd</sub>     |                                                                               | -    | 4.7  | -    |       |
| Input Capacitance                                     | C <sub>iss</sub>    | V <sub>DS</sub> =25V, V <sub>GS</sub> =0V,<br>f=1.0MHZ                        | -    | 463  | -    | pF    |
| Output Capacitance                                    | C <sub>oss</sub>    |                                                                               | -    | 60   | -    |       |
| Reverse Transfer Capacitance                          | C <sub>rss</sub>    |                                                                               | -    | 1    | -    |       |
| Turn-On Delay Time                                    | td <sub>(on)</sub>  | V <sub>DD</sub> =325V, I <sub>D</sub> =4A,<br>R <sub>G</sub> =25Ω (Note 2,3)  | -    | 9    | -    | ns    |
| Turn-On Rise Time                                     | t <sub>r</sub>      |                                                                               | -    | 23   | -    |       |
| Turn-Off Delay Time                                   | td <sub>(off)</sub> |                                                                               | -    | 21   | -    |       |
| Turn-Off Fall Time                                    | t <sub>f</sub>      |                                                                               | -    | 23   | -    |       |
| Drain-Source Diode                                    |                     |                                                                               |      |      |      |       |
| Maximum Continuous Drain-Source Diode Forward Current | I <sub>S</sub>      | ---                                                                           | -    | -    | 4    | A     |
| Maximum Pulsed Drain-Source Diode Forward Current     | I <sub>SM</sub>     | ---                                                                           | -    | -    | 16   | A     |
| Reverse Recovery Time                                 | trr                 | V <sub>GS</sub> =0V, I <sub>S</sub> =4A                                       | -    | 266  | -    | ns    |
| Reverse Recovery Charge                               | Qrr                 | di <sub>F</sub> / dt=100A/us (Note 2)                                         | -    | 2.24 | -    | uC    |

**NOTES :**

1.  $L=30\text{mH}, I_{AS}=3.6A, V_{DD}=50V, R_G=25\Omega$ , Starting  $T_J=25^{\circ}\text{C}$
2. Pulse width  $\leq 300\mu s$ , Duty cycle  $\leq 2\%$
3. Essentially independent of operating temperature typical characteristics.
4. Guaranteed by design, not subject to production testing

