

## Product Summary

| $V_{(BR)DSS}$ | $R_{DS(on)TYP}$ | $I_D$ |
|---------------|-----------------|-------|
| 60V           | 23mΩ@10V        | 20A   |
|               | 30mΩ@4.5V       |       |
| -60V          | 30mΩ@-10V       | -35A  |
|               | 35mΩ@-4.5V      |       |



**合肥矽普半导体**

Siliup Semiconductor Technology Co., Ltd

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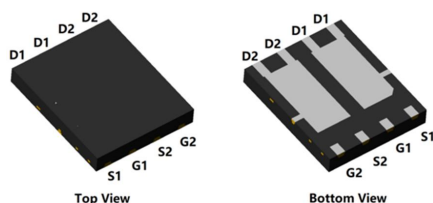
## Feature

- Fast switching speed
- Surface mount package
- ROHS Compliant & Halogen-Free
- 100% Single Pulse avalanche energy Test

## Applications

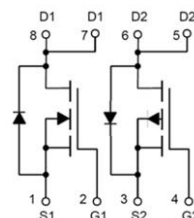
- DC-DC Converters.
- Motor Control.

## Package

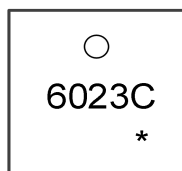


PDFN5X6-8L

## Circuit diagram



## Marking



6023C  
\*

:Device Code  
:Month Code

## Order Information

| Device    | Package    | Unit/Tape |
|-----------|------------|-----------|
| SP6023CNK | PDFN5X6-8L | 5000      |

**Absolute maximum ratings (Ta=25°C, unless otherwise noted)**

| Parameter                                   | Symbol          | Rating     |           | Unit |
|---------------------------------------------|-----------------|------------|-----------|------|
|                                             |                 | N-Channel  | P-Channel |      |
| Drain-Source Voltage                        | $V_{DS}$        | 60         | -60       | V    |
| Gate-Source Voltage                         | $V_{GS}$        | $\pm 20$   | $\pm 20$  | V    |
| Continuous Drain Current (Tc=25°C)          | $I_D$           | 20         | -35       | A    |
| Pulse Drain Current Tested                  | $I_{DM}$        | 80         | -140      | A    |
| Single pulsed avalanche energy <sup>1</sup> | $E_{AS}$        | 40         | 115       | mJ   |
| Power Dissipation (Tc=25°C)                 | $P_D$           | 45         |           | W    |
| Thermal Resistance Junction-to-Case         | $R_{\theta JC}$ | 2.7        |           | °C/W |
| Storage Temperature Range                   | $T_{STG}$       | -55 to 150 |           | °C   |
| Operating Junction Temperature Range        | $T_J$           | -55 to 150 |           | °C   |

**N-Electrical characteristics (Ta=25°C, unless otherwise noted)**

| Parameter                         | Symbol            | Conditions                      | Min. | Typ. | Max. | Unit |
|-----------------------------------|-------------------|---------------------------------|------|------|------|------|
| Static Characteristics            |                   |                                 |      |      |      |      |
| Drain-Source Breakdown Voltage    | BV <sub>DSS</sub> | VGS=0V , ID=250uA               | 60   | -    | -    | V    |
| Drain-Source Leakage Current      | Idss              | VDS=48V , VGS=0V , TJ=25℃       | -    | -    | 1    | uA   |
| Gate-Source Leakage Current       | IGSS              | VGS=±20V , VDS=0V               | -    | -    | ±100 | nA   |
| Gate Threshold Voltage            | VGS(th)           | VGS=VDS , ID =250uA             | 1.0  | 1.6  | 2.5  | V    |
| Static Drain-Source On-Resistance | RDS(ON)           | VGS = 10V, ID = 10A             | -    | 23   | 29   | mΩ   |
|                                   |                   | VGS = 4.5V, ID = 5A             | -    | 30   | 40   |      |
| Dynamic characteristics           |                   |                                 |      |      |      |      |
| Input Capacitance                 | Ciss              | VDS=15V , VGS=0V , f=1MHz       | -    | 1640 | -    | pF   |
| Output Capacitance                | Coss              |                                 | -    | 120  | -    |      |
| Reverse Transfer Capacitance      | Crss              |                                 | -    | 106  | -    |      |
| Total Gate Charge                 | Qg                | VDS=48V , VGS=4.5V , ID=10A     | -    | 42   | -    | nC   |
| Gate-Source Charge                | Qgs               |                                 | -    | 8    | -    |      |
| Gate-Drain Charge                 | Qgd               |                                 | -    | 11.5 | -    |      |
| Switching Characteristics         |                   |                                 |      |      |      |      |
| Turn-On Delay Time                | Td(on)            | VDD=30V VGS=10V , RG=3Ω, ID=10A | -    | 9    | -    | nS   |
| Rise Time                         | Tr                |                                 | -    | 10.5 | -    |      |
| Turn-Off Delay Time               | Td(off)           |                                 | -    | 36   | -    |      |
| Fall Time                         | Tf                |                                 | -    | 5    | -    |      |
| Diode Characteristics             |                   |                                 |      |      |      |      |
| Diode Forward Voltage             | VSD               | VGS=0V , IS=1A , TJ=25℃         | -    | -    | 1.2  | V    |
| Diode Continuous Current          | IS                |                                 | -    | -    | 20   | A    |
| Reverse recover time              | Trr               | Is=20A, di/dt=100A/us, Tj=25℃   | -    | 35   | -    | nS   |
| Reverse recovery charge           | Qrr               |                                 | -    | 52   | -    | nC   |

