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

| Device | $BV_{DSS}$ | $R_{DS(ON)}$ Max | $I_D$ Max $T_C$ = +25°C |
|---|---|---|---|
| Q1 & Q2 | 30V | 20mΩ @ $V_{GS}$ = 10V | 8.5A |
| | | 32mΩ @ $V_{GS}$ = 4.5V | 5.5A |

## Features and Benefits

- Low Gate Threshold Voltage

## Description

This new generation MOSFET is designed to minimize the on-state resistance ($R_{DS(ON)}$) and yet maintain superior switching performance, making it ideal for high efficiency power management applications.

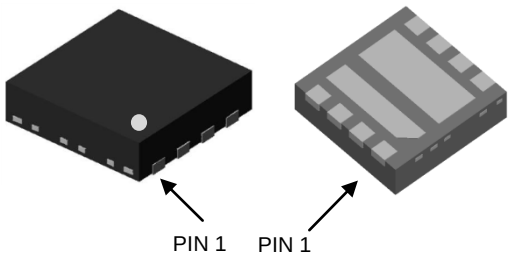
## Mechanical Data

- Case: V-DFN3030-8 (Type K)
- Case Material: Molded Plastic, “Green” Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish – NiPdAu over Copper Leadframe. Solderable per MIL-STD-202, Method 208 e4
- Weight: 0.02 grams (Approximate)

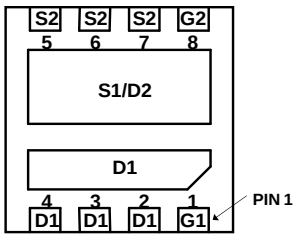
## Applications

- General Purpose Interfacing Switch
- Power Management Functions

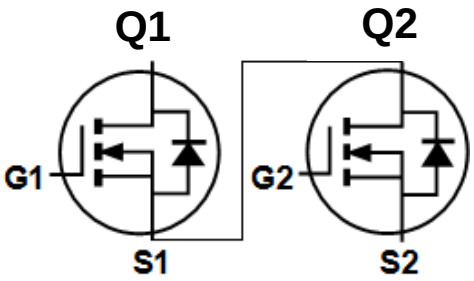
V-DFN3030-8 (Type K)




Top View Bottom View




Bottom View
Internal Schematic




Equivalent Circuit

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

| Characteristic | | | Symbol | Q1&Q2 | Unit |
|---|---|---|---|---|---|
| Drain-Source Voltage | | | $V_{DSS}$ | 30 | V |
| Gate-Source Voltage | | | $V_{GSS}$ | ±20 | V |
| Continuous Drain Current (Note 6) $V_{GS}$ = 10V | Steady State | $T_C$ = +25°C<br>$T_C$ = +70°C | $I_D$ | 8.5<br>7.0 | A |
| Pulsed Drain Current (10μs Pulse, Duty Cycle = 1%) | | | $I_{DM}$ | 55 | A |
| Maximum Body Diode Forward Current (Note 6) | | | $I_S$ | 2.5 | A |
| Pulsed Body Diode Forward Current (10μs Pulse, Duty Cycle = 1%) | | | $I_{SM}$ | 55 | A |
| Avalanche Current (Note 7) L = 0.1mH | | | $I_{AS}$ | 11.4 | A |
| Avalanche Energy (Note 7) L = 0.1mH | | | $E_{AS}$ | 6.5 | mJ |

