优尚

YOUSHANG SEMICONDUCTOR

# 设计研发新型功率器件

## 各类小信号开关

## 中低压及高压大电流等场效应管

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## Product Summary

| $BV_{DSS}$ | $R_{DS(on)}$ max | $I_D$ $T_A$ = +25°C |
|---|---|---|
| -70V | 160mΩ @ $V_{GS}$= -10V | -5.7A |
| | 250mΩ @ $V_{GS}$= -4.5V | -5.3A |

## Description

This new generation of trench MOSFETs utilizes a unique structure that combines the benefits of low on-resistance with fast switching speed. The NK-ZXMP7A17KQ is ideal for high efficiency, low voltage
power management applications.

## Applications

- DC-DC Converters
- Power Management Functions
- Disconnect Switches
- Motor Control
- Class D Audio Output Stages

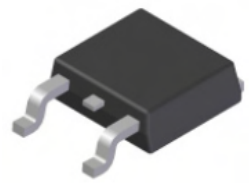
## Features and Benefits

- Low On-Resistance
- Fast Switching Speed
- Low Threshold
- Low Gate Drive
- DPAK Package

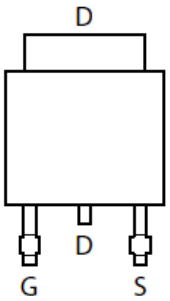
## Mechanical Data

- Case: TO252 (DPAK)
- Case Material: Molded Plastic, “Green” Molding Compound; UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals Connections: See Diagram Below
- Terminals: Finish - Matte Tin Annealed over Copper Leadframe; Solderable per MIL-STD-202, Method 208 e3
- Weight: 0.315 grams (Approximate)

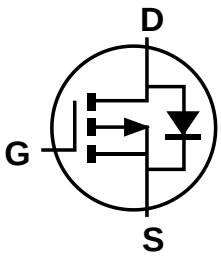
TO252



Top View




Top View
Pin Out




Equivalent Circuit

## Maximum Ratings (@$T_A$ = +25°C, unless otherwise specified.)

| Characteristic | | | Symbol | Value | Unit |
|---|---|---|---|---|---|
| Drain-Source Voltage | | | $V_{DSS}$ | -70 | V |
| Gate-Source Voltage | | | $V_{GS}$ | ±20 | V |
| Continuous Drain Current | $V_{GS}$ = 10V | (Note 7) | $I_D$ | -5.7 | A |
| | | $T_A$ = +70°C (Note 7) | | -4.6 | |
| | | (Note 6) | | -3.8 | |
| Pulsed Drain Current | $V_{GS}$= 10V | (Note 8) | $I_{DM}$ | -17.7 | A |
| Continuous Source Current (Body diode) | | (Note 7) | $I_S$ | -9.2 | A |
| Pulsed Source Current (Body diode) | | (Note 8) | $I_{SM}$ | -17.7 | A |

## Thermal Characteristics (@$T_A$ = +25°C, unless otherwise specified.)

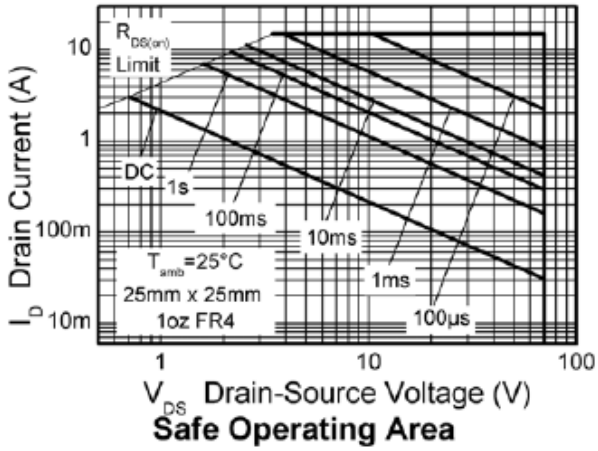
| Characteristic | | Symbol | Value | Unit |
|---|---|---|---|---|
| Power Dissipation<br>Linear Derating Factor | (Note 6) | $P_D$ | 4.17<br>33.3 | W<br>mW/°C |
| | (Note 7) | | 9.25<br>74 | |
| | (Note 9) | | 2.11<br>16.8 | |
| Thermal Resistance, Junction to Ambient | (Note 6) | $R_{\theta JA}$ | 30 | °C/W |
| | (Note 7) | | 13.5 | |
| | (Note 8) | | 59.1 | |
| Operating and Storage Temperature Range | | $T_J$, $T_{STG}$ | -55 to +150 | °C |