**Note:**

- The EAS Test condition is  $V_{DD}=30V, V_{GS}=10V, L=0.5mH, R_g=25\Omega$

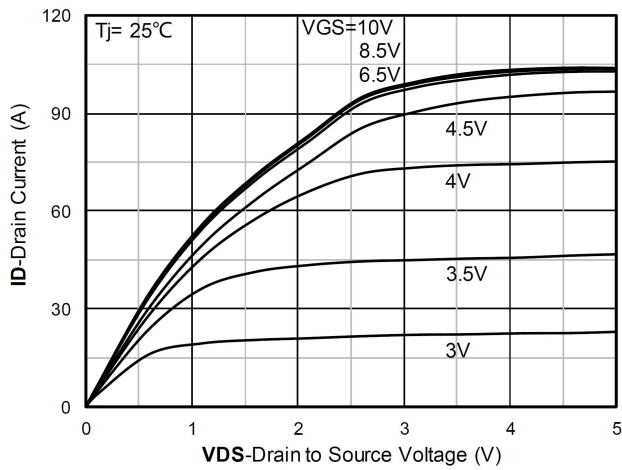
**P-Electrical characteristics (Ta=25°C, unless otherwise noted)**

| Parameter                         | Symbol            | Conditions                        | Min. | Typ. | Max. | Unit |
|-----------------------------------|-------------------|-----------------------------------|------|------|------|------|
| Static Characteristics            |                   |                                   |      |      |      |      |
| Drain-Source Breakdown Voltage    | BV <sub>DSS</sub> | VGS=0V , ID=-250uA                | -60  | -    | -    | V    |
| Drain-Source Leakage Current      | Idss              | VDS=-48V , VGS=0V , TJ=25℃        | -    | -    | -1   | uA   |
| Gate-Source Leakage Current       | IGSS              | VGS=±20V , VDS=0V                 | -    | -    | ±100 | nA   |
| Gate Threshold Voltage            | VGS(th)           | VGS=VDS , ID =-250uA              | -1.0 | -1.8 | -2.5 | V    |
| Static Drain-Source On-Resistance | RDS(ON)           | VGS =-10V, ID =-10A               | -    | 30   | 38   | mΩ   |
|                                   |                   | VGS =-4.5V, ID =-5A               | -    | 35   | 47   |      |
| Dynamic characteristics           |                   |                                   |      |      |      |      |
| Input Capacitance                 | Ciss              | VDS=-30V , VGS=0V , f=1MHz        | -    | 2417 | -    | pF   |
| Output Capacitance                | Coss              |                                   | -    | 179  | -    |      |
| Reverse Transfer Capacitance      | Crss              |                                   | -    | 120  | -    |      |
| Total Gate Charge                 | Qg                | VDS=-30V , VGS=-10V , ID=-6A      | -    | 46.5 | -    | nC   |
| Gate-Source Charge                | Qgs               |                                   | -    | 9.1  | -    |      |
| Gate-Drain Charge                 | Qgd               |                                   | -    | 9.2  | -    |      |
| Switching Characteristics         |                   |                                   |      |      |      |      |
| Turn-On Delay Time                | Td(on)            | VDD=-30V VGS=-10V , RG=3Ω, ID=-6A | -    | 9.8  | -    | nS   |
| Rise Time                         | Tr                |                                   | -    | 6.1  | -    |      |
| Turn-Off Delay Time               | Td(off)           |                                   | -    | 44   | -    |      |
| Fall Time                         | Tf                |                                   | -    | 12.7 | -    |      |
| Diode Characteristics             |                   |                                   |      |      |      |      |
| Diode Forward Voltage             | VSD               | VGS=0V , IS=-1A , TJ=25℃          | -    | -    | -1.2 | V    |
| Diode Continuous Current          | IS                |                                   | -    | -    | -35  | A    |
| Reverse recover time              | Trr               | IS=-20A, di/dt=-100A/us, Tj=25℃   | -    | 25   | -    | nS   |
| Reverse recovery charge           | Qrr               |                                   | -    | 55   | -    | nC   |