# PJU4NA65 / PJD4NA65 / PJP4NA65 / PJF4NA65

## TYPICAL CHARACTERISTIC CURVES

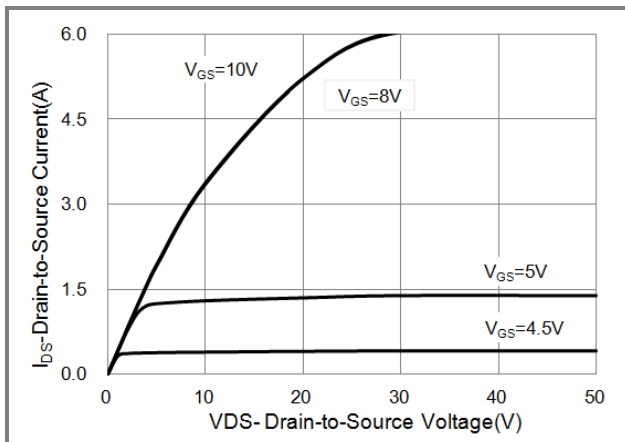


Fig.1 Output Characteristics

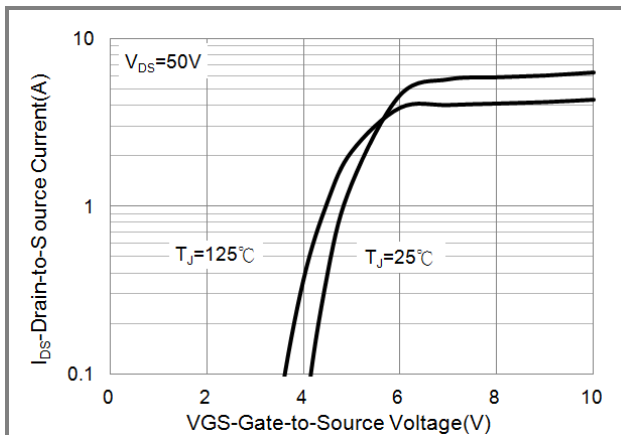


Fig.2 Transfer Characteristics

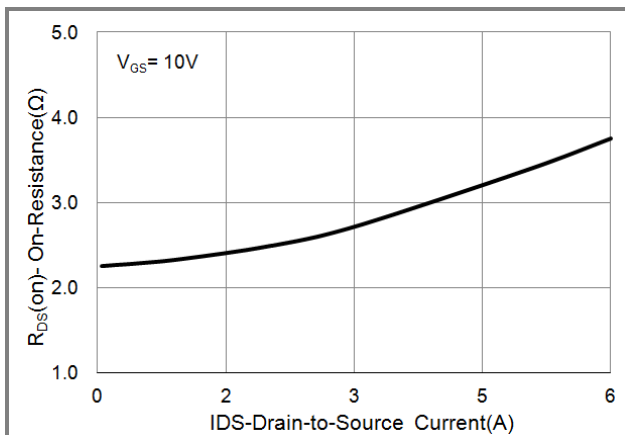


Fig.3 On-Resistance vs. Drain Current

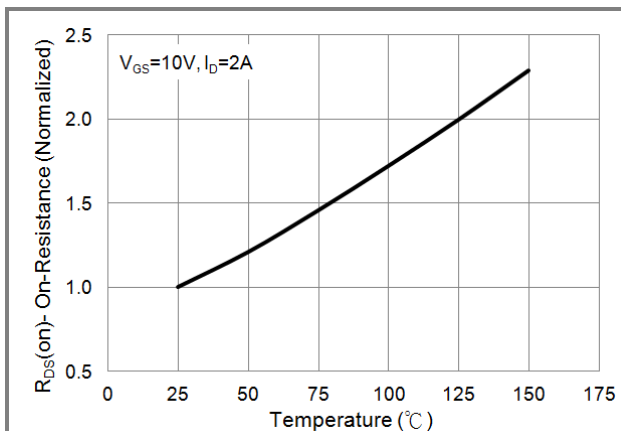


Fig.4 On-Resistance vs. Junction Temperature