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

| Characteristic | | Symbol | Value | Unit |
|---|---|---|---|---|
| Total Power Dissipation (Note 5) | $T_A$ = +25°C | $P_D$ | 0.67 | W |
| Thermal Resistance, Junction to Ambient (Note 5) | Steady State | $R_{\theta JA}$ | 119 | °C/W |
| Total Power Dissipation (Note 6) | $T_A$ = +25°C | $P_D$ | 1.95 | W |
| Thermal Resistance, Junction to Ambient (Note 6) | Steady State | $R_{\theta JA}$ | 64 | °C/W |
| Thermal Resistance, Junction to Case (Note 6) | | $R_{\theta JC}$ | 13.5 | |
| 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 (Note 8)** | | | | | | |
| Drain-Source Breakdown Voltage | $BV_{DSS}$ | 30 | — | — | V | $V_{GS}$ = 0V, $I_D$ = 250μA |
| Zero Gate Voltage Drain Current | $I_{DSS}$ | — | — | 1 | μA | $V_{DS}$ = 24V, $V_{GS}$ = 0V |
| Gate-Source Leakage | $I_{GSS}$ | — | — | ±100 | nA | $V_{GS}$ = ±12V, $V_{DS}$ = 0V |
| **ON CHARACTERISTICS (Note 8)** | | | | | | |
| Gate Threshold Voltage | $V_{GS(TH)}$ | 1.0 | — | 2.5 | V | $V_{DS}$ = $V_{GS}$, $I_D$ = 250μA |
| Static Drain-Source On-Resistance | $R_{DS(ON)}$ | — | — | 20 | mΩ | $V_{GS}$ = 10V, $I_D$ = 6A |
| | | — | — | 32 | | $V_{GS}$ = 4.5V, $I_D$ = 5A |
| Diode Forward Voltage | $V_{SD}$ | — | — | 1.2 | V | $V_{GS}$ = 0V, $I_S$ = 2A |
| **DYNAMIC CHARACTERISTICS (Note 9)** | | | | | | |
| Input Capacitance | $C_{iss}$ | — | 393 | — | pF | $V_{DS}$ = 15V, $V_{GS}$ = 0V, f = 1.0MHz |
| Output Capacitance | $C_{oss}$ | — | 173 | — | | |
| Reverse Transfer Capacitance | $C_{rss}$ | — | 27 | — | | |
| Gate Resistance | $R_G$ | — | 1.1 | — | Ω | $V_{DS}$ = 0V, $V_{GS}$ = 0V, f = 1.0MHz |
| Total Gate Charge ($V_{GS}$ = 10V) | $Q_g$ | — | 7.0 | — | nC | $V_{DD}$ = 15V, $I_D$ = 9A |
| Total Gate Charge ($V_{GS}$ = 4.5V) | $Q_g$ | — | 3.6 | — | | |
| Gate-Source Charge | $Q_{gs}$ | — | 0.9 | — | | |
| Gate-Drain Charge | $Q_{gd}$ | — | 1.5 | — | | |
| Turn-On Delay Time | $t_{D(ON)}$ | — | 1.8 | — | ns | $V_{DD}$ = 15V, $V_{GS}$ = 10V, $R_G$ = 6Ω, $I_D$ = 9A |
| Turn-On Rise Time | $t_R$ | — | 1.9 | — | | |
| Turn-Off Delay Time | $t_{D(OFF)}$ | — | 7.5 | — | | |
| Turn-Off Fall Time | $t_F$ | — | 2.4 | — | | |
| Body Diode Reverse Recovery Time | $t_{RR}$ | — | 10 | — | ns | $I_F$ = 9A, dI/dt = 100A/μs |
| Body Diode Reverse Recovery Charge | $Q_{RR}$ | — | 2.6 | — | nC | |

Notes:
5. Device mounted on FR-4 substrate PC board, 2oz copper, with minimum recommended pad layout.
6. Device mounted on FR-4 substrate PC board, 2oz copper, with 1inch square copper plate.
7. $I_{AS}$ and $E_{AS}$ ratings are based on low frequency and duty cycles to keep $T_J$ = +25°C.
8. Short duration pulse test used to minimize self-heating effect.
9. Guaranteed by design. Not subject to product testing.

