# KSM40N50

## 500V N-Channel MOSFET

## General Description

The KSM40N50 is obtained by the self-aligned planar Technology which reduce the conduction loss, improve switching performance and enhance the avalanche energy. The transistor can be used in various power switching circuit for system miniaturization and higher efficiency.

## Product Summary

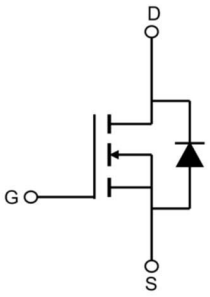
| $V_{DS}$ (V) | $R_{DS(on)}$ (mΩ) | $I_D$ (A) |
|---|---|---|
| 500 | 135 at $V_{GS}$ = 10 V | 40 |

## Features

- Fast Switching
- LowON Resistance
- Low Gate Charge

## **TO-3PN** Pin Configuration






## Applications

- Power switch circuit of electron ballast and adaptor.

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

| Symbol | Parameter | Rating | Units |
|---|---|---|---|
| $V_{DS}$ | Drain-Source Voltage | 500 | V |
| $V_{GS}$ | Gate-Source Voltage | ±30 | V |
| $I_D$ | Drain Current – Continuous ($T_C$=25℃) | 40 | A |
| | Drain Current – Continuous ($T_C$=100℃) | 20 | A |
| $I_{DM}$ | Drain Current – Pulsed[1] | 130 | A |
| $P_D$ | Power Dissipation ($T_C$=25℃) | 380 | W |
| | Power Dissipation ($T_C$=100℃) | 2.2 | W/℃ |
| $T_{STG}$ | Storage Temperature Range | -55 to 150 | ℃ |
| $T_J$ | Operating Junction Temperature Range | -55 to 150 | ℃ |

## Thermal Characteristics

| Symbol | Parameter | Typ. | Max. | Unit |
|---|---|---|---|---|
| $R_{\theta JA}$ | Thermal Resistance Junction to ambient | --- | 52 | ℃/W |
| $R_{\theta JC}$ | Thermal Resistance Junction to Case | --- | 0.5 | ℃/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 | 500 | --- | --- | V |
| $I_{DSS}$ | Drain-Source Leakage Current | $V_{DS}$=500V , $V_{GS}$=0V , $T_J$=25℃ | --- | --- | 1 | uA |
| | | $V_{DS}$=400V , $V_{GS}$=0V , $T_J$=125℃ | --- | --- | 100 | uA |
| $I_{GSS}$ | Gate-Source Leakage Current | $V_{GS}$=±30V , $V_{DS}$=0V | --- | --- | ±100 | nA |

### On Characteristics

| | | | | | | |
|---|---|---|---|---|---|---|
| $R_{DS(ON)}$ | Static Drain-Source On-Resistance | $V_{GS}$=10V , $I_D$=15A | --- | 135 | 170 | mΩ |
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{GS}$=$V_{DS}$ , $I_D$ =250uA | 2.0 | 3.0 | 4.0 | V |
| gfs | Forward Transconductance | $V_{DS}$=15V , $I_S$=15A | --- | 35 | --- | S |

### Dynamic and switching Characteristics

| | | | | | | |
|---|---|---|---|---|---|---|
| $Q_g$ | Total Gate Charge | $V_{DS}$=400V , $V_{GS}$=10V , $I_D$=30A | --- | 95 | --- | nC |
| $Q_{gs}$ | Gate-Source Charge | | --- | 26 | --- | |
| $Q_{gd}$ | Gate-Drain Charge | | --- | 50 | --- | |
| $T_{d(on)}$ | Turn-On Delay Time | $V_{DS}$=250V ID=30A,$R_G$=25Ω | --- | 61 | --- | ns |
| $T_r$ | Rise Time | | --- | 112 | --- | |
| $T_{d(off)}$ | Turn-Off Delay Time | | --- | 90 | --- | |
| $T_f$ | Fall Time | | --- | 58 | --- | |
| $C_{iss}$ | Input Capacitance | $V_{DS}$=50V , $V_{GS}$=0V , F=1MHz | --- | 6860 | --- | pF |
| $C_{oss}$ | Output Capacitance | | --- | 515 | --- | |
| $C_{rss}$ | Reverse Transfer Capacitance | | --- | 13 | --- | |

