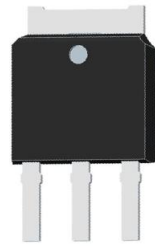
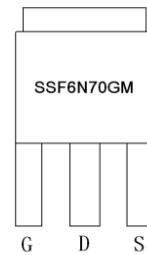


**Main Product Characteristics:**

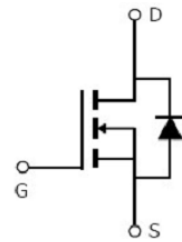
|              |                      |
|--------------|----------------------|
| $V_{DS}$     | 700V                 |
| $R_{DS(on)}$ | 1.49 $\Omega$ (typ.) |
| $I_D$        | 6A                   |



**IPAKM-S2**  
(Details in page6)



**Marking and pin  
Assignment**



**Schematic diagram**

**Features and Benefits:**

- Advanced MOSFET process technology
- Special designed for PWM, load switching and general purpose applications
- Ultra low on-resistance with low gate charge
- Fast switching and reverse body recovery
- 150°C operating temperature


**Description:**

It utilizes the latest processing techniques to achieve the high cell density and reduces the on-resistance with high repetitive avalanche rating. These features combine to make this design an extremely efficient and reliable device for use in power switching application and a wide variety of other applications.

**Absolute max Rating:**

| Symbol             | Parameter                                        | Max.        | Units |
|--------------------|--------------------------------------------------|-------------|-------|
| $I_D$ @ TC = 25°C  | Continuous Drain Current, $V_{GS}$ @ 10V①        | 6           | A     |
| $I_D$ @ TC = 100°C | Continuous Drain Current, $V_{GS}$ @ 10V①        | 3.8         |       |
| $I_{DM}$           | Pulsed Drain Current②                            | 24          |       |
| $P_D$ @TC = 25°C   | Power Dissipation③                               | 113         | W     |
|                    | Linear Derating Factor                           | 0.91        | W/°C  |
| $V_{DS}$           | Drain-Source Voltage                             | 700         | V     |
| $V_{GS}$           | Gate-to-Source Voltage                           | ± 30        | V     |
| $E_{AS}$           | Single Pulse Avalanche Energy @ L=20mH           | 313         | mJ    |
| $I_{AS}$           | Avalanche Current @ L=20mH                       | 5.6         | A     |
| $T_J$ $T_{STG}$    | Operating Junction and Storage Temperature Range | -55 to +150 | °C    |

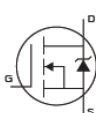
## Thermal Resistance

| Symbol          | Characterizes                                     | Typ. | Max. | Units |
|-----------------|---------------------------------------------------|------|------|-------|
| $R_{\theta JC}$ | Junction-to-case <sup>③</sup>                     | —    | 1.1  | °C/W  |
| $R_{\theta JA}$ | Junction-to-ambient ( $t \leq 10s$ ) <sup>④</sup> | —    | 110  | °C/W  |

