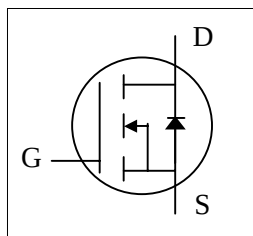


- ▼ 100%  $R_g$  & UIS Test
- ▼ Simple Drive Requirement
- ▼ Ultra Low On-resistance
- ▼ RoHS Compliant & Halogen-Free

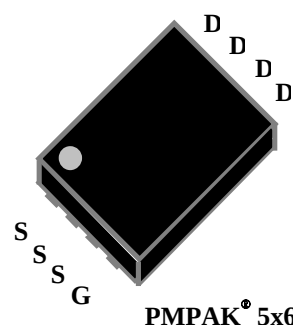


|              |               |
|--------------|---------------|
| $BV_{DSS}$   | 30V           |
| $R_{DS(ON)}$ | 1.6m $\Omega$ |

## Description

XP3N1R6 series are innovated design and silicon process technology to achieve the lowest possible on-resistance and fast switching performance. It provides the designer with an extreme efficient device for use in a wide range of power applications.

The PMPAK<sup>®</sup> 5x6 package is special for DC-DC converters application and the foot print is compatible with SO-8 with backside heat sink and lower profile.



## Absolute Maximum Ratings@ $T_j=25^{\circ}\text{C}$ (unless otherwise specified)

| Symbol                       | Parameter                                                    | Rating     | Units              |
|------------------------------|--------------------------------------------------------------|------------|--------------------|
| $V_{DS}$                     | Drain-Source Voltage                                         | 30         | V                  |
| $V_{GS}$                     | Gate-Source Voltage                                          | $\pm 20$   | V                  |
| $I_D@T_C=25^{\circ}\text{C}$ | Drain Current, $V_{GS}$ @ 10V <sup>4</sup> (Silicon Limited) | 175        | A                  |
| $I_D@T_C=25^{\circ}\text{C}$ | Drain Current, $V_{GS}$ @ 10V <sup>4</sup> (Package Limited) | 100        | A                  |
| $I_D@T_A=25^{\circ}\text{C}$ | Drain Current, $V_{GS}$ @ 10V <sup>3</sup>                   | 43.1       | A                  |
| $I_D@T_A=70^{\circ}\text{C}$ | Drain Current, $V_{GS}$ @ 10V <sup>3</sup>                   | 34.5       | A                  |
| $I_{DM}$                     | Pulsed Drain Current <sup>1</sup>                            | 240        | A                  |
| $P_D@T_C=25^{\circ}\text{C}$ | Total Power Dissipation                                      | 83.3       | W                  |
| $P_D@T_A=25^{\circ}\text{C}$ | Total Power Dissipation <sup>3</sup>                         | 5          | W                  |
| $E_{AS}$                     | Single Pulse Avalanche Energy <sup>5</sup>                   | 151        | mJ                 |
| $T_{STG}$                    | Storage Temperature Range                                    | -55 to 150 | $^{\circ}\text{C}$ |
| $T_J$                        | Operating Junction Temperature Range                         | -55 to 150 | $^{\circ}\text{C}$ |

## Thermal Data

| Symbol      | Parameter                                                 | Value | Unit                        |
|-------------|-----------------------------------------------------------|-------|-----------------------------|
| $R_{thj-c}$ | Maximum Thermal Resistance, Junction-case                 | 1.5   | $^{\circ}\text{C}/\text{W}$ |
| $R_{thj-a}$ | Maximum Thermal Resistance, Junction-ambient <sup>3</sup> | 25    | $^{\circ}\text{C}/\text{W}$ |

