# -60V P-Channel Enhancement Mode MOSFET

## Features

- Advanced HEFET™ Technology
- Ultra Low On-Resistance
- Excellent $Q_g x R_{DS(on)}$ Product
- 100% avalanche tested
- 175°C Operating Temperature
- Lead Free and Green Devices Available (RoHS Comp

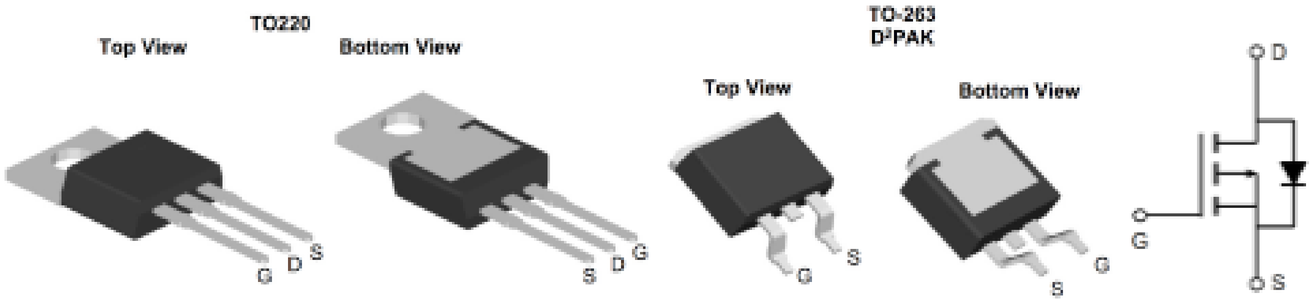
## Applications

- Motor Drives
- Uninterruptible Power Supplies
- DC/DC converter
- General Purpose Applications

Pb-Free RoHS HF Halogen-Free

$V_{DS}$ = -60V $I_D$ =-120A

$R_{DS(ON)}$ <6.5mΩ @ $V_{GS}$=10V




| Product ID | Pack | Marking | Qty(PCS) |
|---|---|---|---|
| XPX120P06TU | TO-220-3L | XPX120P06TU XXX YYYY | 1000 |
| XPX120P06TT | TO-263-3L | XPX120P06TT XXX YYYY | 800 |

## Absolute Maximum Ratings ($T_C$=25℃unless otherwise noted)

| Symbol | Parameter | Rating | Units |
|---|---|---|---|
| $V_{DS}$ | Drain-Source Voltage | -60 | V |
| $V_{GS}$ | Gate-Source Voltage | ±20 | V |
| $I_D$@$T_C$=25˚C | Continuous Drain Current, -$V_{GS}$ @ -10V[1] | -120 | A |
| $I_D$@$T_C$=100˚C | Continuous Drain Current, -$V_{GS}$ @ -10V[1] | -65 | A |
| $I_{DM}$ | Pulsed Drain Current[2] | -300 | A |
| EAS | Single Pulse Avalanche Energy[3] | 650 | mJ |
| $I_{AS}$ | Avalanche Current | 80 | A |
| $P_D$@$T_C$=25˚C | Total Power Dissipation[4] | 142 | W |
| $T_{STG}$ | Storage Temperature Range | -55 to 150 | ˚C |
| $T_J$ | Operating Junction Temperature Range | -55 to 150 | ˚C |
| $R_{θJA}$ | Thermal Resistance Junction-Ambient [1] | 0.88 | ˚C/W |
| $R_{θJC}$ | Thermal Resistance Junction-Case[1] | 60 | ˚C/W |