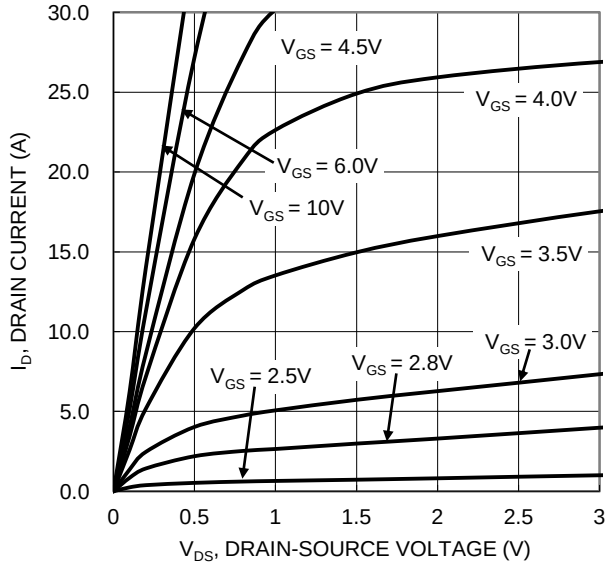



Figure 1. Typical Output Characteristic

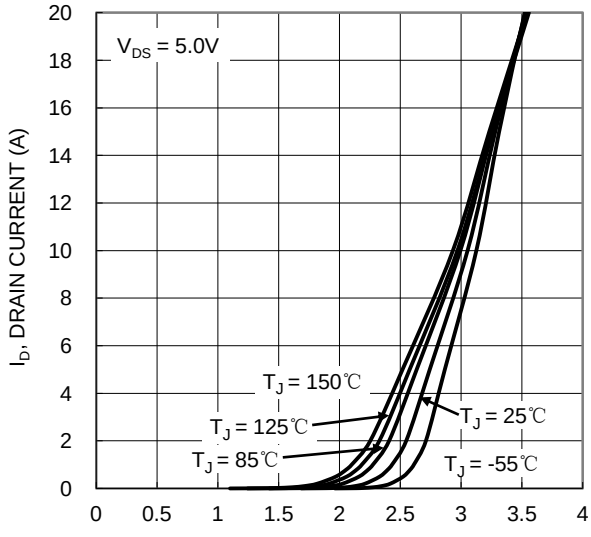



Figure 2. Typical Transfer Characteristic

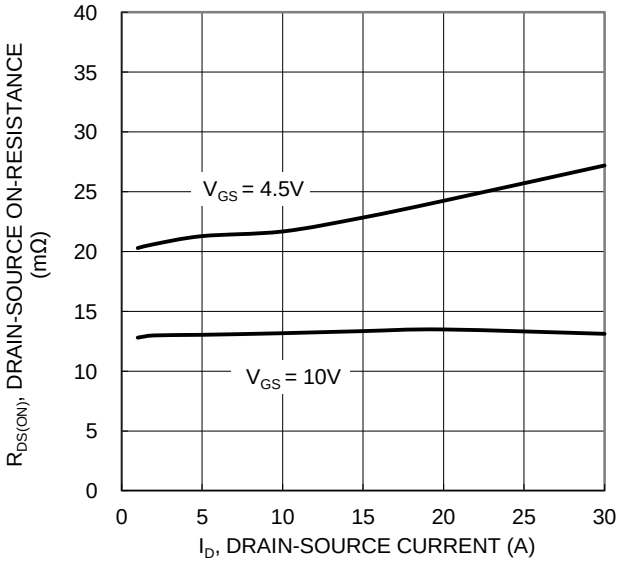



Figure 3. Typical On-Resistance vs. Drain Current and Gate Voltage

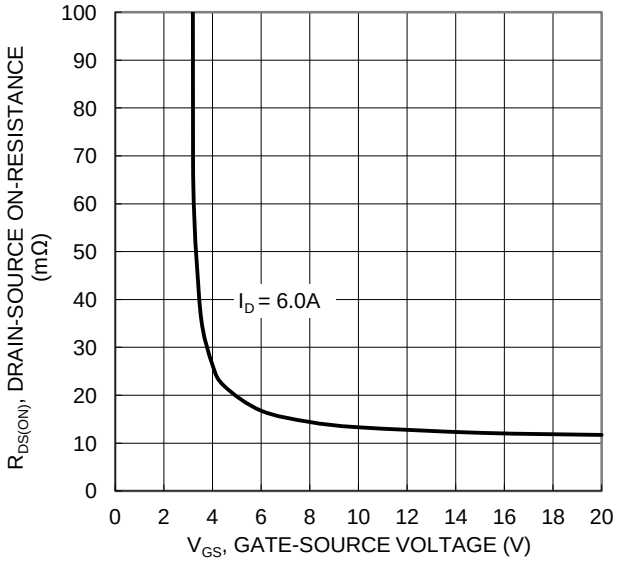



Figure 4. Typical Transfer Characteristic