**Electrical Characteristics@T<sub>j</sub>=25°C(unless otherwise specified)**

| Symbol              | Parameter                                      | Test Conditions                                          | Min. | Typ. | Max. | Units |
|---------------------|------------------------------------------------|----------------------------------------------------------|------|------|------|-------|
| BV <sub>DSS</sub>   | Drain-Source Breakdown Voltage                 | V <sub>GS</sub> =0V, I <sub>D</sub> =250uA               | 30   | -    | -    | V     |
| R <sub>DS(ON)</sub> | Static Drain-Source On-Resistance <sup>2</sup> | V <sub>GS</sub> =10V, I <sub>D</sub> =20A                | -    | -    | 1.6  | mΩ    |
|                     |                                                | V <sub>GS</sub> =4.5V, I <sub>D</sub> =20A               | -    | -    | 2.6  | mΩ    |
| V <sub>GS(th)</sub> | Gate Threshold Voltage                         | V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250uA | 1    | -    | 3    | V     |
| g <sub>fs</sub>     | Forward Transconductance                       | V <sub>DS</sub> =5V, I <sub>D</sub> =30A                 | -    | 150  | -    | S     |
| I <sub>DSS</sub>    | Drain-Source Leakage Current                   | V <sub>DS</sub> =24V, V <sub>GS</sub> =0V                | -    | -    | 10   | uA    |
| I <sub>GSS</sub>    | Gate-Source Leakage                            | V <sub>GS</sub> =±20V, V <sub>DS</sub> =0V               | -    | -    | ±100 | nA    |
| Q <sub>g</sub>      | Total Gate Charge                              | I <sub>D</sub> =20A                                      | -    | 57   | 91.2 | nC    |
| Q <sub>gs</sub>     | Gate-Source Charge                             | V <sub>DS</sub> =15V                                     | -    | 13   | -    | nC    |
| Q <sub>gd</sub>     | Gate-Drain ("Miller") Charge                   | V <sub>GS</sub> =4.5V                                    | -    | 25   | -    | nC    |
| t <sub>d(on)</sub>  | Turn-on Delay Time                             | V <sub>DS</sub> =15V                                     | -    | 14   | -    | ns    |
| t <sub>r</sub>      | Rise Time                                      | I <sub>D</sub> =30A                                      | -    | 77   | -    | ns    |
| t <sub>d(off)</sub> | Turn-off Delay Time                            | R <sub>G</sub> =3Ω                                       | -    | 67   | -    | ns    |
| t <sub>f</sub>      | Fall Time                                      | V <sub>GS</sub> =10V                                     | -    | 110  | -    | ns    |
| C <sub>iss</sub>    | Input Capacitance                              | V <sub>GS</sub> =0V                                      | -    | 5750 | 9200 | pF    |
| C <sub>oss</sub>    | Output Capacitance                             | V <sub>DS</sub> =15V                                     | -    | 1120 | -    | pF    |
| C <sub>rss</sub>    | Reverse Transfer Capacitance                   | f=1.0MHz                                                 | -    | 500  | -    | pF    |
| R <sub>g</sub>      | Gate Resistance                                | f=1.0MHz                                                 | -    | 1.2  | 2.4  | Ω     |

**Source-Drain Diode**

| Symbol          | Parameter                       | Test Conditions                           | Min. | Typ. | Max. | Units |
|-----------------|---------------------------------|-------------------------------------------|------|------|------|-------|
| I <sub>S</sub>  | Source Current ( Body Diode )   |                                           | -    | -    | 100  | A     |
| V <sub>SD</sub> | Forward On Voltage <sup>2</sup> | I <sub>S</sub> =20A, V <sub>GS</sub> =0V  | -    | -    | 1.2  | V     |
| t <sub>rr</sub> | Reverse Recovery Time           | I <sub>S</sub> =30A, V <sub>GS</sub> =0V, | -    | 24   | -    | ns    |
| Q <sub>rr</sub> | Reverse Recovery Charge         | dI/dt=100A/μs                             | -    | 11   | -    | nC    |

