

# PJN1NA60A / PJW1NA60A / PJU1NA60A / PJD1NA60A

## 600V N-Channel MOSFET

**Voltage**

**600 V**

**Current**

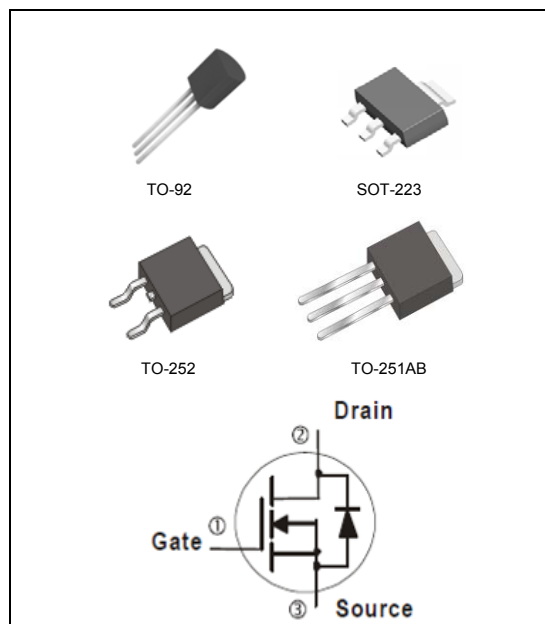
**1 A**

### Features

- $R_{DS(ON)}, V_{GS}@10V, I_D@0.5A < 7.9\Omega$
- 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, SOT-223, TO-92 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
- SOT-223 Approx. Weight : 0.043 ounces, 0.123grams
- TO-92 Approx. Weight : 0.007 ounces, 0.196grams



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

| PARAMETER                                         |                                 | SYMBOL          | TO-251AB/TO-252 | SOT-223                  | TO-92 | UNITS               |
|---------------------------------------------------|---------------------------------|-----------------|-----------------|--------------------------|-------|---------------------|
| Drain-Source Voltage                              |                                 | $V_{DS}$        | 600             |                          |       | V                   |
| Gate-Source Voltage                               |                                 | $V_{GS}$        | +30             |                          |       | V                   |
| Continuous Drain Current                          |                                 | $I_D$           | 1               | 0.4                      |       | A                   |
| Pulsed Drain Current                              |                                 | $I_{DM}$        | 4               | 1.6                      |       | A                   |
| Single Pulse Avalanche Energy <sup>(Note 1)</sup> |                                 | $E_{AS}$        | 52              |                          |       | mJ                  |
| Power Dissipation                                 | $T_C=25^\circ\text{C}$          | $P_D$           | 28              | 3.3                      | 3     | W                   |
|                                                   | Derate above $25^\circ\text{C}$ |                 | 0.22            | 0.026                    | 0.024 | W/ $^\circ\text{C}$ |
| Operating Junction and Storage Temperature Range  |                                 | $T_J, T_{STG}$  | -55~150         |                          |       | $^\circ\text{C}$    |
| Typical Thermal resistance                        |                                 |                 |                 |                          |       | $^\circ\text{C/W}$  |
| - Junction to Case                                |                                 | $R_{\theta JC}$ | 4.46            | -                        | -     |                     |
| - Junction to Ambient                             |                                 | $R_{\theta JA}$ | 110             | 37.9 <sup>(Note 4)</sup> | 140   |                     |