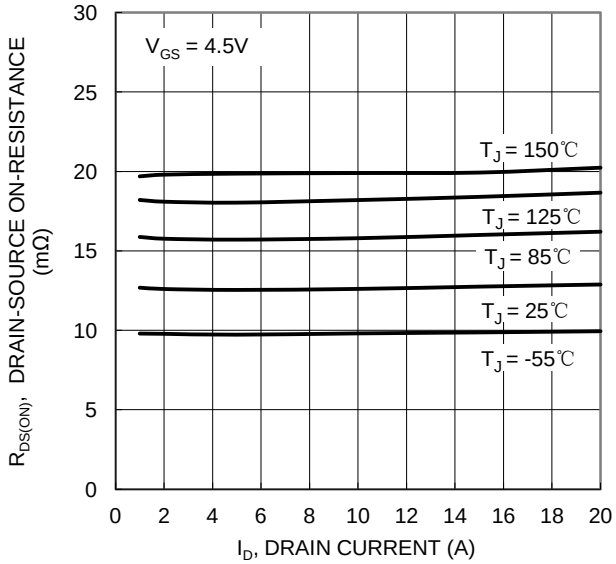



Figure 5. Typical On-Resistance vs. Drain Current and Temperature

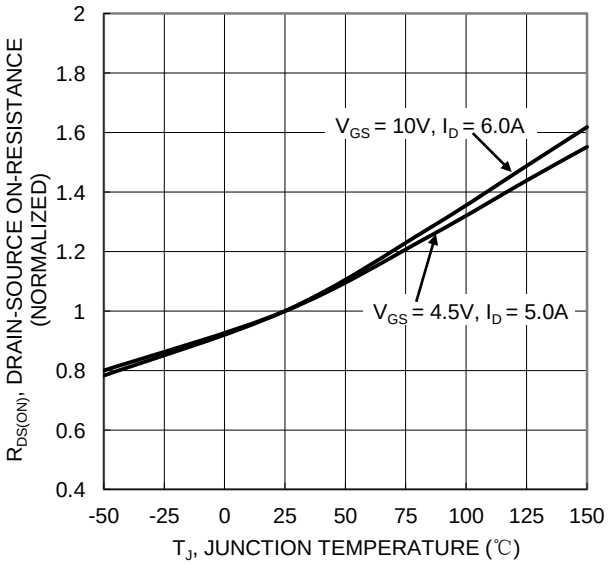



Figure 6. On-Resistance Variation with Temperature

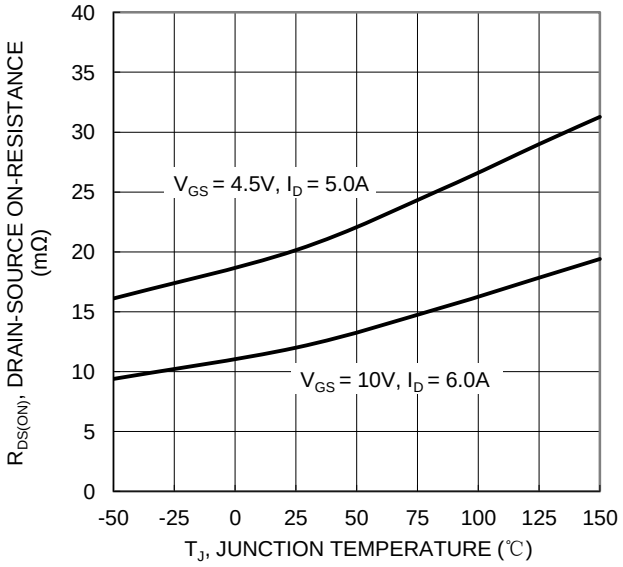


Figure 7. On-Resistance Variation with Temperature

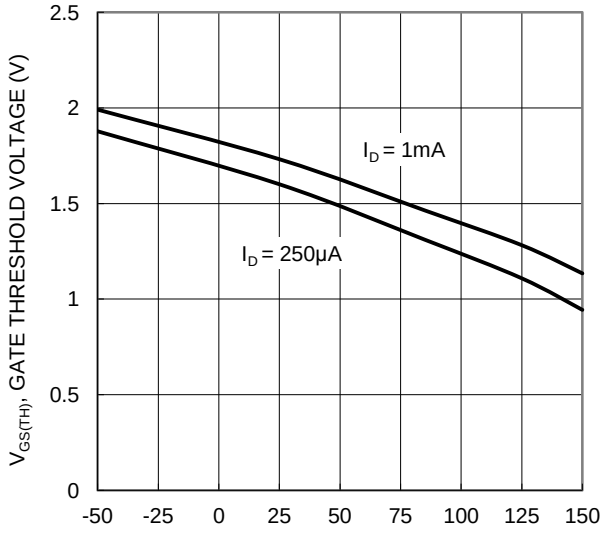


Figure 8. Gate Threshold Variation vs. Junction Temperature

