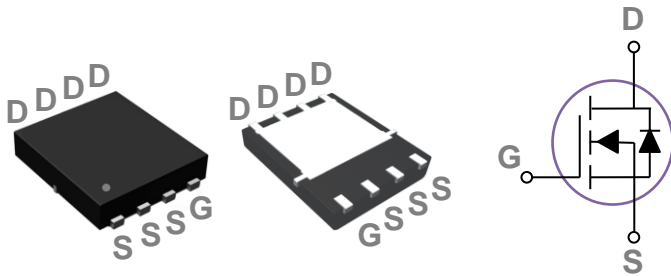


### General Description

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.

### PPAK5X6 Pin Configuration



|       |       |     |
|-------|-------|-----|
| BVDSS | RDSON | ID  |
| 115V  | 7.6mΩ | 85A |

### Features

- 115V,85A,  $R_{DS(ON)} = 7.6m\Omega$  @  $V_{GS} = 10V$
- Improved  $dv/dt$  capability
- Fast switching
- 100% EAS Guaranteed
- Green Device Available

### Applications

- Motor Drive
- Power Tools
- LED Lighting

### Absolute Maximum Ratings $T_c=25^\circ C$ unless otherwise noted

| Symbol    | Parameter  | Rating     | Units         |
|-----------|--|------------|---------------|
| $V_{DS}$  | Drain-Source Voltage                             | 115        | V             |
| $V_{GS}$  | Gate-Source Voltage                              | +20 / -12  | V             |
| $I_D$     | Drain Current – Continuous ( $T_c=25^\circ C$ )  | 85         | A             |
|           | Drain Current – Continuous ( $T_c=100^\circ C$ ) | 54         | A             |
| $I_{DM}$  | Drain Current – Pulsed <sup>1</sup>              | 340        | A             |
| EAS       | Single Pulse Avalanche Energy <sup>2</sup>       | 266        | mJ            |
| IAS       | Single Pulse Avalanche Current <sup>2</sup>      | 73         | A             |
| $P_D$     | Power Dissipation ( $T_c=25^\circ C$ )           | 240        | W             |
|           | Power Dissipation – Derate above $25^\circ C$    | 1.92       | W/ $^\circ C$ |
| $T_{STG}$ | Storage Temperature Range                        | -55 to 150 | $^\circ C$    |
| $T_J$     | Operating Junction Temperature Range             | -55 to 150 | $^\circ C$    |

### Thermal Characteristics

| Symbol          | Parameter                              | Typ. | Max. | Unit         |
|-----------------|--|------|------|--------------|
| $R_{\theta JA}$ | Thermal Resistance Junction to ambient | ---  | 62   | $^\circ C/W$ |
| $R_{\theta JC}$ | Thermal Resistance Junction to Case    | ---  | 0.52 | $^\circ C/W$ |

**Electrical Characteristics (T<sub>J</sub>=25 °C, unless otherwise noted)**
**Off Characteristics**

| Symbol            | Parameter                      | Conditions   | Min. | Typ. | Max. | Unit |
|-------------------|--------------------------------|--|------|------|------|------|
| BV <sub>DSS</sub> | Drain-Source Breakdown Voltage | V <sub>GS</sub> =0V , I <sub>D</sub> =250uA                        | 115  | ---  | ---  | V    |
| I <sub>DSS</sub>  | Drain-Source Leakage Current   | V <sub>DS</sub> =100V , V <sub>GS</sub> =0V , T <sub>J</sub> =25°C | ---  | ---  | 1    | uA   |
|                   |                                | V <sub>DS</sub> =100V , V <sub>GS</sub> =0V , T <sub>J</sub> =85°C | ---  | ---  | 10   | uA   |
| I <sub>GSS</sub>  | Gate-Source Leakage Current    | V <sub>GS</sub> =20V , V <sub>DS</sub> =0V                         | ---  | ---  | 100  | nA   |

**On Characteristics**

|                     |  |  |     |     |     |    |
|---------------------|--|--|-----|-----|-----|----|
| R <sub>DS(ON)</sub> | Static Drain-Source On-Resistance <sup>3</sup> | V <sub>GS</sub> =10V , I <sub>D</sub> =20A               | --- | 6.4 | 7.6 | mΩ |
|                     |  | V <sub>GS</sub> =4.5V , I <sub>D</sub> =10A              | --- | 8.7 | 11  | mΩ |
| V <sub>GS(th)</sub> | Gate Threshold Voltage                         | V <sub>GS</sub> =V <sub>DS</sub> , I <sub>D</sub> =250uA | 1.2 | 1.8 | 2.5 | V  |
| g <sub>fs</sub>     | Forward Transconductance                       | V <sub>DS</sub> =10V , I <sub>D</sub> =3A                | --- | 12  | --- | S  |

