# KSN90P03X

## -30V P-Channel MOSFET

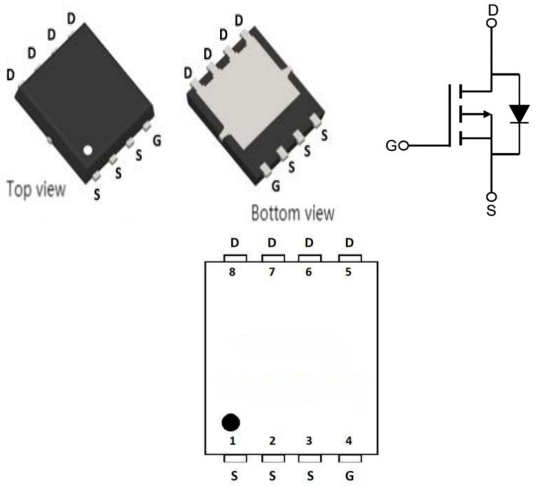
## General Description

The KSN90P03X combines advanced trench MOSFET technology with a low resistance package to provide extremely low $R_{DS}$(ON). This device is ideal for load switch and battery protection applications.

## Product Summary

| $V_{DS}$ (V) | $R_{DS(on)}$ (mΩ) | $I_D$ (A) |
|---|---|---|
| -30 | 3.7 at $V_{GS}$ = 10 V | -90 |
| | 5.2 at$V_{GS}$ = 4.5 V | -80 |

## PDFN5x6 Pin Configuration




## Features

- Improved dv/dt capability
- Green Device Available
- Suit for 1.8V Gate Drive Applications

## Applications

- Load Switch
- Battery protection
- Uninterruptible power supply

***100% UIS TESTED!***
***100% ΔVds TESTED!***

## Absolute Maximum Ratings Tc=25℃ unless otherwise noted

| Symbol | Parameter | Rating | Units |
|---|---|---|---|
| $V_{DS}$ | Drain-Source Voltage | -30 | V |
| $V_{GS}$ | Gate-Source Voltage | ±20 | V |
| $I_D$ | Drain Current – Continuous ($T_C$=25℃) | -90 | A |
| | Drain Current – Continuous ($T_C$=100℃) | -60 | A |
| $I_{DM}$ | Drain Current – Pulsed[1] | -250 | A |
| $P_D$ | Power Dissipation ($T_C$=25℃) | 70 | W |
| | Power Dissipation – Derate above 25℃ | 0.85 | W/℃ |
| $T_{STG}$ | Storage Temperature Range | -50 to 150 | ℃ |
| $T_J$ | Operating Junction Temperature Range | -50 to 150 | ℃ |

## Thermal Characteristics

| Symbol | Parameter | Typ. | Max. | Unit |
|---|---|---|---|---|
| $R_{\theta JA}$ | Thermal Resistance Junction to ambient | --- | 62 | ℃/W |
| $R_{\theta JC}$ | Thermal Resistance Junction to Case | --- | 1.47 | ℃/W |

## Electrical Characteristics ($T_J$=25 ℃, unless otherwise noted)

### Off Characteristics

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $BV_{DSS}$ | Drain-Source Breakdown Voltage | $V_{GS}$=0V , $I_D$=250uA | -30 | --- | --- | V |
| $\triangle BV_{DSS}/\triangle T_J$ | $BV_{DSS}$ Temperature Coefficient | Reference to 25℃ , $I_D$=1mA | --- | 0.01 | --- | V/℃ |
| $I_{DSS}$ | Drain-Source Leakage Current | $V_{DS}$=-20V , $V_{GS}$=0V , $T_J$=25℃ | --- | --- | 1 | uA |
| | | $V_{DS}$=-20V , $V_{GS}$=0V , $T_J$=125℃ | --- | --- | 10 | uA |
| $I_{GSS}$ | Gate-Source Leakage Current | $V_{GS}$=±20V , $V_{DS}$=0V | --- | --- | ±100 | nA |