## Electrical Characterizes @ $T_A=25^\circ\text{C}$ unless otherwise specified

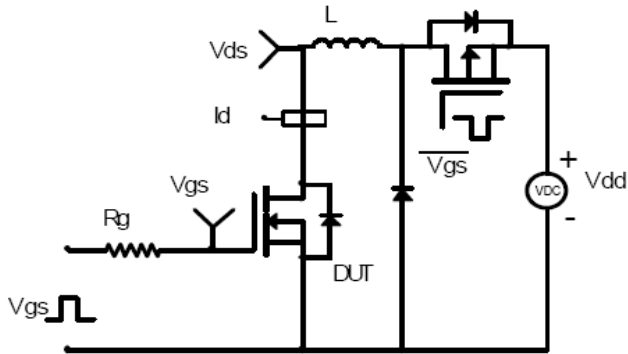
| Symbol        | Parameter                            | Min. | Typ. | Max. | Units    | Conditions                                               |
|---------------|--------------------------------------|------|------|------|----------|----------------------------------------------------------|
| $V_{(BR)DSS}$ | Drain-to-Source breakdown voltage    | 700  | —    | —    | V        | $V_{GS} = 0V, I_D = 250\mu A$                            |
| $R_{DS(on)}$  | Static Drain-to-Source on-resistance | —    | 1.49 | 1.7  | $\Omega$ | $V_{GS}=10V, I_D = 3A$                                   |
|               |                                      | —    | 3.12 | —    |          | $T_J = 125^\circ\text{C}$                                |
| $V_{GS(th)}$  | Gate threshold voltage               | 2    | —    | 4    | V        | $V_{DS} = V_{GS}, I_D = 250\mu A$                        |
|               |                                      | —    | 2.0  | —    |          | $T_J = 125^\circ\text{C}$                                |
| $I_{DSS}$     | Drain-to-Source leakage current      | —    | —    | 1    | $\mu A$  | $V_{DS} = 700V, V_{GS} = 0V$                             |
|               |                                      | —    | —    | 50   |          | $T_J = 125^\circ\text{C}$                                |
| $I_{GSS}$     | Gate-to-Source forward leakage       | —    | —    | 100  | nA       | $V_{GS} = 30V$                                           |
|               |                                      | —    | —    | -100 |          | $V_{GS} = -30V$                                          |
| $Q_g$         | Total gate charge                    | —    | 16   | —    | nC       | $I_D = 6A,$<br>$V_{DS}=400V,$<br>$V_{GS} = 10V$          |
| $Q_{gs}$      | Gate-to-Source charge                | —    | 5.5  | —    |          |                                                          |
| $Q_{gd}$      | Gate-to-Drain("Miller") charge       | —    | 4.6  | —    |          |                                                          |
| $t_{d(on)}$   | Turn-on delay time                   | —    | 15   | —    | ns       | $V_{GS}=10V, V_{DS}=350V,$<br>$R_{GEN}=25\Omega, I_D=6A$ |
| $t_r$         | Rise time                            | —    | 20   | —    |          |                                                          |
| $t_{d(off)}$  | Turn-Off delay time                  | —    | 41   | —    |          |                                                          |
| $t_f$         | Fall time                            | —    | 24   | —    |          |                                                          |
| $C_{iss}$     | Input capacitance                    | —    | 881  | —    | pF       | $V_{GS} = 0V$                                            |
| $C_{oss}$     | Output capacitance                   | —    | 91   | —    |          | $V_{DS} = 25V$                                           |
| $C_{rss}$     | Reverse transfer capacitance         | —    | 1.6  | —    |          | $f = 1MHz$                                               |

## Source-Drain Ratings and Characteristics

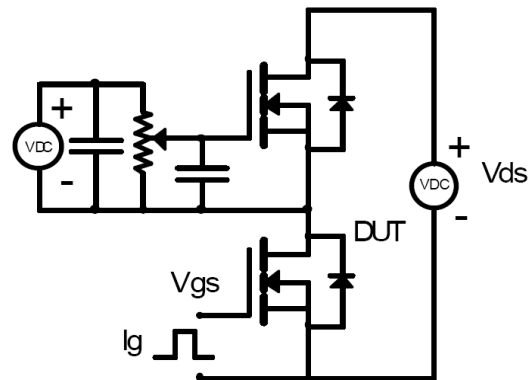
| Symbol   | Parameter                                 | Min. | Typ. | Max. | Units   | Conditions                                                                                                                                                       |
|----------|-------------------------------------------|------|------|------|---------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| $I_S$    | Continuous Source Current<br>(Body Diode) | —    | —    | 6    | A       | MOSFET symbol<br>showing the<br>integral reverse<br>p-n junction diode.<br> |
| $I_{SM}$ | Pulsed Source Current<br>(Body Diode)     | —    | —    | 24   | A       |                                                                                                                                                                  |
| $V_{SD}$ | Diode Forward Voltage                     | —    | 0.86 | 1.4  | V       | $I_S=6A, V_{GS}=0V$                                                                                                                                              |
| $t_{rr}$ | Reverse Recovery Time                     | —    | 589  | —    | ns      | $T_J = 25^\circ\text{C}, I_F = 6A,$<br>$di/dt = 100A/\mu s$                                                                                                      |
| $Q_{rr}$ | Reverse Recovery Charge                   | —    | 3.7  | —    | $\mu C$ |                                                                                                                                                                  |