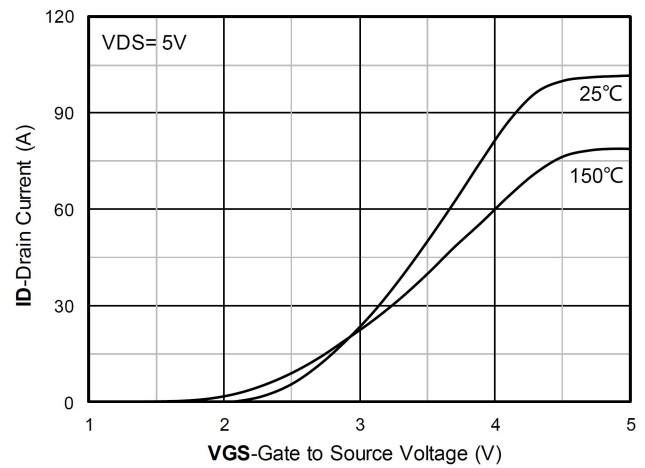
**Note:**

2. The EAS Test condition is  $V_{DD}=-30V$ ,  $V_{GS}=-10V$ ,  $L=0.5mH$ ,  $R_g=25\Omega$

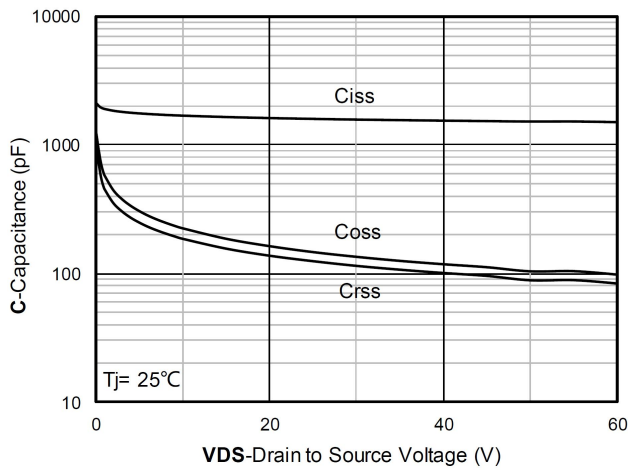
## N-Channel Typical Characteristics



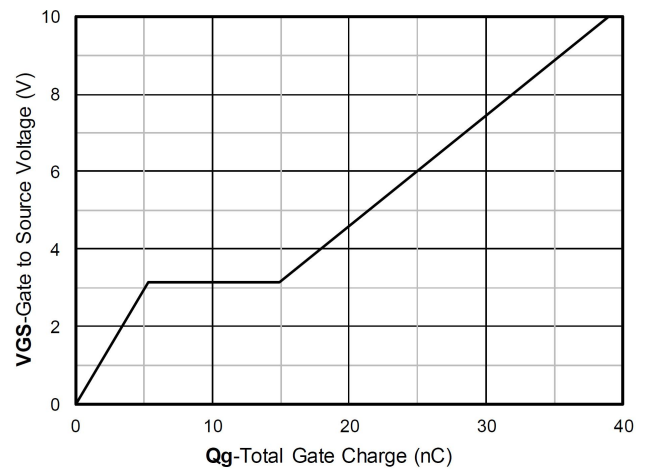
Output Characteristics



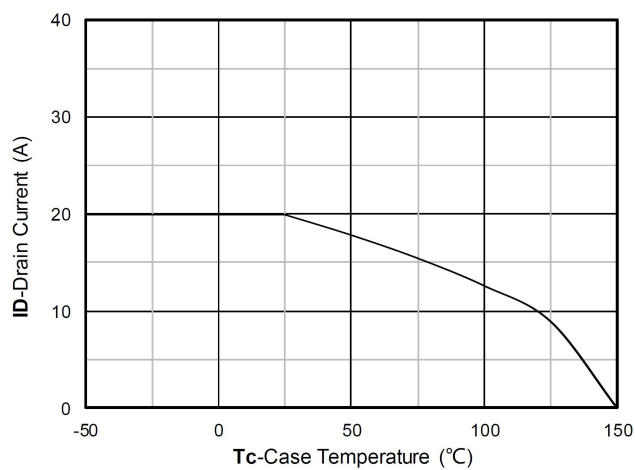
Transfer Characteristics



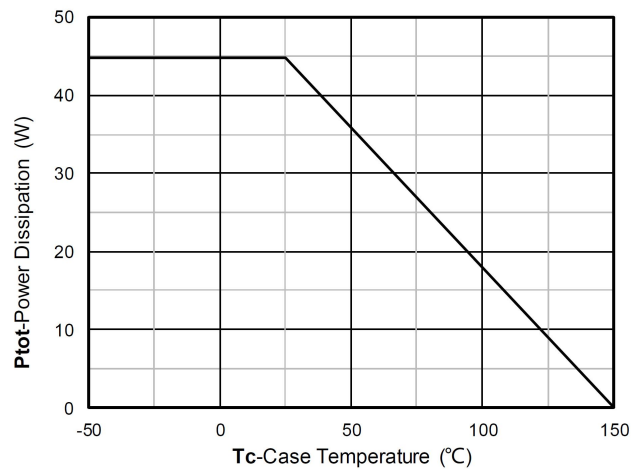