**Dynamic and switching Characteristics**

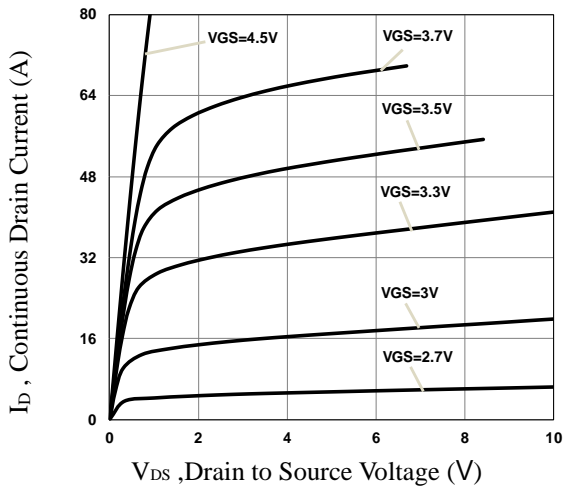
|                     |                                     |   |     |      |      |    |
|---------------------|-------------------------------------|---|-----|------|------|----|
| Q <sub>g</sub>      | Total Gate Charge <sup>3, 4</sup>   | V <sub>DS</sub> =60V , V <sub>GS</sub> =10V , I <sub>D</sub> =40A                       | --- | 70   | 105  | nC |
| Q <sub>gs</sub>     | Gate-Source Charge <sup>3, 4</sup>  |   | --- | 14   | 21   |    |
| Q <sub>gd</sub>     | Gate-Drain Charge <sup>3, 4</sup>   |   | --- | 16   | 24   |    |
| T <sub>d(on)</sub>  | Turn-On Delay Time <sup>3, 4</sup>  | V <sub>DS</sub> =60V , V <sub>GS</sub> =10V , R <sub>G</sub> =6Ω<br>I <sub>D</sub> =40A | --- | 22   | 35   | ns |
| T <sub>r</sub>      | Rise Time <sup>3, 4</sup>           |   | --- | 25   | 40   |    |
| T <sub>d(off)</sub> | Turn-Off Delay Time <sup>3, 4</sup> |   | --- | 35   | 55   |    |
| T <sub>f</sub>      | Fall Time <sup>3, 4</sup>           |   | --- | 18   | 30   |    |
| C <sub>iss</sub>    | Input Capacitance                   | V <sub>DS</sub> =60V , V <sub>GS</sub> =0V , F=1MHz                                     | --- | 4500 | 6700 | pF |
| C <sub>oss</sub>    | Output Capacitance                  |   | --- | 350  | 520  |    |
| C <sub>rss</sub>    | Reverse Transfer Capacitance        |   | --- | 10   | 20   |    |
| R <sub>g</sub>      | Gate Resistance                     | V <sub>GS</sub> =0V , V <sub>DS</sub> =0V , F=1MHz                                      | --- | 1.7  | ---  | Ω  |

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

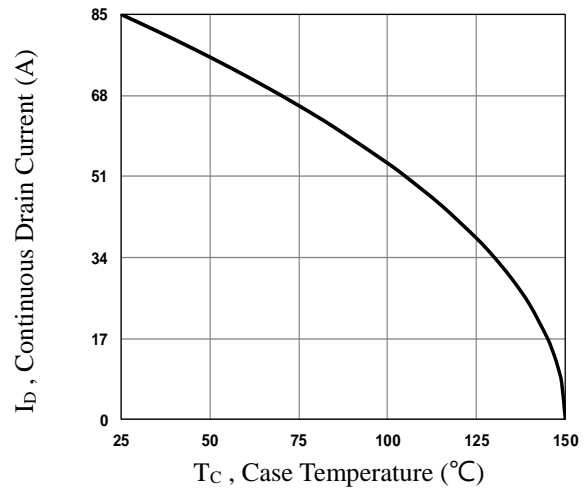
| Symbol          | Parameter                            | Conditions  | Min.                                 | Typ. | Max. | Unit |
|-----------------|--------------------------------------|---|--------------------------------------|------|------|------|
| I <sub>S</sub>  | Continuous Source Current            | V <sub>G</sub> =V <sub>D</sub> =0V , Force Current              | ---                                  | ---  | 85   | A    |
| I <sub>SM</sub> | Pulsed Source Current                |   | ---                                  | ---  | 170  | A    |
| V <sub>SD</sub> | Diode Forward Voltage                | V <sub>GS</sub> =0V , I <sub>S</sub> =1A , T <sub>J</sub> =25°C | ---                                  | ---  | 1    | V    |
| t <sub>rr</sub> | Reverse Recovery Time <sup>3</sup>   | V <sub>R</sub> =100V , I <sub>S</sub> =10A                      | ---                                  | 66   | ---  | ns   |
| Q <sub>rr</sub> | Reverse Recovery Charge <sup>3</sup> |   | dI/dt=100A/μs , T <sub>J</sub> =25°C | ---  | 130  | ---  |