## Test circuits and Waveforms

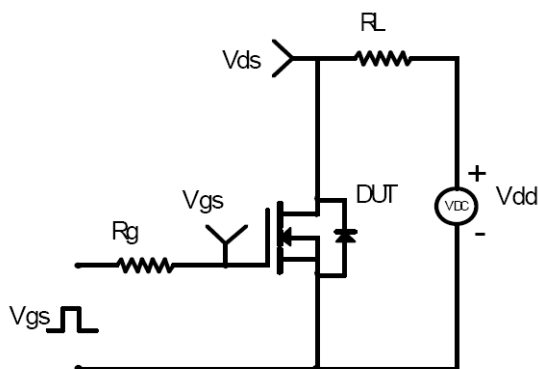
EAS Test Circuit:



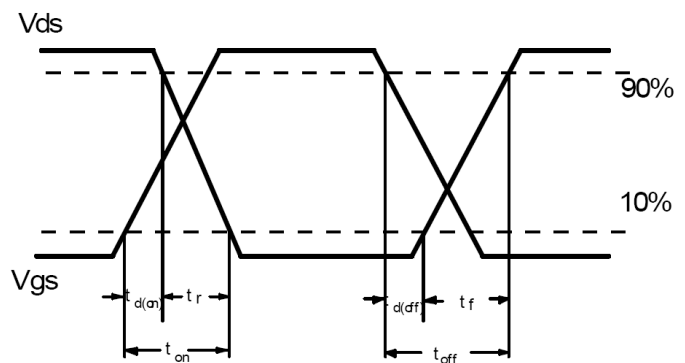
Gate charge test circuit:



Switching Time Test Circuit:



Switching Waveforms:



## Notes:

- ① Calculated continuous current based on maximum allowable junction temperature.
- ② Repetitive rating; pulse width limited by max. junction temperature.
- ③ The power dissipation PD is based on max. junction temperature, using junction-to-case thermal resistance.
- ④ The value of  $R_{\theta JA}$  is measured with the device mounted on 1 in 2 FR-4 board with 2oz. Copper, in a still air environment with  $T_A = 25^\circ\text{C}$

