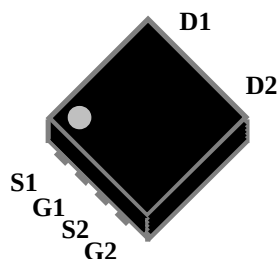


- ▼ Simple Drive Requirement
- ▼ Good Thermal Performance
- ▼ Fast Switching Performance
- ▼ RoHS Compliant & Halogen-Free

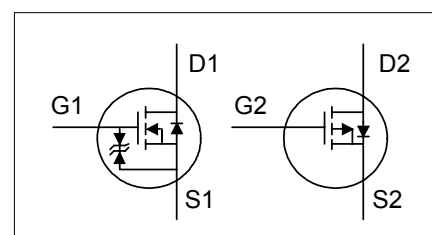
PMPAK<sup>®</sup> 3x3

|      |              |              |
|------|--------------|--------------|
| N-CH | $BV_{DSS}$   | 30V          |
|      | $R_{DS(ON)}$ | 35m $\Omega$ |
| P-CH | $BV_{DSS}$   | -30V         |
|      | $R_{DS(ON)}$ | 48m $\Omega$ |

## Description

XP3702 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.



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

| Symbol                      | Parameter                                  | Rating     |           | Units |
|-----------------------------|--------------------------------------------|------------|-----------|-------|
|                             |                                            | N-channel  | P-channel |       |
| $V_{DS}$                    | Drain-Source Voltage                       | 30         | -30       | V     |
| $V_{GS}$                    | Gate-Source Voltage                        | +20        | +20       | V     |
| $I_D@T_C=25^\circ\text{C}$  | Drain Current, $V_{GS}$ @ 10V              | 14.7       | -13.4     | A     |
| $I_D@T_C=100^\circ\text{C}$ | Drain Current, $V_{GS}$ @ 10V              | 9.3        | -8.5      | A     |
| $I_D@T_A=25^\circ\text{C}$  | Drain Current, $V_{GS}$ @ 10V <sup>3</sup> | 6.6        | -6        | A     |
| $I_D@T_A=70^\circ\text{C}$  | Drain Current, $V_{GS}$ @ 10V <sup>3</sup> | 5.3        | -4.8      | A     |
| $I_{DM}$                    | Pulsed Drain Current <sup>1</sup>          | 24         | -20       | A     |
| $P_D@T_A=25^\circ\text{C}$  | Total Power Dissipation                    | 2.5        |           | W     |
| $T_{STG}$                   | 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                 | 10    | °C/W |
| Rthj-a | Maximum Thermal Resistance, Junction-ambient <sup>3</sup> | 50    | °C/W |

**N-CH 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> =6A                 | -    | -    | 35   | mΩ    |
|                     |                                                | V <sub>GS</sub> =4.5V, I <sub>D</sub> =4A                | -    | -    | 56   | mΩ    |
| V <sub>GS(th)</sub> | Gate Threshold Voltage                         | V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250uA | 1.4  | -    | 2.5  | V     |
| g <sub>fs</sub>     | Forward Transconductance                       | V <sub>DS</sub> =5V, I <sub>D</sub> =6A                  | -    | 15   | -    | 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               | -    | -    | ±30  | uA    |
| Q <sub>g</sub>      | Total Gate Charge                              | I <sub>D</sub> =4A                                       | -    | 4    | 6.4  | nC    |
| Q <sub>gs</sub>     | Gate-Source Charge                             | V <sub>DS</sub> =15V                                     | -    | 1.5  | -    | nC    |
| Q <sub>gd</sub>     | Gate-Drain ("Miller") Charge                   | V <sub>GS</sub> =4.5V                                    | -    | 1.5  | -    | nC    |
| t <sub>d(on)</sub>  | Turn-on Delay Time                             | V <sub>DS</sub> =15V                                     | -    | 6    | -    | ns    |
| t <sub>r</sub>      | Rise Time                                      | I <sub>D</sub> =1A                                       | -    | 9    | -    | ns    |
| t <sub>d(off)</sub> | Turn-off Delay Time                            | R <sub>G</sub> =3.3Ω                                     | -    | 12   | -    | ns    |
| t <sub>f</sub>      | Fall Time                                      | V <sub>GS</sub> =10V                                     | -    | 3    | -    | ns    |
| C <sub>iss</sub>    | Input Capacitance                              | V <sub>GS</sub> =0V                                      | -    | 300  | 480  | pF    |
| C <sub>oss</sub>    | Output Capacitance                             | V <sub>DS</sub> =15V                                     | -    | 55   | -    | pF    |
| C <sub>rss</sub>    | Reverse Transfer Capacitance                   | f=1.0MHz                                                 | -    | 45   | -    | pF    |

**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> =2A, V <sub>GS</sub> =0V | -    | -    | 1.2  | V     |
| t <sub>rr</sub> | Reverse Recovery Time           | I <sub>S</sub> =6A, V <sub>GS</sub> =0V | -    | 8    | -    | ns    |
| Q <sub>rr</sub> | Reverse Recovery Charge         | di/dt=100A/μs                           | -    | 2    | -    | nC    |

