# P-Channel Enhancement Mode MOSFET  TDM3421

## DESCRIPTION

The TDM3421 uses advanced trench technology to provide excellent RDS(ON) and low gate charge. This device is suitable for use as a load switch or in PWM applications.

## GENERAL FEATURES

- RDS(ON) < 32mΩ @ VGS=-4.5V
  RDS(ON) < 19mΩ @ VGS=-10V
- Reliable and Rugged
- ESD protection pass 2KV
- Lead free product is available
- PPAK-3*3-8 Package

## Application

- PWM applications
- Load switch
- Power management
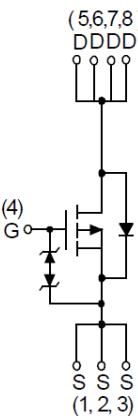


P-Channel MOSFET
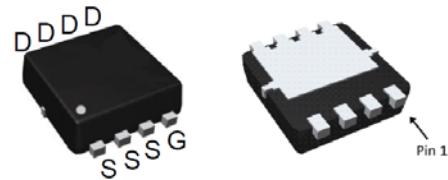


PPAK-3*3-8

## ABSOLUTE MAXIMUM RATINGS(TA=25℃ unless otherwise noted)

| Parameter | Symbol | Rating | Unit |
|---|---|---|---|
| Drain-Source Voltage | $V_{DS}$ | -30 | V |
| Gate-Source Voltage | $V_{GS}$ | ±25 | V |
| Diode Continuous Forward Current | $I_S$(Tc=25℃) | -16 | A |
| Pulsed Drain Current | $I_{DM}$ (Tc=25℃) | -70 | A |
| Continuous Drain Current | $I_D$ (Tc=25℃) | -32 | A |
| | $I_D$ (Tc=100℃) | -20 | A |
| Maximum Power Dissipation | $P_D$(Tc=25℃) | 29.8 | W |
| | $P_D$(Tc=100℃) | 11.9 | W |
| Continuous Drain Current | $I_D$ (TA=25℃) | -10.5 | A |
| | $I_D$ (TA=70℃) | -8.4 | A |
| Maximum Power Dissipation (note1) | $P_D$(TA=25℃) | 3.1 | W |
| | $P_D$(TA=70℃) | 2 | W |
| Maximum Junction Temperature | $T_J$ | 150 | ℃ |
| Storage Temperature Range | $T_{STG}$ | -55 to 150 | ℃ |
| Thermal Resistance-Junction to Ambient (note1) | RθJA(t≤10s) | 40 | ℃/W |
| | RθJA(Steady State) | 75 | ℃/W |