**Notes:**

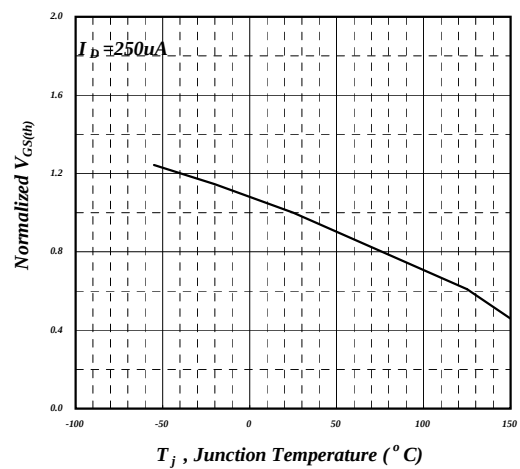
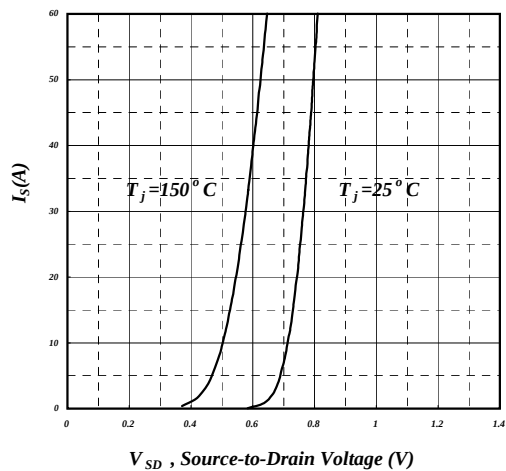
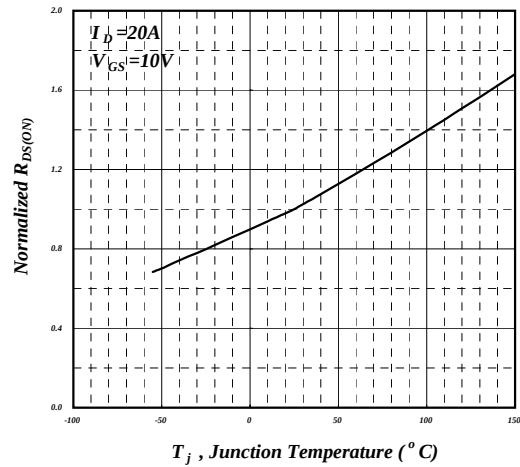
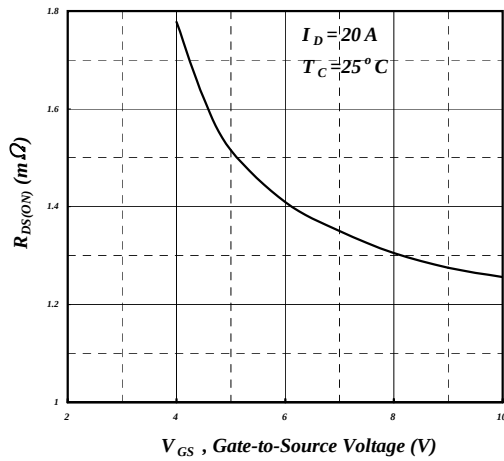
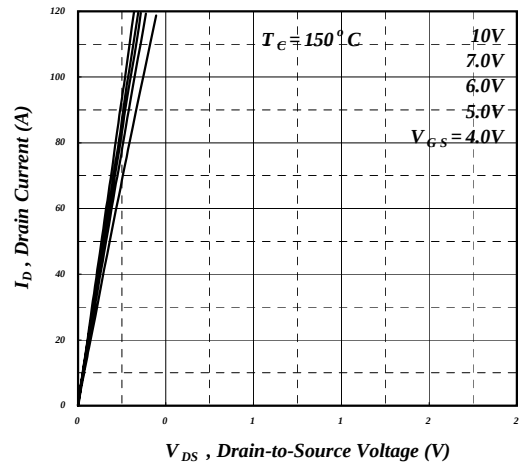
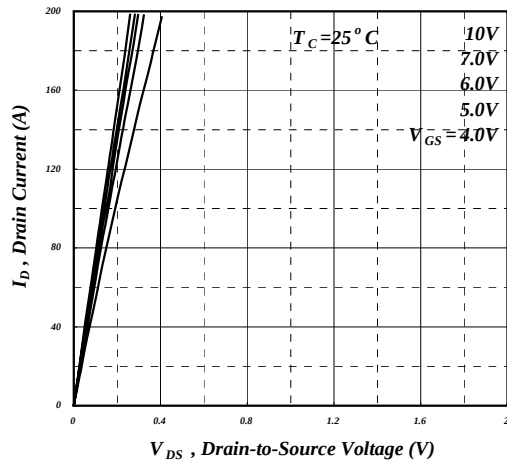
- 1.Pulse width limited by Max. junction temperature.
- 2.Pulse test
- 3.Surface mounted on 1 in<sup>2</sup> copper pad of FR4 board, t ≤10sec ; 60°C/W at steady state.
- 4.Package limitation current is 100A .
- 5.Starting T<sub>j</sub>=25°C , V<sub>DD</sub>=30V , L=0.1mH , R<sub>G</sub>=25Ω , V<sub>GS</sub>=10V

THIS PRODUCT IS SENSITIVE TO ELECTROSTATIC DISCHARGE, PLEASE HANDLE WITH CAUTION.