**Electrical Characteristics ($T_C$=25℃unless otherwise noted)**

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| BVDSS | Drain-Source Breakdown Voltage | $V_{GS}$=0V , $I_D$=-250uA | -60 | -72 | --- | V |
| △BVDSS/△TJ | $BV_{DSS}$ Temperature Coefficient | Reference to 25℃ , $I_D$=-1mA | --- | -0.035 | --- | V/℃ |
| RDS(ON) | Static Drain-Source On-Resistance[2] | $V_{GS}$=-10V , $I_D$=-20A | --- | 6.5 | 8.5 | mΩ |
| | | $V_{GS}$=-4.5V , $I_D$=-15A | --- | 7.8 | 10 | |
| VGS(th) | Gate Threshold Voltage | $V_{GS}$=$V_{DS}$ , $I_D$ =-250uA | -1.2 | -1.6 | -2.5 | V |
| △$V_{GS(th)}$ | $V_{GS(th)}$ Temperature Coefficient | | --- | 4.28 | --- | mV/℃ |
| IDSS | Drain-Source Leakage Current | $V_{DS}$=-60V , $V_{GS}$=0V , $T_J$=25℃ | --- | --- | 1 | uA |
| | | $V_{DS}$=-60V , $V_{GS}$=0V , $T_J$=55℃ | --- | --- | 5 | |
| IGSS | Gate-Source Leakage Current | $V_{GS}$=±20V , $V_{DS}$=0V | --- | --- | ±100 | nA |
| gfs | Forward Transconductance | $V_{DS}$=-5V , $I_D$=-20A | --- | 18 | --- | S |
| $R_g$ | Gate Resistance | $V_{DS}$=0V , $V_{GS}$=0V , f=1MHz | --- | 4.0 | --- | Ω |
| $Q_g$ | Total Gate Charge (-4.5V) | $V_{DS}$=-48, $V_{GS}$=-10V , $I_D$=-5 | --- | 141 | --- | nC |
| $Q_{gs}$ | Gate-Source Charge | | --- | 17 | --- | |
| $Q_{gd}$ | Gate-Drain Charge | | --- | 28.6 | --- | |
| Td(on) | Turn-On Delay Time | $V_{DD}$=-48,$V_{GS}$=-10V , $R_G$=6,$I_D$=-1A | --- | 70 | --- | ns |
| $T_r$ | Rise Time | | --- | 205 | --- | |
| Td(off) | Turn-Off Delay Time | | --- | 402 | --- | |
| $T_f$ | Fall Time | | --- | 402 | --- | |
| $C_{iss}$ | Input Capacitance | $V_{DS}$=-25V , $V_{GS}$=0V , f=1MHz | --- | 8610 | --- | pF |
| Coss | Output Capacitance | | --- | 486 | --- | |
| Crss | Reverse Transfer Capacitance | | --- | 288 | --- | |
| $I_S$ | Continuous Source Current[1,5] | $V_G$=$V_D$=0V , Force Current | --- | --- | -10 | A |
| ISM | Pulsed Source Current[2,5] | | --- | --- | -144 | A |
| VSD | Diode Forward Voltage[2] | $V_{GS}$=0V , $I_S$=-1A , $T_J$=25℃ | --- | --- | -1.2 | V |

**Note :**

1、The data tested by surface mounted on a 1 inch 2 FR-4 board with 2OZ copper.

2、The data tested by pulsed , pulse width ≦ 300us , duty cycle ≦ 2%

3、The EAS data shows Max. rating . The test condition is VDD =-48V,VGS =-10V,L=0.1mH,IAS =-80A

4、The power dissipation is limited by 150℃ junction temperature

5、The data is theoretically the same as I D and I DM , in real applications , should be limited by total power dissipation.