- Limited only By Maximum Junction Temperature



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

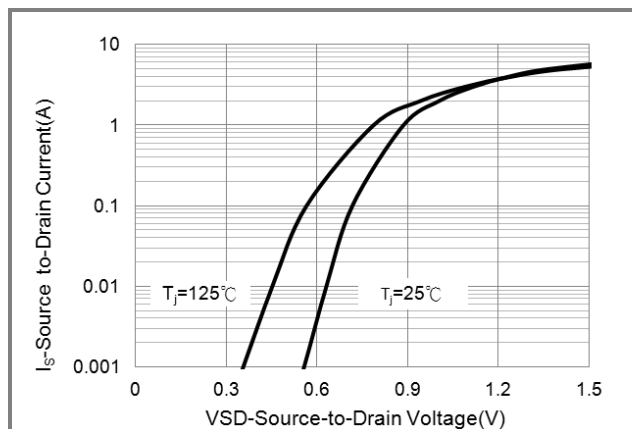
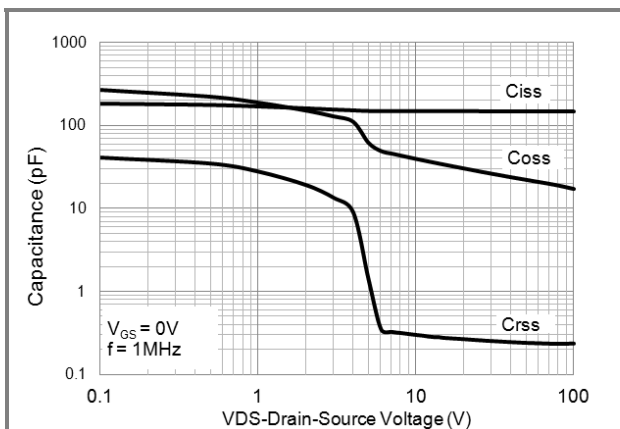
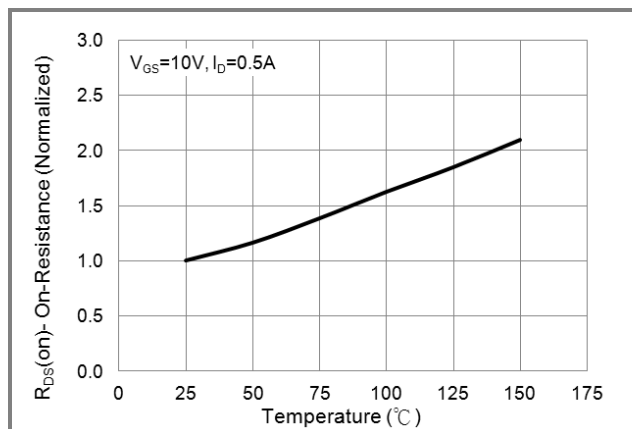
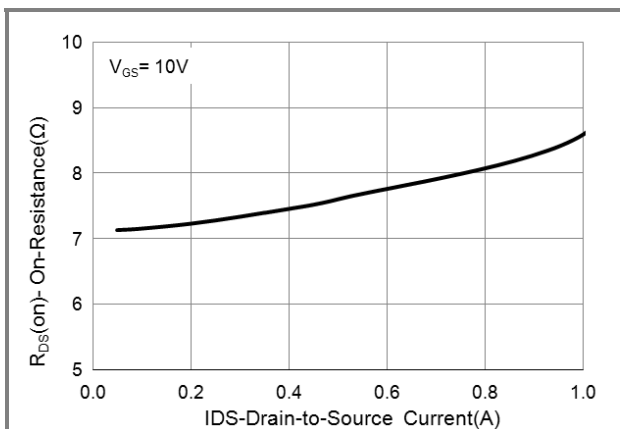
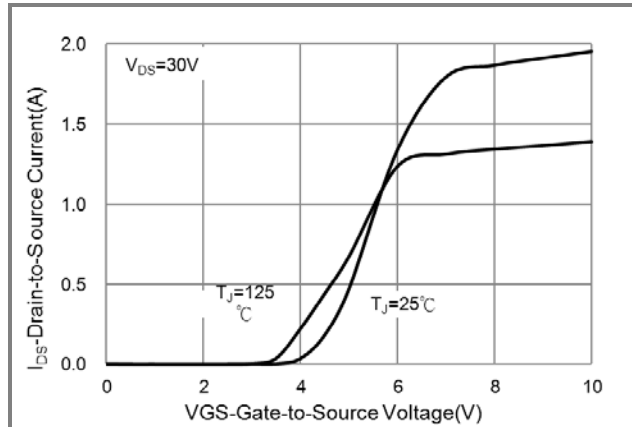
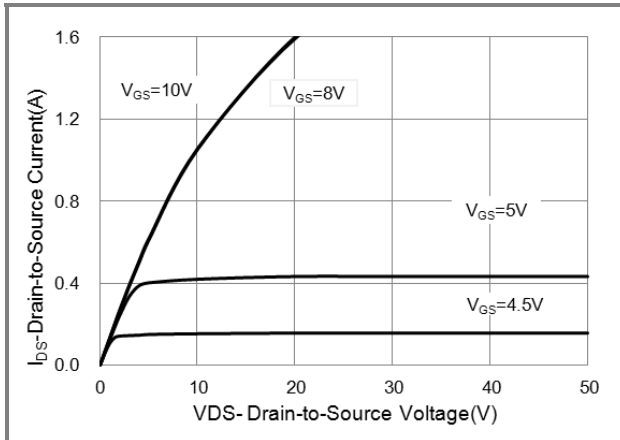
| PARAMETER                                             | SYMBOL              | TEST CONDITION                                                                | MIN. | TYP. | MAX. | UNITS |
|-------------------------------------------------------|---------------------|-------------------------------------------------------------------------------|------|------|------|-------|
| Static                                                |                     |                                                                               |      |      |      |       |
| Drain-Source Breakdown Voltage                        | BV <sub>DSS</sub>   | V <sub>GS</sub> =0V, I <sub>D</sub> =250uA                                    | 600  | -    | -    | V     |
| Gate Threshold Voltage                                | V <sub>GS(th)</sub> | V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250uA                      | 2    | 3.3  | 4    | V     |
| Drain-Source On-State Resistance                      | R <sub>DS(on)</sub> | V <sub>GS</sub> =10V, I <sub>D</sub> =0.5A                                    | -    | 7.2  | 7.9  | Ω     |
| Zero Gate Voltage Drain Current                       | I <sub>DSS</sub>    | V <sub>DS</sub> =600V, V <sub>GS</sub> =0V                                    | -    | 0.02 | 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> =1A, V <sub>GS</sub> =0V                                       | -    | 0.88 | 1.4  | V     |
| Dynamic (Note 5)                                      |                     |                                                                               |      |      |      |       |
| Total Gate Charge                                     | Q <sub>g</sub>      | V <sub>DS</sub> =480V, I <sub>D</sub> =1A,<br>V <sub>GS</sub> =10V (Note 2,3) | -    | 3.1  | -    | nC    |
| Gate-Source Charge                                    | Q <sub>gs</sub>     |                                                                               | -    | 1.3  | -    |       |