## P-Channel Enhancement Mode MOSFET — TDM3421

## ELECTRICAL CHARACTERISTICS (T$_A$=25℃ unless otherwise noted)

| Parameter | Symbol | Test Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| STATIC CHARACTERISTICS | | | | | | |
| Drain-Source Breakdown Voltage | BV$_{DSS}$ | V$_{GS}$=0V, I$_D$=-250µA | -30 | - | - | V |
| Zero Gate Voltage Drain Current | I$_{DSS}$ | V$_{DS}$=-24, V$_{GS}$=0V | - | - | -1 | µA |
| Gate-Body Leakage Current | I$_{GSS}$ | V$_{GS}$=±25V, V$_{DS}$=0V | - | - | $\pm$10 | µA |
| ON CHARACTERISTICS (Note 3) | | | | | | |
| Gate Threshold Voltage | V$_{GS(th)}$ | V$_{DS}$=VGS,I$_D$=-250µA | -1.3 | -1.8 | -2.3 | V |
| Drain-Source On-State Resistance | R$_{DS(ON)}$ | V$_{GS}$=-4.5V,I$_{DS}$=-8.2A | - | 25 | 32 | mΩ |
| | | V$_{GS}$=-10V, I$_{DS}$=-10.5A | - | 16 | 19 | mΩ |
| DYNAMIC CHARACTERISTICS (Note4) | | | | | | |
| Gate Resistance | R$_g$ | V$_{GS}$=0V, V$_{DS}$=0V,F=1MHz | - | 4 | - | Ω |
| Input Capacitance | C$_{iss}$ | V$_{DS}$=-15V,V$_{GS}$=0V, F=1.0MHz | - | 999 | - | PF |
| Output Capacitance | C$_{oss}$ | | - | 220 | - | PF |
| Reverse Transfer Capacitance | C$_{rss}$ | | - | 170 | - | PF |
| SWITCHING CHARACTERISTICS (Note 4) | | | | | | |
| Turn-on Delay Time | t$_{d(on)}$ | V$_{DD}$=-15V, R$_L$=15Ω, V$_{GEN}$=-10V, R$_G$=6Ω I$_{DS}$=-1A | - | 11.2 | | nS |
| Turn-on Rise Time | t$_r$ | | - | 10.6 | | nS |
| Turn-Off Delay Time | t$_{d(off)}$ | | - | 37 | | nS |
| Turn-Off Fall Time | t$_f$ | | - | 50 | | nS |
| Total Gate Charge | Q$_g$ | V$_{DS}$=-15V,I$_{DS}$=-10.5A,V$_{GS}$=-10V | - | 20 | | nC |
| Gate-Source Charge | Q$_{gs}$ | | - | 1.1 | - | nC |
| Gate-Drain Charge | Q$_{gd}$ | | - | 7.7 | - | nC |
| Body Diode Reverse Recovery Time | T$_{rr}$ | I$_{DS}$=-10.5A, dI/dt=100A/µs | - | 18 | - | nS |
| Body Diode Reverse Recovery Charge | Q$_{rr}$ | | - | 9 | - | nC |
| DRAIN-SOURCE DIODE CHARACTERISTICS | | | | | | |
| Diode Forward Voltage (Note 3) | V$_{SD}$ | V$_{GS}$=0V,I$_{SD}$=-1A | - | -0.7 | -1 | V |

NOTES:

1. Surface Mounted on 1in$^2$ pad area, t≤ 10sec. R$_{θJA}$ steady state t = 999s.

2. The power dissipation P$_D$ is based on T$_{J(MAX)}$ = 150$^o$C, and it is useful for reducing junction-to-case thermal resistance (R$_{θJC}$) when additional heat sink is used.