## Electrical Characteristics (@$T_A$ = +25°C, unless otherwise specified.)

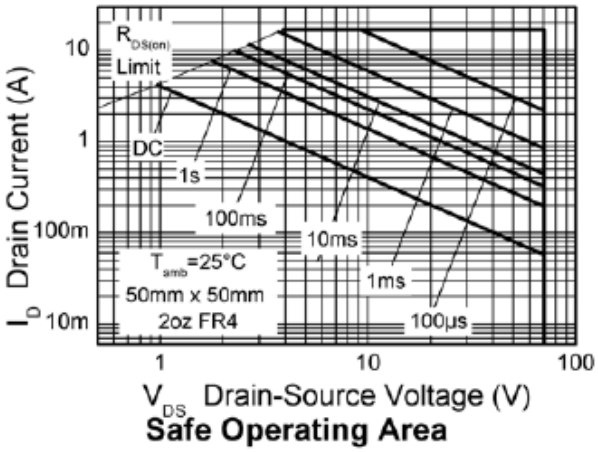
| Characteristic | Symbol | Min | Typ | Max | Unit | Test Condition |
|---|---|---|---|---|---|---|
| **OFF CHARACTERISTICS** | | | | | | |
| Drain-Source Breakdown Voltage | $BV_{DSS}$ | -70 | — | — | V | $I_D$ = -250μA, $V_{GS}$= 0V |
| Zero Gate Voltage Drain Current | $I_{DSS}$ | — | — | -1 | μA | $V_{DS}$= -70V, $V_{GS}$= 0V |
| Gate-Source Leakage | $I_{GSS}$ | — | — | ±100 | nA | $V_{GS}$= ±20V, $V_{DS}$= 0V |
| **ON CHARACTERISTICS** | | | | | | |
| Gate Threshold Voltage | $V_{GS(th)}$ | -1.0 | — | — | V | $I_D$= -250μA, $V_{DS}$= $V_{GS}$ |
| Static Drain-Source On-Resistance (Note 10) | $R_{DS(ON)}$ | — | — | 0.16 | Ω | $V_{GS}$= -10V, $I_D$= -2.1A |
| | | | | 0.25 | | $V_{GS}$= -4.5V, $I_D$= -1.7A |
| Forward Transconductance (Notes 10 & 11) | $g_{fs}$ | — | 4.4 | — | S | $V_{DS}$= -15V, $I_D$= -2.1A |
| Diode Forward Voltage (Note 10) | $V_{SD}$ | — | -0.85 | -0.95 | V | $I_S$= -2.0A, $V_{GS}$= 0V, $T_J$ = +25°C |
| Reverse Recovery Time (Note 11) | $t_{rr}$ | | 29.8 | — | ns | $I_S$= -2.1A, di/dt= 100A/μs |
| Reverse Recovery Charge (Note 11) | $Q_{rr}$ | — | 38.5 | — | nC | |
| **DYNAMIC CHARACTERISTICS** (Note 11) | | | | | | |
| Input Capacitance | $C_{iss}$ | — | 635 | — | pF | $V_{DS}$= -40V, $V_{GS}$= 0V<br>f= 1MHz |
| Output Capacitance | $C_{oss}$ | — | 52 | — | pF | |
| Reverse Transfer Capacitance | $C_{rss}$ | — | 42.5 | — | pF | |
| Total Gate Charge (Note 12) | $Q_g$ | — | 9.6 | — | nC | $V_{GS}$= -5V<br>$V_{DS}$= -35V<br>$I_D$= -2.1A |
| Total Gate Charge (Note 12) | $Q_g$ | — | 18 | — | nC | $V_{GS}$= -10V |
| Gate-Source Charge (Note 12) | $Q_{gs}$ | — | 1.77 | — | nC | |
| Gate-Drain Charge (Note 12) | $Q_{gd}$ | — | 3.66 | — | nC | |
| Turn-On Delay Time (Note 12) | $t_{D(on)}$ | — | 2.5 | — | ns | $V_{DD}$= -35V, $V_{GS}$= -10V<br>$I_D$= -1A, $R_G \cong 6.0\Omega$ |
| Turn-On Rise Time (Note 12) | $t_r$ | — | 3.4 | — | ns | |
| Turn-Off Delay Time (Note 12) | $t_{D(off)}$ | — | 27.9 | — | ns | |
| Turn-Off Fall Time (Note 12) | $t_f$ | — | 8 | — | ns | |

