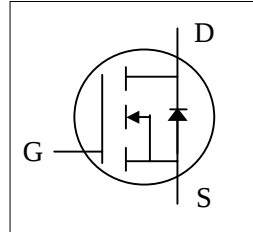


- ▼ Simple Drive Requirement
- ▼ Small Size & Lower Profile
- ▼ RoHS Compliant & Halogen-Free

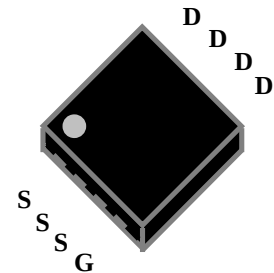


|              |              |
|--------------|--------------|
| $BV_{DSS}$   | 150V         |
| $R_{DS(ON)}$ | 59m $\Omega$ |

## Description

XP1504 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> 3x3 package is special for voltage conversion application using standard infrared reflow technique with the backside heat sink to achieve the good thermal performance.



**PMPAK<sup>®</sup> 3 x 3**

## Absolute Maximum Ratings@T<sub>j</sub>=25°C(unless otherwise specified)

| Symbol                      | Parameter                                  | Rating     | Units |
|-----------------------------|--------------------------------------------|------------|-------|
| $V_{DS}$                    | Drain-Source Voltage                       | 150        | V     |
| $V_{GS}$                    | Gate-Source Voltage                        | $\pm 20$   | V     |
| $I_D@T_C=25^\circ\text{C}$  | Drain Current, $V_{GS}$ @ 10V              | 15.8       | A     |
| $I_D@T_C=100^\circ\text{C}$ | Drain Current, $V_{GS}$ @ 10V              | 10         | A     |
| $I_D@T_A=25^\circ\text{C}$  | Drain Current, $V_{GS}$ @ 10V <sup>3</sup> | 5          | A     |
| $I_D@T_A=70^\circ\text{C}$  | Drain Current, $V_{GS}$ @ 10V <sup>3</sup> | 4          | A     |
| $I_{DM}$                    | Pulsed Drain Current <sup>1</sup>          | 40         | A     |
| $P_D@T_C=25^\circ\text{C}$  | Total Power Dissipation                    | 31.2       | W     |
| $P_D@T_A=25^\circ\text{C}$  | Total Power Dissipation <sup>3</sup>       | 3.12       | W     |
| $E_{AS}$                    | Single Pulse Avalanche Energy <sup>5</sup> | 40.5       | mJ    |
| $T_{STG}$                   | Storage Temperature Range                  | -55 to 150 | °C    |
| $T_J$                       | Operating Junction Temperature Range       | -55 to 150 | °C    |

## Thermal Data

| Symbol | Parameter                                                 | Value | Unit |
|--------|-----------------------------------------------------------|-------|------|
| Rthj-c | Maximum Thermal Resistance, Junction-case                 | 4     | °C/W |
| Rthj-a | Maximum Thermal Resistance, Junction-ambient <sup>3</sup> | 40    | °C/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               | 150  | -    | -    | V     |
| R <sub>DS(ON)</sub> | Static Drain-Source On-Resistance <sup>2</sup> | V <sub>GS</sub> =10V, I <sub>D</sub> =9A                 | -    | 50   | 59   | mΩ    |
| V <sub>GS(th)</sub> | Gate Threshold Voltage                         | V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250uA | 2    | 3    | 4    | V     |
| g <sub>fs</sub>     | Forward Transconductance                       | V <sub>DS</sub> =5V, I <sub>D</sub> =9A                  | -    | 14   | -    | S     |
| I <sub>DSS</sub>    | Drain-Source Leakage Current                   | V <sub>DS</sub> =120V, V <sub>GS</sub> =0V               | -    | -    | 25   | uA    |
| I <sub>GSS</sub>    | Gate-Source Leakage                            | V <sub>GS</sub> = ±20V, V <sub>DS</sub> =0V              | -    | -    | ±0.1 | uA    |
| Q <sub>g</sub>      | Total Gate Charge <sup>4</sup>                 | I <sub>D</sub> =9A                                       | -    | 16   | 25.6 | nC    |
| Q <sub>gs</sub>     | Gate-Source Charge <sup>4</sup>                | V <sub>DS</sub> =75V                                     | -    | 4    | -    | nC    |
| Q <sub>gd</sub>     | Gate-Drain ("Miller") Charge <sup>4</sup>      | V <sub>GS</sub> =10V                                     | -    | 6    | -    | nC    |
| t <sub>d(on)</sub>  | Turn-on Delay Time <sup>4</sup>                | V <sub>DS</sub> =75V                                     | -    | 8.5  | -    | ns    |
| t <sub>r</sub>      | Rise Time <sup>4</sup>                         | I <sub>D</sub> =1A                                       | -    | 7.5  | -    | ns    |
| t <sub>d(off)</sub> | Turn-off Delay Time <sup>4</sup>               | R <sub>G</sub> =3.3 Ω                                    | -    | 21   | -    | ns    |
| t <sub>f</sub>      | Fall Time <sup>4</sup>                         | V <sub>GS</sub> =10V                                     | -    | 23   | -    | ns    |
| C <sub>iss</sub>    | Input Capacitance <sup>4</sup>                 | V <sub>GS</sub> =0V                                      | -    | 615  | 984  | pF    |
| C <sub>oss</sub>    | Output Capacitance <sup>4</sup>                | V <sub>DS</sub> =100V                                    | -    | 57   | -    | pF    |
| C <sub>rss</sub>    | Reverse Transfer Capacitance <sup>4</sup>      | f=1.0MHz                                                 | -    | 15   | -    | pF    |
| R <sub>g</sub>      | Gate Resistance                                | f=1.0MHz                                                 | -    | 0.6  | 1.2  | Ω     |