## Typical Characteristics

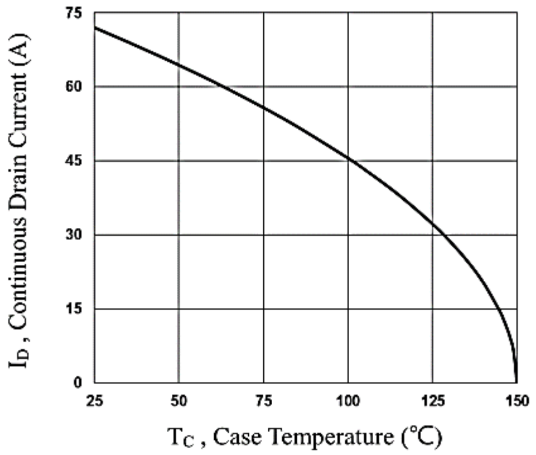



**Fig.1Typical Output Characteristics**

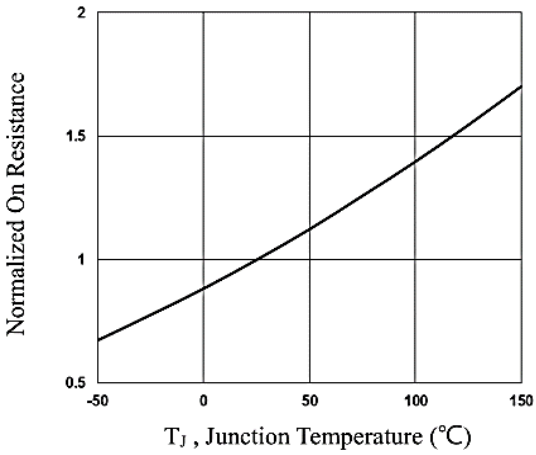



**Fig.2 Normalized RDSON vs. TJ**

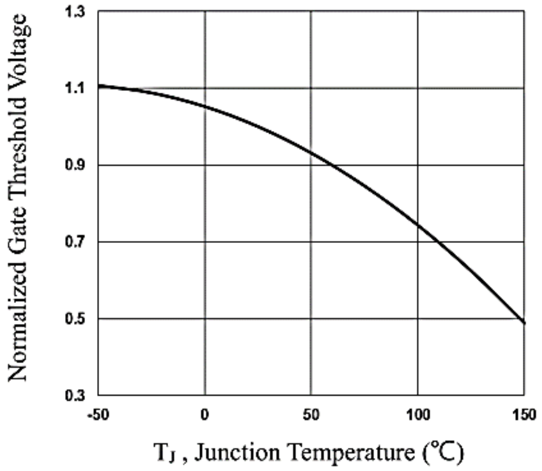



**Fig.3 Normalized RDSON vs. TJ**

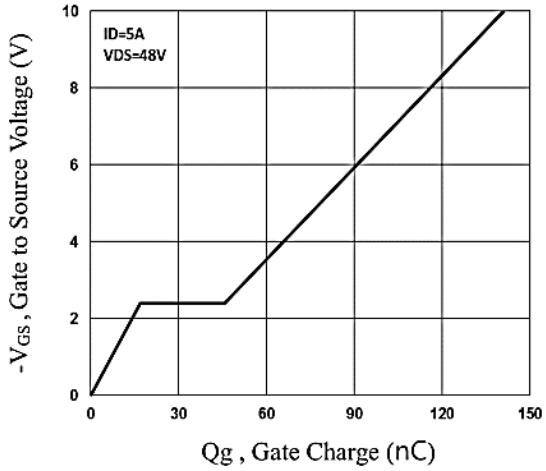



**Fig.4 Normalized Vth vs. TJ**

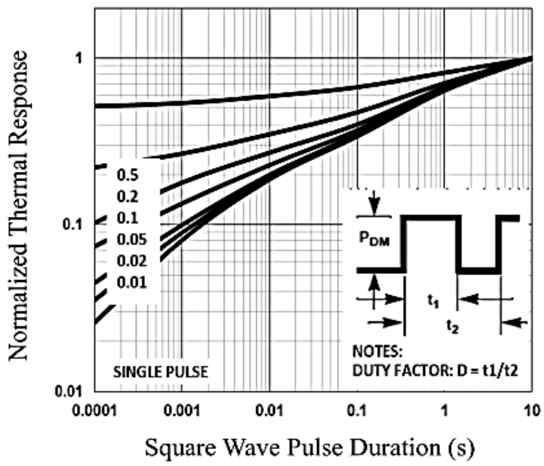



**Fig.5 Normalized Transient Impedance**

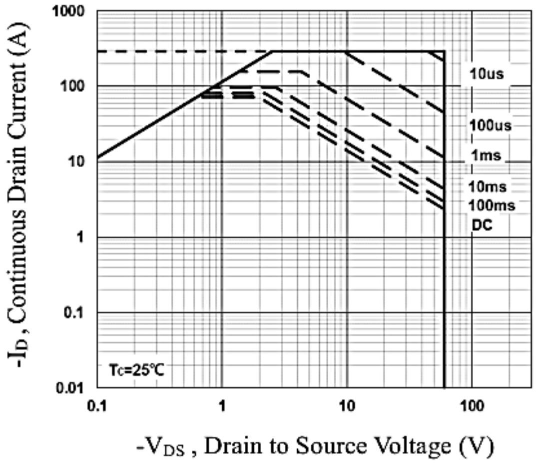
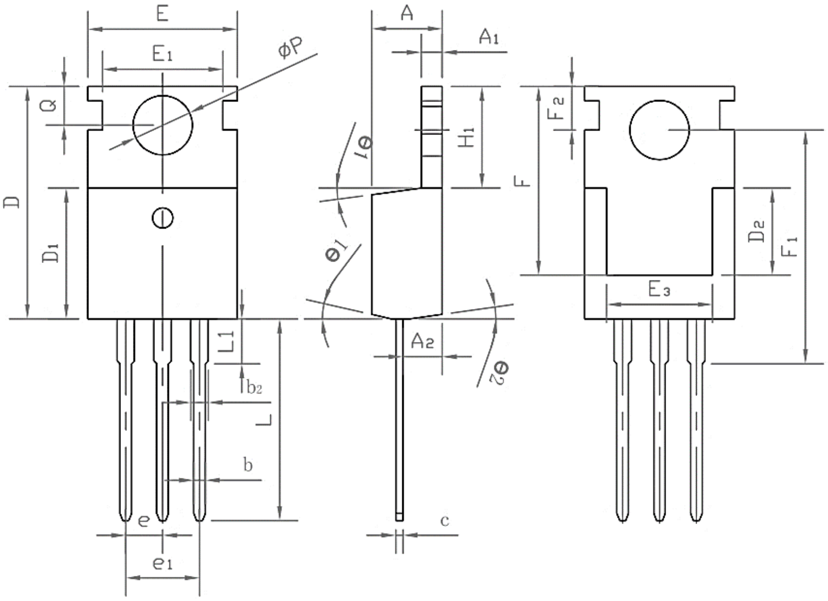


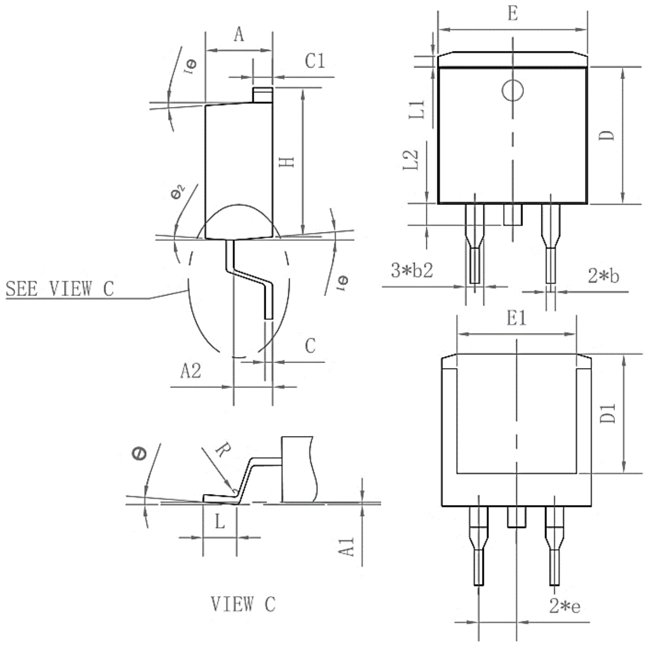

**Fig.6 Maximum Safe Operation Area**

## Package Mechanical Data-TO-220-3L-SLK




| Symbol | Common | | |
|---|---|---|---|