Note :

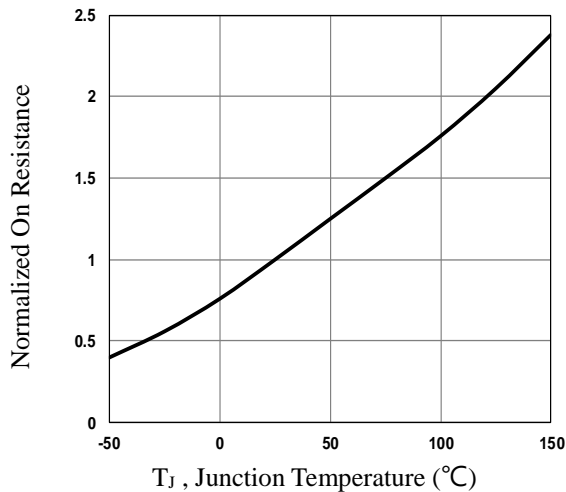
1. Repetitive Rating : Pulsed width limited by maximum junction temperature.
2. V<sub>DD</sub>=50V, V<sub>GS</sub>=10V, L=0.1mH, I<sub>AS</sub>=73A., R<sub>G</sub>=25Ω, Starting T<sub>J</sub>=25°C.
3. The data tested by pulsed , pulse width ≤ 300us , duty cycle ≤ 2%.
4. Essentially independent of operating temperature.



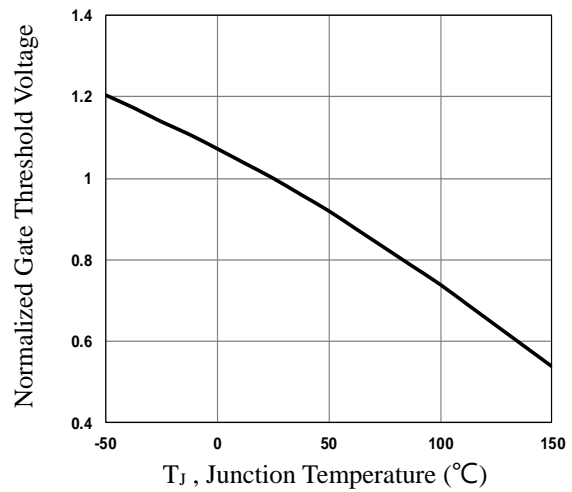
**Fig.1 Typical Output Characteristics**



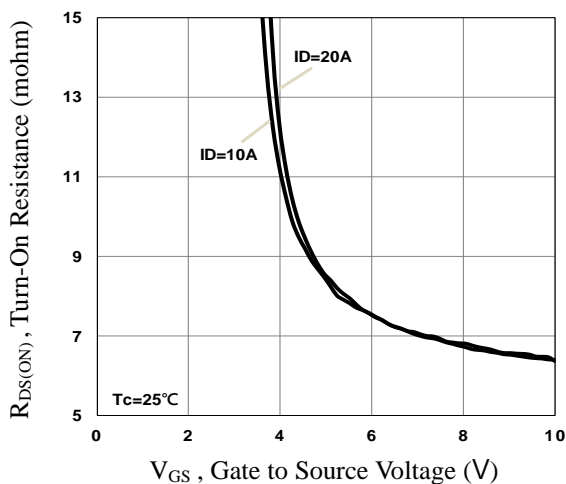
**Fig.2 Continuous Drain Current vs. T<sub>c</sub>**