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

| Symbol              | Parameter                                      | Test Conditions                                           | Min. | Typ. | Max. | Unit |
|---------------------|------------------------------------------------|-----------------------------------------------------------|------|------|------|------|
| 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> =-6A                | -    | -    | 48   | mΩ   |
|                     |                                                | V <sub>GS</sub> =-4.5V, I <sub>D</sub> =-3A               | -    | -    | 85   | mΩ   |
| V <sub>GS(th)</sub> | Gate Threshold Voltage                         | V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =-250uA | -1   | -    | -2.5 | V    |
| g <sub>fs</sub>     | Forward Transconductance                       | V <sub>DS</sub> =-5V, I <sub>D</sub> =-6A                 | -    | 9    | -    | 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                | -    | -    | ±1   | uA   |
| Q <sub>g</sub>      | Total Gate Charge                              | I <sub>D</sub> =-3A                                       | -    | 6    | 9.6  | nC   |
| Q <sub>gs</sub>     | Gate-Source Charge                             | V <sub>DS</sub> =-15V                                     | -    | 2.2  | -    | nC   |
| Q <sub>gd</sub>     | Gate-Drain ("Miller") Charge                   | V <sub>GS</sub> =-4.5V                                    | -    | 2    | -    | nC   |
| t <sub>d(on)</sub>  | Turn-on Delay Time                             | V <sub>DS</sub> =-15V                                     | -    | 10   | -    | ns   |
| t <sub>r</sub>      | Rise Time                                      | I <sub>D</sub> =-1A                                       | -    | 6.5  | -    | ns   |
| t <sub>d(off)</sub> | Turn-off Delay Time                            | R <sub>G</sub> =6Ω                                        | -    | 32   | -    | ns   |
| t <sub>f</sub>      | Fall Time                                      | V <sub>GS</sub> =-10V                                     | -    | 17   | -    | ns   |
| C <sub>iss</sub>    | Input Capacitance                              | V <sub>GS</sub> =0V                                       | -    | 610  | 976  | pF   |
| C <sub>oss</sub>    | Output Capacitance                             | V <sub>DS</sub> =-15V                                     | -    | 100  | -    | pF   |
| C <sub>rss</sub>    | Reverse Transfer Capacitance                   | f=1.0MHz                                                  | -    | 70   | -    | pF   |

**Source-Drain Diode**

| Symbol          | Parameter                       | Test Conditions                           | Min. | Typ. | Max. | Unit |
|-----------------|---------------------------------|-------------------------------------------|------|------|------|------|
| V <sub>SD</sub> | Forward On Voltage <sup>2</sup> | I <sub>S</sub> =-2A, V <sub>GS</sub> =0V  | -    | -    | -1.2 | V    |
| t <sub>rr</sub> | Reverse Recovery Time           | I <sub>S</sub> =-6A, V <sub>GS</sub> =0V, | -    | 9    | -    | ns   |
| Q <sub>rr</sub> | Reverse Recovery Charge         | dI/dt=100A/μs                             | -    | 4    | -    | 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, 90°C/W at steady state.

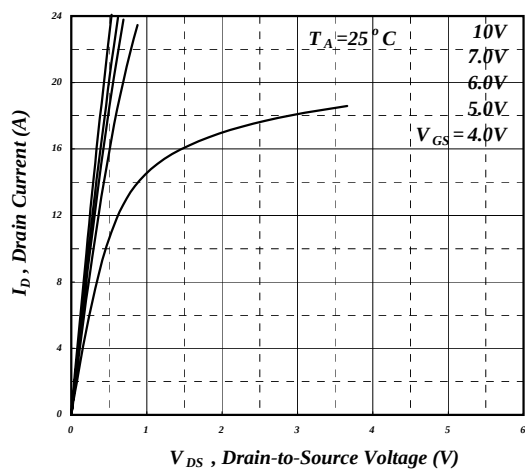
THIS PRODUCT IS SENSITIVE TO ELECTROSTATIC DISCHARGE, PLEASE HANDLE WITH CAUTION.

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

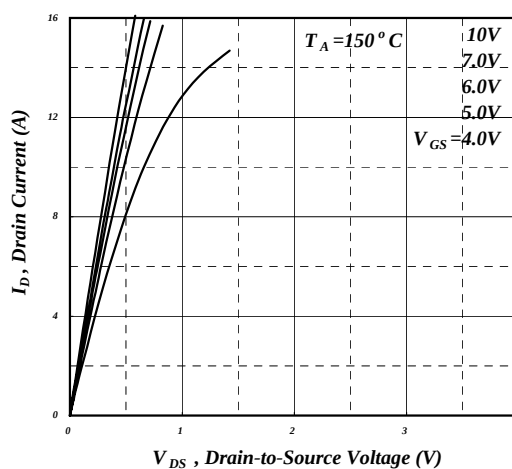
YAGEO XSEMI DOES NOT ASSUME ANY LIABILITY ARISING OUT OF THE APPLICATION OR USE OF ANY PRODUCT OR CIRCUIT DESCRIBED HEREIN; NEITHER DOES IT CONVEY ANY LICENSE UNDER ITS PATENT RIGHTS, NOR THE RIGHTS OF OTHERS.