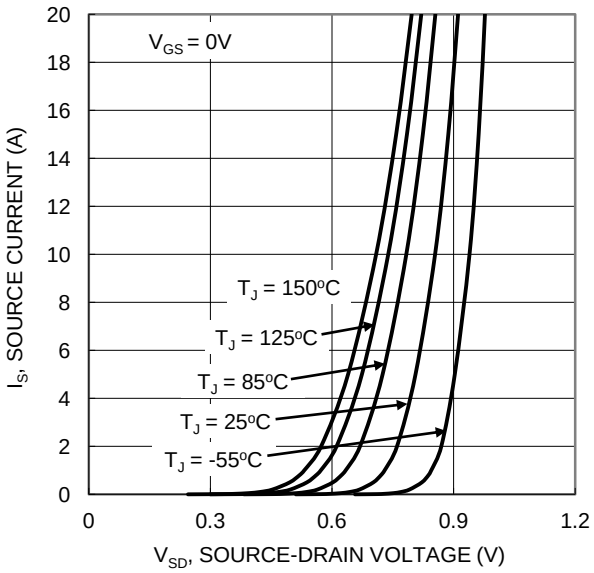


Figure 9. Diode Forward Voltage vs. Current

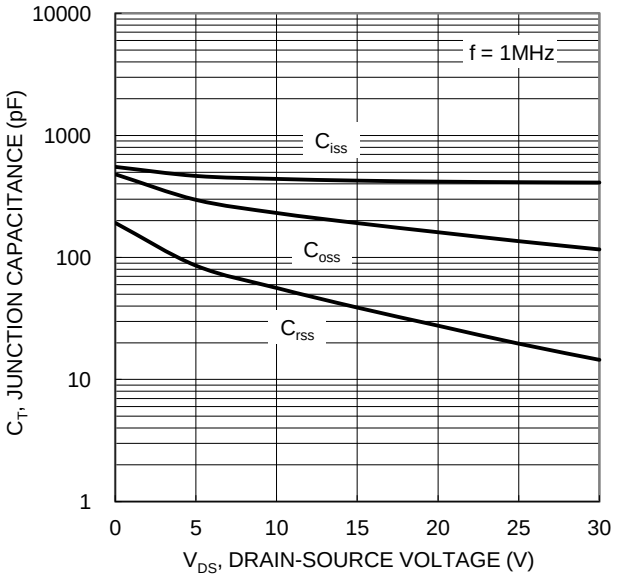


Figure 10. Typical Junction Capacitance

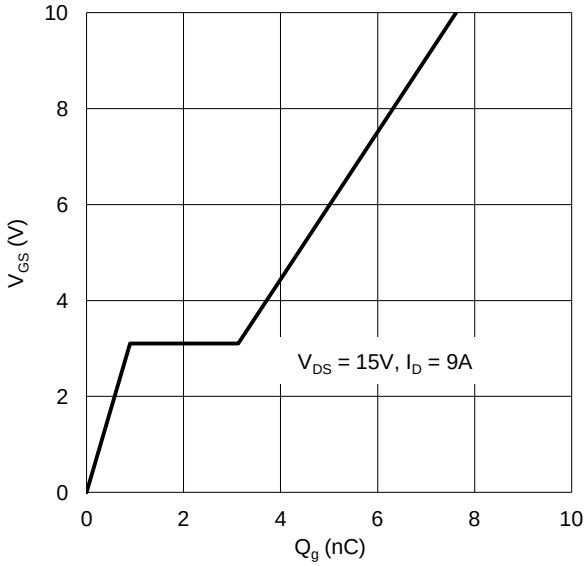


Figure 11. Gate Charge

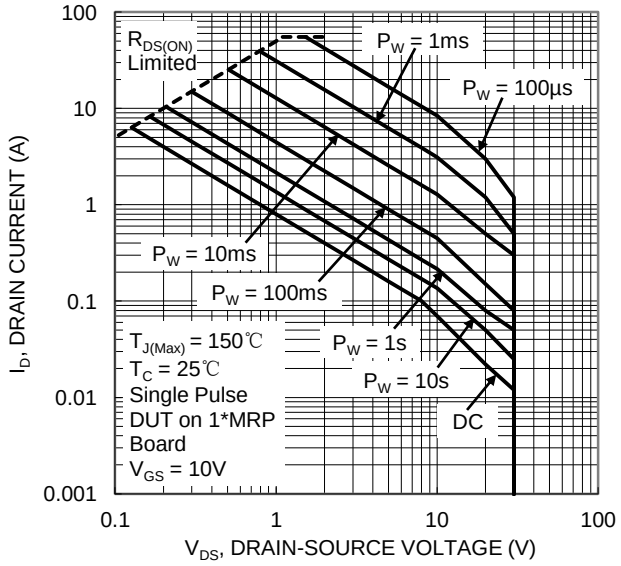


Figure 12. SOA, Safe Operation Area

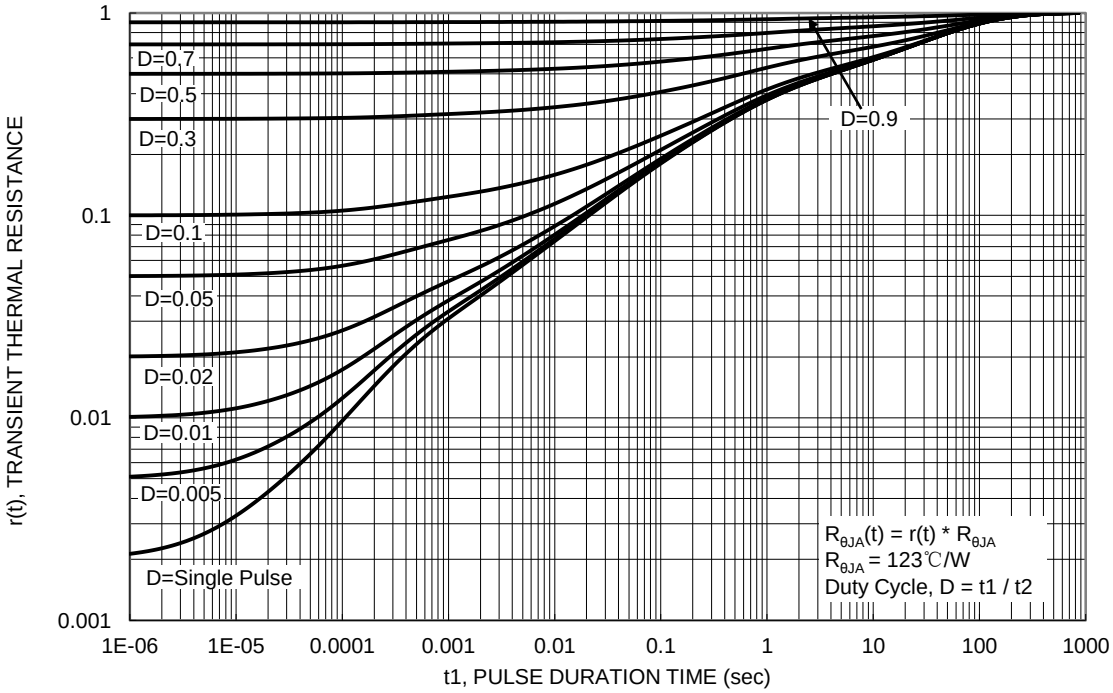