## Typical electrical and thermal characteristics

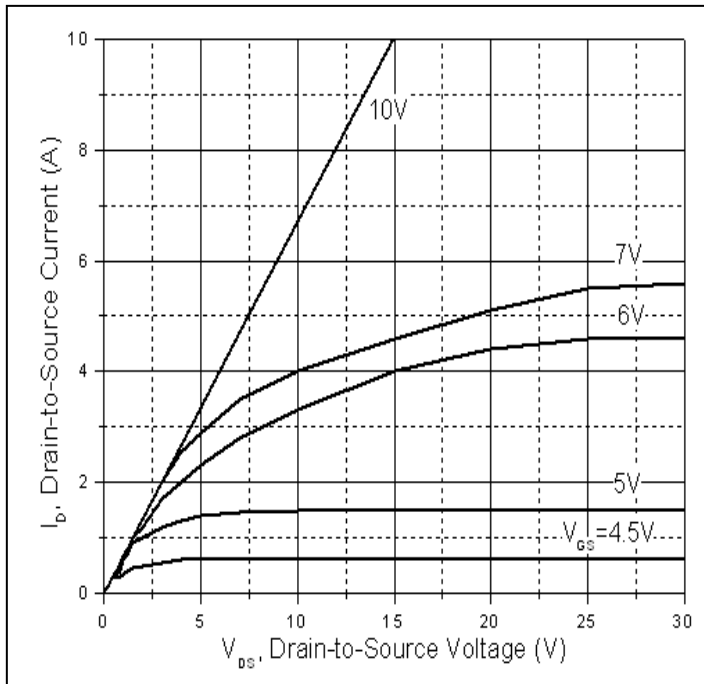


Figure 1: Typical Output Characteristics

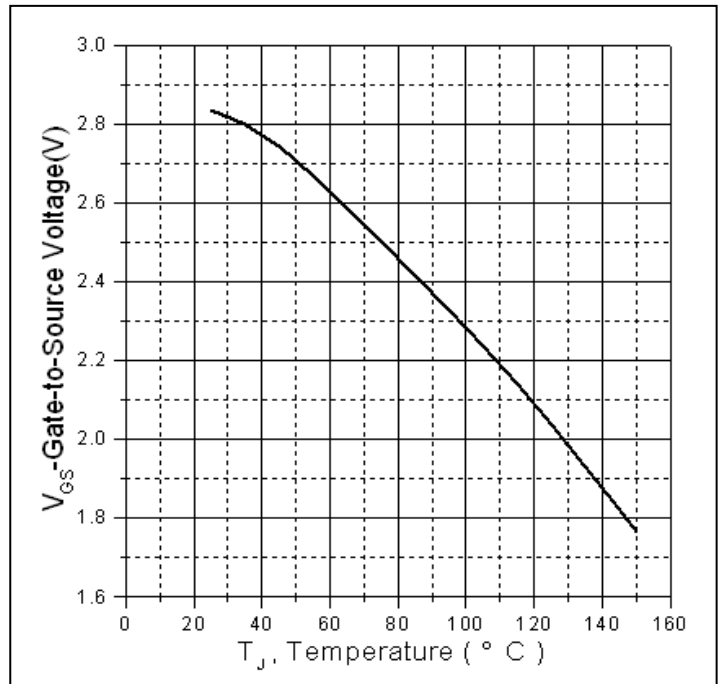


Figure 2. Gate to source cut-off voltage