Capacitance Characteristics



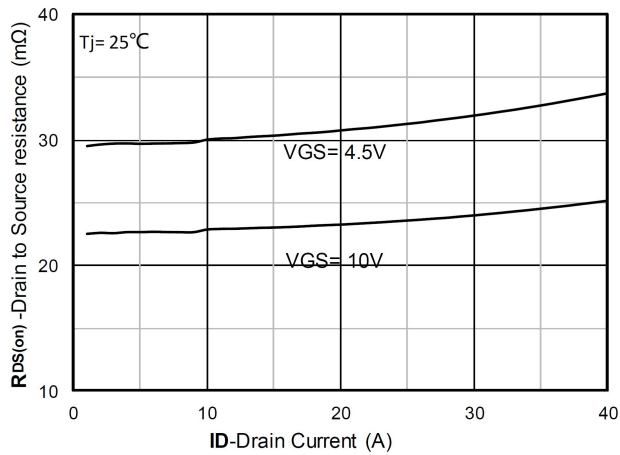
Gate Charge



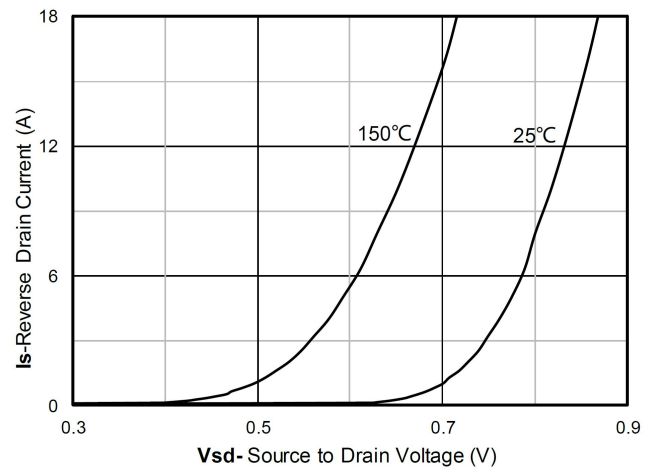
Current dissipation



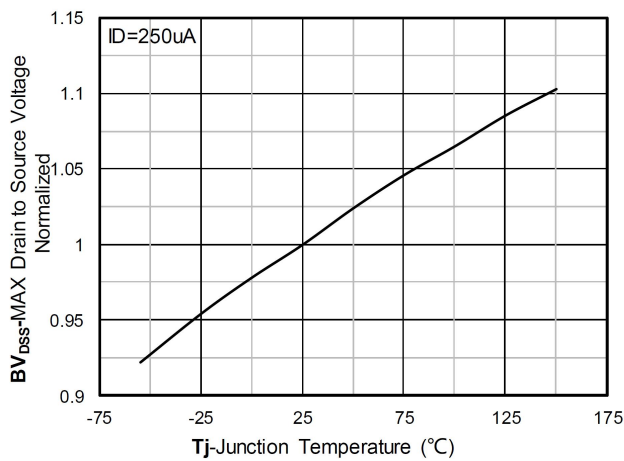
Power dissipation



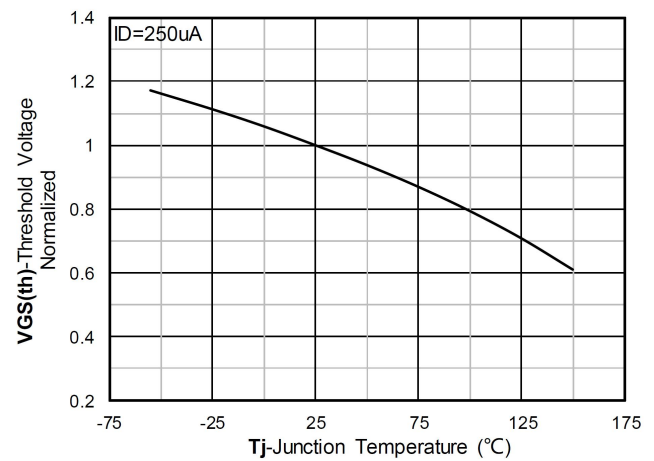
RDS(on) VS Drain Current



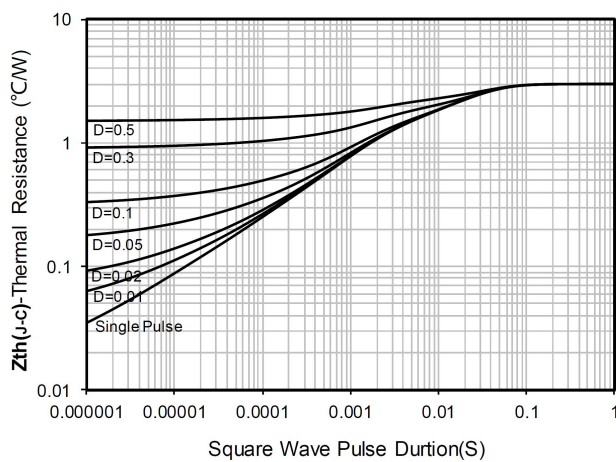
Forward characteristics of reverse diode