3. Pulse Test: Pulse Width $\leqslant$ 300µs, Duty Cycle $\leqslant$ 2%.

4. Guaranteed by design, not subject to production testing

## Typical Operating Characteristics

### Power Dissipation



### Drain Current



### Safe Operation Area



### Thermal Transient Impedance
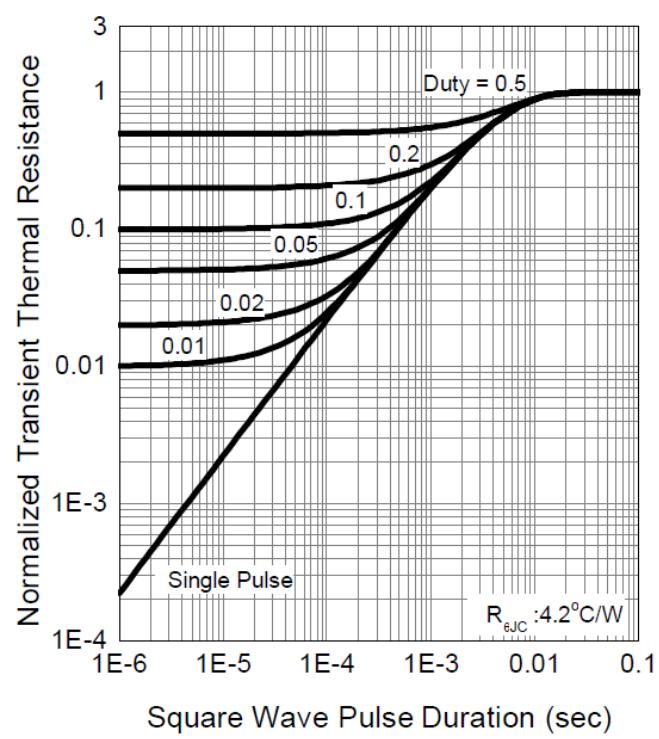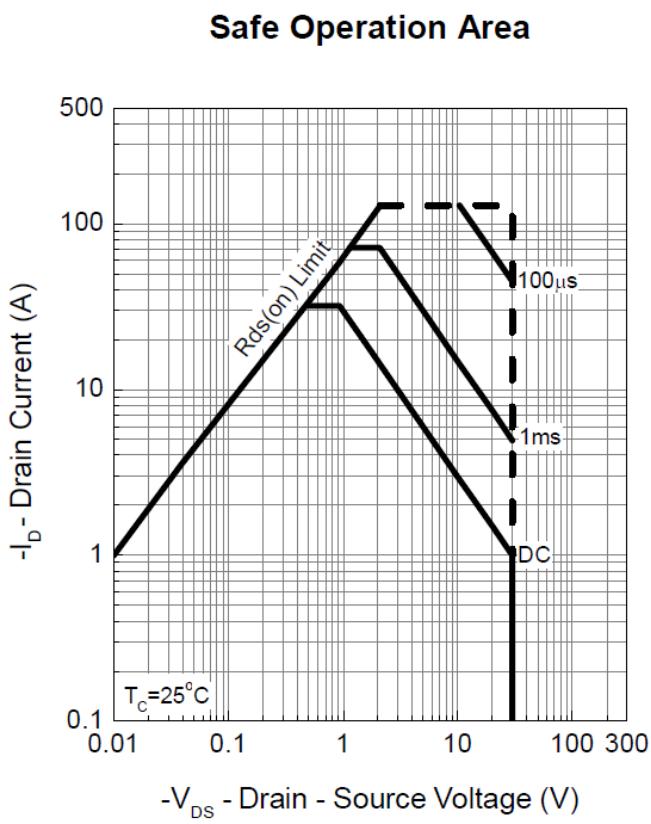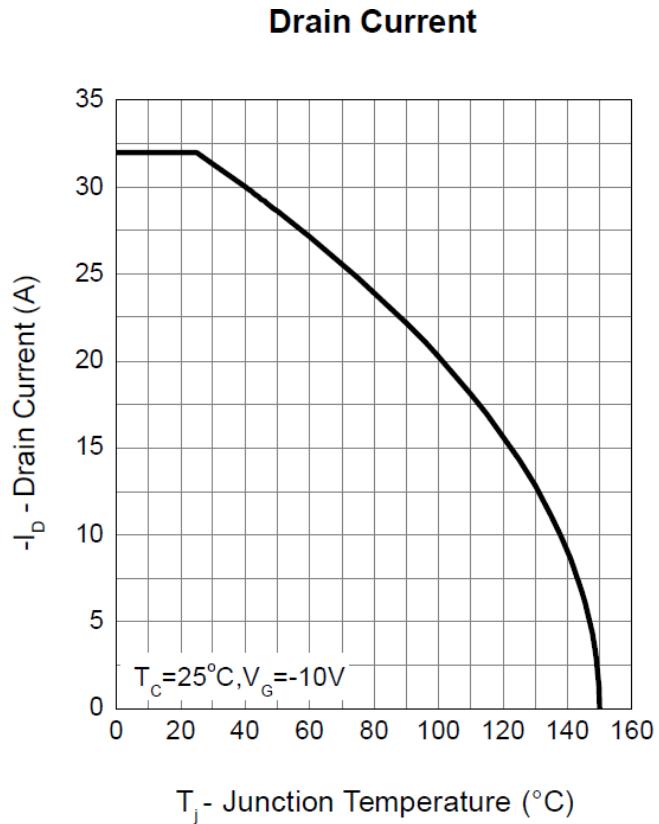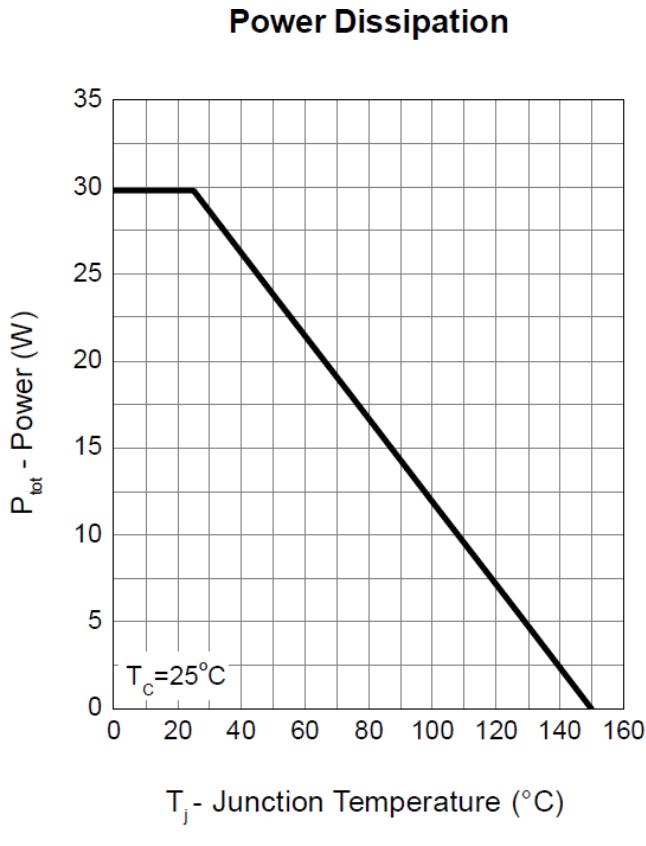
## Typical Operating Characteristics(Cont.)