### 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 | --- | --- | 40 | A |
| $I_{SM}$ | Pulsed Source Current | | --- | --- | 100 | A |
| $V_{SD}$ | Diode Forward Voltage | $V_{GS}$=0V , $I_S$=1A , $T_J$=25℃ | --- | --- | 1.5 | V |

Note :

**1.** Repetitive Rating: Pulse width limited by maximum junction temperature.
**2.** Surface Mounted on FR4 Board, t ≤ 10 sec.
**3.** Pulse Test: Pulse Width ≤ 300μs, Duty Cycle ≤ 2%.
**4.** Guaranteed by design, not subject to production

## Typical Electrical and Thermal Characteristics (Curves)

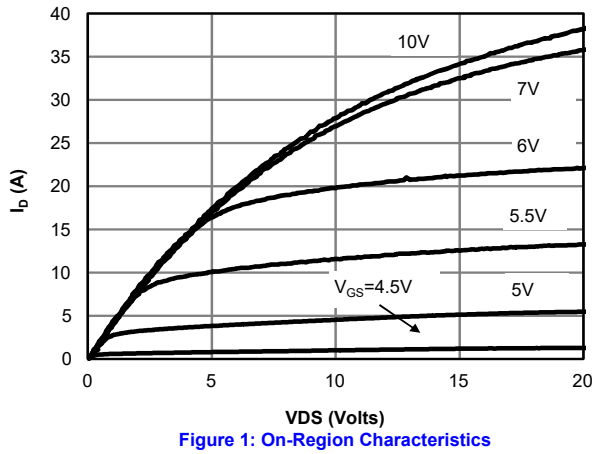