**Source-Drain Diode**

| Symbol          | Parameter                            | Test Conditions                           | Min. | Typ. | Max. | Units |
|-----------------|--------------------------------------|-------------------------------------------|------|------|------|-------|
| V <sub>SD</sub> | Forward On Voltage <sup>2</sup>      | I <sub>S</sub> =2.4A, V <sub>GS</sub> =0V | -    | -    | 1.3  | V     |
| t <sub>rr</sub> | Reverse Recovery Time <sup>4</sup>   | I <sub>S</sub> =9A, V <sub>GS</sub> =0V,  | -    | 50   | -    | ns    |
| Q <sub>rr</sub> | Reverse Recovery Charge <sup>4</sup> | dI/dt=100A/μs                             | -    | 100  | -    | nC    |

**Notes:**

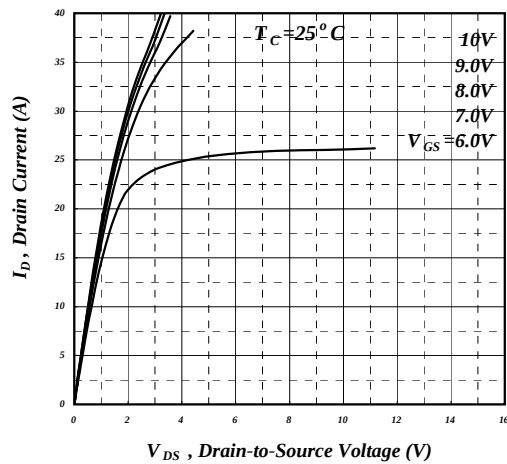
- 1.Pulse width limited by Max. junction temperature.
- 2.Pulse test
- 3.Surface mounted on 1 in<sup>2</sup> 2oz copper pad of FR4 board, t ≤10sec, 210°C/W when mounted on min. copper pad.
- 4.Guaranteed by design.
- 5.Starting T<sub>j</sub>=25°C , V<sub>DD</sub>=50V , L=1mH , R<sub>G</sub>=25Ω , V<sub>GS</sub>=10V

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

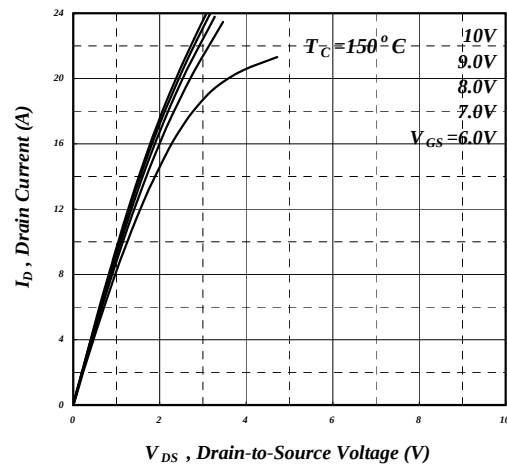
USE OF THIS PRODUCT AS A CRITICAL COMPONENT IN LIFE SUPPORT, AUTOMOTIVE OR OTHER SIMILAR SYSTEMS IS NOT AUTHORIZED.