USE OF THIS PRODUCT AS A CRITICAL COMPONENT IN LIFE SUPPORT OR OTHER SIMILAR SYSTEMS IS NOT AUTHORIZED.

XSEMI DOES NOT ASSUME ANY LIABILITY ARISING OUT OF THE APPLICATION OR USE OF ANY PRODUCT OR CIRCUIT DESCRIBED HEREIN; NEITHER DOES IT CONVEY ANY LICENSE UNDER ITS PATENT RIGHTS, NOR THE RIGHTS OF OTHERS.

XSEMI RESERVES THE RIGHT TO MAKE CHANGES WITHOUT FURTHER NOTICE TO ANY PRODUCTS HEREIN TO IMPROVE RELIABILITY, FUNCTION OR DESIGN.



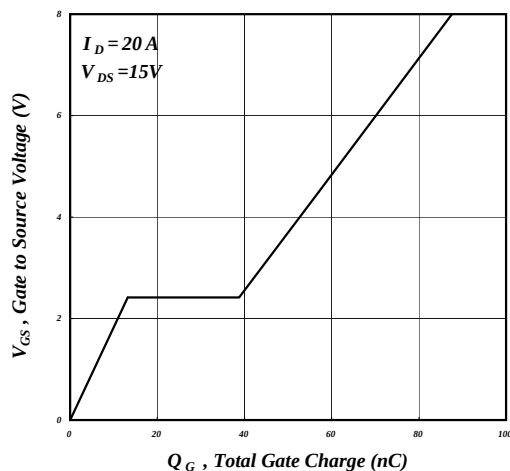