Figure 1: On-Region Characteristics

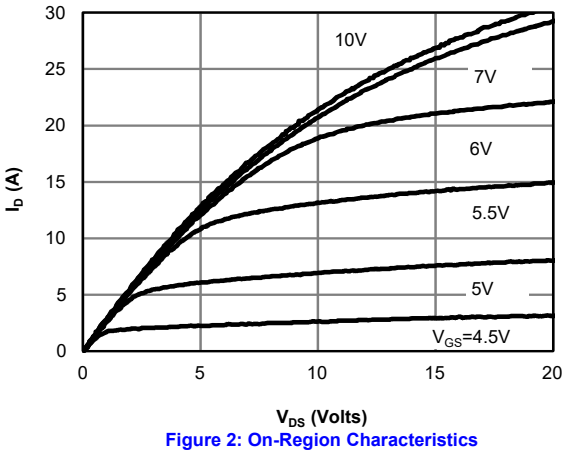



Figure 2: On-Region Characteristics

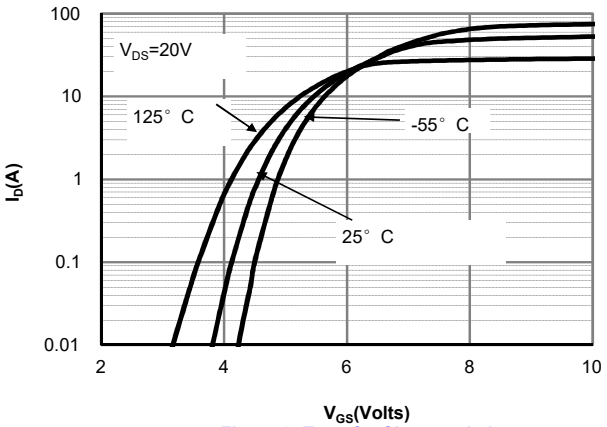



Figure 3: Transfer Characteristics

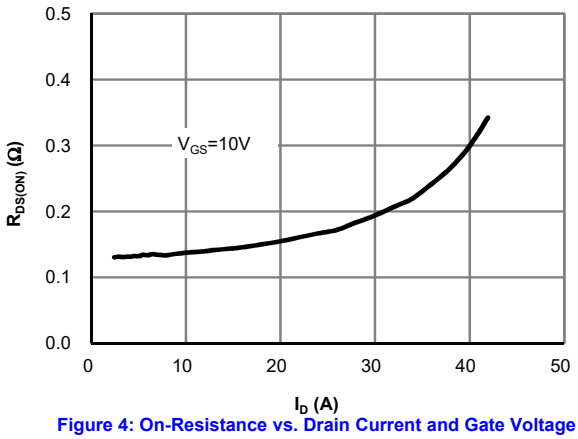



Figure 4: On-Resistance vs. Drain Current and Gate Voltage

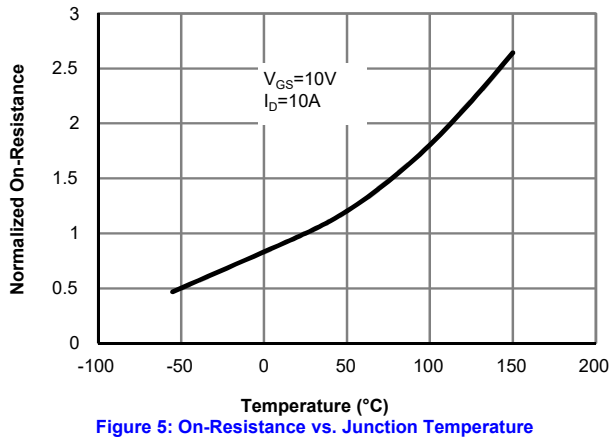



Figure 5: On-Resistance vs. Junction Temperature

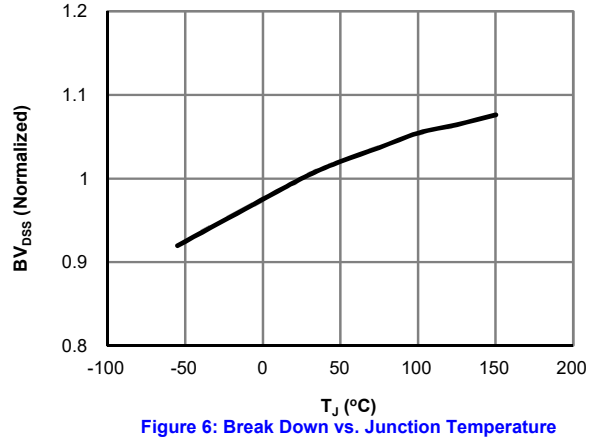



Figure 6: Break Down vs. Junction Temperature

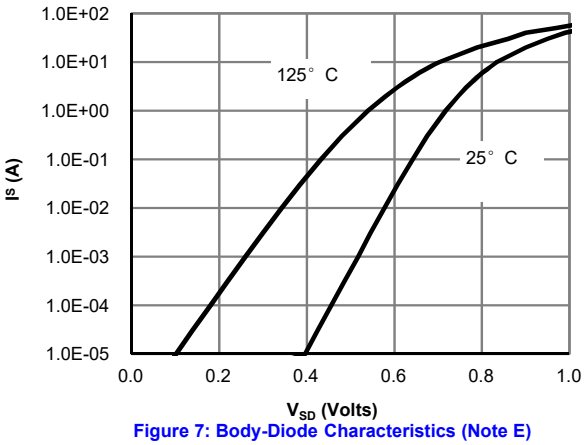



Figure 7: Body-Diode Characteristics (Note E)