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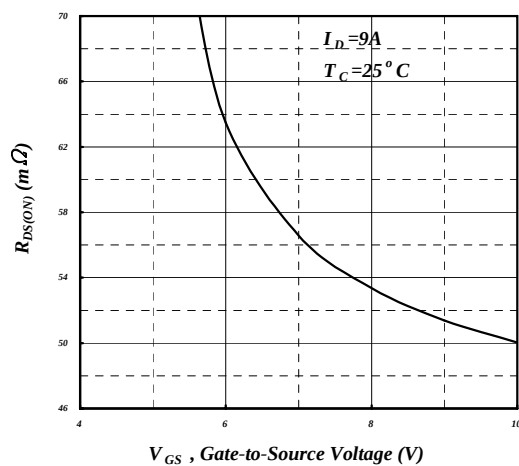
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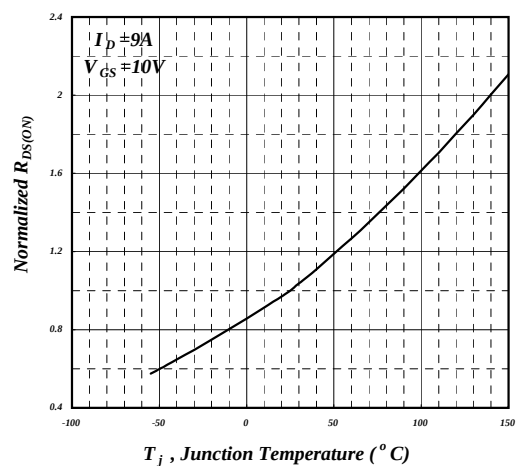
**Fig 1. Typical Output Characteristics**



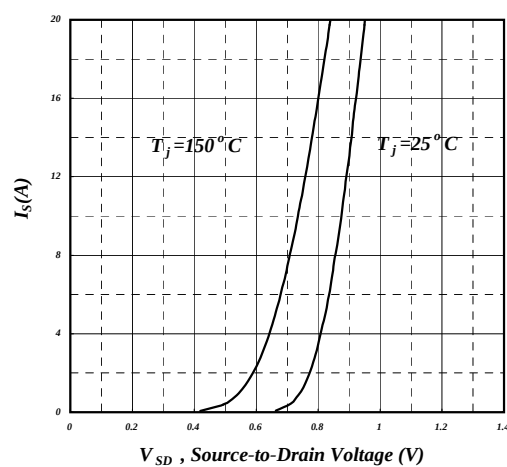
**Fig 2. Typical Output Characteristics**



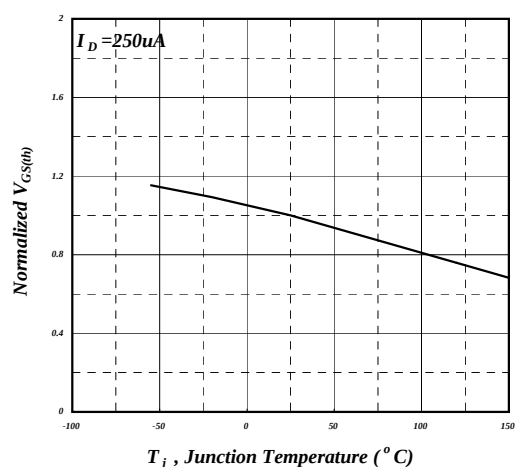
**Fig 3. On-Resistance v.s. Gate Voltage**



