

## General Description

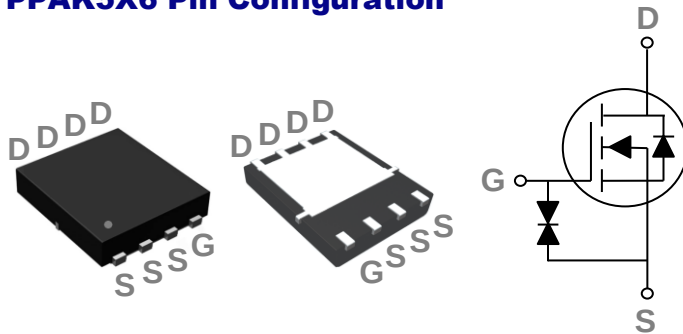
These N-Channel enhancement mode power field effect transistors are using trench DMOS technology. This advanced technology has been especially tailored to minimize on-state resistance, provide superior switching performance, and withstand high energy pulse in the avalanche and commutation mode. These devices are well suited for high efficiency fast switching applications.

| BVDSS | RDS(ON) | ID  |
|-------|---------|-----|
| 30V   | 3.3mΩ   | 95A |

## Features

- 30V,95A,  $R_{DS(ON)} = 3.3m\Omega @ V_{GS} = 10V$
- Improved dv/dt capability
- Fast switching
- Green Device Available

## PPAK5X6 Pin Configuration



## Applications

- MB / VGA / Vcore
- POL Applications
- SMPS 2<sup>nd</sup> SR

## Absolute Maximum Ratings $T_C=25^\circ\text{C}$ unless otherwise noted

| Symbol    | Parameter                                              | Rating     | Units               |
|-----------|--------------------------------------------------------|------------|---------------------|
| $V_{DS}$  | Drain-Source Voltage                                   | 30         | V                   |
| $V_{GS}$  | Gate-Source Voltage                                    | $\pm 20$   | V                   |
| $I_D$     | Drain Current – Continuous ( $T_C=25^\circ\text{C}$ )  | 95         | A                   |
|           | Drain Current – Continuous ( $T_C=100^\circ\text{C}$ ) | 60         | A                   |
| $I_{DM}$  | Drain Current – Pulsed <sup>1</sup>                    | 380        | A                   |
| EAS       | Single Pulse Avalanche Energy <sup>2</sup>             | 68         | mJ                  |
| IAS       | Single Pulse Avalanche Current <sup>2</sup>            | 37         | A                   |
| $P_D$     | Power Dissipation ( $T_C=25^\circ\text{C}$ )           | 59.5       | W                   |
|           | Power Dissipation – Derate above $25^\circ\text{C}$    | 0.48       | W/ $^\circ\text{C}$ |
| $T_{STG}$ | Storage Temperature Range                              | -55 to 150 | $^\circ\text{C}$    |
| $T_J$     | Operating Junction Temperature Range                   | -55 to 150 | $^\circ\text{C}$    |

## Thermal Characteristics

| Symbol          | Parameter                              | Typ. | Max. | Unit               |
|-----------------|----------------------------------------|------|------|--------------------|
| $R_{\theta JA}$ | Thermal Resistance Junction to ambient | ---  | 62   | $^\circ\text{C/W}$ |
| $R_{\theta JC}$ | Thermal Resistance Junction to Case    | ---  | 2.1  | $^\circ\text{C/W}$ |

**Electrical Characteristics ( $T_J=25^\circ\text{C}$ , unless otherwise noted)**
**Off Characteristics**

| Symbol     | Parameter                      | Conditions                                          | Min. | Typ. | Max.     | Unit    |
|------------|--------------------------------|-----------------------------------------------------|------|------|----------|---------|
| $BV_{DSS}$ | Drain-Source Breakdown Voltage | $V_{GS}=0V$ , $I_D=250\mu A$                        | 30   | ---  | ---      | V       |
| $I_{DSS}$  | Drain-Source Leakage Current   | $V_{DS}=30V$ , $V_{GS}=0V$ , $T_J=25^\circ\text{C}$ | ---  | ---  | 1        | $\mu A$ |
|            |                                | $V_{DS}=24V$ , $V_{GS}=0V$ , $T_J=85^\circ\text{C}$ | ---  | ---  | 10       | $\mu A$ |
| $I_{GSS}$  | Gate-Source Leakage Current    | $V_{GS}=\pm 20V$ , $V_{DS}=0V$                      | ---  | ---  | $\pm 20$ | $\mu A$ |