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

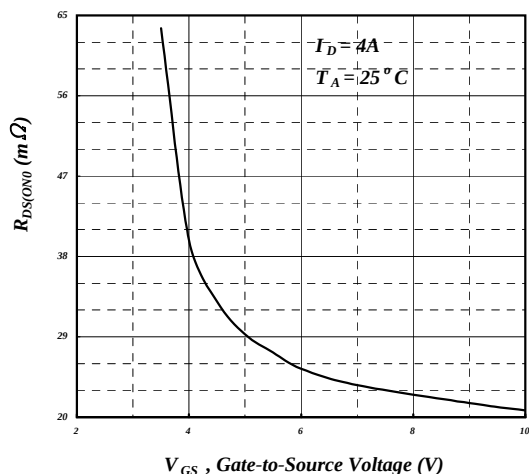
**N-Channel**



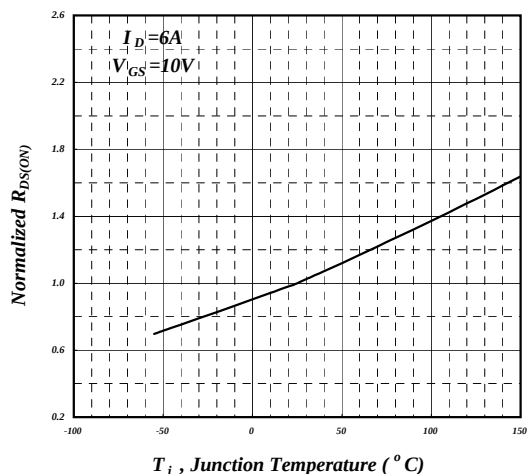
**Fig 1. Typical Output Characteristics**



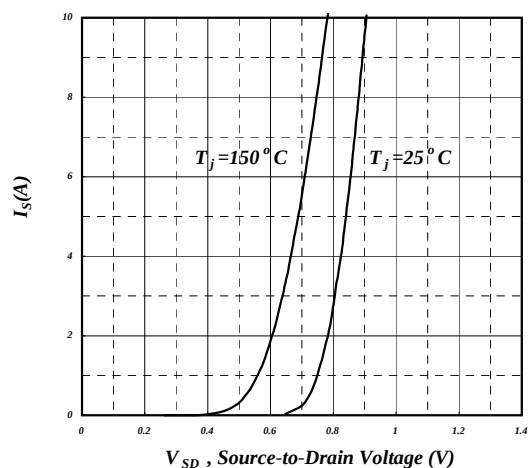
**Fig 2. Typical Output Characteristics**



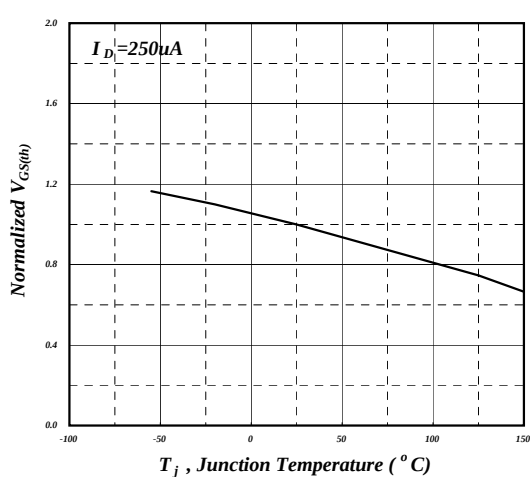
**Fig 3. On-Resistance v.s. Gate Voltage**