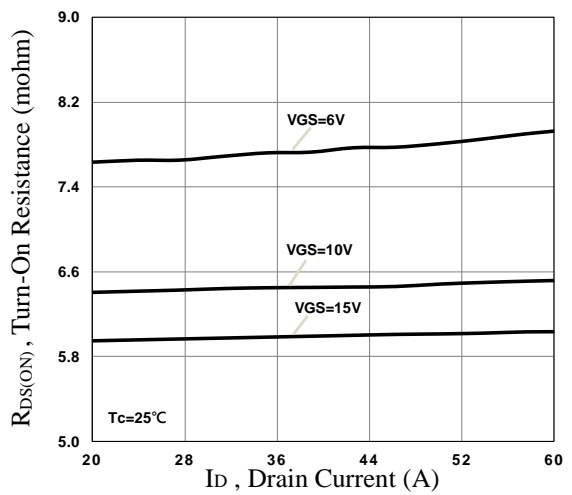
**Fig.3 Normalized R<sub>DS(on)</sub> vs. T<sub>j</sub>**



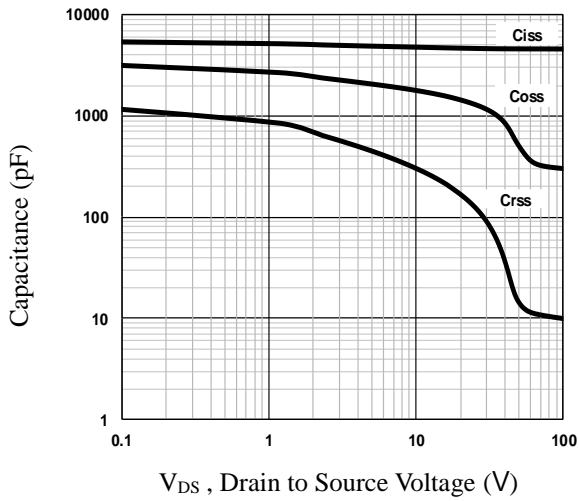
**Fig.4 Normalized V<sub>th</sub> vs. T<sub>j</sub>**



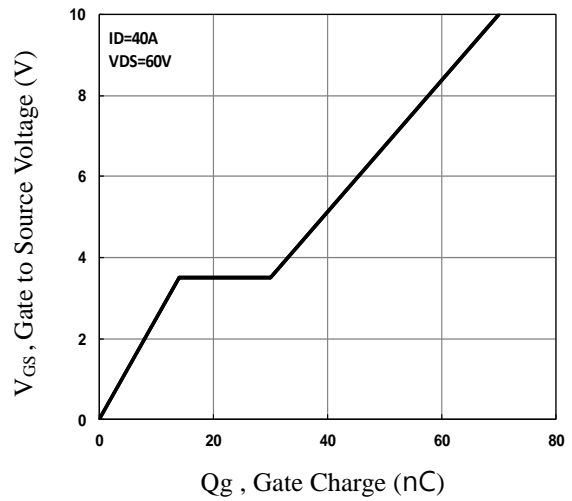
**Fig.5 Turn-On Resistance vs. V<sub>GS</sub>**



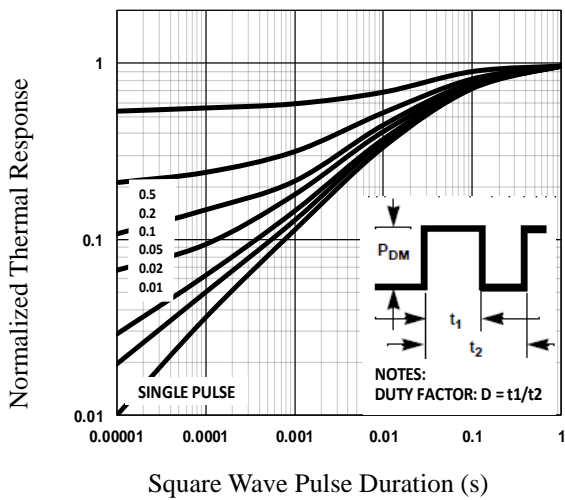
**Fig.6 Turn-On Resistance vs. I<sub>D</sub>**