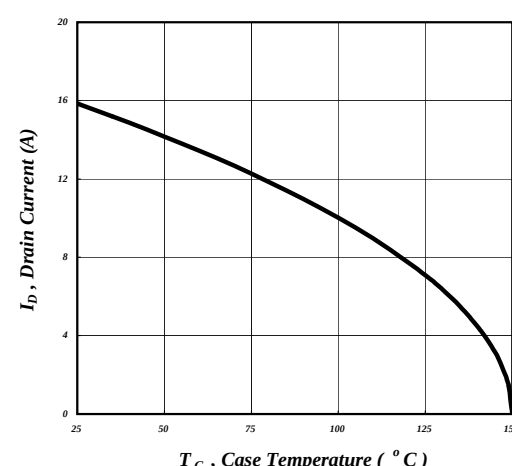
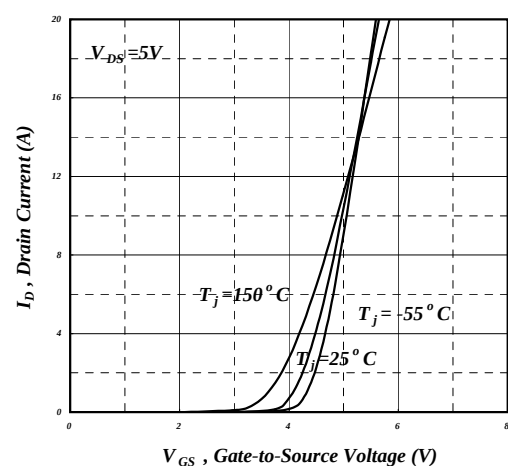
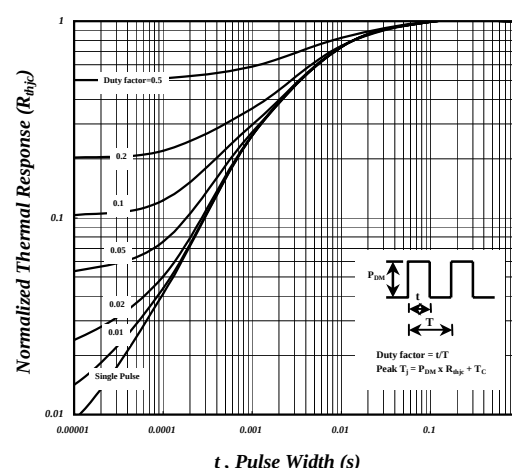
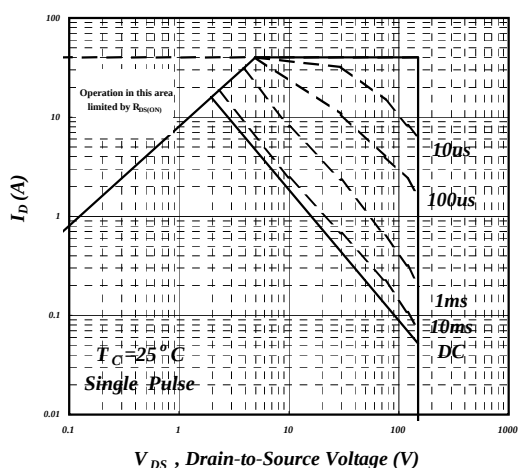
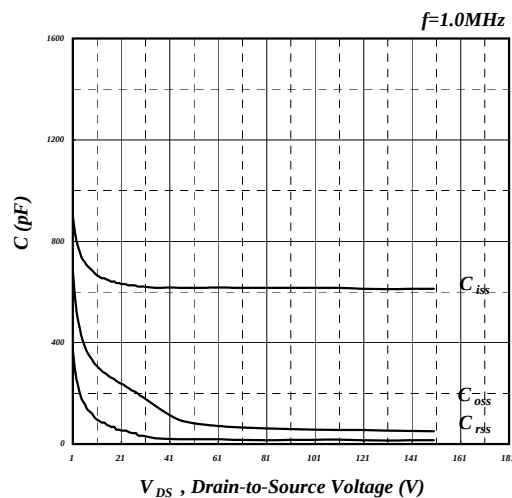
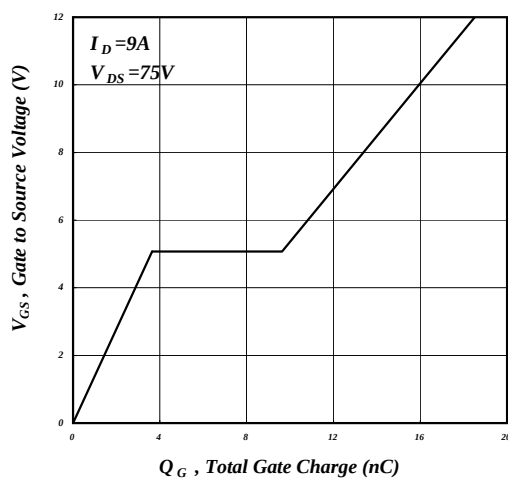
**Fig 4. Normalized On-Resistance  
v.s. Junction Temperature**