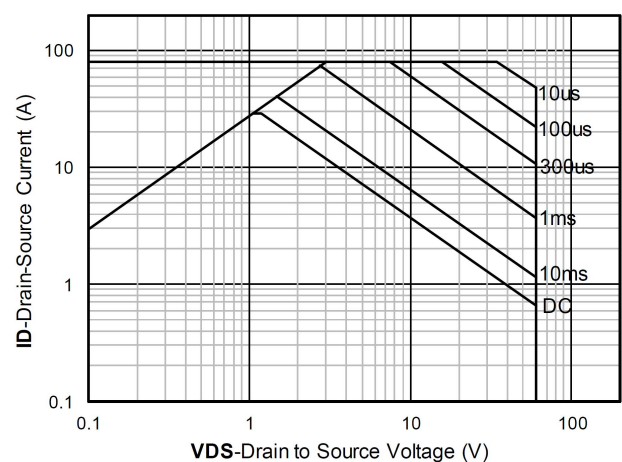
Normalized breakdown voltage



Normalized Threshold voltage

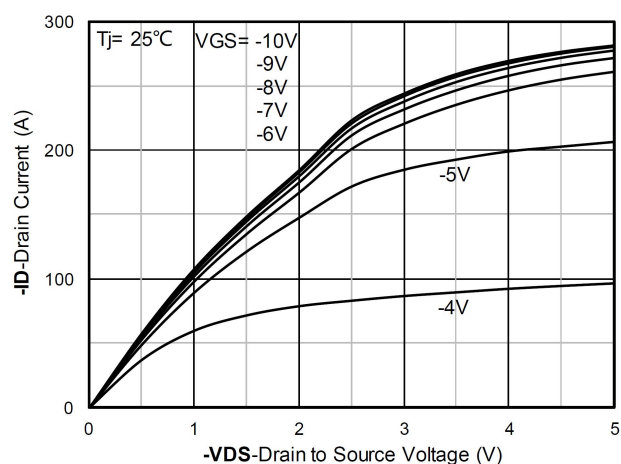


Maximum Transient Thermal Impedance

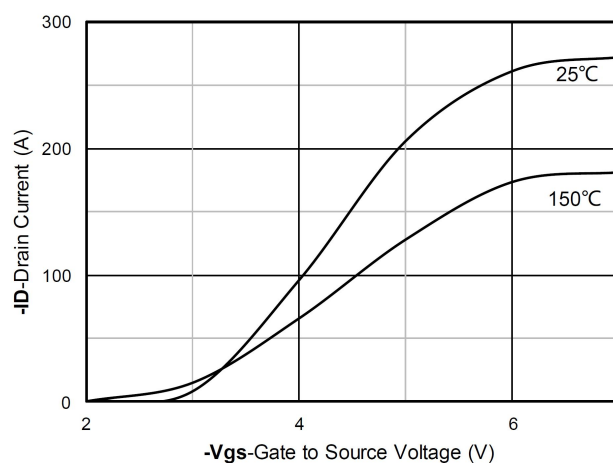


Safe Operation Area

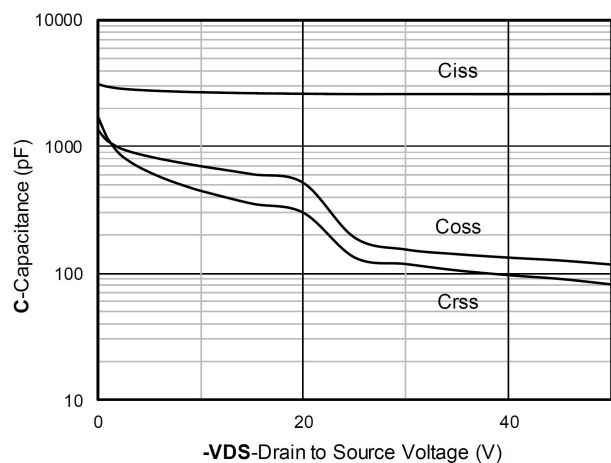