Notes:
6. For a device surface mounted on 50mm x 50mm x 1.6mm FR4 PCB with high coverage of single sided 2oz copper, in still air conditions.
7. For a device surface mounted on FR4 PCB measured at t ≤10 sec.
8. Repetitive rating 50mm x 50mm x 1.6mm FR4 PCB, D=0.02 pulse width=300μs - pulse width limited by maximum junction temperature.
9. For a device surface mounted on 25mm x 25mm x 1.6mm FR4 PCB with high coverage of single sided 1oz copper, in still air conditions.
10. Measured under pulsed conditions. Pulse width ≤300μs; duty cycle ≤ 2%.
11. Switching characteristics are independent of operating junction temperature.
12. For design aid only, not subject to production testing.

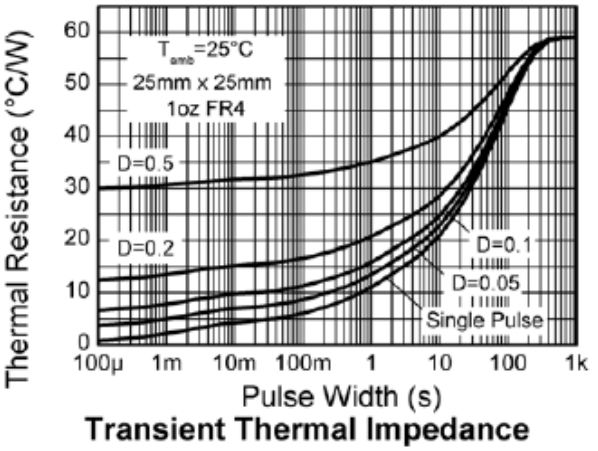
## Thermal Characteristics



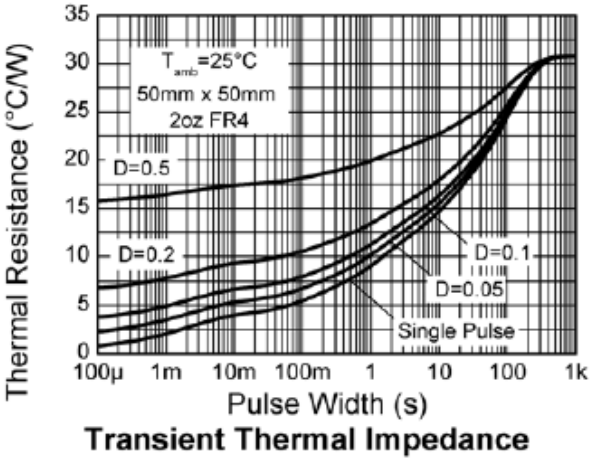
Safe Operating Area



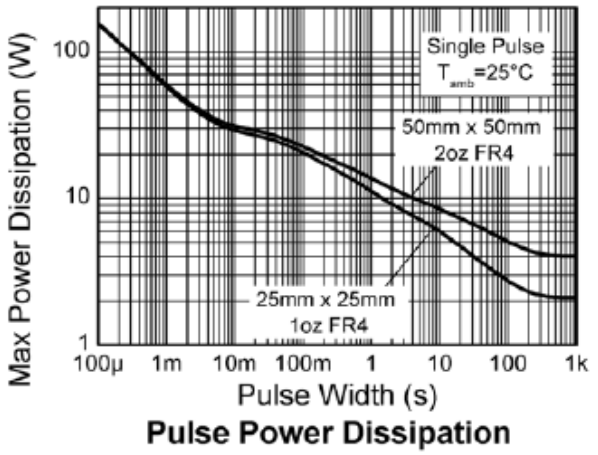
Safe Operating Area



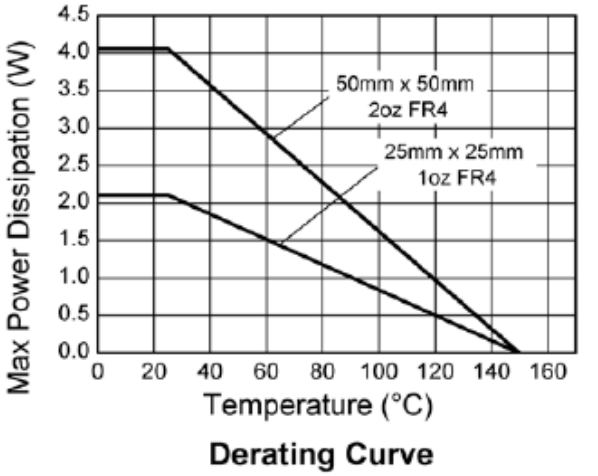
Transient Thermal Impedance



Transient Thermal Impedance

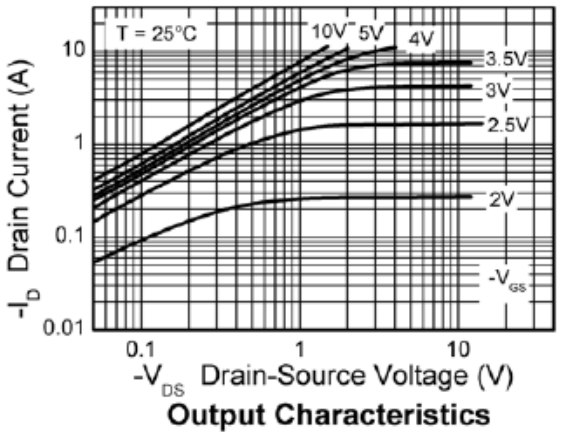


Pulse Power Dissipation

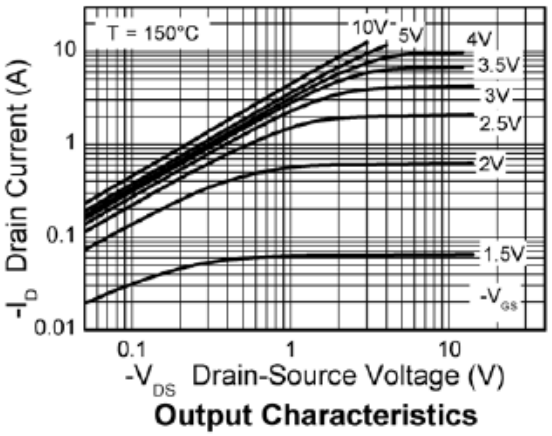


Derating Curve

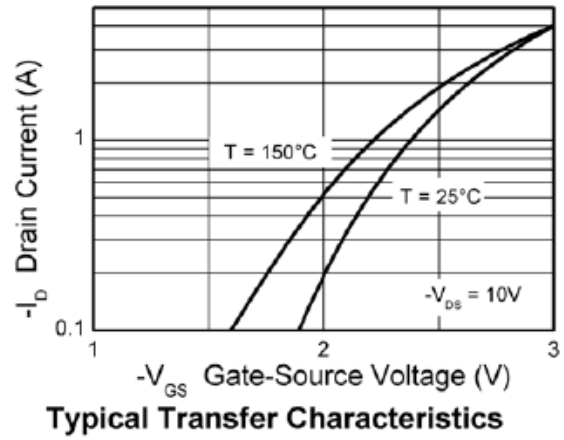
## Typical Characteristics



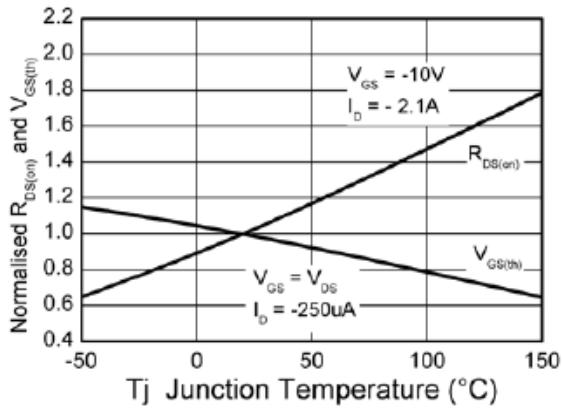

**Output Characteristics**



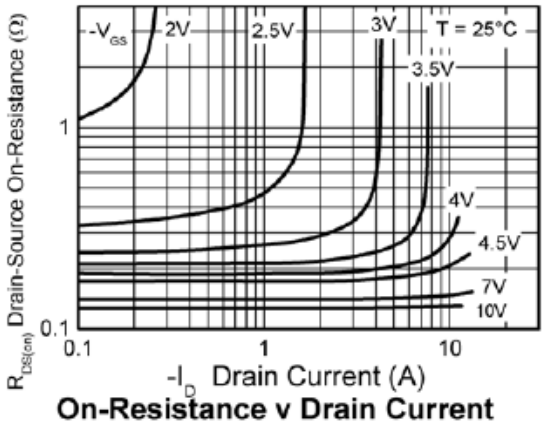