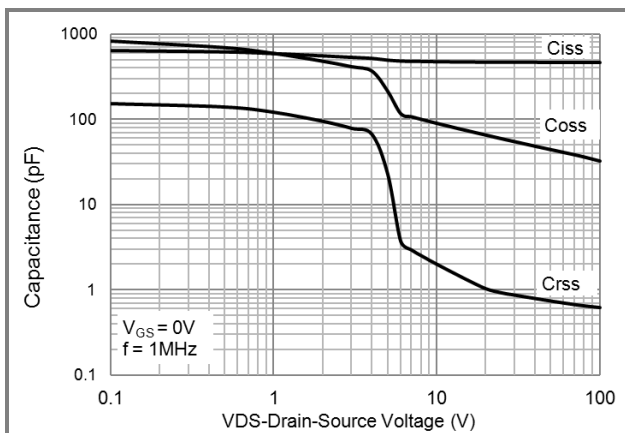


Fig.5 Capacitance vs. Drain-Source Voltage

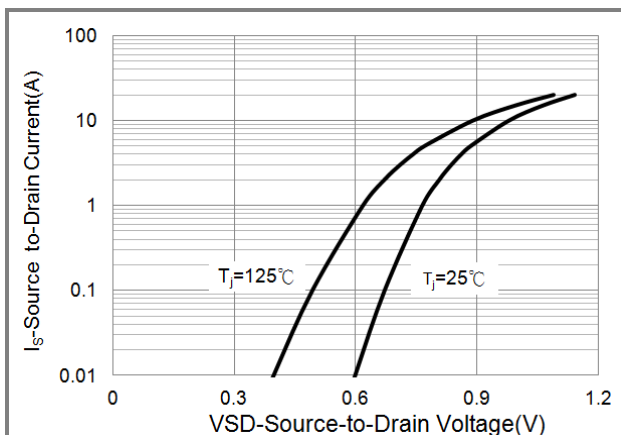


Fig.6 Source-Drain Diode Forward Voltage

# PJU4NA65 / PJD4NA65 / PJP4NA65 / PJF4NA65

## TYPICAL CHARACTERISTIC CURVES

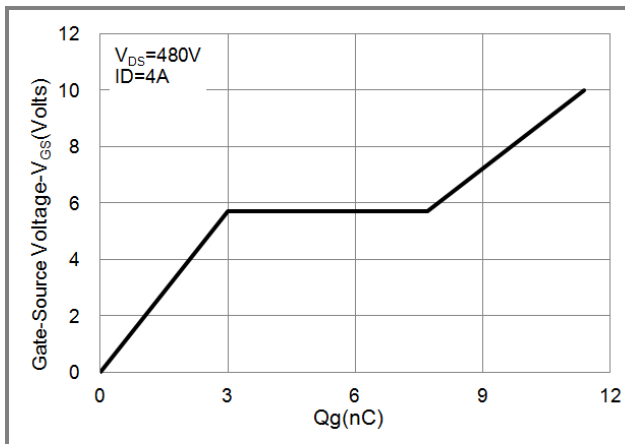


Fig.7 Gate Charge

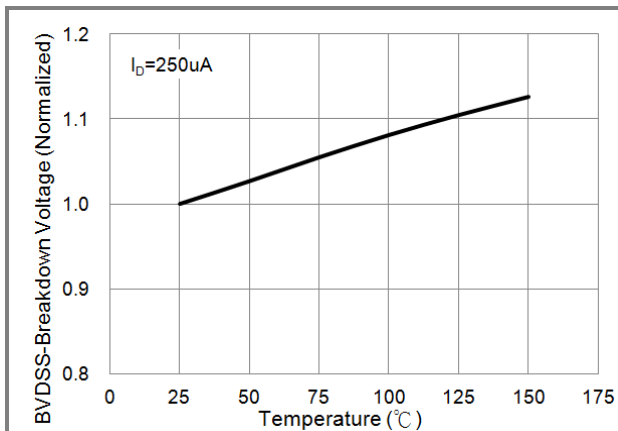


Fig.8  $BV_{DS}$  vs. Junction Temperature