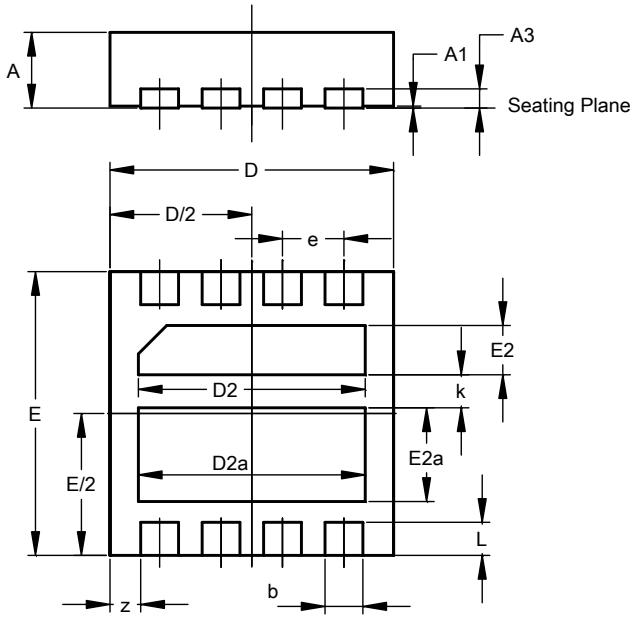



Figure 13. Transient Thermal Resistance

## Package Outline Dimensions

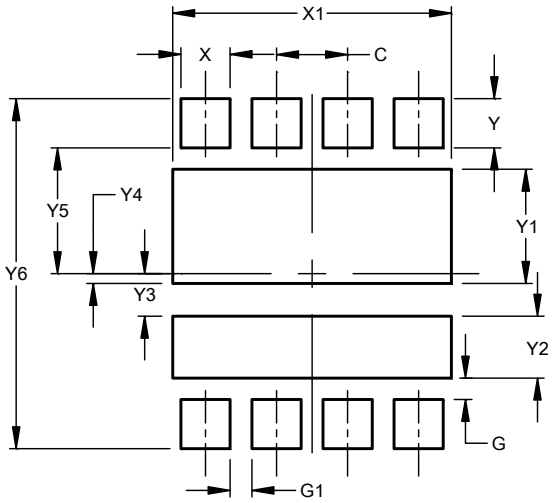
**V-DFN3030-8 (Type K)**




| V-DFN3030-8 (Type K) | | | |
|---|---|---|---|
| **Dim** | **Min** | **Max** | **Typ** |
| **A** | 0.77 | 0.85 | 0.80 |
| **A1** | 0.00 | 0.05 | 0.02 |
| **A3** | 0.20BSC | | |
| **b** | 0.35 | 0.45 | 0.40 |
| **D** | 2.95 | 3.050 | 3.00 |
| **D2** | 2.30 | 2.50 | 2.40 |
| **D2a** | 2.30 | 2.50 | 2.40 |
| **E** | 2.95 | 3.050 | 3.00 |
| **E2** | 0.42 | 0.62 | 0.52 |
| **E2a** | 0.89 | 1.09 | 0.99 |
| **e** | 0.65BSC | | |
| **k** | - | - | 0.35 |
| **L** | 0.30 | 0.40 | 0.35 |
| **z** | 0.325BSC | | |
| **All Dimensions in mm** | | | |