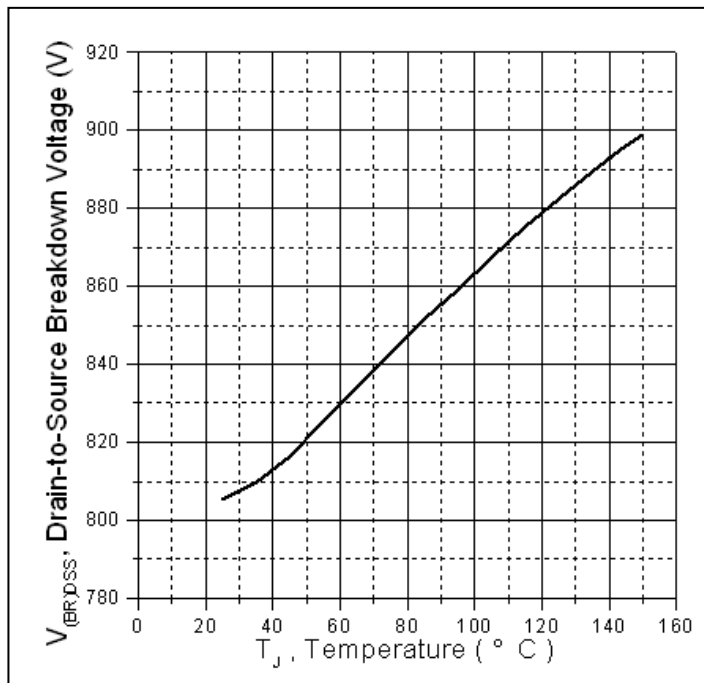


Figure 3. Drain-to-Source Breakdown Voltage Vs. Case Temperature

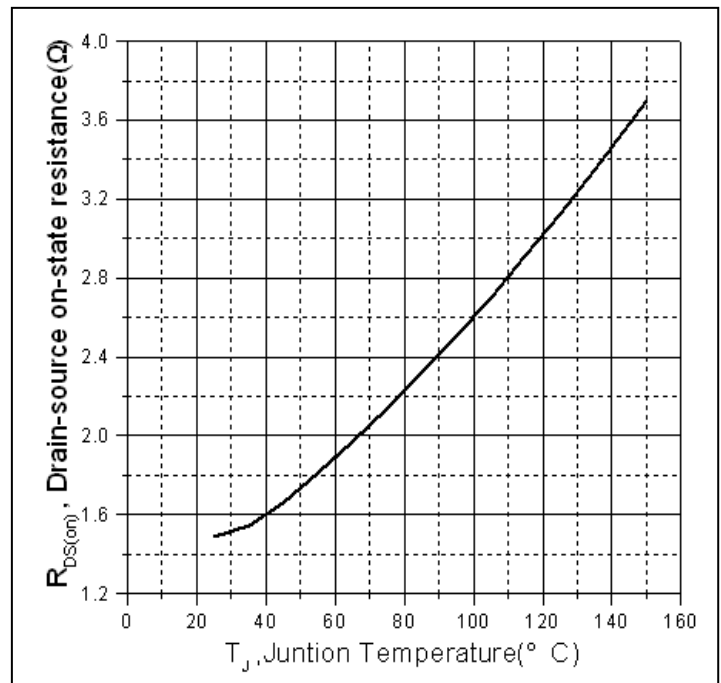
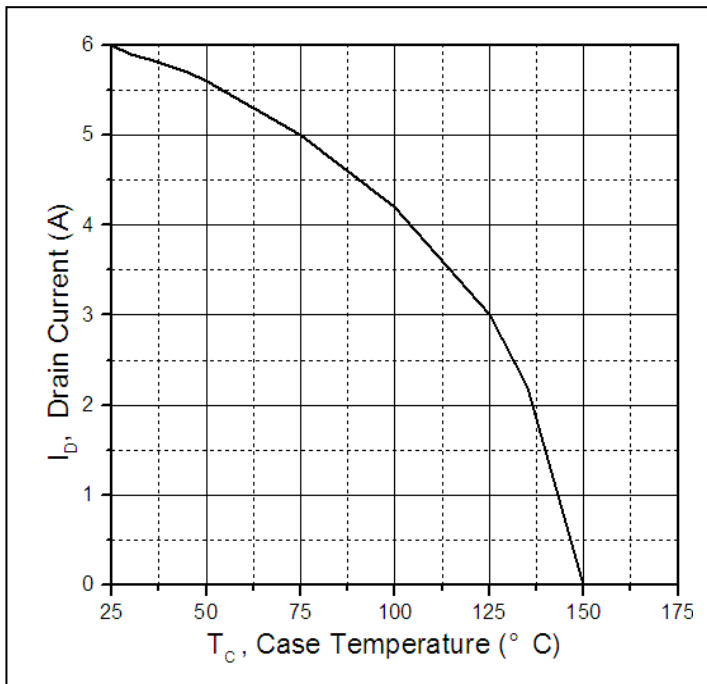
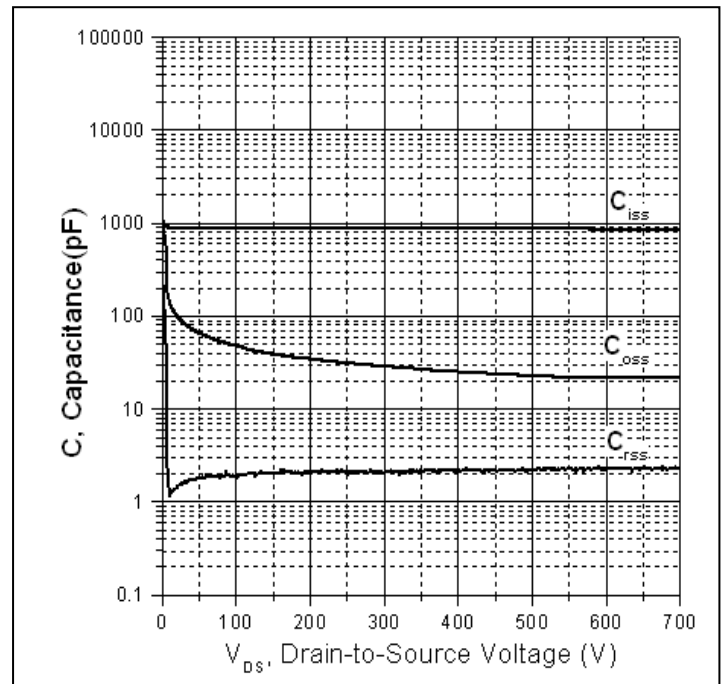