| | mm | | |
| | Mim | Nom | Max |
| A | 4.27 | 4.57 | 4.87 |
| A1 | 1.15 | 1.30 | 1.45 |
| A2 | 2.10 | 2.40 | 2.70 |
| b | 0.70 | 0.80 | 1.00 |
| b2 | 1.17 | 1.27 | 1.50 |
| D | 0.40 | 0.50 | 0.65 |
| D1 | 8.80 | 9.10 | 9.40 |
| D2 | 5.70 | 6.70 | 7.00 |
| E | 9.70 | 10.00 | 10.30 |
| E1 | - | 8.70 | - |
| E2 | 9.63 | 10.00 | 10.35 |
| E3 | 7.00 | 8.00 | 8.40 |
| e | | 0.37 | |
| e1 | | 0.10 | |
| H1 | 6.00 | 6.50 | 6.85 |
| L | 12.75 | 13.50 | 13.90 |
| L1 | - | 3.10 | 3.40 |
| Φp | 3.45 | 3.60 | 3.75 |
| Q | 2.60 | 2.80 | 3.00 |
| θ1 | 4° | 7° | 10° |
| θ2 | 0° | 3° | 6° |
| F | 13.30 | 13.50 | 13.70 |
| F1 | 15.50 | 15.90 | 16.30 |
| F2 | 2.80 | 3.00 | 3.20 |