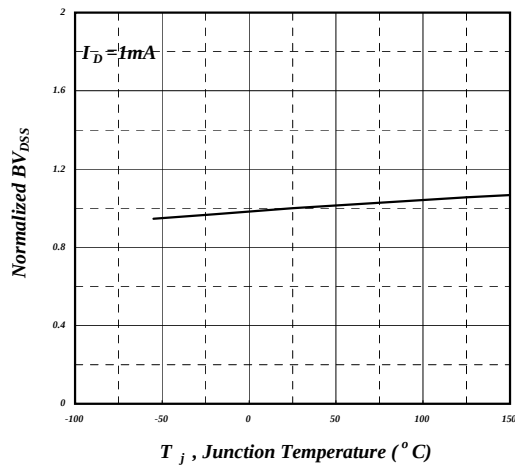


**Fig 5. Forward Characteristic of  
Reverse Diode**

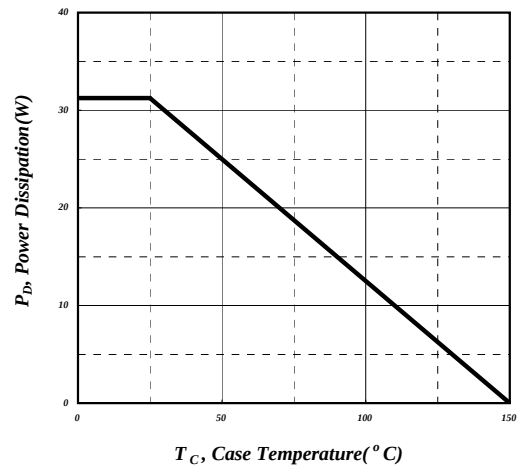


**Fig 6. Gate Threshold Voltage v.s.  
Junction Temperature**

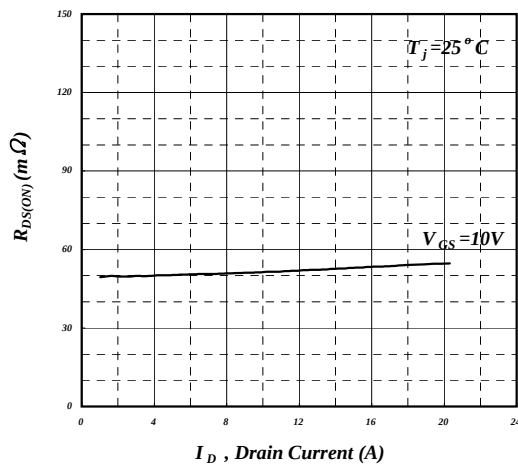




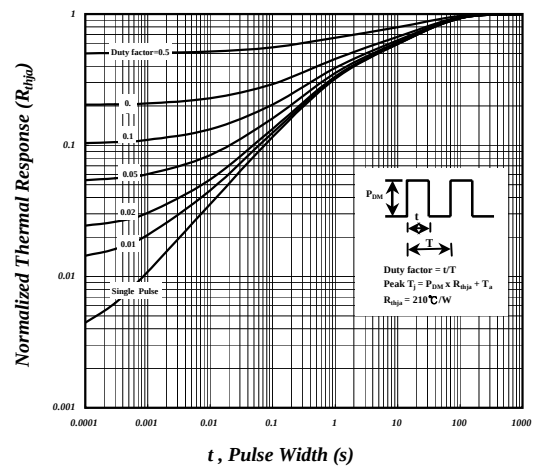
**Fig 13. Normalized  $BV_{DSS}$  v.s. Junction Temperature**