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

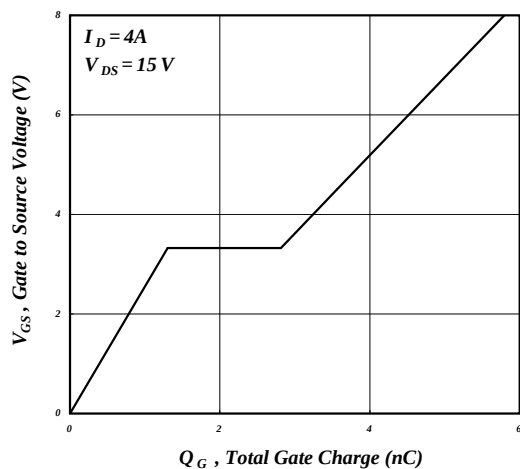


**Fig 5. Forward Characteristic of Reverse Diode**

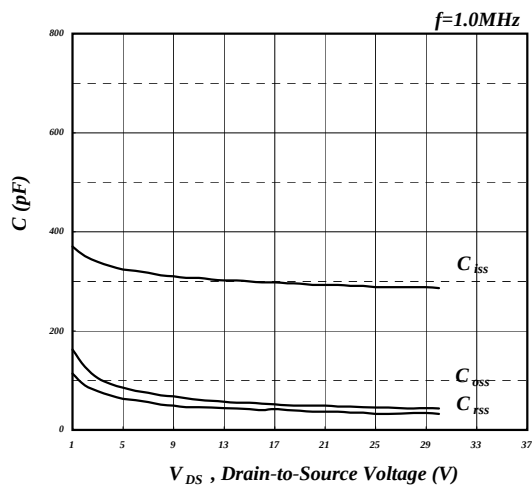


**Fig 6. Gate Threshold Voltage v.s. Junction Temperature**

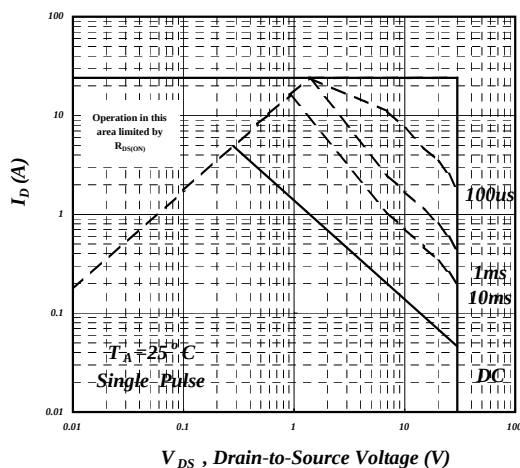
**N-Channel**



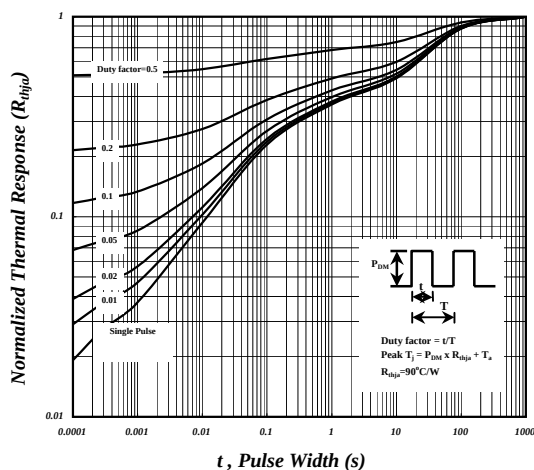
**Fig 7. Gate Charge Characteristics**



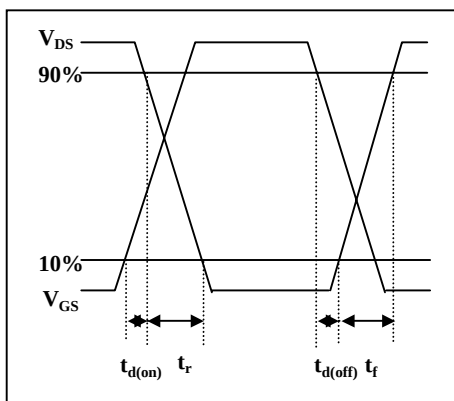
**Fig 8. Typical Capacitance Characteristics**