## P-Channel Typical Characteristics



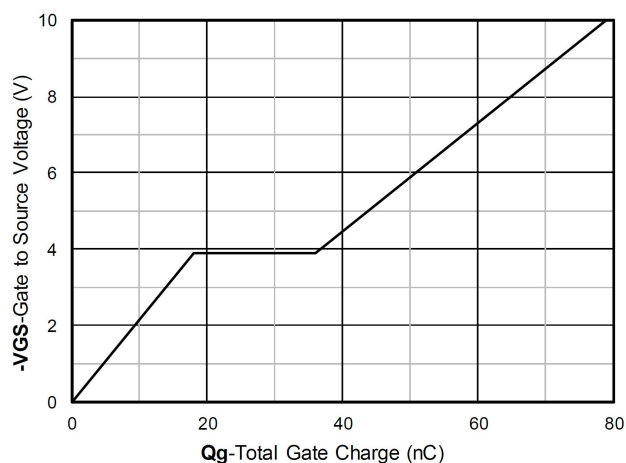
Output Characteristics



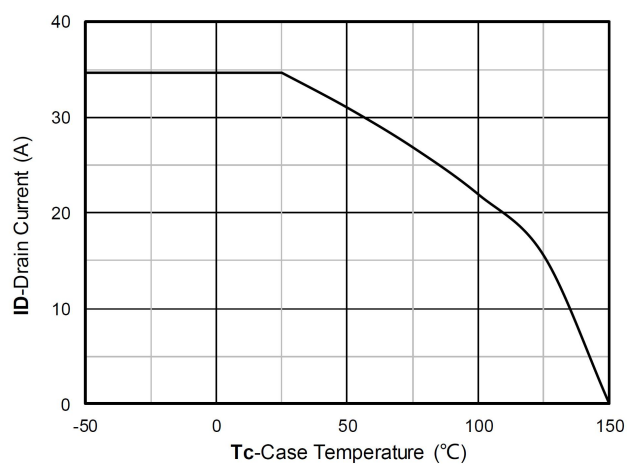
Transfer Characteristics



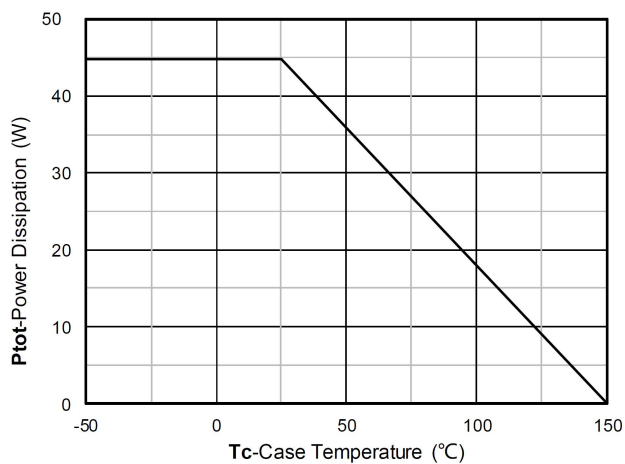
Capacitance Characteristics



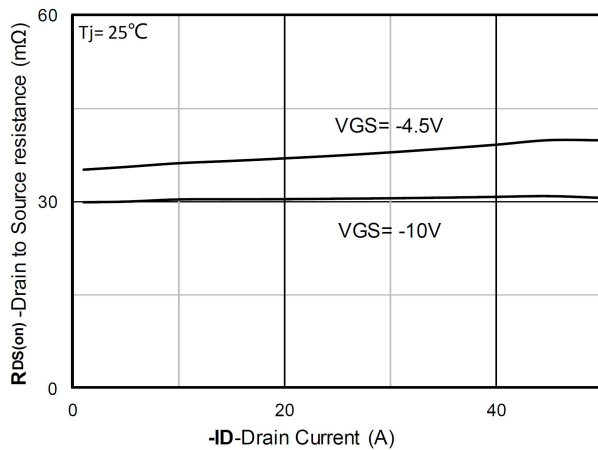