| Gate-Drain Charge                                     | Q <sub>gd</sub>     |                                                                               | -    | 0.4  | -    |       |
| Input Capacitance                                     | C <sub>iss</sub>    | V <sub>DS</sub> =25V, V <sub>GS</sub> =0V,<br>f=1.0MHZ                        | -    | 148  | -    | pF    |
| Output Capacitance                                    | C <sub>oss</sub>    |                                                                               | -    | 28   | -    |       |
| Reverse Transfer Capacitance                          | C <sub>rss</sub>    |                                                                               | -    | 0.3  | -    |       |
| Turn-On Delay Time                                    | td <sub>(on)</sub>  | V <sub>DD</sub> =300V, I <sub>D</sub> =1A,<br>R <sub>G</sub> =25Ω (Note 2,3)  | -    | 6    | -    | ns    |
| Turn-On Rise Time                                     | t <sub>r</sub>      |                                                                               | -    | 20   | -    |       |
| Turn-Off Delay Time                                   | td <sub>(off)</sub> |                                                                               | -    | 9    | -    |       |
| Turn-Off Fall Time                                    | t <sub>f</sub>      |                                                                               | -    | 26   | -    |       |
| Drain-Source Diode                                    |                     |                                                                               |      |      |      |       |
| Maximum Continuous Drain-Source Diode Forward Current | I <sub>S</sub>      | ---                                                                           | -    | -    | 1    | A     |
| Maximum Pulsed Drain-Source Diode Forward Current     | I <sub>SM</sub>     | ---                                                                           | -    | -    | 4    | A     |
| Reverse Recovery Time                                 | trr                 | V <sub>GS</sub> =0V, I <sub>S</sub> =1A                                       | -    | 190  | -    | ns    |
| Reverse Recovery Charge                               | Qrr                 | di <sub>F</sub> / dt=100A/us (Note 2)                                         | -    | 0.53 | -    | uC    |