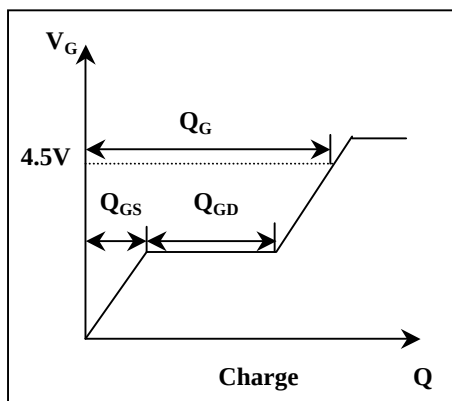
**Fig 9. Maximum Safe Operating Area**



**Fig 10. Effective Transient Thermal Impedance**

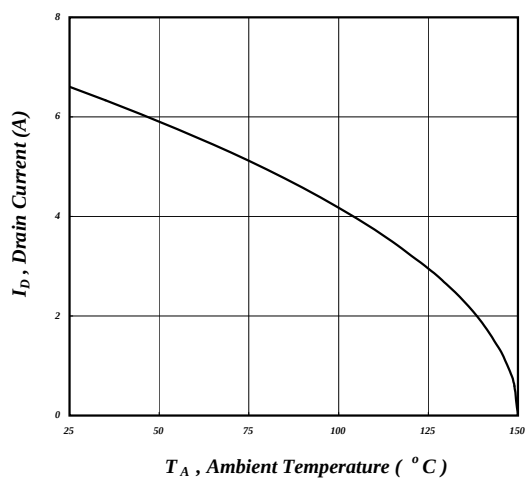


**Fig 11. Switching Time Waveform**

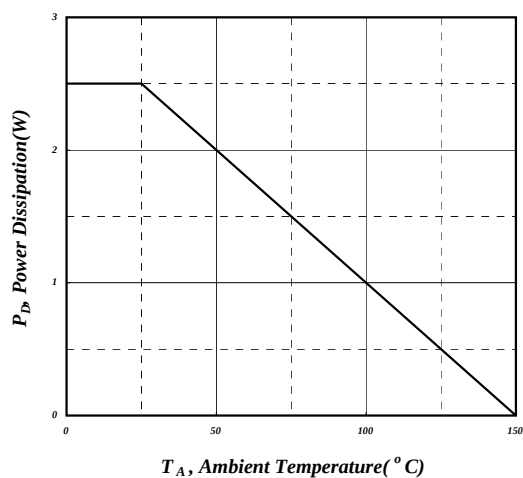


**Fig 12. Gate Charge Waveform**

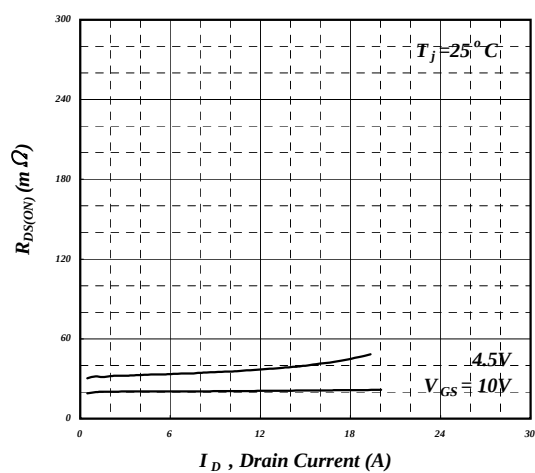
**N-Channel**



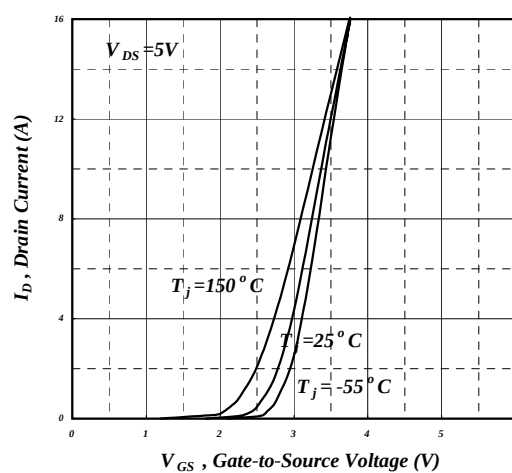
**Fig 13. Drain Current v.s. Ambient Temperature**



**Fig 14. Total Power Dissipation**

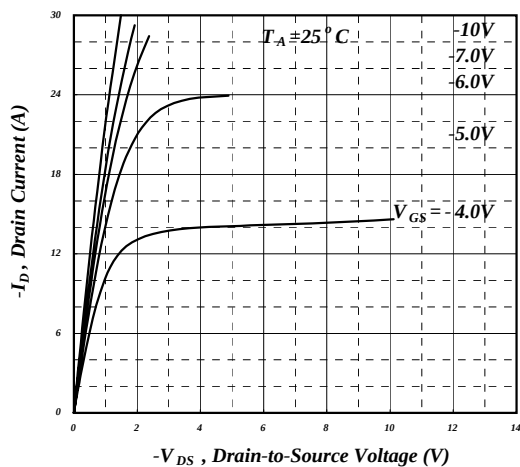


**Fig 15. Typ. Drain-Source on State Resistance**

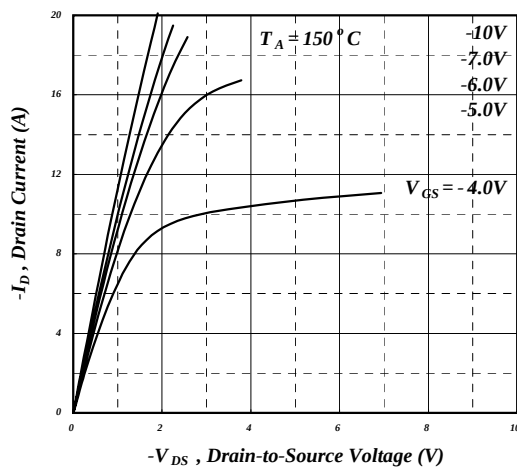


**Fig 16. Transfer Characteristics**

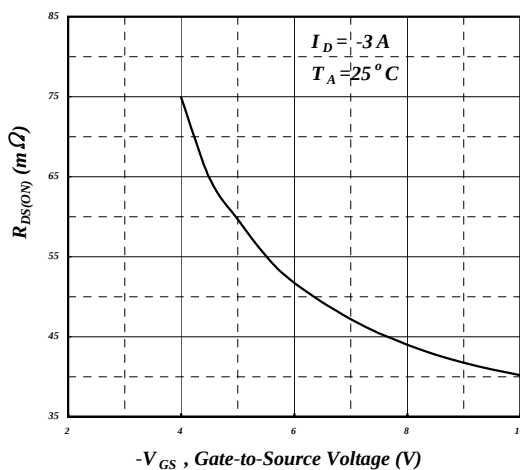
**P-Channel**



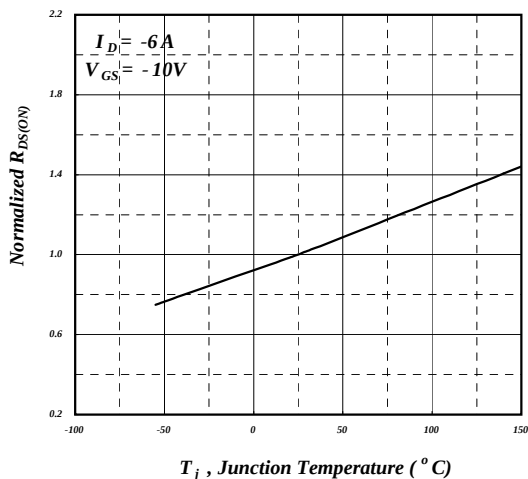
**Fig 1. Typical Output Characteristics**



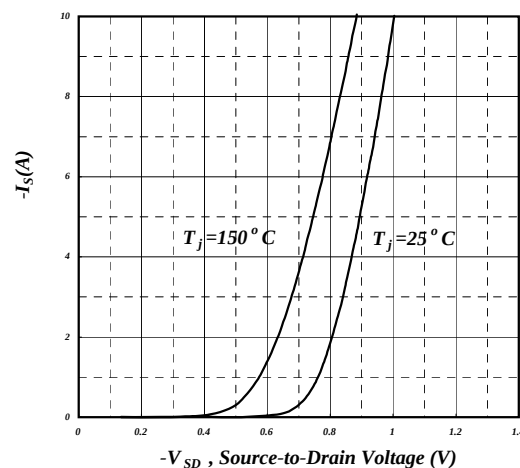
**Fig 2. Typical Output Characteristics**