## Package Mechanical Data-TO-263-3L-SLK




| Symbol | Common | | |
|---|---|---|---|
| | mm | | |
| | Mim | Nom | Max |
| A | 4.35 | 4.47 | 4.60 |
| A1 | 0.09 | 0.10 | 0.11 |
| A2 | 2.30 | 2.40 | 2.70 |
| b | 0.70 | 0.80 | 1.00 |
| b2 | 1.25 | 1.36 | 1.50 |
| C | 0.45 | 0.50 | 0.65 |
| C1 | 1.29 | 1.30 | 9.40 |
| D | 9.10 | 9.20 | 9.30 |
| D1 | 7.90 | 8.00 | 8.10 |
| E | 9.85 | 10.00 | 10.20 |
| E1 | 7.90 | 8.00 | 8.10 |
| H | 15.30 | 15.50 | 15.70 |
| e | - | 2.54 | - |
| L | 2.34 | 2.54 | 2.74 |
| L1 | 1.00 | 1.10 | 1.20 |
| L2 | 1.30 | 1.40 | 1.50 |
| R | 0.24 | 0.25 | 0.26 |
| θ | 0° | 4° | 8° |
| Θ1 | 4° | 7° | 10° |
| Θ2 | 0° | 3° | 6° |

Flow (wave) soldering (solder dipping)

| Product | Peak Temperature | Dipping Time |
|---|---|---|
| Pb device | 245℃±5℃ | 5sec±1sec |
| Pb-Free device | 260℃+0/-5℃ | 5sec±1sec |

This integrated circuit can be damaged by ESD UniverChip Corporation recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedure can cause damage. ESD damage can range from subtle performance degradation to complete device failure. Precision integrated circuits may be more susceptible to damage because very small parametric changes could cause the device not to meet its published specifications.

## Attention:

- Any and all XPX power products described or contained herein do not have specifications that can handle applications that require extremely high levels of reliability, such as life-support systems, aircraft's control systems, or other applications whose failure can be reasonably expected to result in serious physical and/or material damage. Consult with your XPX power representative nearest you before using any XPX power products described or contained herein in such applications.

- XPX power assumes no responsibility for equipment failures that result from using products at values that exceed, even momentarily, rated values (such as maximum ratings, operating condition ranges, or other parameters) listed in products specifications of any and all XPX power products described or contained herein.

- Specifications of any and all XPX power products described or contained herein stipulate the performance, characteristics, and functions of the described products in the independent state, and are not guarantees of the performance, characteristics, and functions of the described products as mounted in the customer's products or equipment. To verify symptoms and states that cannot be evaluated in an independent device, the customer should always evaluate and test devices mounted in the customer's products or equipment.

- XPX power Semiconductor CO.,LTD. strives to supply high-quality high-reliability products. However, any and all semiconductor products fail with some probability. It is possible that these probabilistic failures could give rise to accidents or events that could endanger human lives, that could give rise to smoke or fire, or that could cause damage to other property. When designing equipment, adopt safety measures so that these kinds of accidents or events cannot occur. Such measures include but are not limited to protective circuits and error prevention circuits for safe design, redundant design, and structural design.

- In the event that any or all XPX power products(including technical data, services) described or contained herein are controlled under any of applicable local export control laws and regulations, such products must not be exported without obtaining the export license from the authorities concerned in accordance with the above law.

- 

- Information (including circuit diagrams and circuit parameters) herein is for example only ; it is not guaranteed for volume production. XPX power believes information herein is accurate and reliable, but no guarantees are made or implied regarding its use or any infringements of intellectual property rights or other rights of third parties.

- Any and all information described or contained herein are subject to change without notice due to product/ technology improvement, etc. When designing equipment, refer to the "Delivery Specification" for the XPX power product that you intend to use.

- This catalog provides information as of Sep.2019. Specifications and information herein are subject to change without notice.