### NOTES :

1.  $L=30\text{mH}, I_{AS}=1.8A, V_{DD}=50V, R_G=25\text{ohm}$ , 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.  $R_{\theta JA}$  is the sum of the junction-to-case and case-to-ambient thermal resistance where the case thermal reference is defined as the solder mounting surface of the drain pins mounted on a 1 inch FR-4 with 2oz. square pad of copper.
5. Guaranteed by design, not subject to production testing

# PJN1NA60A / PJW1NA60A / PJU1NA60A / PJD1NA60A

## TYPICAL CHARACTERISTIC CURVES



# PJN1NA60A / PJW1NA60A / PJU1NA60A / PJD1NA60A

## TYPICAL CHARACTERISTIC CURVES

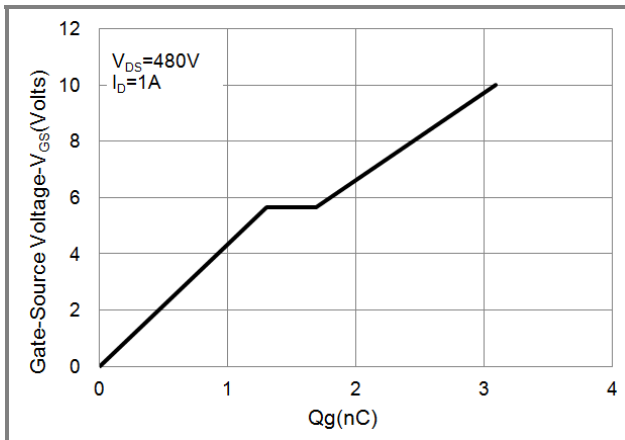


Fig.7 Gate Charge

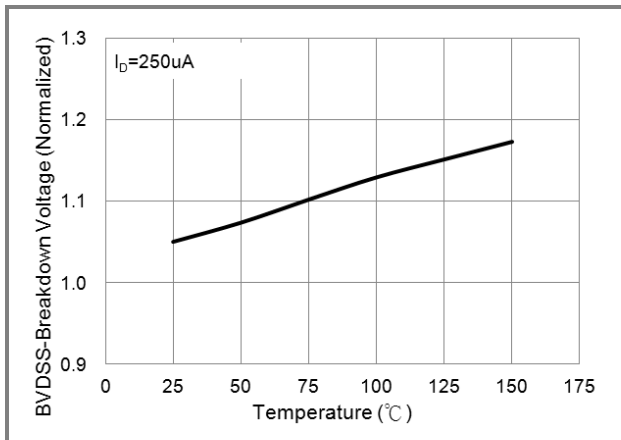


Fig.8  $BV_{DS}$  vs. Junction Temperature

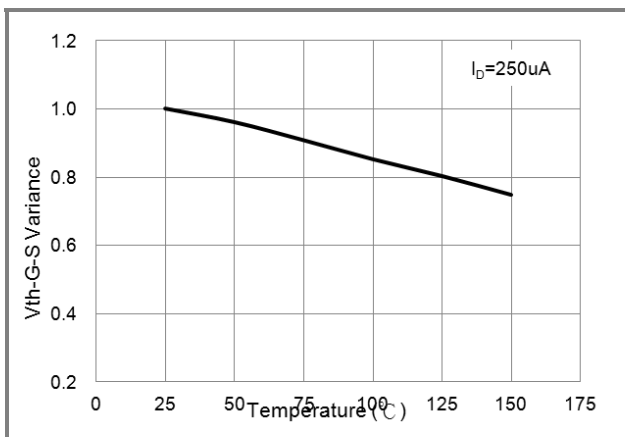


Fig.9 Threshold Voltage Variation with Temperature

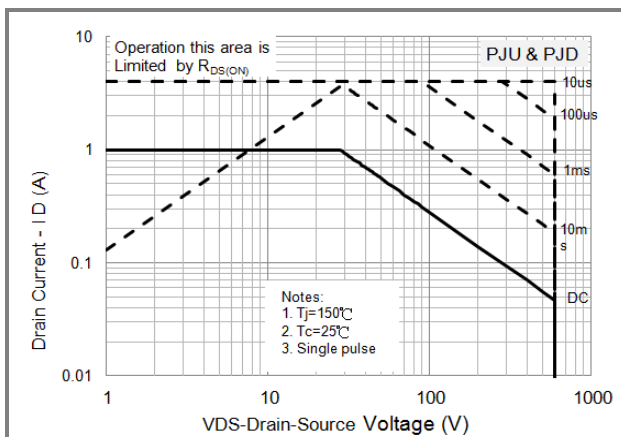


Fig.10 Maximum Safe Operating Area

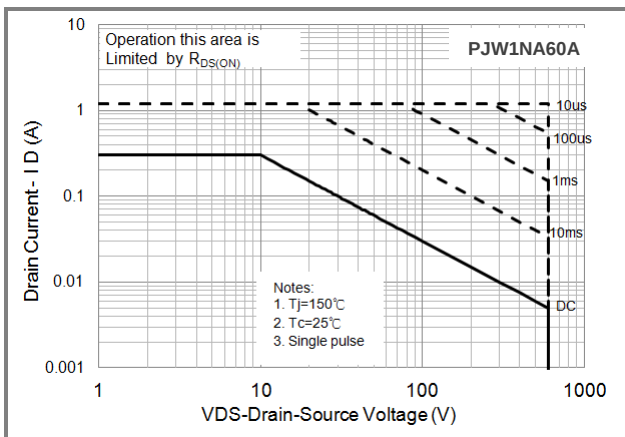


Fig.11 Maximum Safe Operating Area