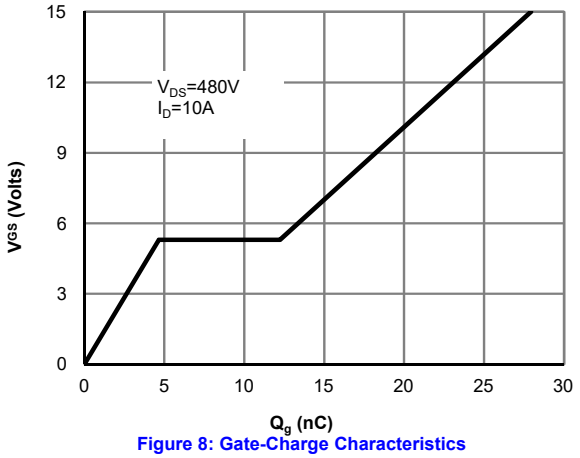



Figure 8: Gate-Charge Characteristics

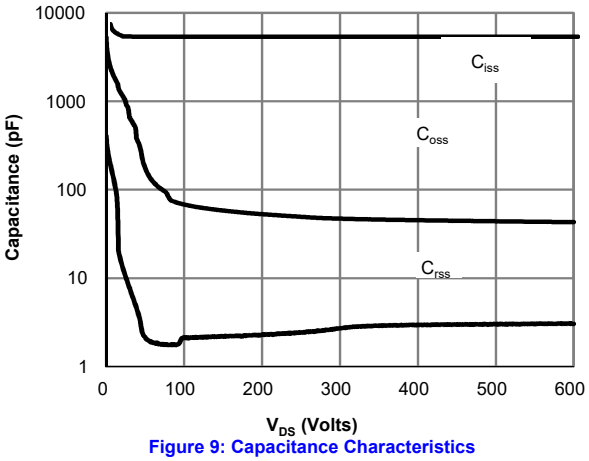



Figure 9: Capacitance Characteristics

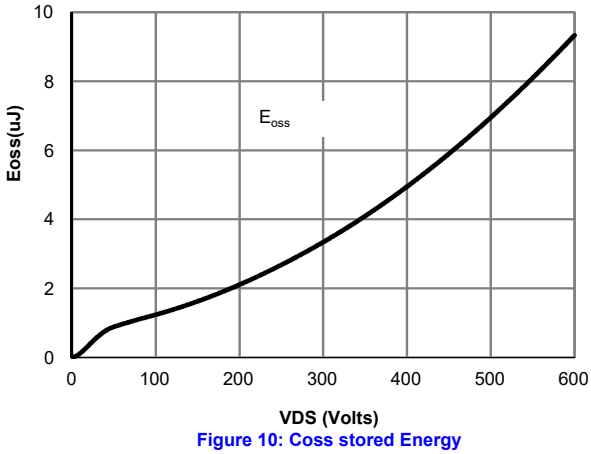



Figure 10: Coss stored Energy

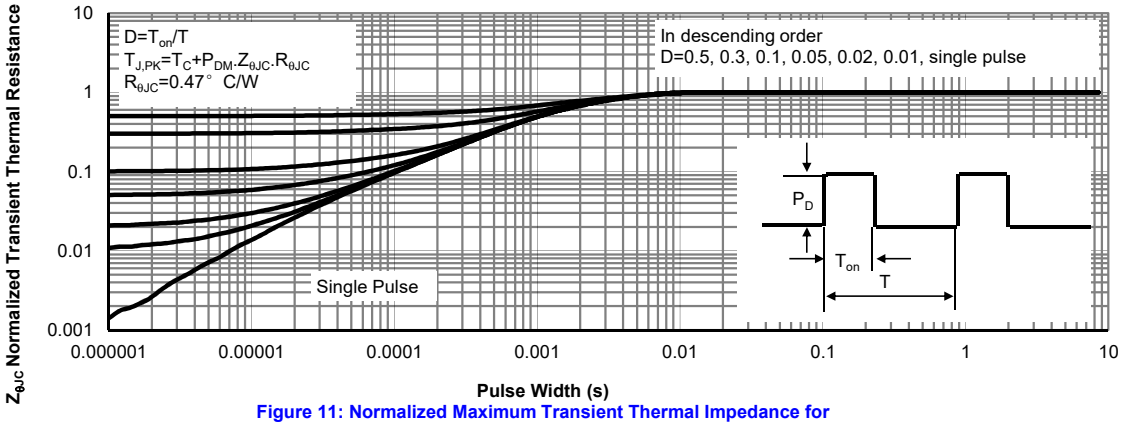



Figure 11: Normalized Maximum Transient Thermal Impedance for

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