### On Characteristics

| | | | | | | |
|---|---|---|---|---|---|---|
| $R_{DS(ON)}$ | Static Drain-Source On-Resistance | $V_{GS}$=-10V , $I_D$=-20A | --- | 3.7 | 4.3 | mΩ |
| | | $V_{GS}$=-4.5V , $I_D$=-15A | --- | 5.2 | 6.0 | mΩ |
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{GS}$=$V_{DS}$ , $I_D$ =250uA | -1.3 | -1.6 | -2.5 | V |
| $\triangle V_{GS(th)}$ | $V_{GS(th)}$ Temperature Coefficient | | --- | 4.3 | --- | mV/℃ |
| gfs | Forward Transconductance | $V_{DS}$=-10V , $I_S$=-15A | --- | 40 | --- | S |

### Dynamic and switching Characteristics

| | | | | | | |
|---|---|---|---|---|---|---|
| $Q_g$ | Total Gate Charge[2,3] | $V_{DS}$=-15V , $V_{GS}$=-10V , $I_D$=-20A | --- | 74 | 103 | nC |
| $Q_{gs}$ | Gate-Source Charge[2,3] | | --- | 16 | 21 | |
| $Q_{gd}$ | Gate-Drain Charge[2,3] | | --- | 23 | 30 | |
| $T_{d(on)}$ | Turn-On Delay Time[2,3] | $V_{DS}$=-15V , $V_{GS}$=-10V , $R_G$=3.3 Ω $I_D$=-10A | --- | 16 | 27 | ns |
| $T_r$ | Rise Time[2,3] | | --- | 21 | 33 | |
| $T_{d(off)}$ | Turn-Off Delay Time[2,3] | | --- | 78 | 95 | |
| $T_f$ | Fall Time[2,3] | | --- | 53 | 65 | |
| $C_{iss}$ | Input Capacitance | $V_{DS}$=-15V , $V_{GS}$=0V , F=1MHz | --- | 4236 | 4730 | pF |
| $C_{oss}$ | Output Capacitance | | --- | 467 | 534 | |
| $C_{rss}$ | Reverse Transfer Capacitance | | --- | 142 | 210 | |

### Drain-Source Diode Characteristics and Maximum Ratings

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $I_S$ | Continuous Source Current | $V_G$=$V_D$=0V , Force Current | --- | --- | -70 | A |
| $I_{SM}$ | Pulsed Source Current | | --- | --- | -140 | A |
| $V_{SD}$ | Diode Forward Voltage | $V_{GS}$=0V , $I_S$=-1A , $T_J$=25℃ | --- | --- | -1.0 | V |

Note :
1. Repetitive Rating : Pulsed width limited by maximum junction temperature.
2. The data tested by pulsed , pulse width ≦ 300us , duty cycle ≦ 2%.
3. Essentially independent of operating temperature.