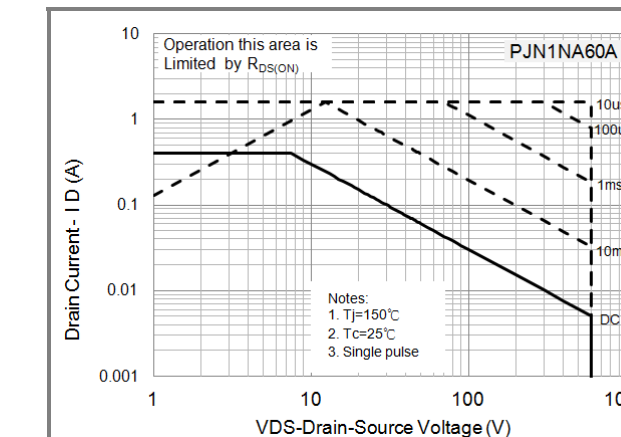


Fig.12 Maximum Safe Operating Area

# PJN1NA60A / PJW1NA60A / PJU1NA60A / PJD1NA60A

## TYPICAL CHARACTERISTIC CURVES

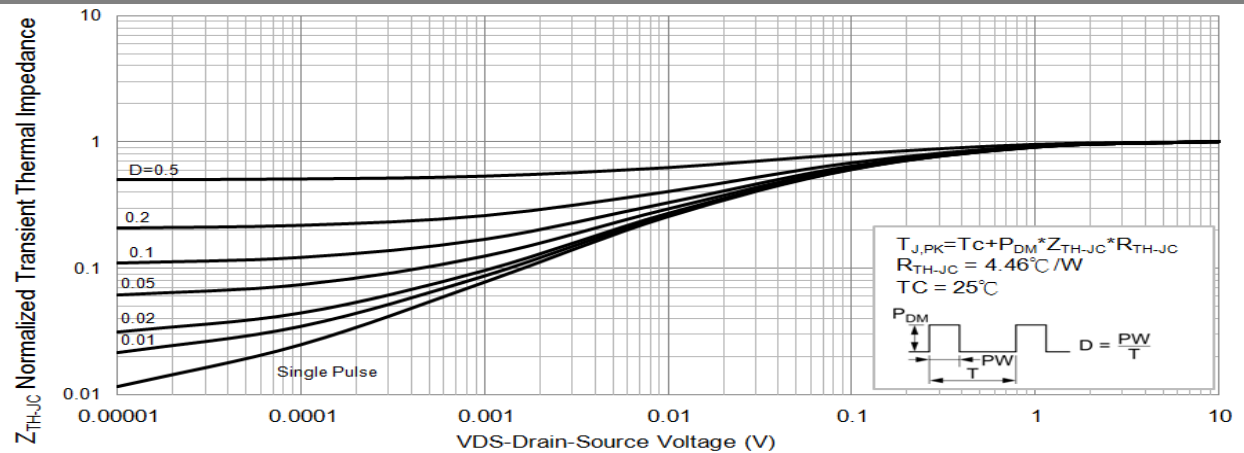


Fig.12 PJU/PJD Normalized Transient Thermal Impedance vs. Pulse Width

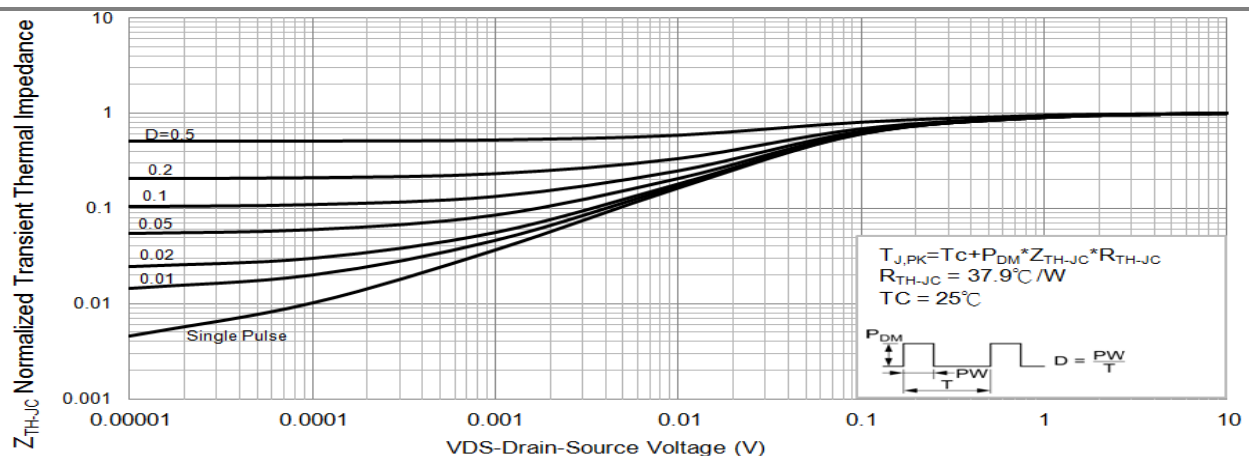


Fig.13 PJW1NA60A Normalized Transient Thermal Impedance vs. Pulse Width

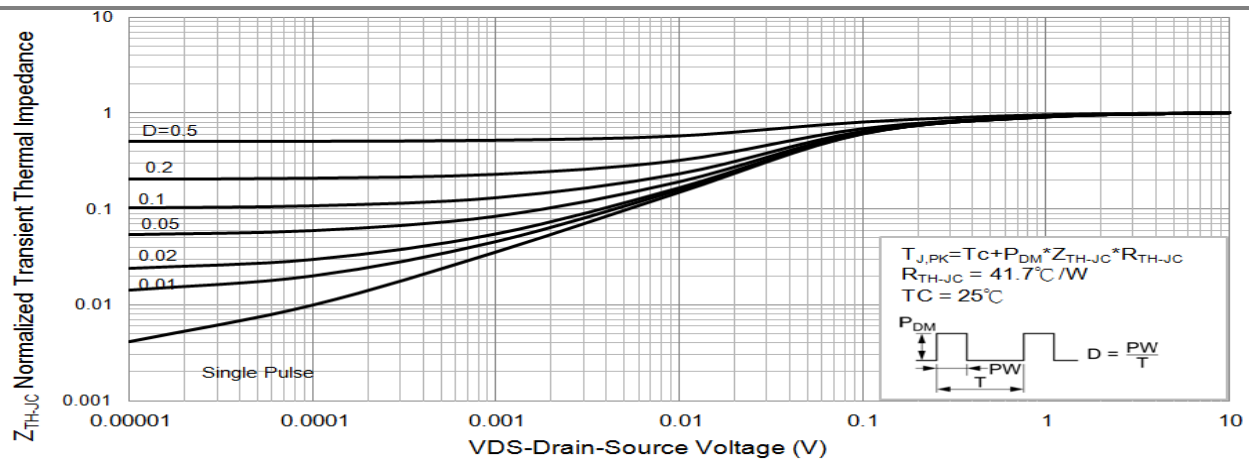
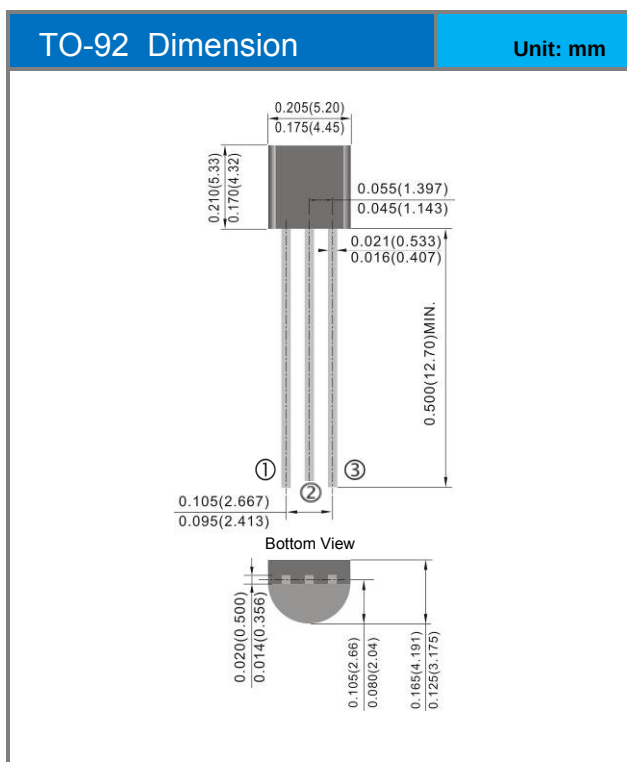
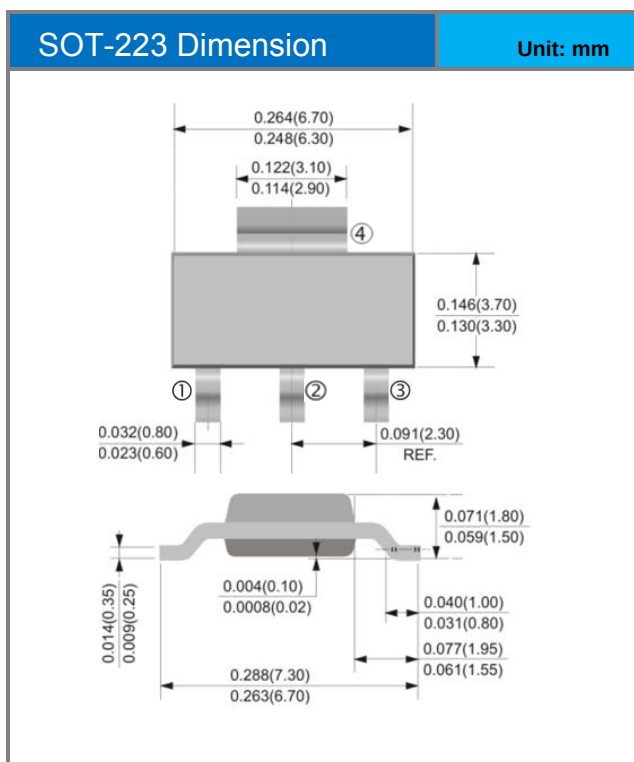