**On Characteristics**

|              |                                   |                                  |     |     |     |           |
|--------------|-----------------------------------|----------------------------------|-----|-----|-----|-----------|
| $R_{DS(ON)}$ | Static Drain-Source On-Resistance | $V_{GS}=10V$ , $I_D=20A$         | --- | 2.7 | 3.3 | $m\Omega$ |
|              |                                   | $V_{GS}=4.5V$ , $I_D=15A$        | --- | 4.2 | 5.5 | $m\Omega$ |
| $V_{GS(th)}$ | Gate Threshold Voltage            | $V_{GS}=V_{DS}$ , $I_D=250\mu A$ | 1.2 | 1.6 | 2.5 | V         |

**Dynamic and switching Characteristics<sup>3</sup>**

|              |                              |                                                          |     |      |     |          |
|--------------|------------------------------|----------------------------------------------------------|-----|------|-----|----------|
| $Q_g$        | Total Gate Charge            | $V_{DS}=15V$ , $V_{GS}=10V$ , $I_D=45A$                  | --- | 23   | --- | nC       |
|              |                              |                                                          | --- | 12   | --- |          |
| $Q_{gs}$     | Gate-Source Charge           | $V_{DS}=15V$ , $V_{GS}=4.5V$ , $I_D=45A$                 | --- | 2    | --- |          |
| $Q_{gd}$     | Gate-Drain Charge            |                                                          | --- | 5.5  | --- |          |
| $T_{d(on)}$  | Turn-On Delay Time           | $V_{DD}=15V$ , $V_{GS}=10V$ , $R_G=6\Omega$<br>$I_D=45A$ | --- | 3    | --- | ns       |
| $T_r$        | Rise Time                    |                                                          | --- | 5    | --- |          |
| $T_{d(off)}$ | Turn-Off Delay Time          |                                                          | --- | 10   | --- |          |
| $T_f$        | Fall Time                    |                                                          | --- | 5    | --- |          |
| $C_{iss}$    | Input Capacitance            | $V_{DS}=15V$ , $V_{GS}=0V$ , $F=1\text{MHz}$             | --- | 1200 | --- | pF       |
| $C_{oss}$    | Output Capacitance           |                                                          | --- | 800  | --- |          |
| $C_{rss}$    | Reverse Transfer Capacitance |                                                          | --- | 60   | --- |          |
| $R_g$        | Gate resistance              | $V_{GS}=0V$ , $V_{DS}=0V$ , $F=1\text{MHz}$              | --- | 1.3  | --- | $\Omega$ |