**Output Characteristics**



**Drain-Source On Resistance**



**Gate-Source On Resistance**
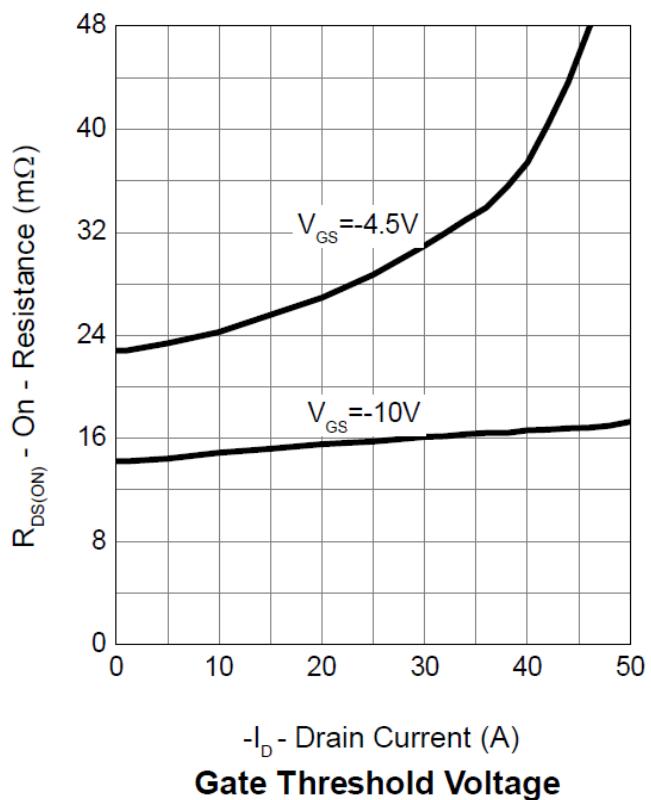


**Gate Threshold Voltage**
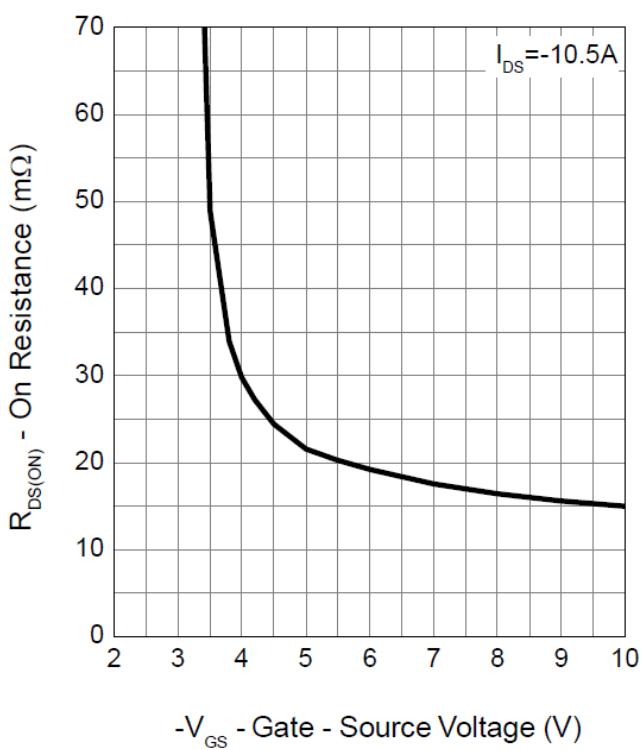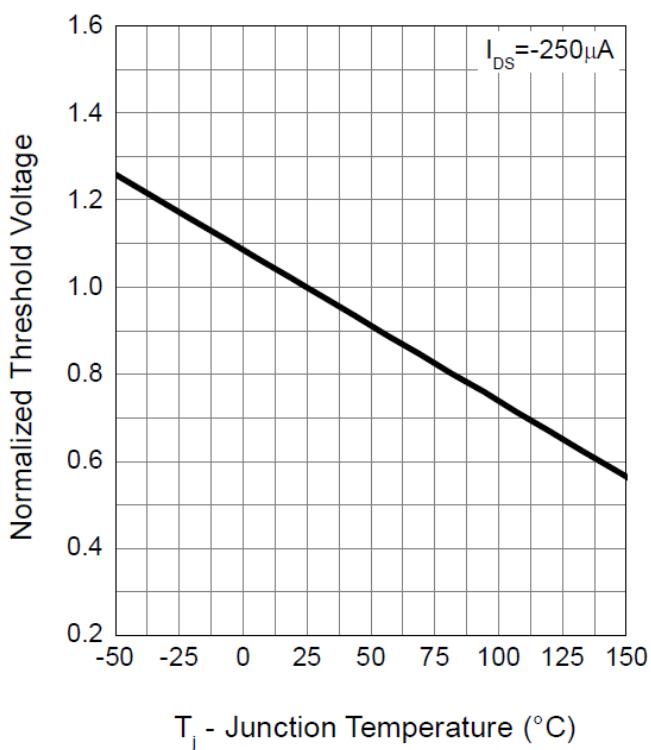
## Typical Operating Characteristics (Cont.)

### Drain-Source On Resistance

$V_{GS}$ = -10V
$I_{DS}$ = -10.5A

$R_{ON}$@$T_j$=25°C: 15mΩ

$T_j$ - Junction Temperature (°C)

Normalized On Resistance
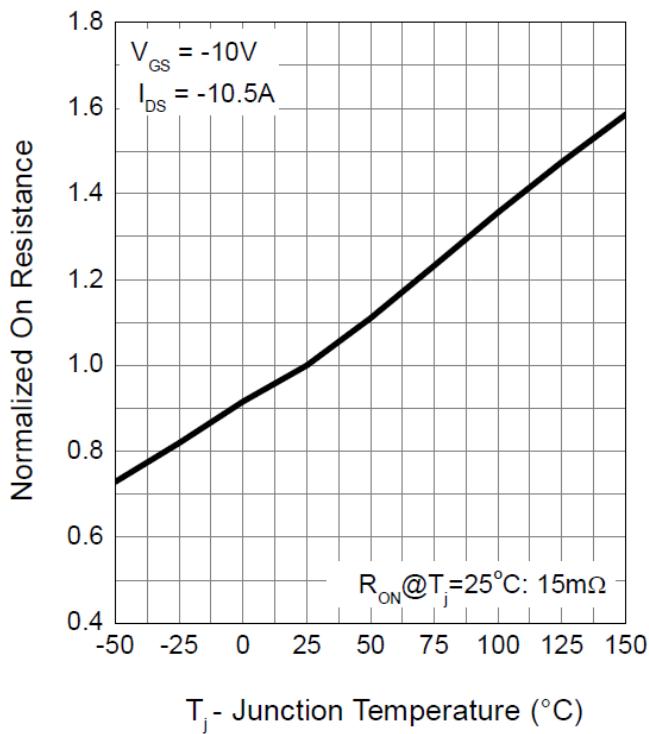
### Source-Drain Diode Forward

$T_j$=150°C

$T_j$=25°C

-$I_S$ - Source Current (A)

-$V_{SD}$ - Source - Drain Voltage (V)

### Capacitance

Frequency=1MHz

Ciss

Coss

Crss

C - Capacitance (pF)

-$V_{DS}$ - Drain - Source Voltage (V)