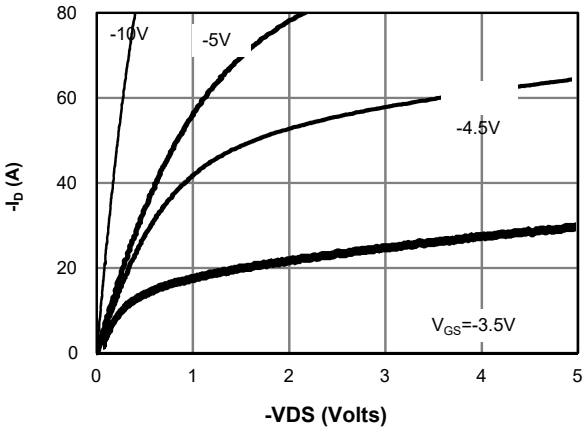



Fig 1: On-Region Characteristics

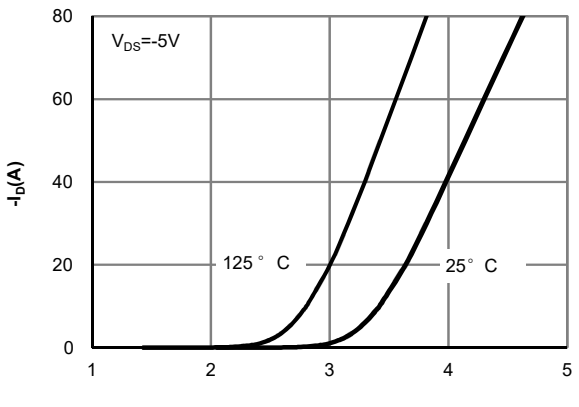



Figure 2: Transfer Characteristics

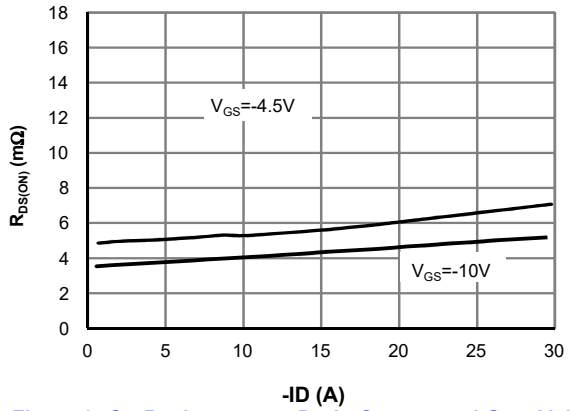



Figure 3: On-Resistance vs. Drain Current and Gate Voltage

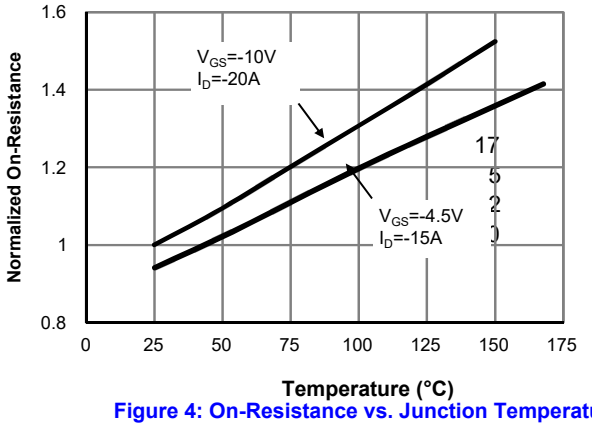



Figure 4: On-Resistance vs. Junction Temperature