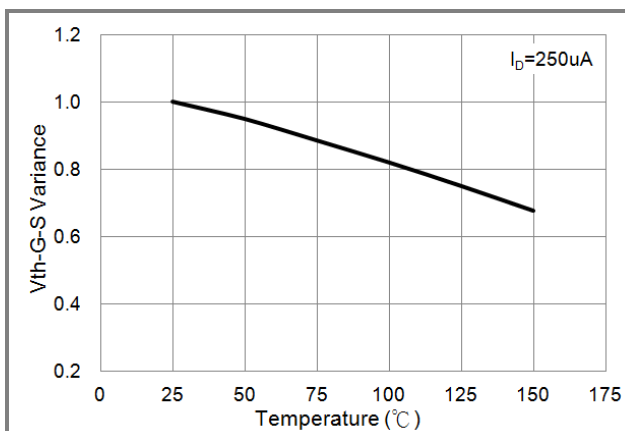


Fig.9 Threshold Voltage Variation with Temperature

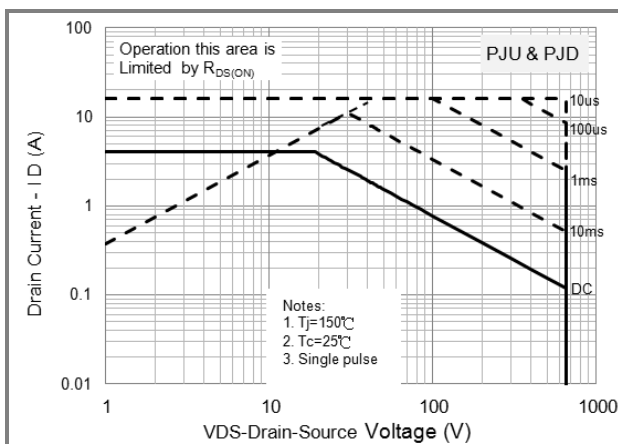


Fig.10 Maximum Safe Operating Area

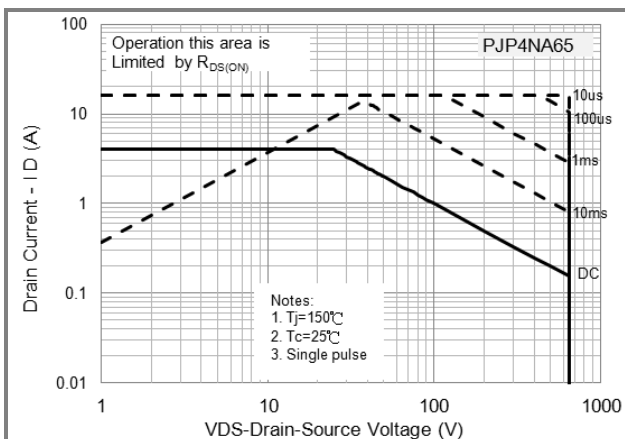


Fig.11 Maximum Safe Operating Area

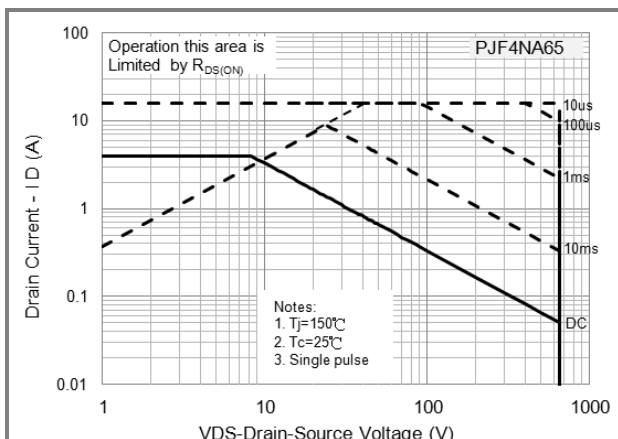


Fig.12 Maximum Safe Operating Area

# PJU4NA65 / PJD4NA65 / PJP4NA65 / PJF4NA65

## TYPICAL CHARACTERISTIC CURVES

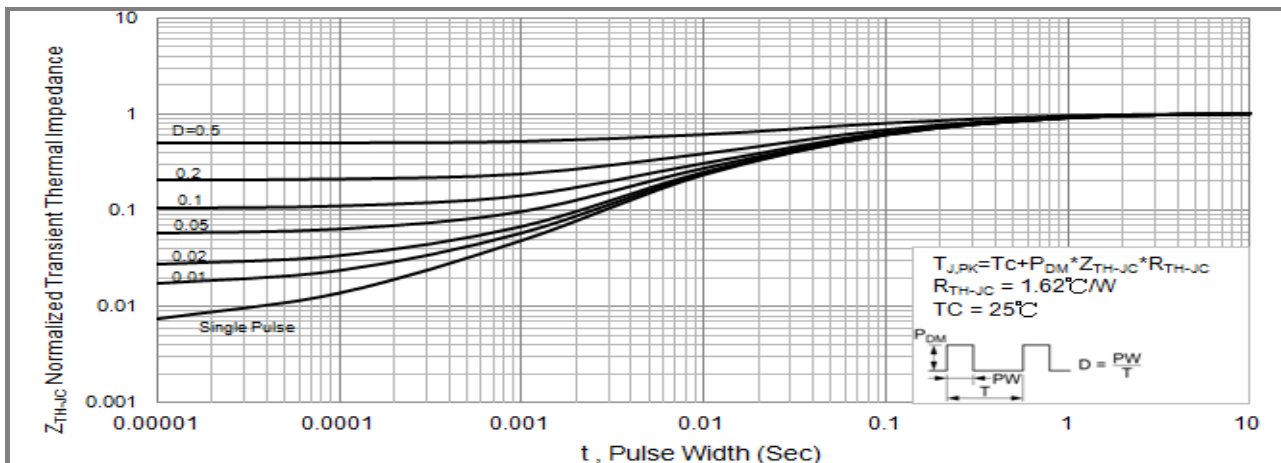