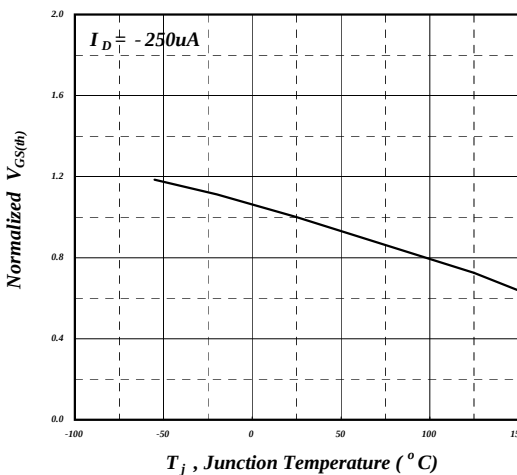
**Fig 3. On-Resistance v.s. Gate Voltage**



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

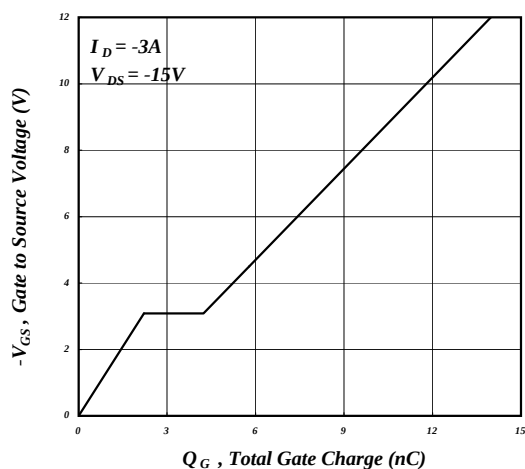


**Fig 5. Forward Characteristic of Reverse Diode**

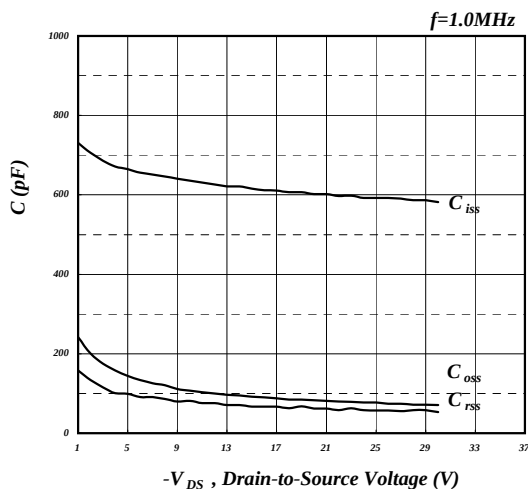


**Fig 6. Gate Threshold Voltage v.s. Junction Temperature**

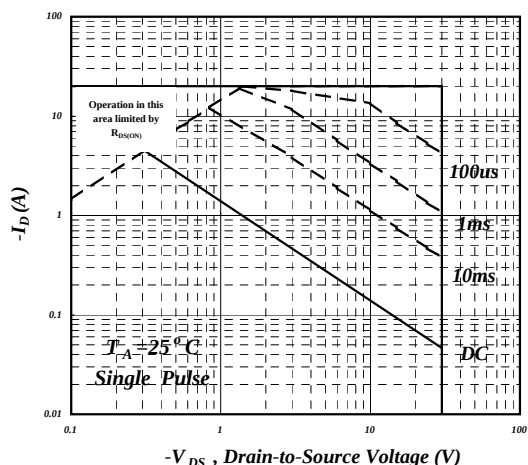
**P-Channel**



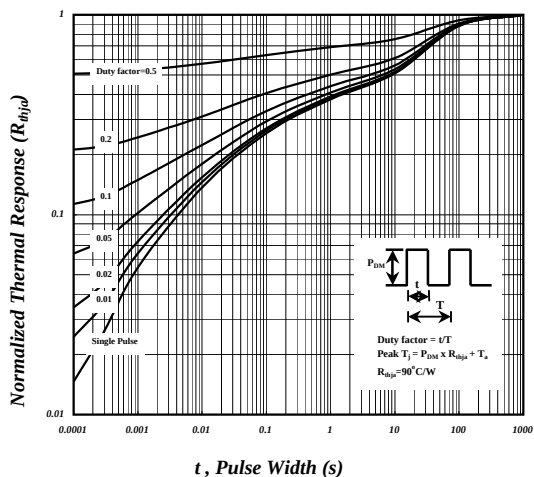
**Fig 7. Gate Charge Characteristics**



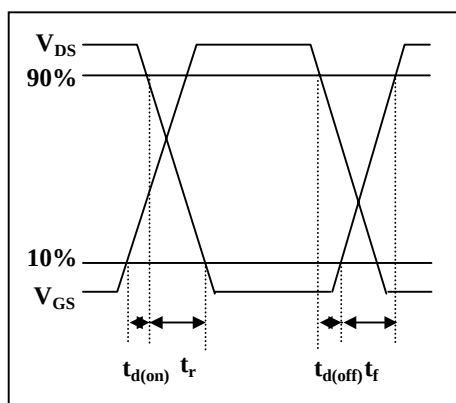
**Fig 8. Typical Capacitance Characteristics**