Gate Charge



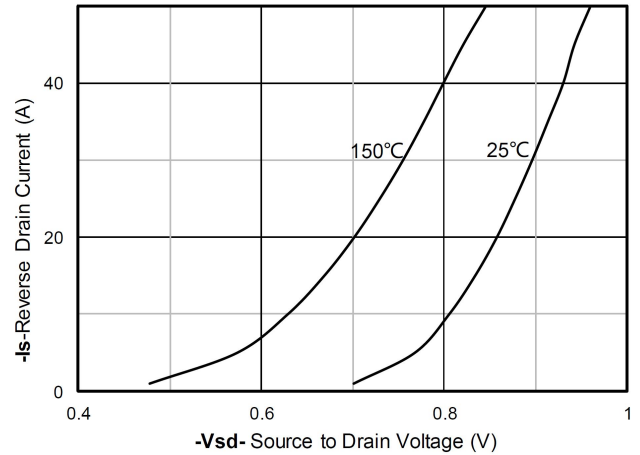
Current dissipation



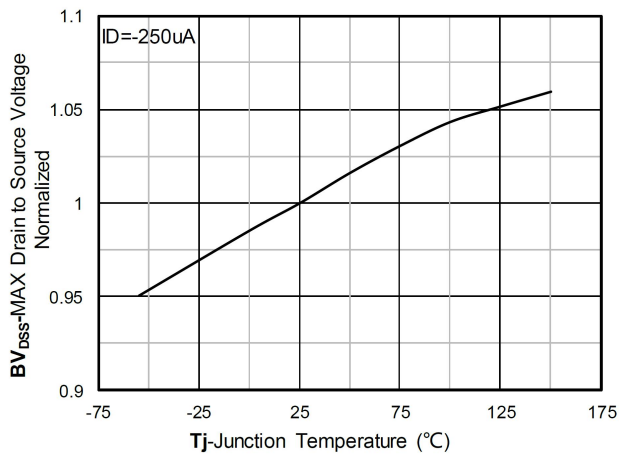
Power dissipation



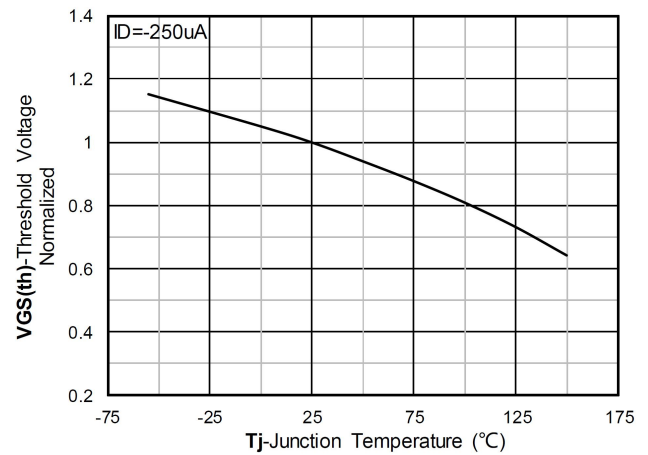
RDS(on) VS Drain Current



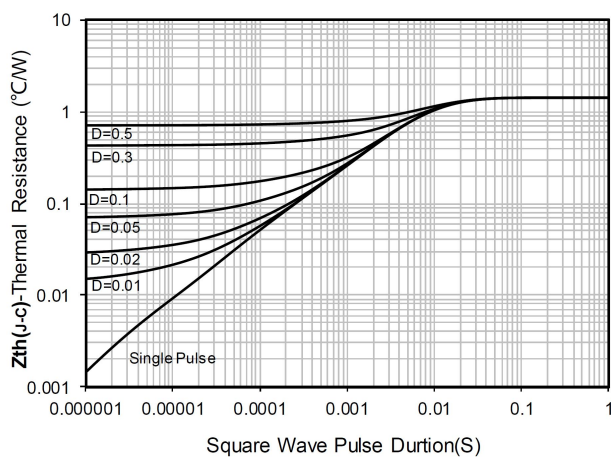
Forward characteristics of reverse diode