Fig.13 PJU/PJD Normalized Transient Thermal Impedance vs. Pulse Width

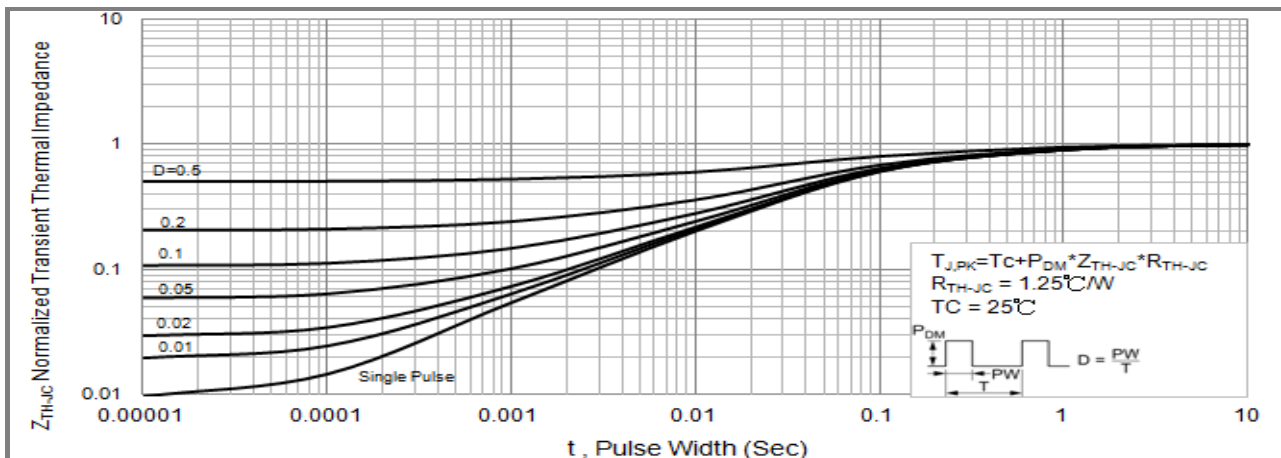


Fig.14 PJP4NA65 Normalized Transient Thermal Impedance vs. Pulse Width

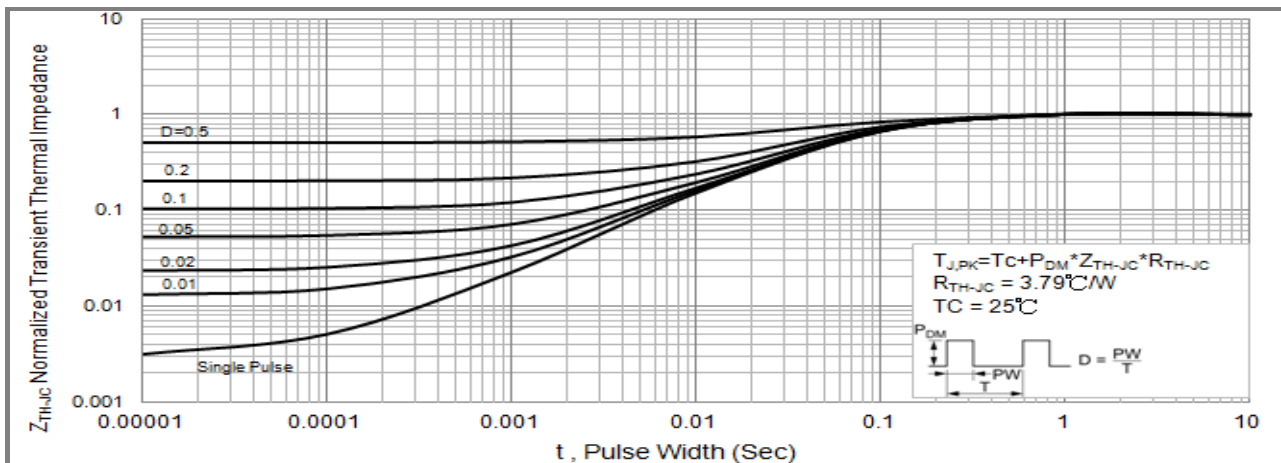


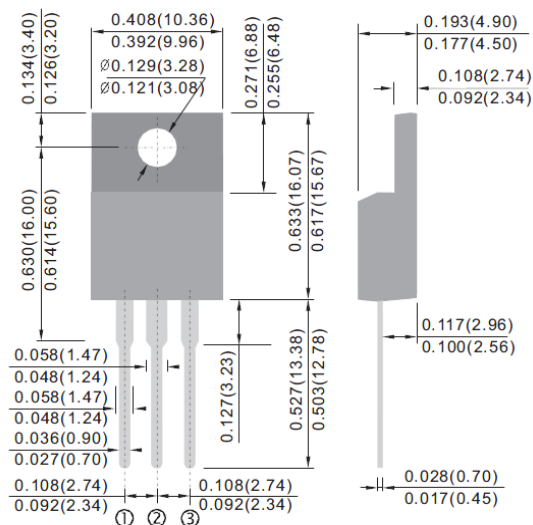
Fig.15 PJF4NA65 Normalized Transient Thermal Impedance vs. Pulse Width