Fig 7. Gate Charge Characteristics

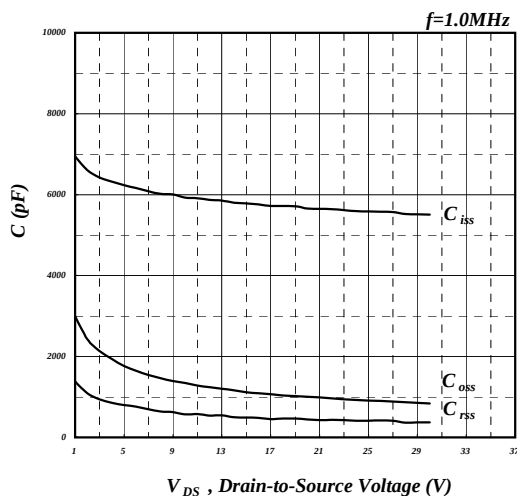


Fig 8. Typical Capacitance Characteristics

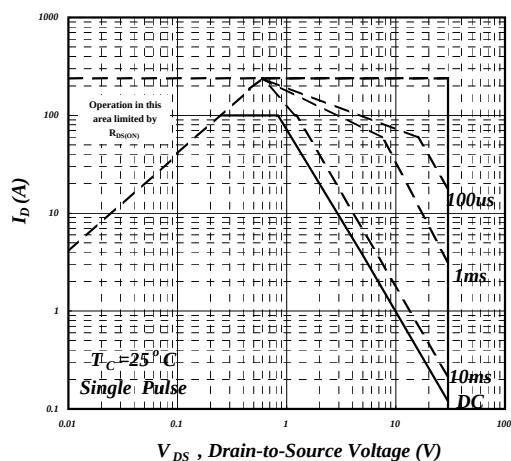


Fig 9. Maximum Safe Operating Area

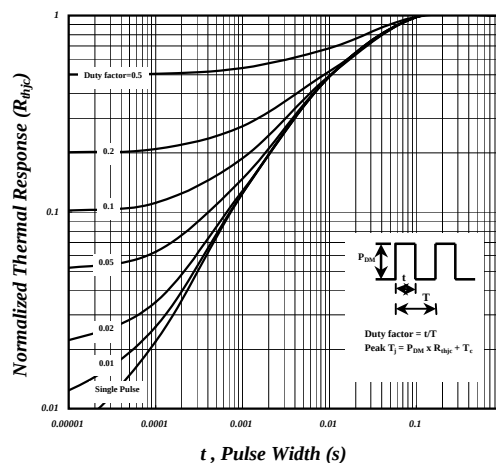


Fig 10. Effective Transient Thermal Impedance

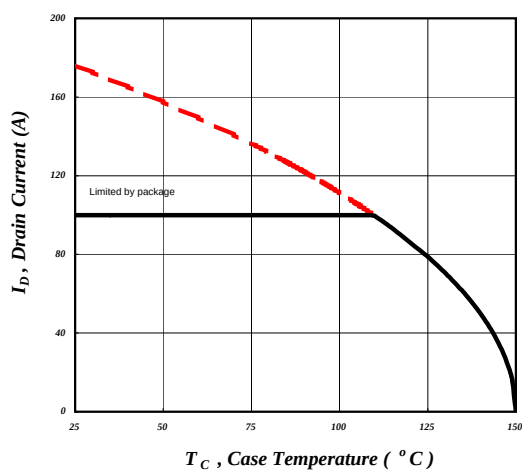


Fig 11. Drain Current v.s. Case Temperature

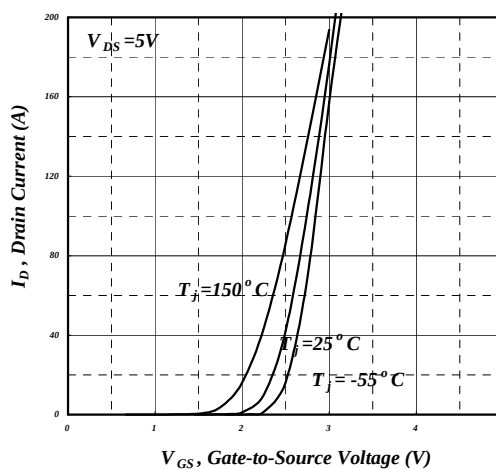
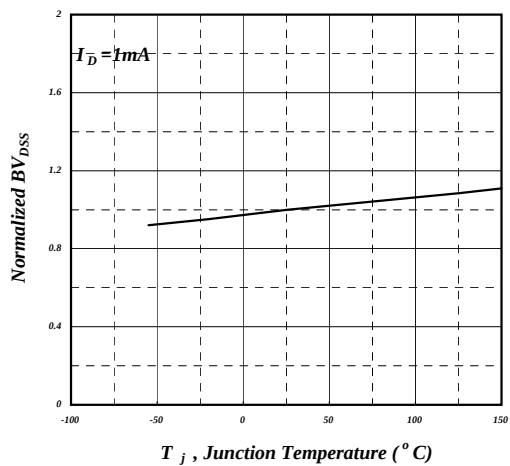
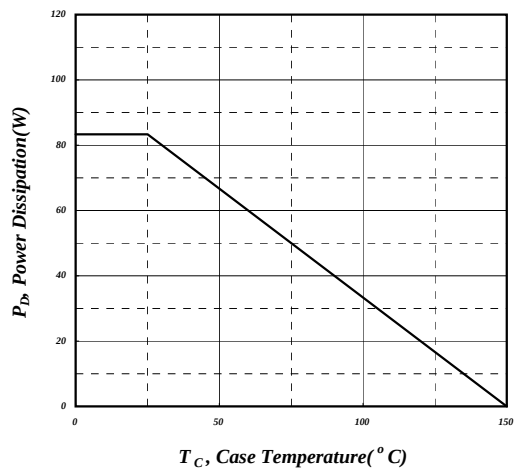