**Fig 14. Total Power Dissipation**

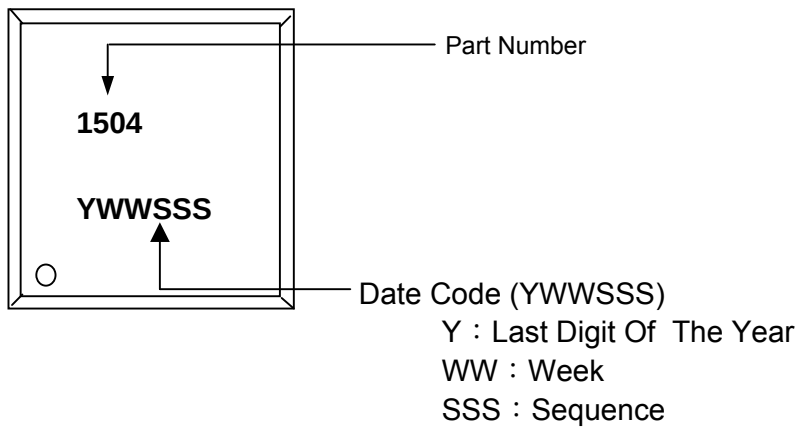


**Fig 15. Typ. Drain-Source on State Resistance**

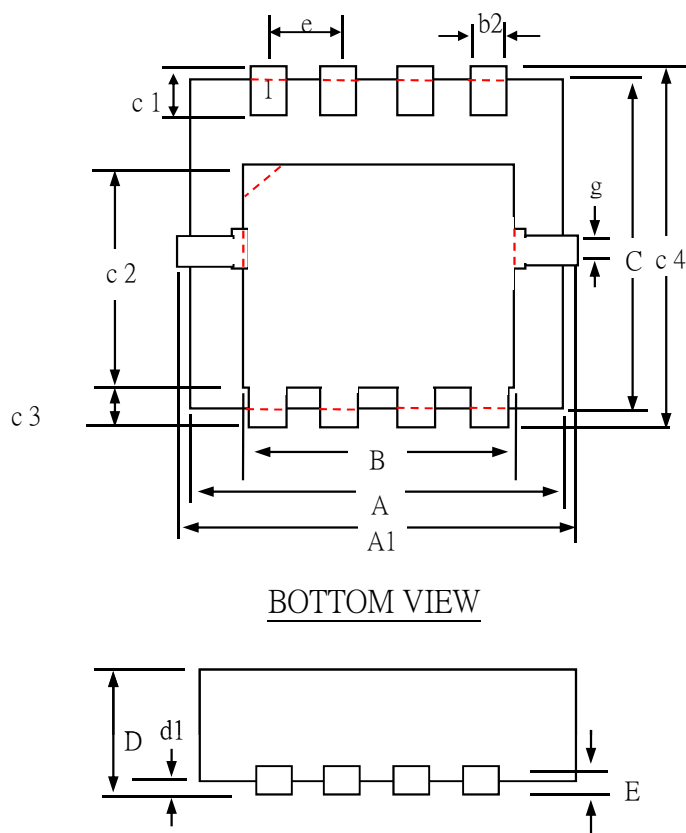


**Fig 16. Effective Transient Thermal Impedance**

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**MARKING INFORMATION**

## Package Outline : PMPAK 3x3

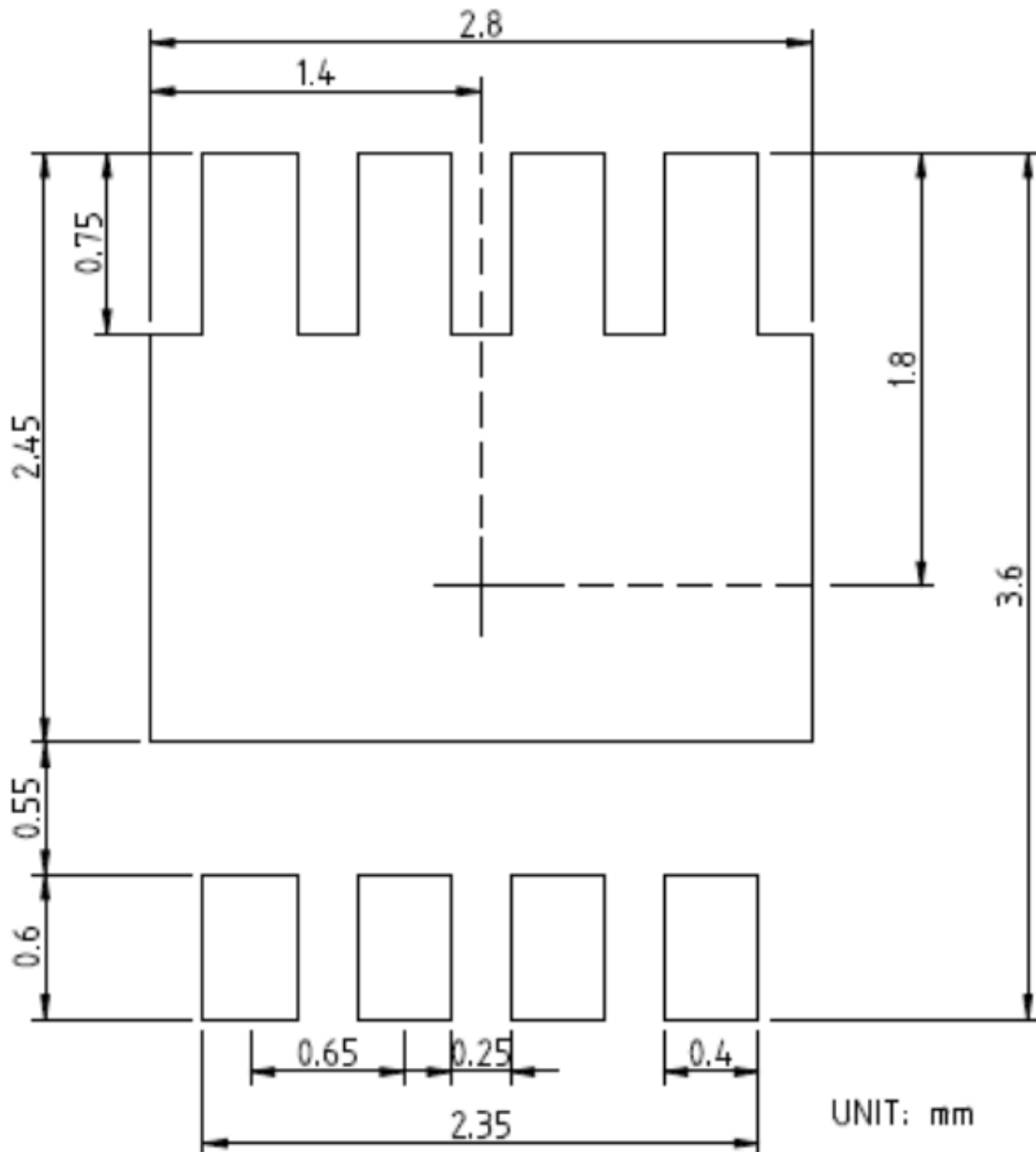


BOTTOM VIEW

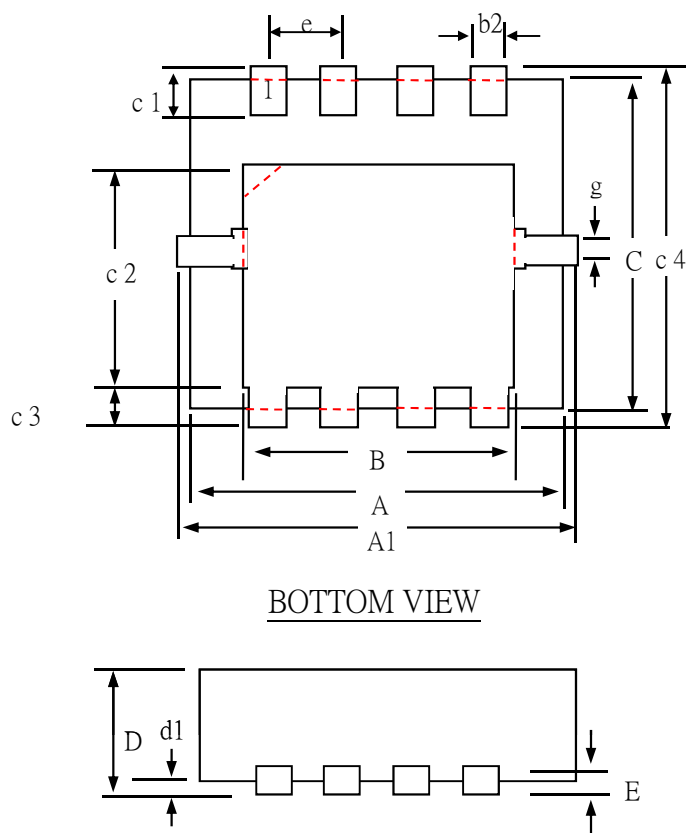
| SYMBOLS | Millimeters |      |       |
|---------|-------------|------|-------|
|         | MIN         | NOM  | MAX   |
| A       | 2.90        | 3.10 | 3.40  |
| B       | 2.20        | 2.45 | 2.80  |
| e       | 0.60        | 0.65 | 0.70  |
| b2      | 0.20        | 0.30 | 0.40  |
| C       | 2.90        | 3.10 | 3.40  |
| c1      | 0.10        | 0.30 | 0.50  |
| c2      | 1.20        | 1.70 | 2.20  |
| c3      | 0.10        | 0.38 | 0.65  |
| D       | 0.65        | 0.80 | 1.05  |
| d1      | 0.00        | 0.10 | 0.20  |
| E       | 0.10        | 0.18 | 0.25  |
| A1      | 2.900       | 3.30 | 3.600 |
| c4      | 2.900       | 3.30 | 3.600 |
| g       | 0.20 (ref)  |      |       |

- 1.All Dimension Are In Millimeters.
- 2.Dimension Does Not Include Mold Protrusions.
3. Thermal PAD and Pin contour is for reference, it may has little difference by option.