# PJU4NA65 / PJD4NA65 / PJP4NA65 / PJF4NA65

## Packaging Information

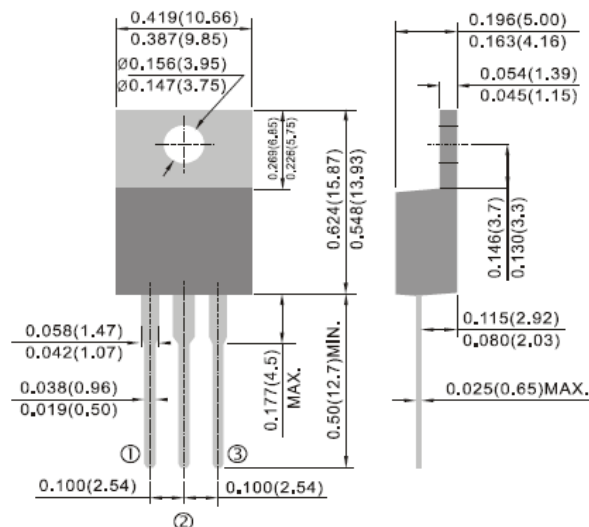
ITO-220AB-F Dimension

Unit: mm



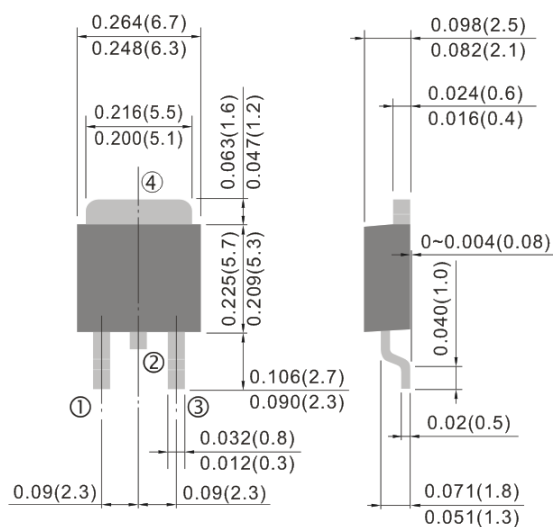
TO-220AB Dimension

Unit: mm



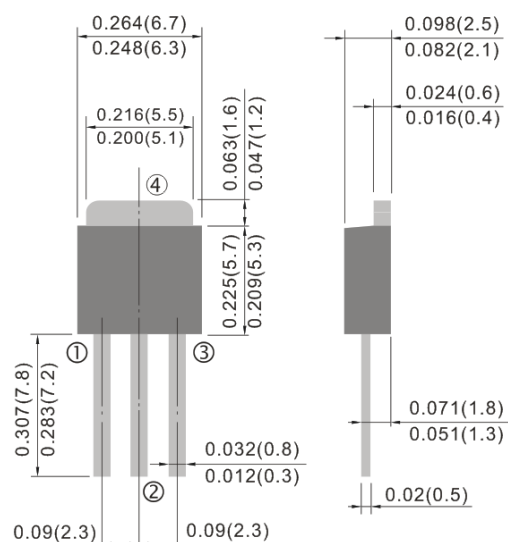
TO-252 Dimension

Unit: mm



TO-251AB Dimension

Unit: mm





## PJU4NA65 / PJD4NA65 / PJP4NA65 / PJF4NA65

### PART NO PACKING CODE VERSION

| Part No Packing Code | Package Type | Packing type        | Marking | Version      |
|----------------------|--------------|---------------------|---------|--------------|
| PJU4NA65_T0_00001    | TO-251AB     | 80pcs / Tube        | U4NA65  | Halogen free |
| PJD4NA65_L2_00001    | TO-252       | 3,000pcs / 13" reel | D4NA65  | Halogen free |
| PJP4NA65_T0_00001    | TO-220AB     | 50pcs / Tube        | P4NA65  | Halogen free |
| PJF4NA65_T0_00001    | ITO-220AB-F  | 50pcs / Tube        | F4NA65  | Halogen free |



## **PJU4NA65 / PJD4NA65 / PJP4NA65 / PJF4NA65**

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