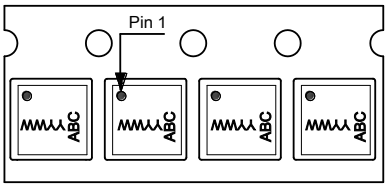
## Suggested Pad Layout

**V-DFN3030-8 (Type K)**



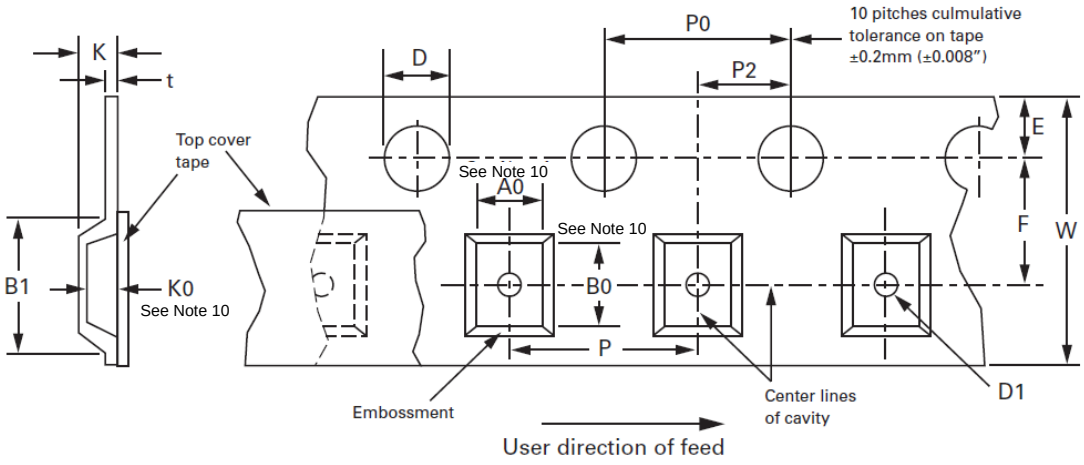

| Dimensions | Value (in mm) |
|---|---|
| **C** | 0.650 |
| **G** | 0.195 |
| **G1** | 0.200 |
| **X** | 0.450 |
| **X1** | 2.550 |
| **Y** | 0.450 |
| **Y1** | 1.044 |
| **Y2** | 0.566 |
| **Y3** | 0.389 |
| **Y4** | 0.089 |
| **Y5** | 1.150 |
| **Y6** | 3.200 |

## Tape and Reel Information

| 12mm | | |
|---|---|---|
| **Package** | **Suffix** | **Tape Orientation** |
| V-DFN3030-8 (Type K) | -7 |  |



## Embossed Carrier Tape Specifications




| 8, 12, 16, 24mm EMBOSSED TAPE DIMENSIONS IN mm | | | | | | |
|---|---|---|---|---|---|---|
| **Tape Size** | **D** | **E** | **P0** | **t_Max** | **A0 B0 K0** | — |
| **12mm** | 1.50 +0.10 -0.0 | 1.75 ± 0.10 | 4.0 ± 0.10 | 0.400 | See Note 10 | **Constant Dimensions** |

| Tape Size | B1 Max | D1 Min | F | K Max | P2 | R Min | W | Package Type |
|---|---|---|---|---|---|---|---|---|
| **12mm** | 8.2 | 1.5 | 5.5 ± 0.05 | 4.5 | 2.0 ± 0.05 | 30 | 12.0 ± 0.30 | V-DFN3030-8 (Type K) |

| P | | | | | |
|---|---|---|---|---|---|
| **Tape Size** | **2.0 ± 0.05** | **4.0 ± 0.10** | **8.0 ± 0.10** | **12.0 ± 0.10** | **16.0 ± 0.10** |
| **12mm** | — | — | V-DFN3030-8 (Type K) | — | — |

Note: 10. A0 B0 K0 are determined by component size.