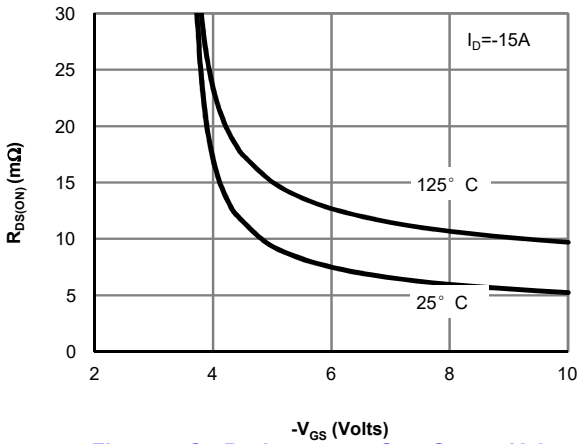



Figure 5: On-Resistance vs. Gate-Source Voltage

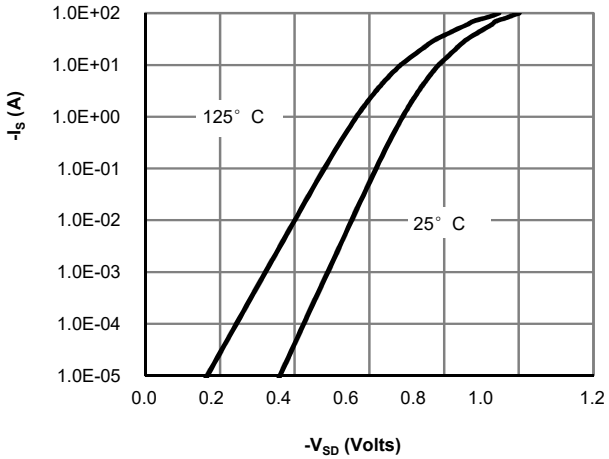



Figure 6: Body-Diode Characteristics

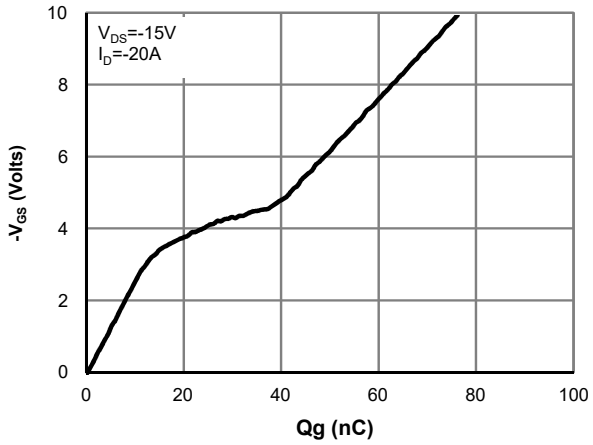



Figure 7: Gate-Charge Characteristics

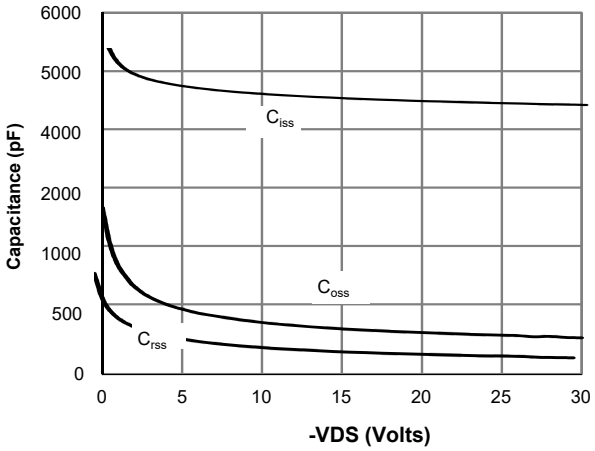



Figure 8: Capacitance Characteristics

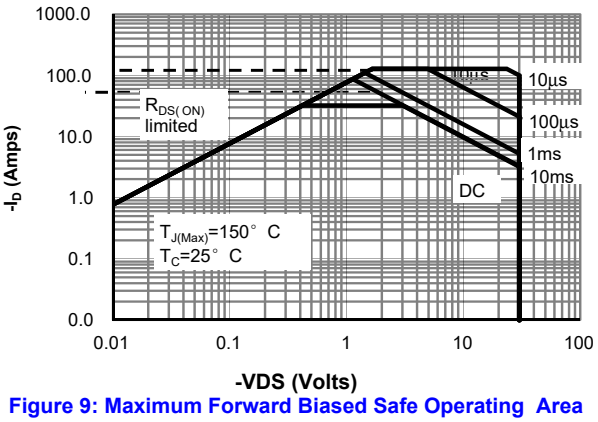