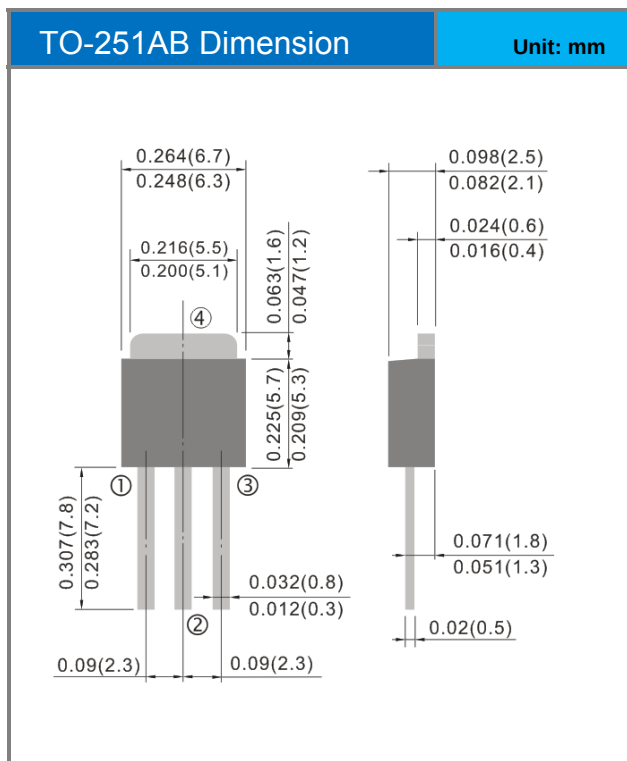
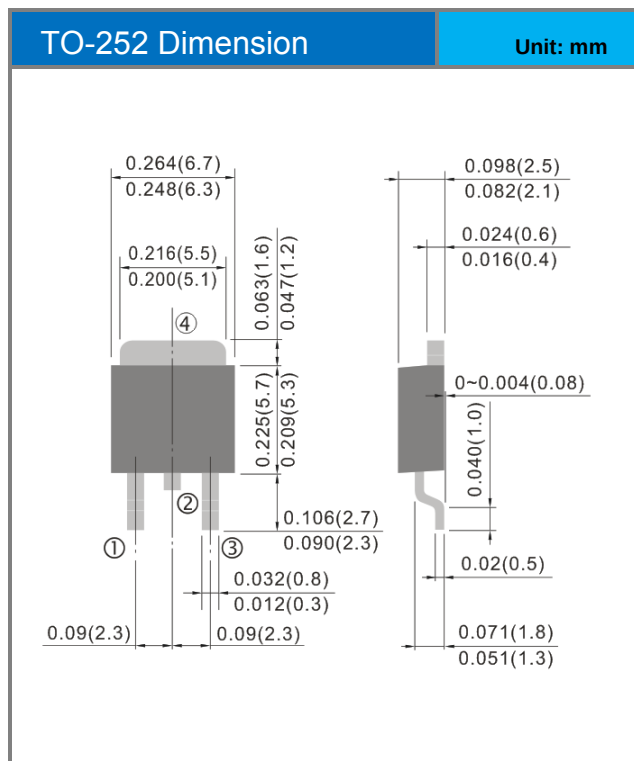


Fig.15 PJN1NA60 Normalized Transient Thermal Impedance vs. Pulse Width

# PJN1NA60A / PJW1NA60A / PJU1NA60A / PJD1NA60A

## Packaging Information





## PJN1NA60A / PJW1NA60A / PJU1NA60A / PJD1NA60A

### PART NO PACKING CODE VERSION

| Part No Packing Code | Package Type | Packing type        | Marking | Version      |
|----------------------|--------------|---------------------|---------|--------------|
| PJU1NA60A_T0_00001   | TO-251AB     | 80pcs / Tube        | U1NA60A | Halogen free |
| PJD1NA60A_L2_00001   | TO-252       | 3,000pcs / 13" reel | D1NA60A | Halogen free |
| PJW1NA60A_R2_00001   | SOT-223      | 2,500pcs / 13" reel | 1NA60A  | Halogen free |
| PJN1NA60A_B0_00001   | TO-92        | 1000pcs / bag       | 1NA60A  | Halogen free |
| PJN1NA60A_A0_00001   | TO-92 AMMO   | 2000pcs / box       | 1NA60A  | Halogen free |



## **PJN1NA60A / PJW1NA60A / PJU1NA60A / PJD1NA60A**

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