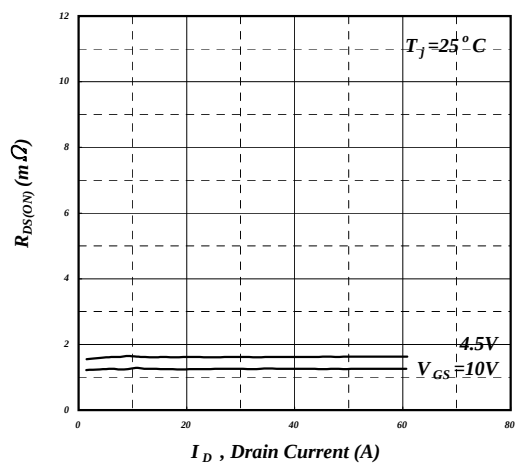
Fig 12. Transfer Characteristics



**Fig 13. Normalized  $BV_{DSS}$  v.s. Junction Temperature**

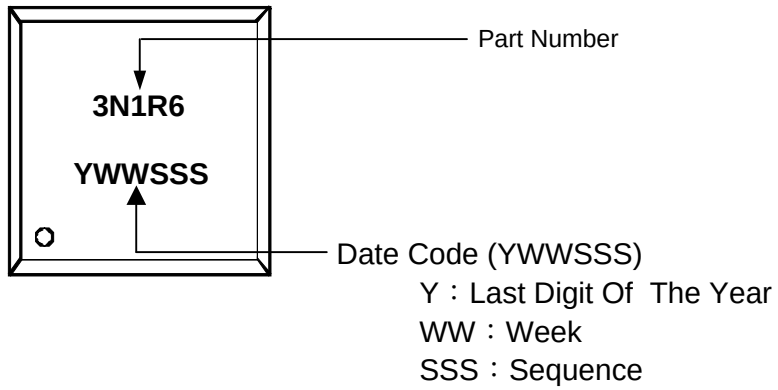


**Fig 14. Total Power Dissipation**

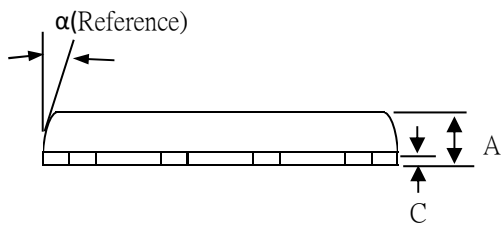
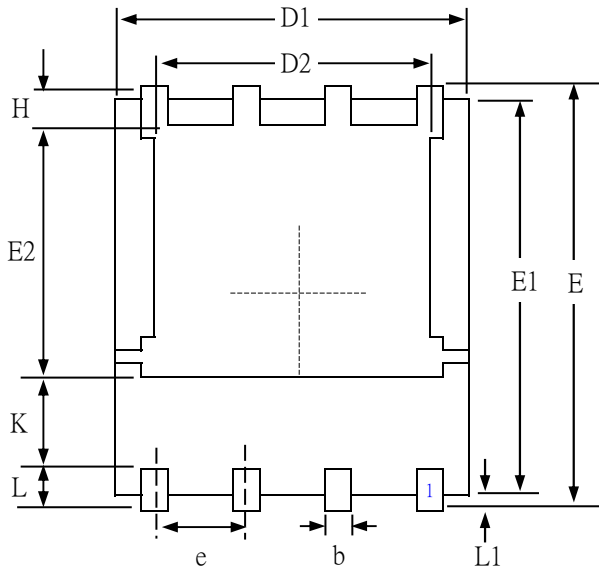