Figure 9: Maximum Forward Biased Safe Operating Area

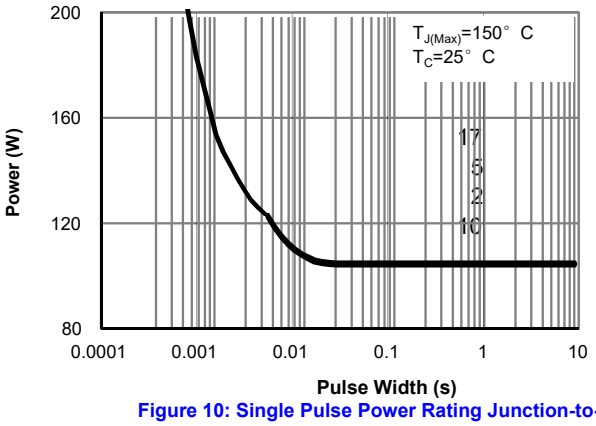



Figure 10: Single Pulse Power Rating Junction-to-Cas

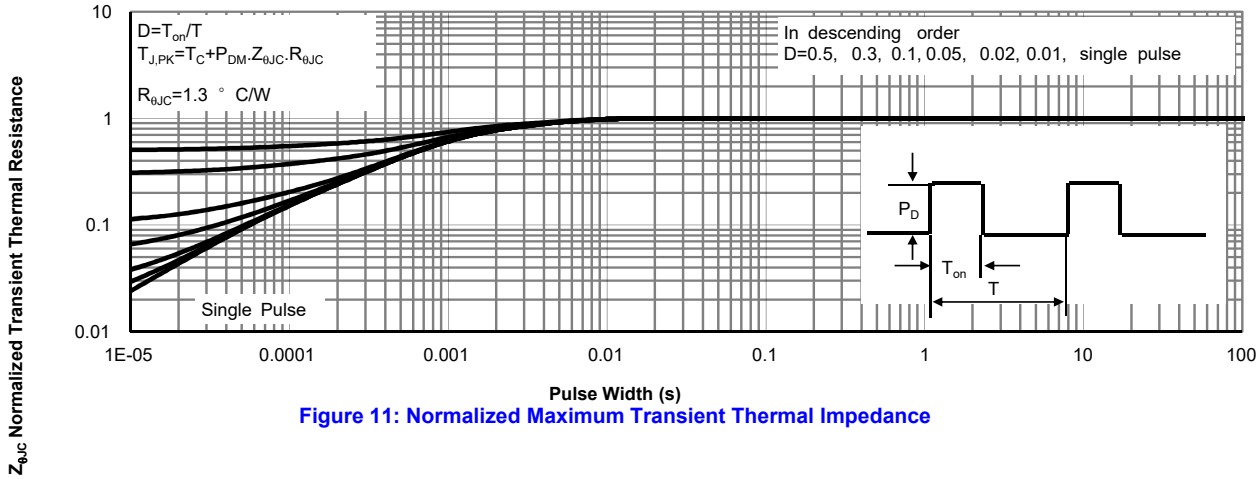



Figure 11: Normalized Maximum Transient Thermal Impedance

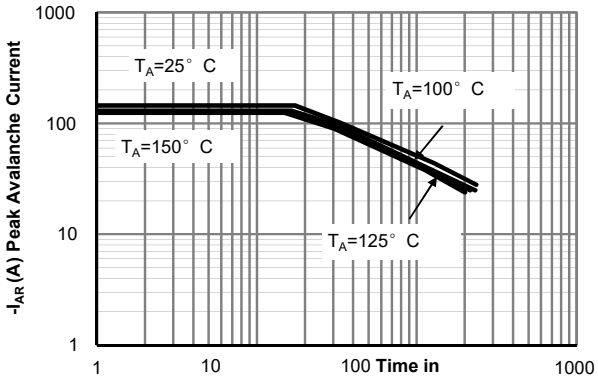



Figure 12: Single Pulse Avalanche capability

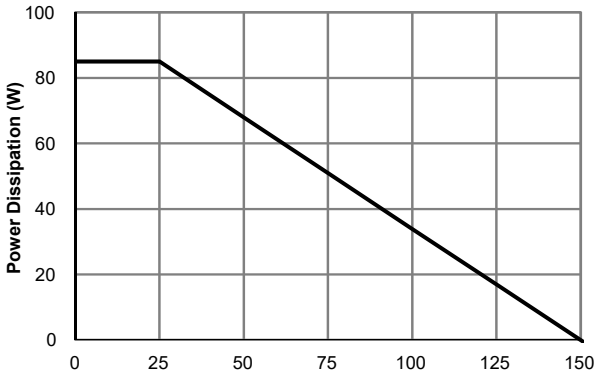