### Gate Charge

$V_{DS}$=-15V
$I_{DS}$=-10.5A

-$V_{GS}$ - Gate - source Voltage (V)

$Q_G$ - Gate Charge (nC)
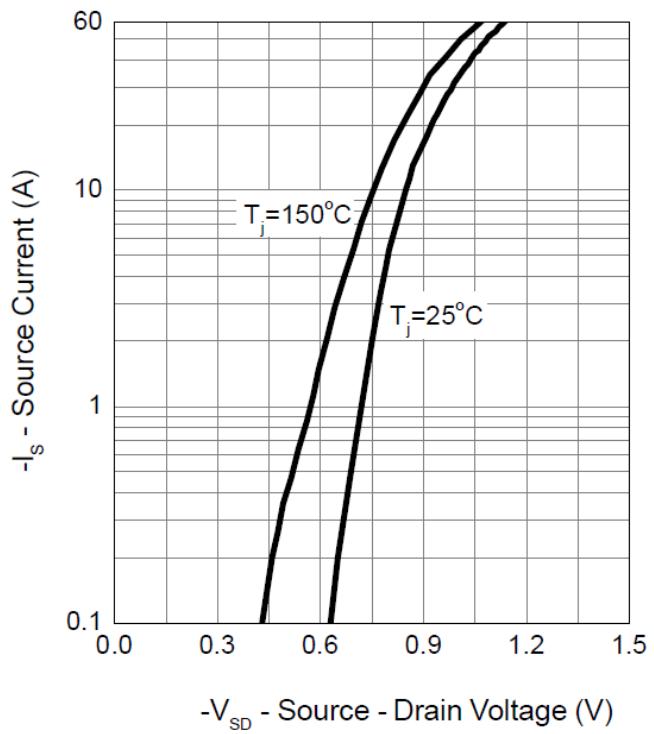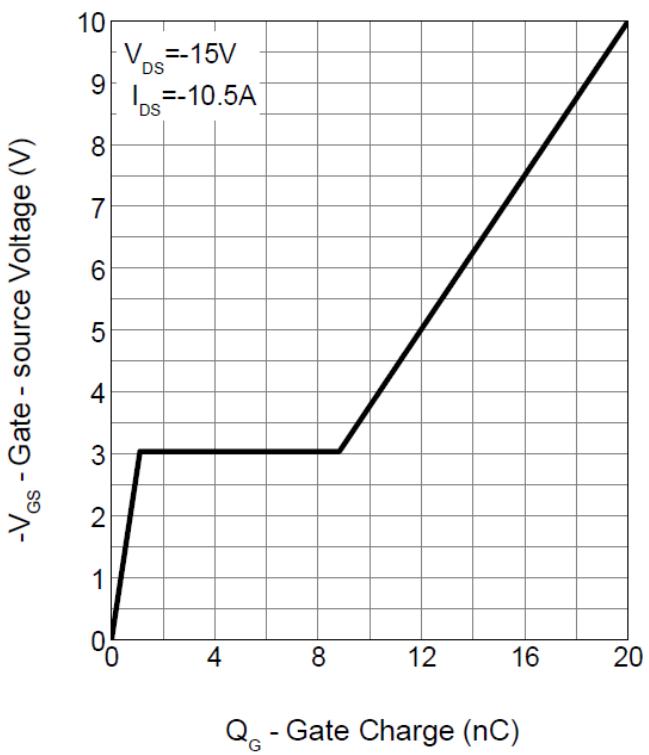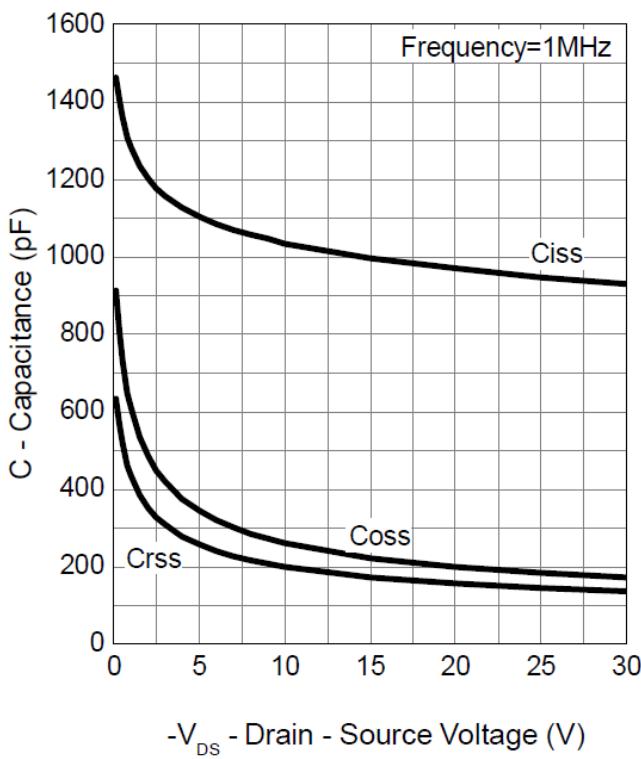
## Package Information