**Guaranteed Avalanche Energy**

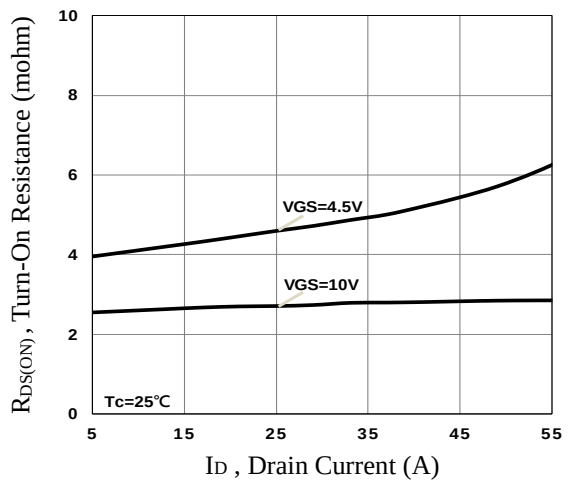
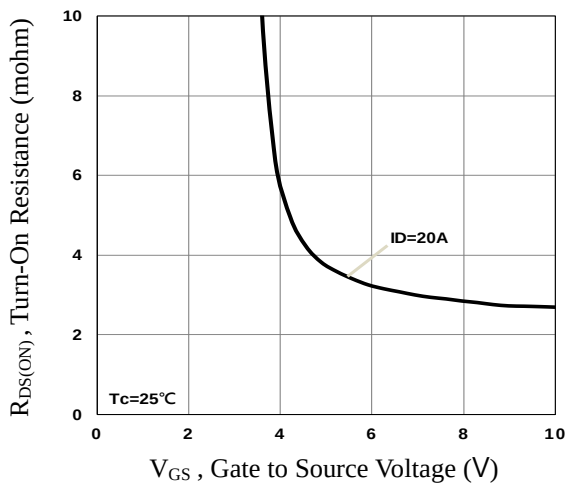
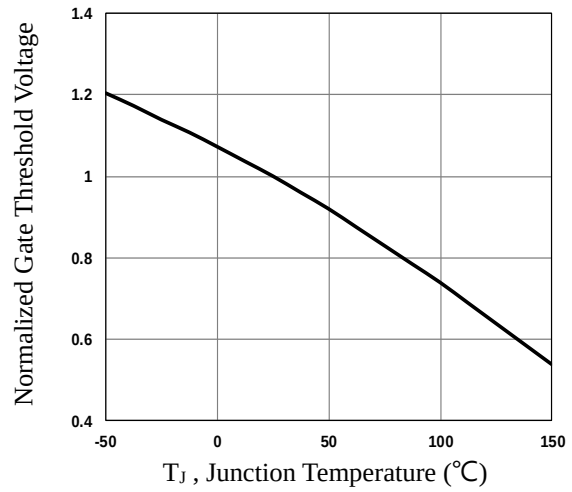
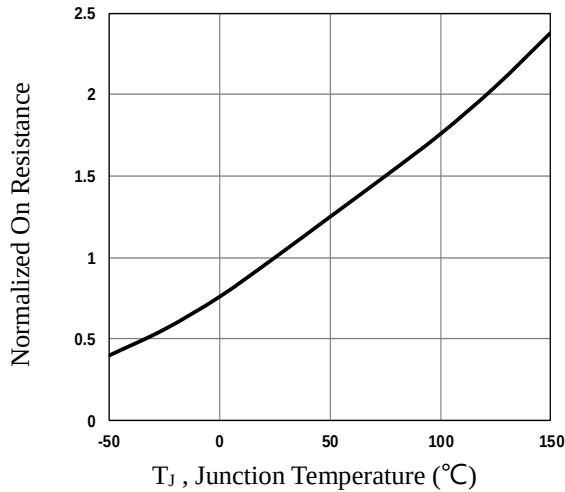
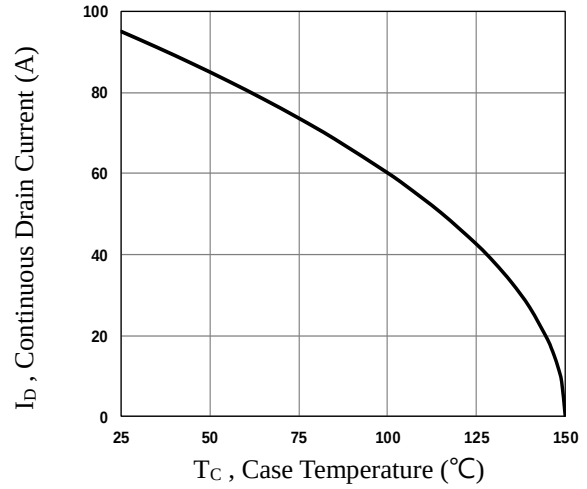
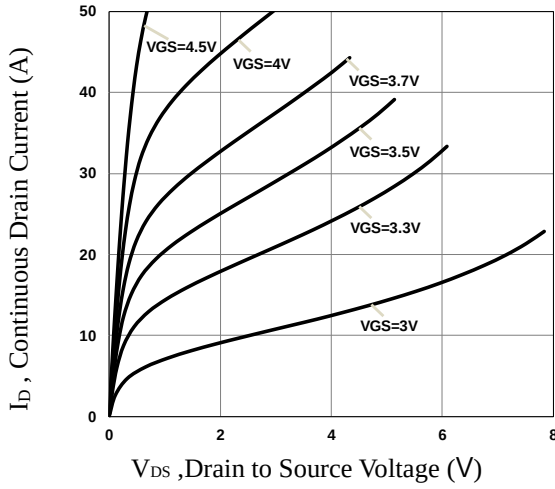
| Symbol | Parameter                     | Conditions                                     | Min. | Typ. | Max. | Unit |
|--------|-------------------------------|------------------------------------------------|------|------|------|------|
| EAS    | Single Pulse Avalanche Energy | $V_{DD}=25V$ , $L=0.1\text{mH}$ , $I_{AS}=27A$ | 36.5 | ---  | ---  | mJ   |