Figure 13: Power De-rating

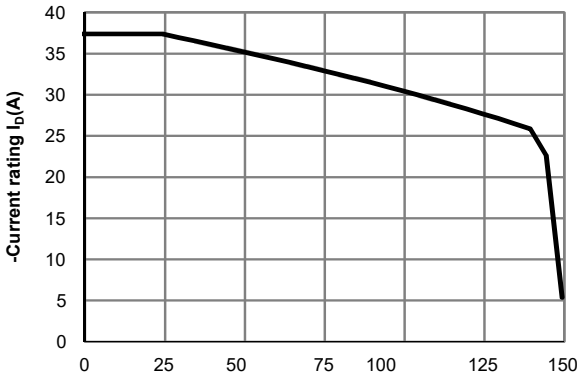



Figure14: Curent De-rating

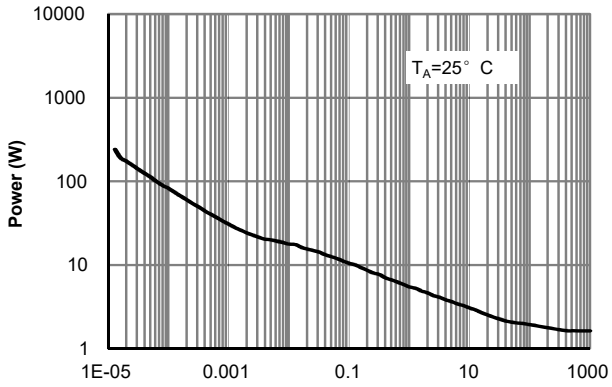



Figure 15:Single Pulse Power Rating Junction-to-bient

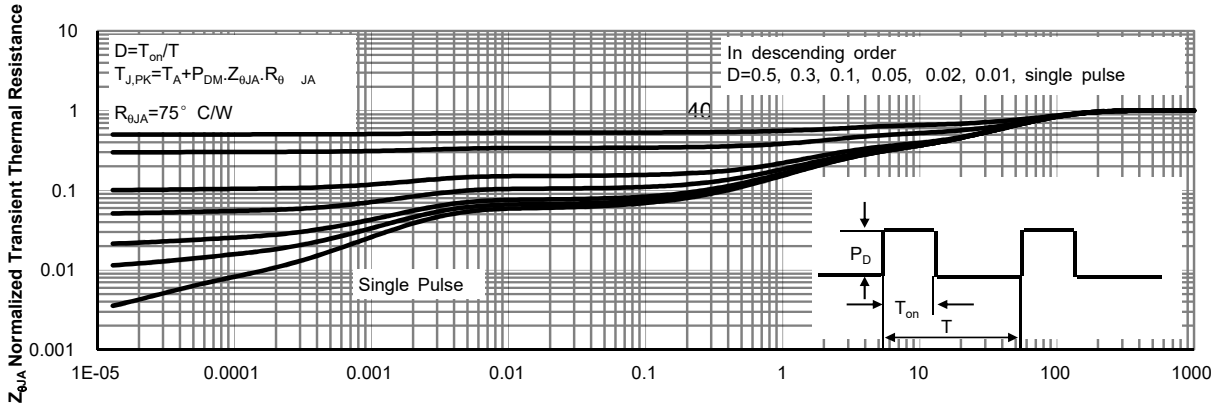



Figure 16: Normalized Maximum Transient Thermal Impedance

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