Figure 4: Normalized On-Resistance Vs. Case Temperature

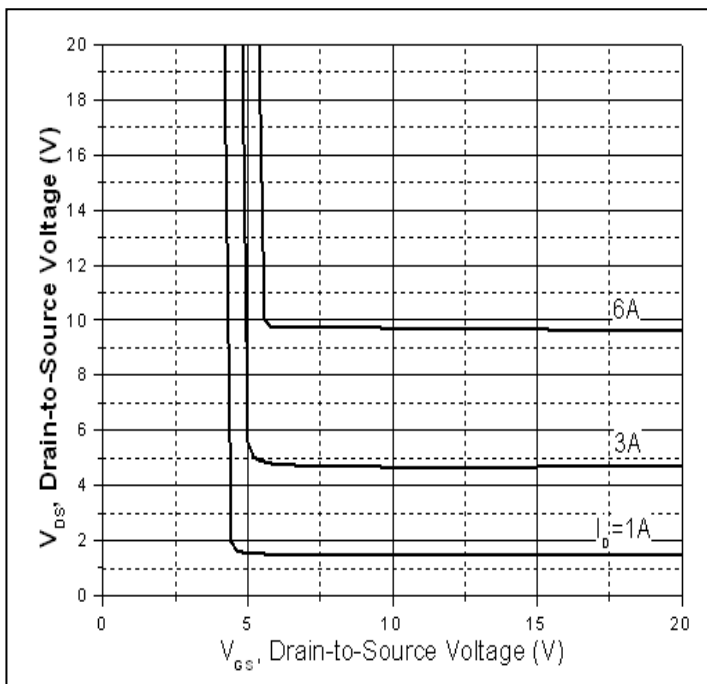
## Typical electrical and thermal characteristics



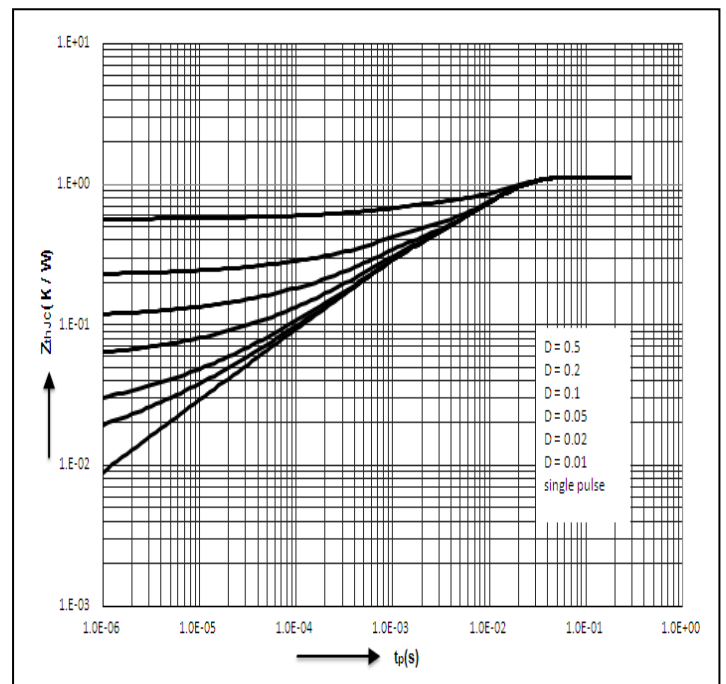
**Figure 5. Maximum Drain Current Vs. Case Temperature**