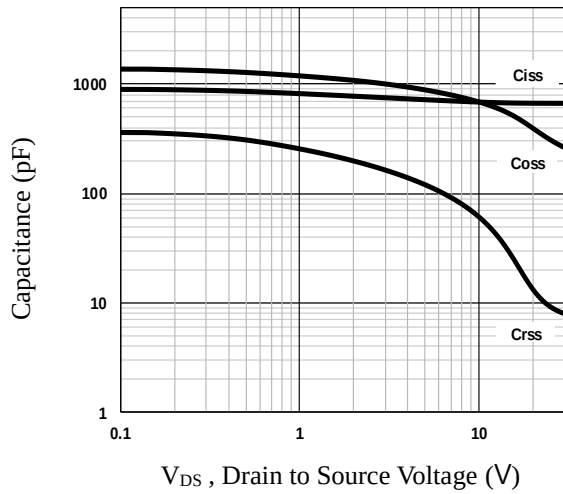
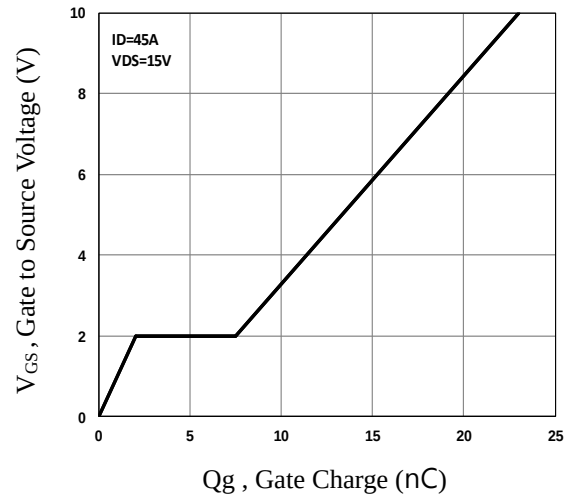
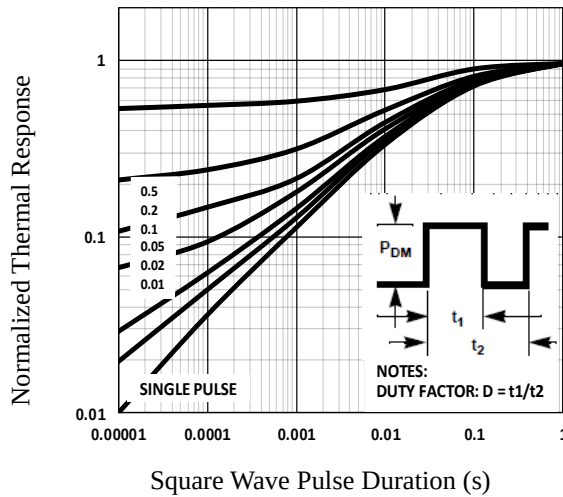
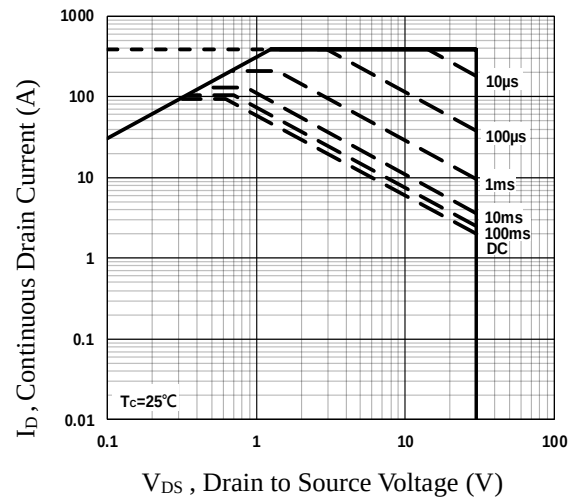
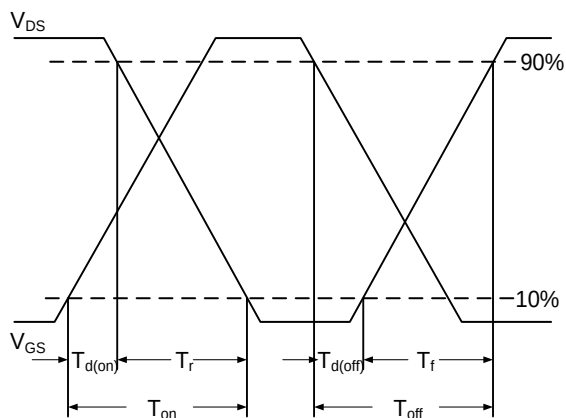
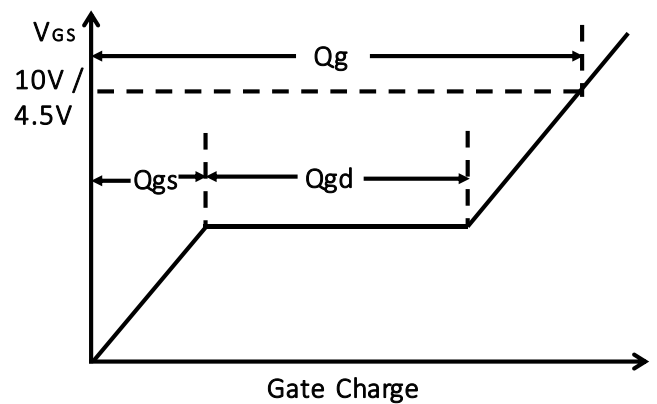
**Drain-Source Diode Characteristics and Maximum Ratings**