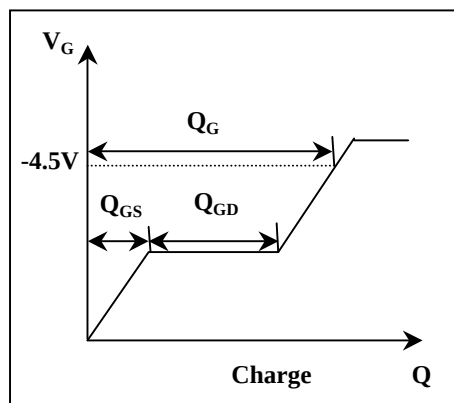
**Fig 9. Maximum Safe Operating Area**



**Fig 10. Effective Transient Thermal Impedance**

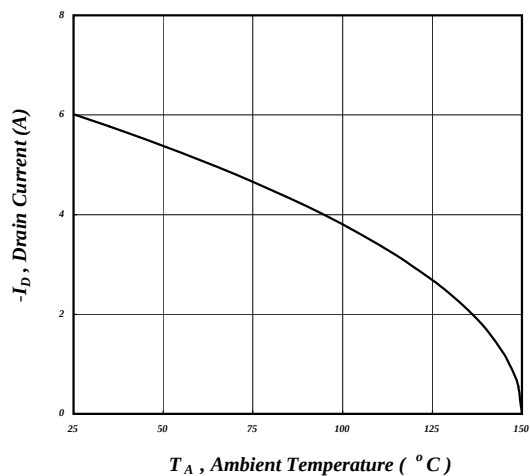


**Fig 11. Switching Time Waveform**

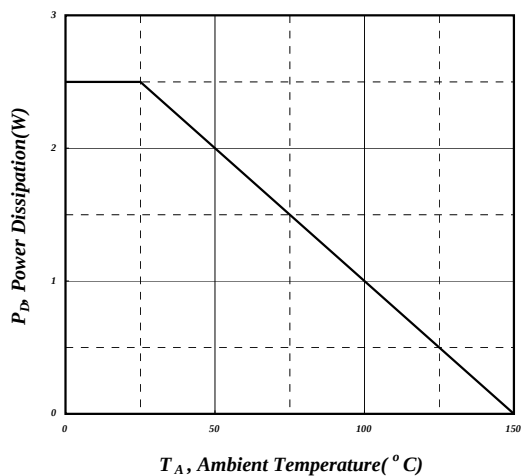


**Fig 12. Gate Charge Waveform**

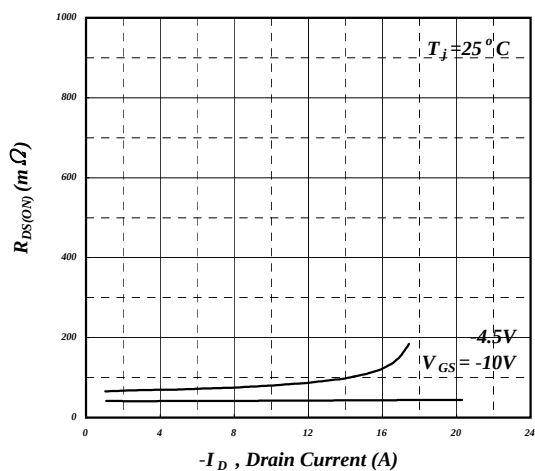
**P-Channel**



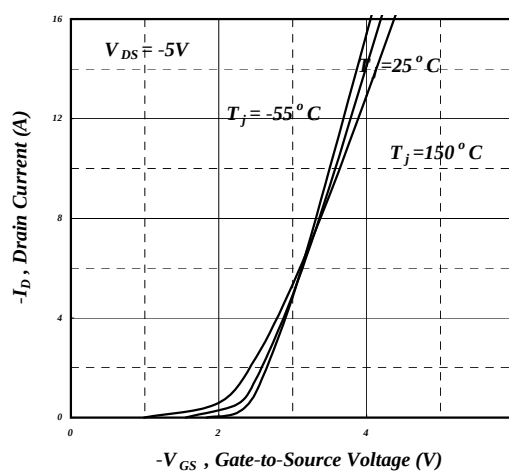
**Fig 13. Drain Current v.s. Ambient Temperature**



**Fig 14. Total Power Dissipation**



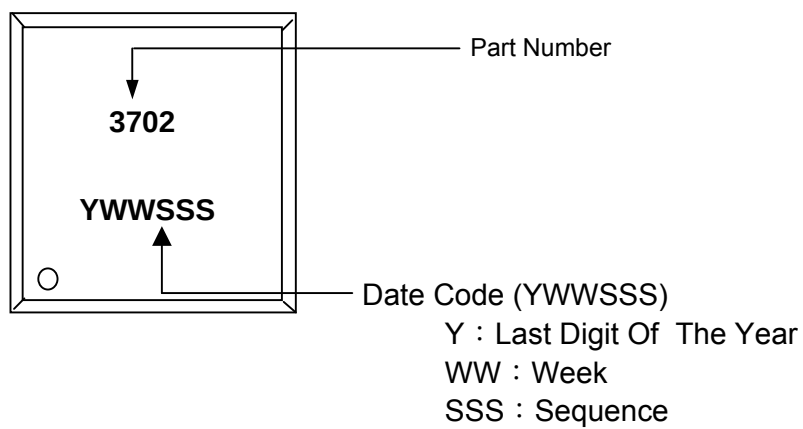
**Fig 15. Typ. Drain-Source on State Resistance**