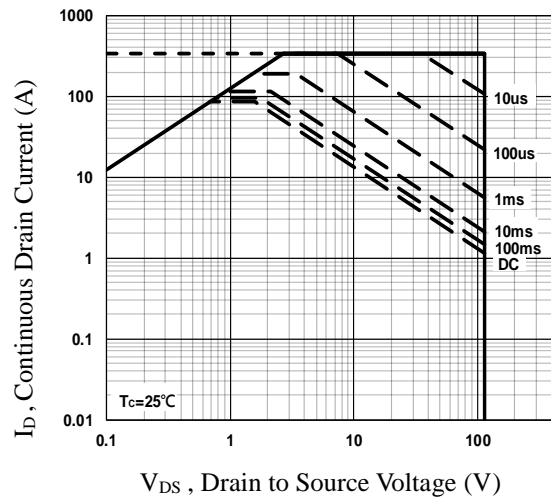
**Fig.7 Capacitance Characteristics**



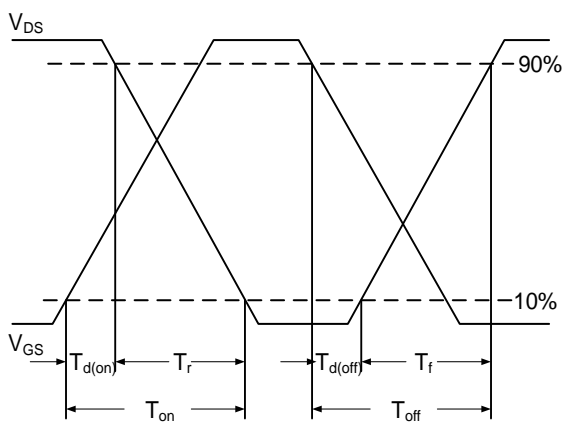
**Fig.8 Gate Charge Characteristics**



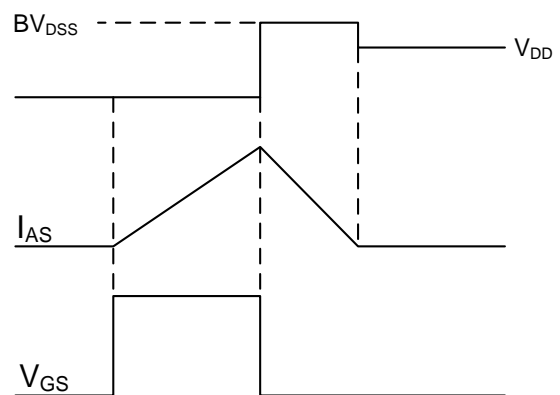
**Fig.9 Normalized Transient Impedance**



**Fig.10 Maximum Safe Operation Area**

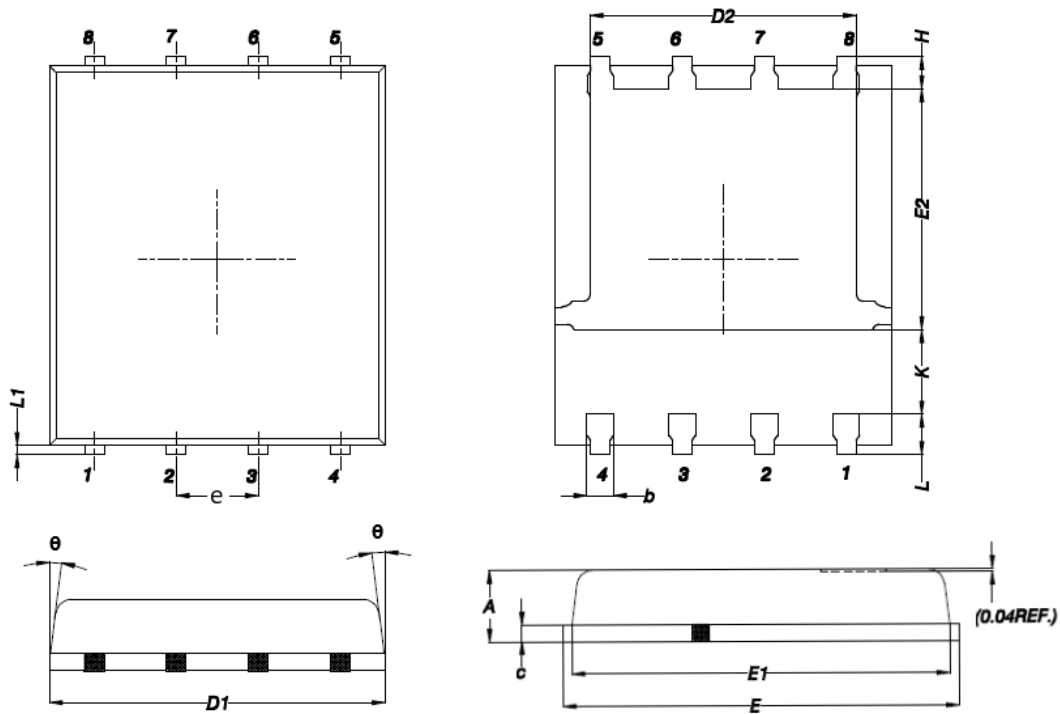


**Fig.11 Switching Time Waveform**



**Fig.12 EAS 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      | 0.650                     | 0.380 | 0.026                | 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°    |