**PMPAK3X3 FOOTPRINT :**



## Package Outline : PMPAK 3x3

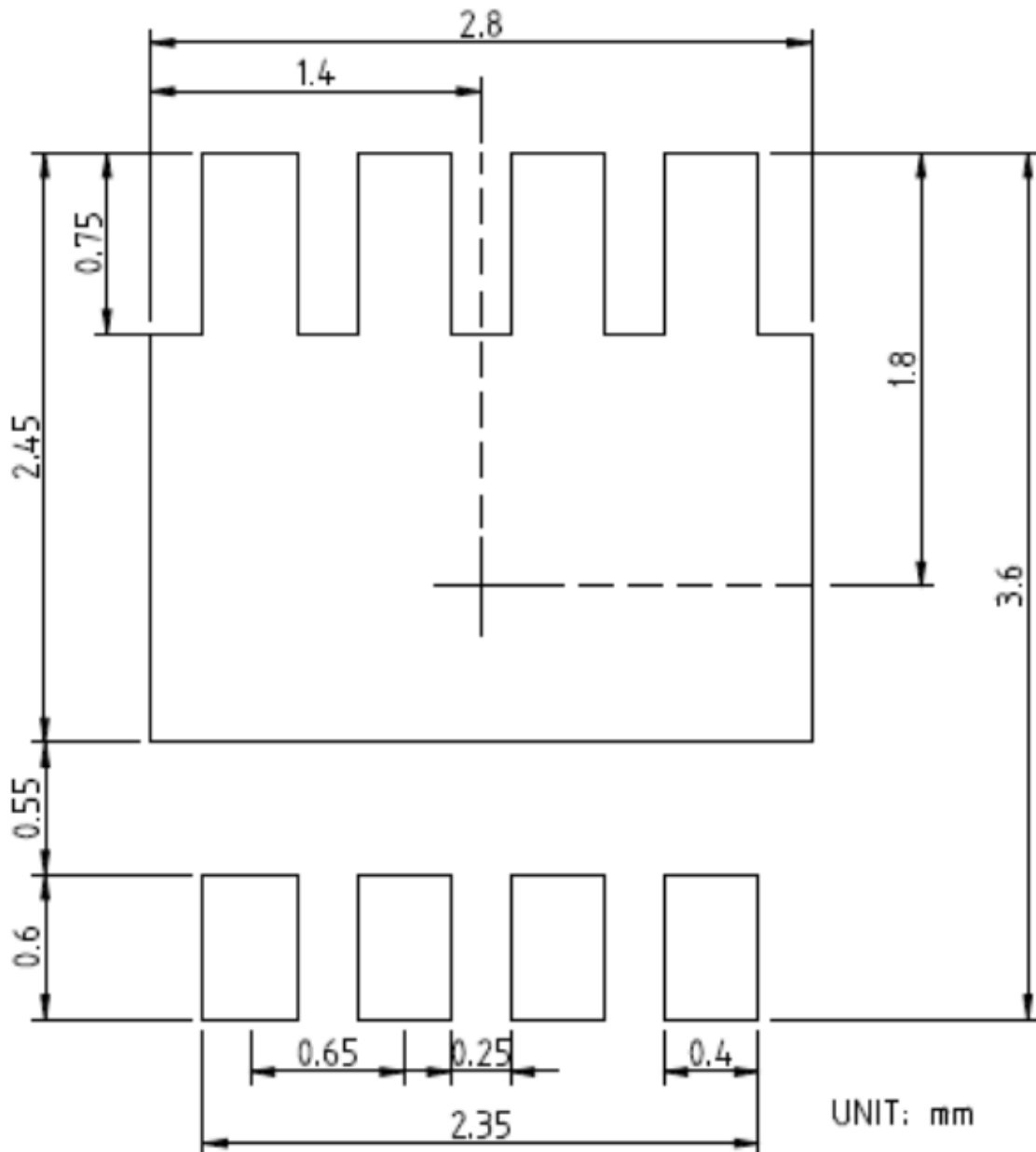


BOTTOM VIEW

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| c1      | 0.10        | 0.30 | 0.50  |
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| A1      | 2.900       | 3.30 | 3.600 |
| c4      | 2.900       | 3.30 | 3.600 |
| g       | 0.20 (ref)  |      |       |

- 1.All Dimension Are In Millimeters.
- 2.Dimension Does Not Include Mold Protrusions.
3. Thermal PAD and Pin contour is for reference, it may has little difference by option.

**PMPAK3X3 FOOTPRINT :**



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