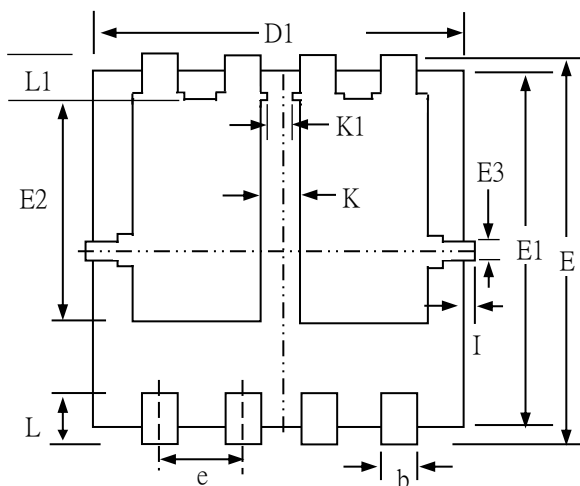
**Fig 16. Transfer Characteristics**

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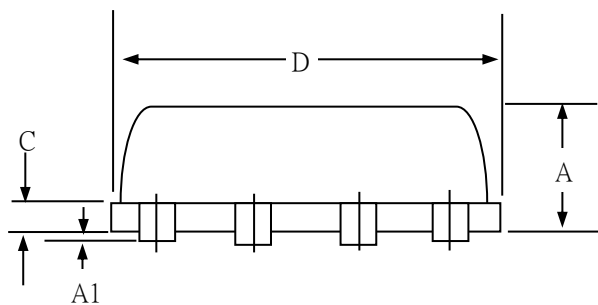
## MARKING INFORMATION



## Package Outline : PMPAK 3x3 (Dual Pad)



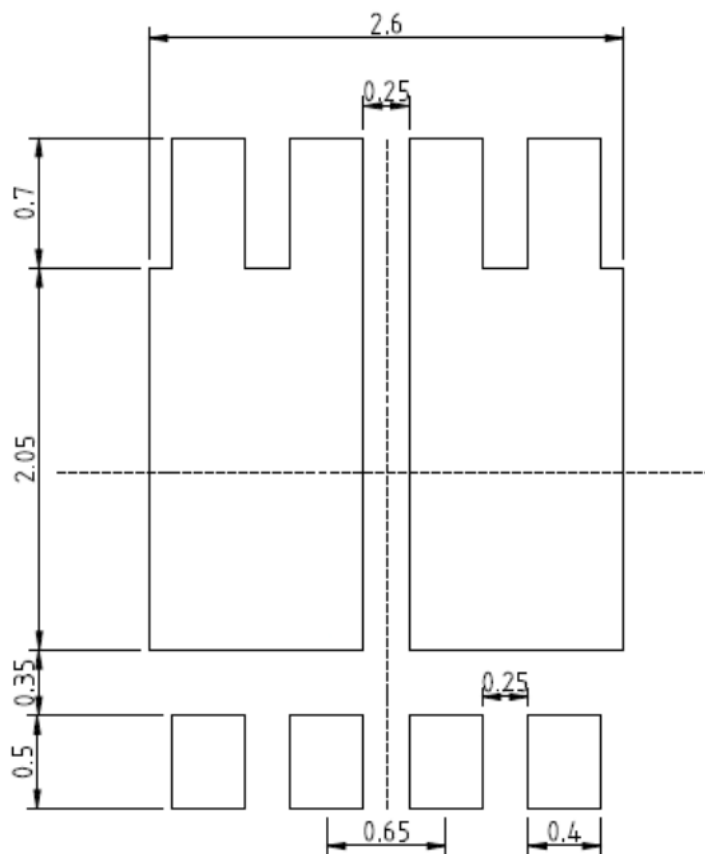
BACKSIDE VIEW



| SYMBOLS | Millimeters |       |      |
|---------|-------------|-------|------|
|         | MIN         | NOM   | MAX  |
| A       | 0.65        | 0.80  | 1.05 |
| A1      | -----       | ----- | 0.15 |
| b       | 0.20        | 0.35  | 0.50 |
| C       | 0.10        | 0.15  | 0.25 |
| D       | 2.85        | 3.30  | 3.60 |
| D1      | 2.85        | 3.10  | 3.40 |
| E       | 2.85        | 3.30  | 3.60 |
| E1      | 2.85        | 3.10  | 3.40 |
| E2      | 1.45        | 1.75  | 2.05 |
| E3      | 0.10        | 0.20  | 0.30 |
| e       | 0.65 (ref.) |       |      |
| L       | 0.15        | 0.40  | 0.50 |
| L1      | 0.15        | 0.50  | 0.70 |
| K       | 0.20        | 0.38  | 0.65 |
| K1      | 0.10        | 0.25  | 0.45 |
| I       | -----       | ----- | 0.15 |

- 1.All Dimension Are In Millimeters.
- 2.Dimension Does Not Include Mold Protrusions.

### PMPAK3X3(Dual Pad) FOOTPRINT :



UNIT: mm