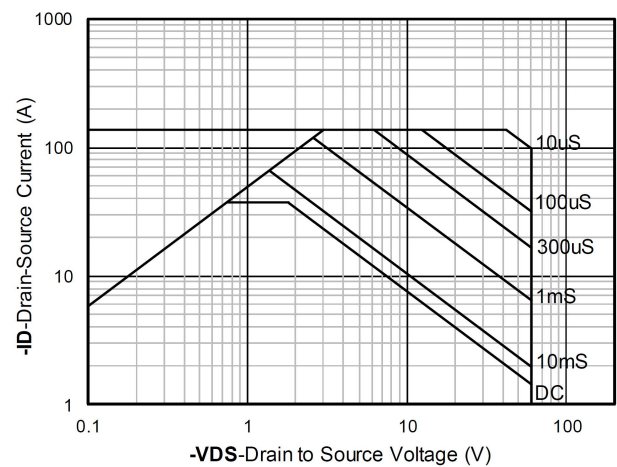
Normalized breakdown voltage



Normalized Threshold voltage



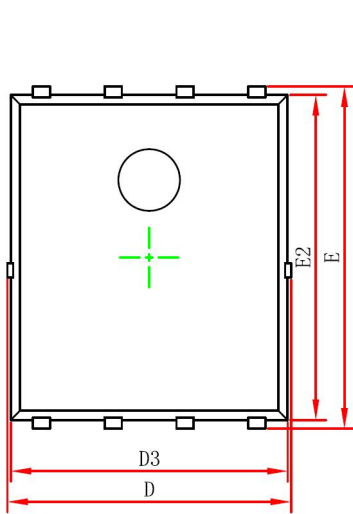
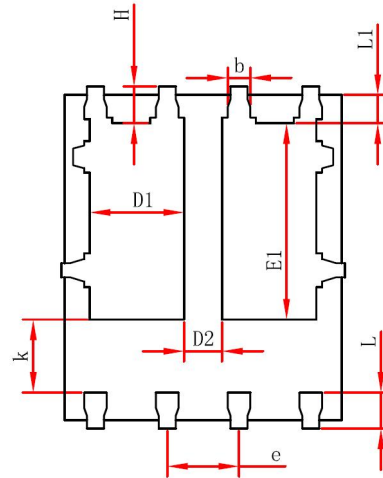
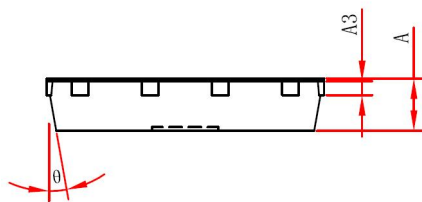
Maximum Transient Thermal Impedance



Safe Operation Area



## PDFN5X6-8L Package Information

Top View  
[顶视图]Bottom View  
[背视图]Side View  
[侧视图]

| Symbol   | Dimensions In Millimeters |       | Dimensions In Inches |       |
|----------|---------------------------|-------|----------------------|-------|
|          | Min.                      | Max.  | Min.                 | Max.  |
| A        | 0.900                     | 1.000 | 0.035                | 0.039 |
| A3       | 0.254 REF.                |       | 0.010REF.            |       |
| D        | 4.944                     | 5.096 | 0.195                | 0.201 |
| E        | 5.974                     | 6.126 | 0.235                | 0.241 |
| D1       | 1.470                     | 1.870 | 0.058                | 0.074 |
| D2       | 0.470                     | 0.870 | 0.019                | 0.034 |
| E1       | 3.375                     | 3.575 | 0.133                | 0.141 |
| D3       | 4.824                     | 4.976 | 0.190                | 0.196 |
| E2       | 5.674                     | 5.826 | 0.223                | 0.229 |
| k        | 1.190                     | 1.390 | 0.047                | 0.055 |
| b        | 0.350                     | 0.450 | 0.014                | 0.018 |
| e        | 1.270TYP.                 |       | 0.050TYP.            |       |
| L        | 0.559                     | 0.711 | 0.022                | 0.028 |
| L1       | 0.424                     | 0.576 | 0.017                | 0.023 |
| H        | 0.574                     | 0.726 | 0.023                | 0.029 |
| $\theta$ | 10°                       | 12°   | 10°                  | 12°   |