PPAK-3*3-8　Package
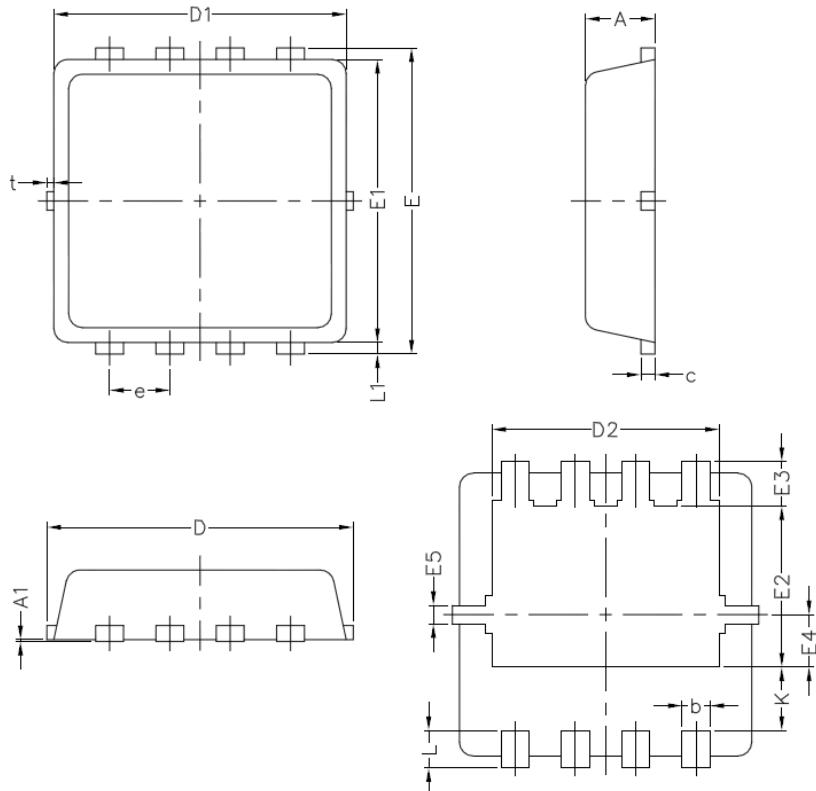


| Symbol | PPAK-3*3-8(mm) | | |
|---|---|---|---|
| | Min | Nom | Max |
| A | 0.70 | 0.75 | 0.85 |
| A1 | / | / | 0.05 |
| b | 0.20 | 0.30 | 0.40 |
| c | 0.10 | 0.152 | 0.25 |
| D | 3.15 | 3.3 | 3.45 |
| D1 | 3.00 | 3.15 | 3.30 |
| D2 | 2.25 | 2.45 | 2.65 |
| E | 3.15 | 3.30 | 3.45 |
| E1 | 2.90 | 3.05 | 3.20 |
| E2 | 1.54 | 1.74 | 1.94 |
| E3 | 0.28 | 0.48 | 0.68 |
| E4 | 0.37 | 0.57 | 0.77 |
| E5 | 0.10 | 0.20 | 0.30 |
| e | 0.60 | 0.65 | 0.70 |
| K | 0.49 | 0.69 | 0.89 |
| L | 0.30 | 0.40 | 0.50 |
| L1 | 0.06 | 0.125 | 0.20 |
| t | / | / | 0.13 |

Design Notes

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