| Symbol   | Parameter                 | Conditions                                      | Min. | Typ. | Max. | Unit |
|----------|---------------------------|-------------------------------------------------|------|------|------|------|
| $I_S$    | Continuous Source Current | $V_G=V_D=0V$ , Force Current                    | ---  | ---  | 95   | A    |
| $I_{SM}$ | Pulsed Source Current     |                                                 | ---  | ---  | 190  | A    |
| $V_{SD}$ | Diode Forward Voltage     | $V_{GS}=0V$ , $I_S=1A$ , $T_J=25^\circ\text{C}$ | ---  | ---  | 1    | V    |
| $t_{rr}$ | Reverse Recovery Time     | $V_R=20V$ , $I_S=10A$                           | ---  | 50   | ---  | ns   |
| $Q_{rr}$ | Reverse Recovery Charge   | $di/dt=100A/\mu s$ , $T_J=25^\circ\text{C}$     | ---  | 45   | ---  | nC   |

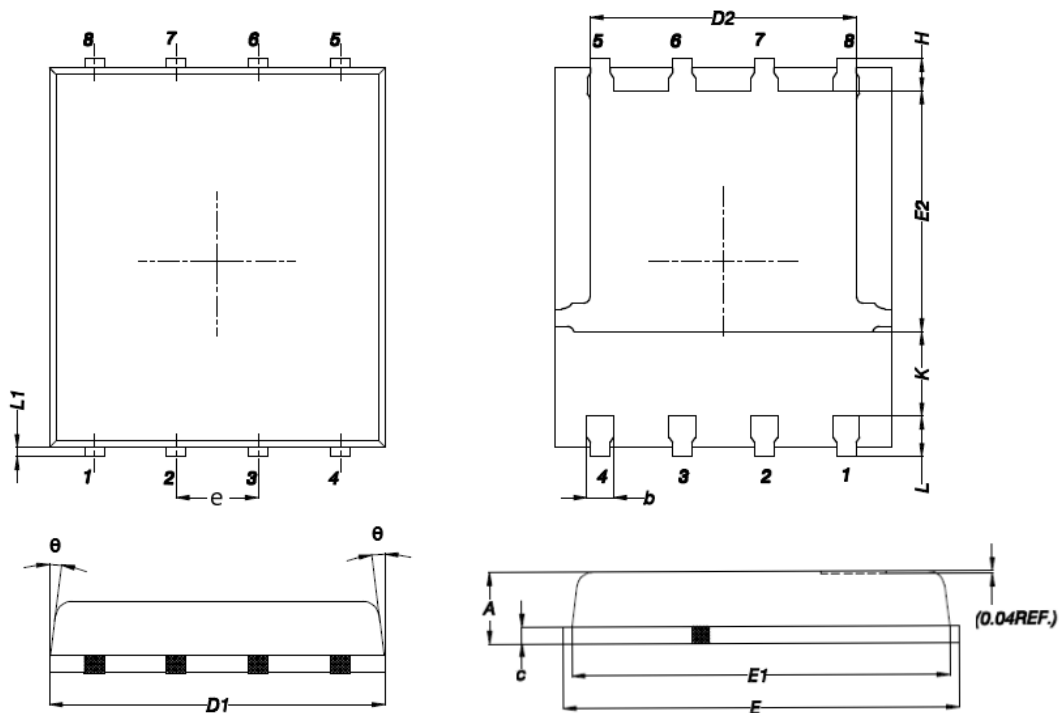
Note :