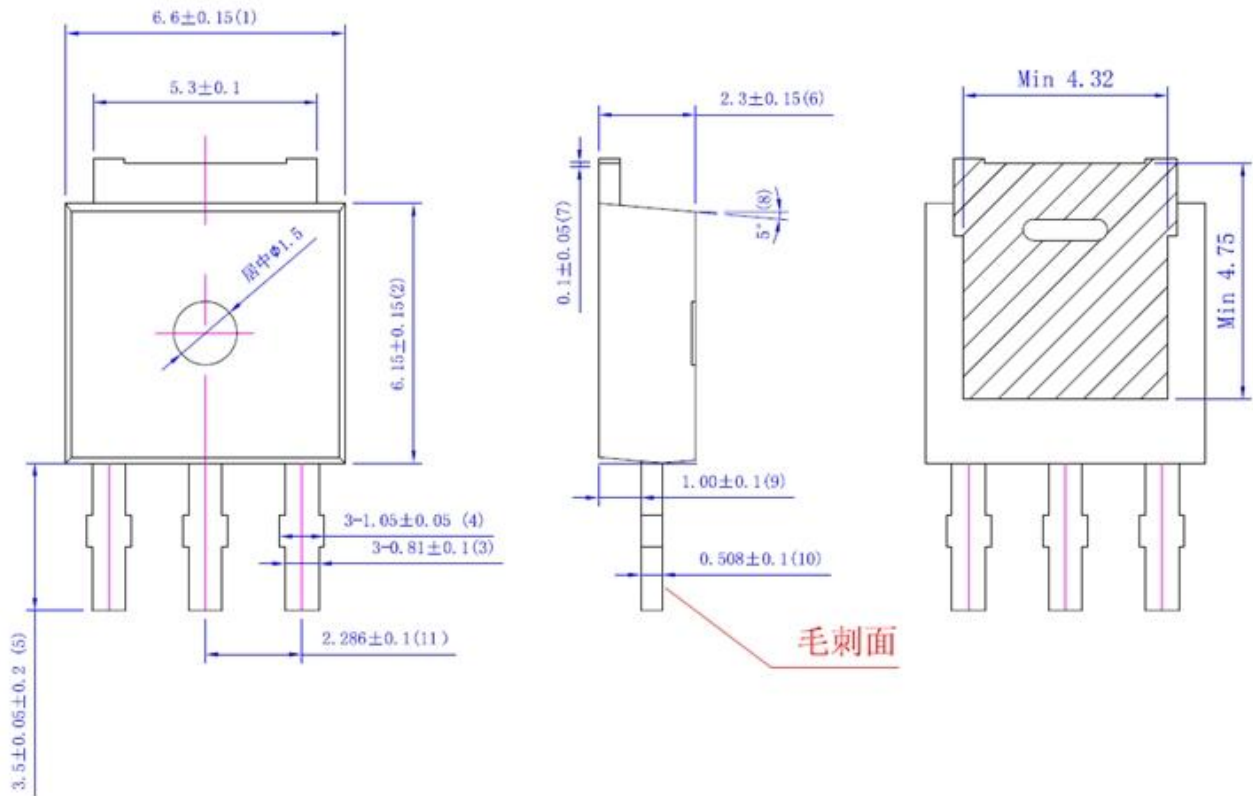
**Figure 6. Typical Capacitance Vs. Drain-to-Source Voltage**



**Figure 7. Drain-to-Source Voltage Vs. Gate-to-Source Voltage**



**Figure 8. Maximum Effective Transient Thermal Impedance, Junction-to-Case**

**Mechanical Data:**
**IPAKM-S2 Package Outline Dimension**


**Ordering and Marking Information****Device Marking: SSF6N70GM****Package (Available)****IPAKM-S2****Operating Temperature Range****C : -55 to 150 °C****Devices per Unit**

| <b>Package Type</b> | <b>Units/ Tube</b> | <b>Tubes/Inner Box</b> | <b>Units/Inner Box</b> | <b>Inner Boxes/Carton Box</b> | <b>Units/Carton Box</b> |
|---------------------|--------------------|------------------------|------------------------|-------------------------------|-------------------------|
| IPAKM-S2            | 75                 | 40                     | 3000                   | 5                             | 15000                   |

**Reliability Test Program**

| <b>Test Item</b>                           | <b>Conditions</b>                                                                                                             | <b>Duration</b>                               | <b>Sample Size</b>         |
|--------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------|----------------------------|
| <b>High Temperature Reverse Bias(HTRB)</b> | <b><math>T_j=125^{\circ}\text{C}</math> to <math>150^{\circ}\text{C}</math> @ 80% of Max <math>V_{DSS}/V_{CES}/V_R</math></b> | <b>168 hours<br/>500 hours<br/>1000 hours</b> | <b>3 lots x 77 devices</b> |
| <b>High Temperature Gate Bias(HTGB)</b>    | <b><math>T_j=150^{\circ}\text{C}</math> @ 100% of Max <math>V_{GSS}</math></b>                                                | <b>168 hours<br/>500 hours<br/>1000 hours</b> | <b>3 lots x 77 devices</b> |

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