**Fig 15. Typ. Drain-Source on State Resistance**

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**MARKING INFORMATION**

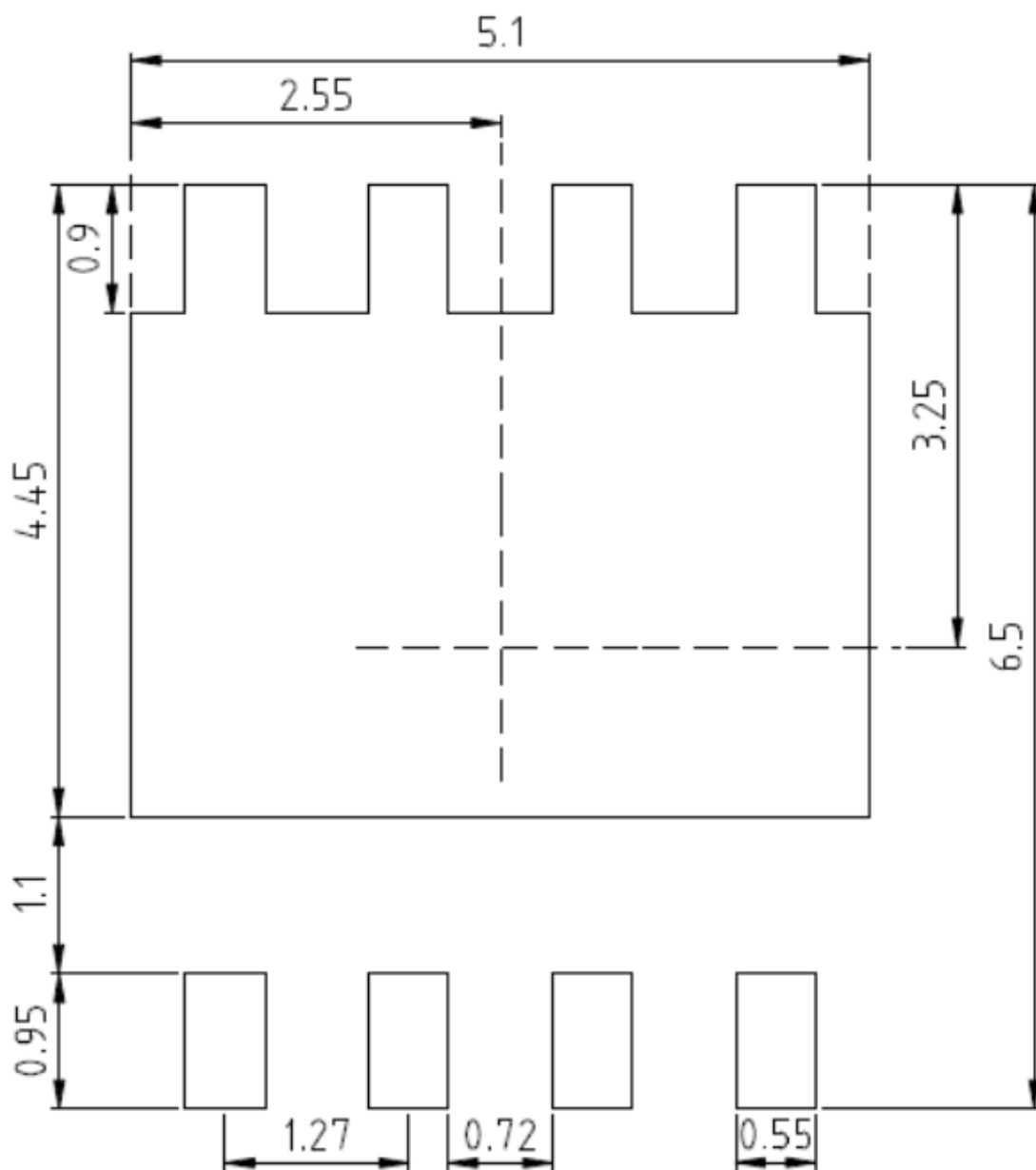
## Package Outline : PMPAK 5x6



| SYMBOLS               | Millimeters |       |      |
|-----------------------|-------------|-------|------|
|                       | MIN         | NOM   | MAX  |
| A                     | 0.90        | 1.10  | 1.30 |
| b                     | 0.33        | 0.41  | 0.51 |
| C                     | 0.254(Ref.) |       |      |
| D1                    | 4.80        | 4.90  | 5.10 |
| D2                    | 3.61        | 4.00  | 4.40 |
| E                     | 5.80        | 6.03  | 6.25 |
| E1 (Ref.)             | 5.60        | 5.75  | 5.90 |
| E2 (Ref.)             | 3.30        | 3.55  | 3.80 |
| e                     | 1.27 BSC    |       |      |
| H                     | 0.35        | —     | 0.90 |
| K (Ref.)              | 1.00        | 1.275 | —    |
| L                     | 0.35        | 0.55  | 0.75 |
| L1                    | 0.06        | 0.13  | 0.20 |
| $\alpha(\text{Ref.})$ | 0°          | —     | 12°  |

- 1.All dimension are in millimeters.
- 2.Dimension does not include burrs and mold flash/protrusions.
- 3.The outline schematic is not to scale and slightly different from the actual product appearance.

**PMPAK 5X6(E-TYPE) FOOTPRINT :**



UNIT: mm