1. Repetitive Rating : Pulsed width limited by maximum junction temperature.
2.  $V_{DD}=25V$ ,  $V_{GS}=10V$ ,  $L=0.1\text{mH}$ ,  $I_{AS}=37A$ ,  $R_G=25\Omega$ , Starting  $T_J=25^\circ\text{C}$ .
3. Essentially independent of operating temperature.



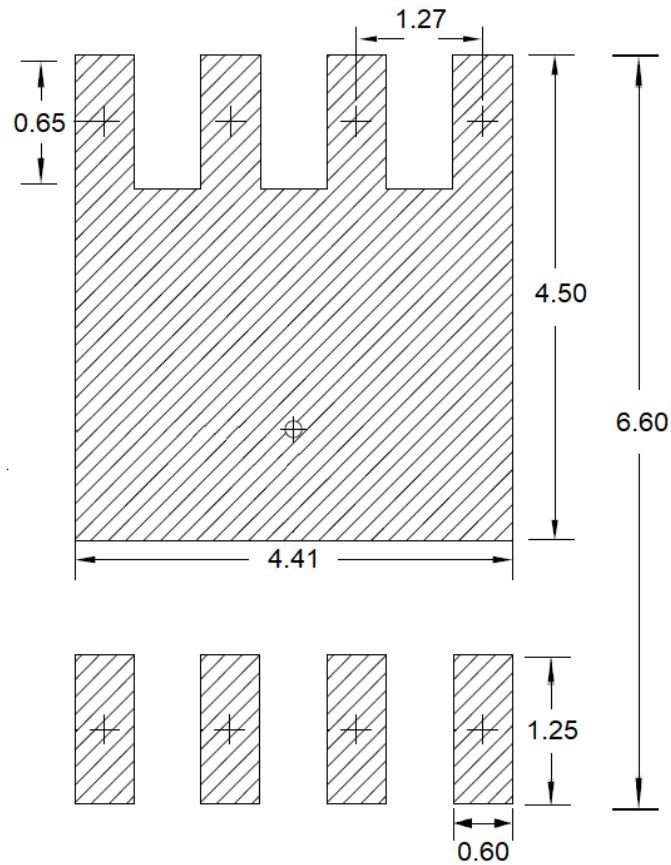

**Fig.7 Capacitance Characteristics**

**Fig.8 Gate Charge Characteristics**

**Fig.9 Normalized Transient Impedance**

**Fig.10 Maximum Safe Operation Area**

**Fig.11 Switching Time Waveform**

**Fig.12 Gate Charge Waveform**

## PPAK5x6 PACKAGE INFORMATION



| Symbol | Dimensions In Millimeters |       | Dimensions In Inches |       |
|--------|---------------------------|-------|----------------------|-------|
|        | MAX                       | MIN   | MAX                  | MIN   |
| A      | 1.200                     | 0.850 | 0.047                | 0.031 |
| b      | 0.510                     | 0.300 | 0.020                | 0.012 |
| C      | 0.300                     | 0.200 | 0.012                | 0.008 |
| D1     | 5.400                     | 4.800 | 0.212                | 0.189 |
| D2     | 4.310                     | 3.610 | 0.170                | 0.142 |
| E      | 6.300                     | 5.850 | 0.248                | 0.230 |
| E1     | 5.960                     | 5.450 | 0.235                | 0.215 |
| E2     | 3.920                     | 3.300 | 0.154                | 0.130 |
| e      | 1.27BSC                   |       | 0.05BSC              |       |
| H      | 0.710                     | 0.380 | 0.027                | 0.015 |
| K      | ---                       | 1.100 | ---                  | 0.043 |
| L      | 0.710                     | 0.380 | 0.028                | 0.015 |
| L1     | 0.250                     | 0.050 | 0.009                | 0.002 |
| θ      | 12°                       | 0°    | 12°                  | 0°    |

## PPAK5X6 RECOMMENDED LAND PATTERN



unit : mm