**Output Characteristics**



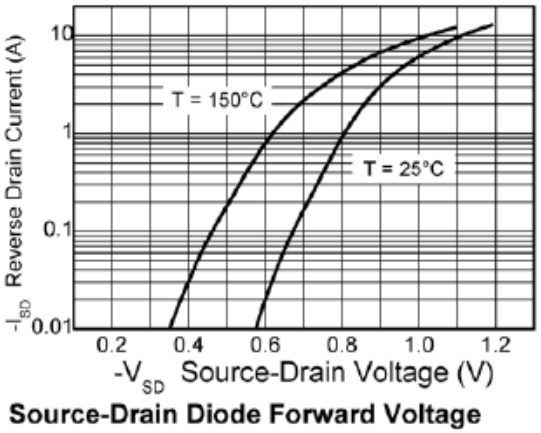

**Typical Transfer Characteristics**




**Normalised Curves v Temperature**

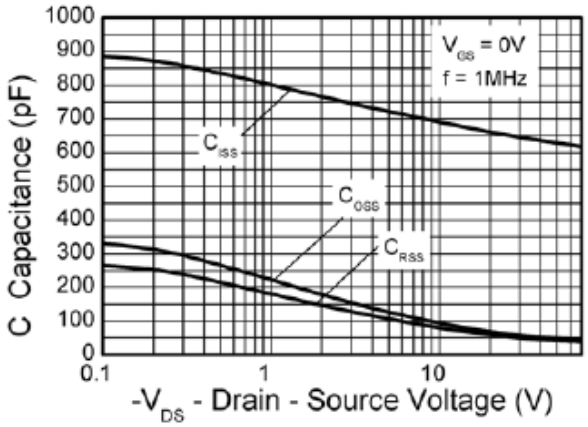



**On-Resistance v Drain Current**

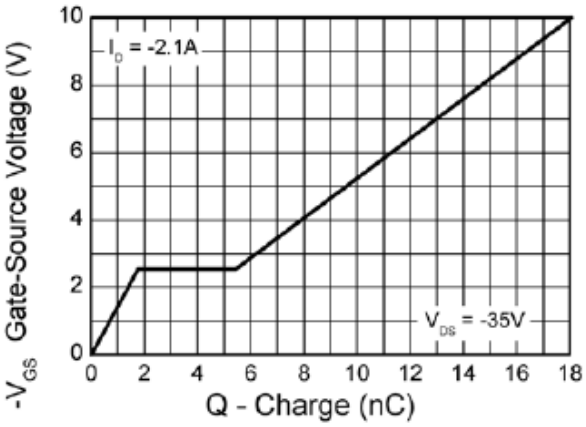



**Source-Drain Diode Forward Voltage**

## Typical Characteristics (cont.)

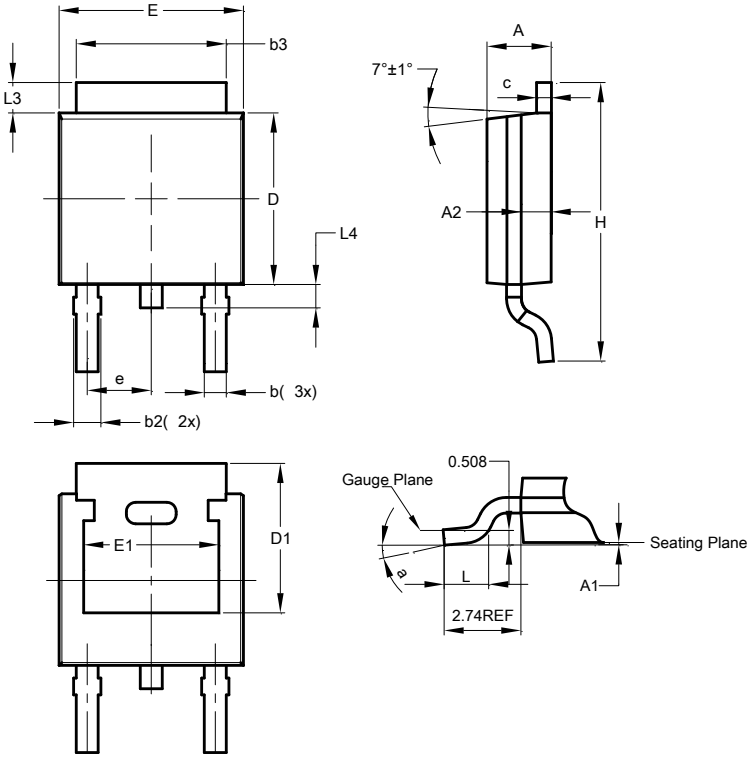



**Capacitance v Drain-Source Voltage**



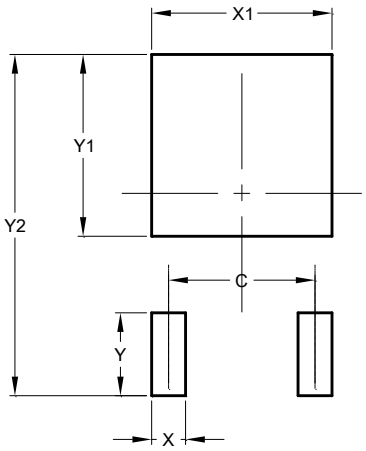

**Gate-Source Voltage v Gate Charge**

## Package Outline Dimensions




| TO252 (DPAK) | | | |
|---|---|---|---|
| **Dim** | **Min** | **Max** | **Typ** |
| **A** | 2.19 | 2.39 | 2.29 |
| **A1** | 0.00 | 0.13 | 0.08 |
| **A2** | 0.97 | 1.17 | 1.07 |
| **b** | 0.64 | 0.88 | 0.783 |
| **b2** | 0.76 | 1.14 | 0.95 |
| **b3** | 5.21 | 5.46 | 5.33 |
| **c** | 0.45 | 0.58 | 0.531 |
| **D** | 6.00 | 6.20 | 6.10 |
| **D1** | 5.21 | - | - |
| **e** | - | - | 2.286 |
| **E** | 6.45 | 6.70 | 6.58 |
| **E1** | 4.32 | - | - |
| **H** | 9.40 | 10.41 | 9.91 |
| **L** | 1.40 | 1.78 | 1.59 |
| **L3** | 0.88 | 1.27 | 1.08 |
| **L4** | 0.64 | 1.02 | 0.83 |
| **a** | 0° | 10° | - |
| **All Dimensions in mm** | | | |

## Suggested Pad Layout




| Dimensions | Value (in mm) |
|---|---|
| **C** | 4.572 |
| **X** | 1.060 |
| **X1** | 5.632 |
| **Y** | 2.600 |
| **Y1** | 5.700 |
| **Y2** | 10.700 |