# N-Channel Enhancement Mode MOSFET TDM2378

## DESCRIPTION

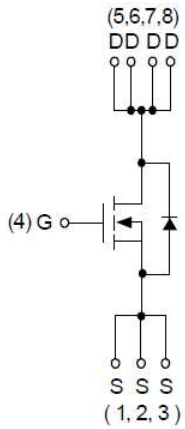
The TDM2378 uses advanced trench technology to provide excellent RDS(ON) and low gate charge. This device is suitable for use as a load switch or in PWM applications.

## GENERAL FEATURES

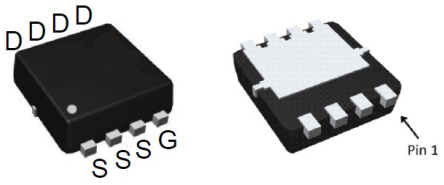
- RDS(ON) < 7.2mΩ @ VGS=10V
  RDS(ON) < 12mΩ @ VGS=4.5V
- High Power and current handling capability
- Surface Mount Package
- Lead Free and Green Devices available (RoHS Compliant)

## Application

- Battery protection
- Uninterruptible power supply
- General purpose applications




N-Channel MOSFET




PPAK-3*3-8

ABSOLUTE MAXIMUM RATINGS($T_A$=25℃unless otherwise noted)

| Parameter | Symbol | Limit | Unit |
|---|---|---|---|
| Drain-Source Voltage | $V_{DS}$ | 30 | V |
| Gate-Source Voltage | $V_{GS}$ | ±20 | V |
| Drain Current @ Continuous | $I_D$（$T_C$=25℃） | 60 | A |
| | $I_D$（$T_C$=100℃） | 42 | A |
| Drain Current @ Current-Pulsed (Note 1) | $I_{DM}$（$T_C$=25℃） | 180 | A |
| Power Dissipation | $P_D$($T_C$=25℃) | 55 | W |
| Single pulsed avalanche energy (Note 2) | $E_{AS}$ | 120 | mJ |
| Thermal Resistance, Junction-to-Ambient | $R_{\theta JA}$ | 62 | ℃/W |
| Thermal Resistance, Junction-to-Case | $R_{\theta JC}$ | 5 | ℃/W |
| Operating Junction Temperature Range | $T_J$ | -55 To 150 | ℃ |
| Storage Temperature Range | $T_{STG}$ | -55 To 150 | ℃ |

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

| Parameter | Symbol | Condition | 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 | $I_{DSS}$ | $V_{DS}$=30V, $V_{GS}$=0V | - | - | 1 | μA |
| Gate-Body Leakage Current | $I_{GSS}$ | $V_{GS}$=±20V, $V_{DS}$=0V | - | - | ±100 | nA |
| Gate Threshold Voltage | $V_{GS(th)}$ | $V_{DS}$=VGS, $I_D$=250μA | 1.0 | 1.5 | 2.5 | V |
| Drain-Source On-State Resistance | $R_{DS(ON)}$ (Note 3) | $V_{GS}$=10V, $I_D$=20A | - | 5.8 | 7.2 | mΩ |
| | | $V_{GS}$=4.5V, $I_D$=20A | - | 7.9 | 12 | |
| Forward Transconductance | $g_{FS}$ | $V_{DS}$=15V, $I_D$=20A | 20 | - | - | S |
| DYNAMIC CHARACTERISTICS | | | | | | |
| Input Capacitance | $C_{iss}$ | $V_{DS}$=15V, $V_{GS}$=0V, F=100KHz | - | 1177 | - | PF |
| Output Capacitance | $C_{oss}$ | | - | 177 | - | PF |
| Reverse Transfer Capacitance | $C_{rss}$ | | - | 131 | - | PF |
| Turn-on Delay Time | $t_{d(on)}$ | $V_{DS}$=15V, $V_{GS}$=10V, $R_G$=2.5Ω | - | 14 | - | nS |
| Turn-on Rise Time | $t_r$ | $I_D$=20A | - | 12 | - | nS |
| Turn-Off Delay Time | $t_{d(off)}$ | | - | 30 | - | nS |
| Turn-Off Fall Time | $t_f$ | | - | 10 | - | nS |
| Total Gate Charge | $Q_g$ | $V_{DS}$=15V, $I_D$=1A, $V_{GS}$=10V | - | 23.1 | - | nC |
| Gate-Source Charge | $Q_{gs}$ | | - | 3.2 | - | nC |
| Gate-Drain Charge | $Q_{gd}$ | | - | 3.6 | - | nC |
| DRAIN-SOURCE DIODE CHARACTERISTICS | | | | | | |
| Diode Forward Voltage | $V_{SD}$ | $V_{GS}$=0V, $I_S$=20A | - | - | 1.2 | V |
| Body Diode Reverse Recovery Time | $T_{rr}$ | $I_F$=20A, dI/dt=100A/μs | - | 24 | - | nS |
| Body Diode Reverse Recovery Charge | $Q_{rr}$ | | - | 52 | - | nC |

NOTES:

1. Repetitive rating; pulse width limited by max. junction temperature.
2. EAS condition： $V_{DD}$=30 V, $V_{GS}$=10 V, L=0.5 mH, starting Tj=25 °C.
3. Pulse Test: Pulse Width≤300μs, Duty Cycle≤0.5%.

## Typical Operating Characteristics

Figure 1： Safe Operation Area

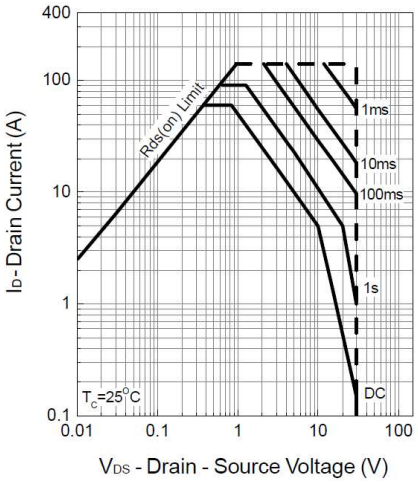



Figure 2： Type. Output Characteristics

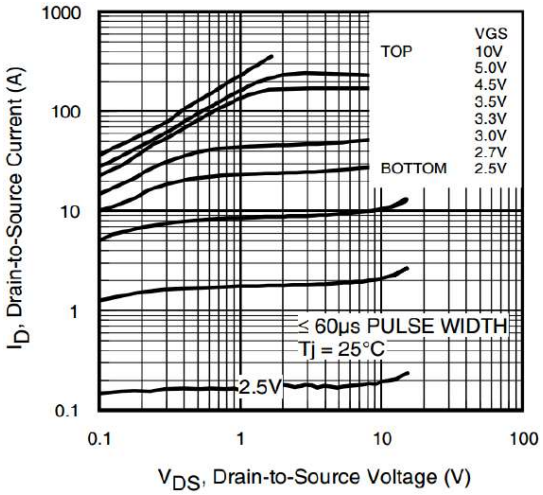



Figure 3： Transfer Characteristics(Junction Temperature)

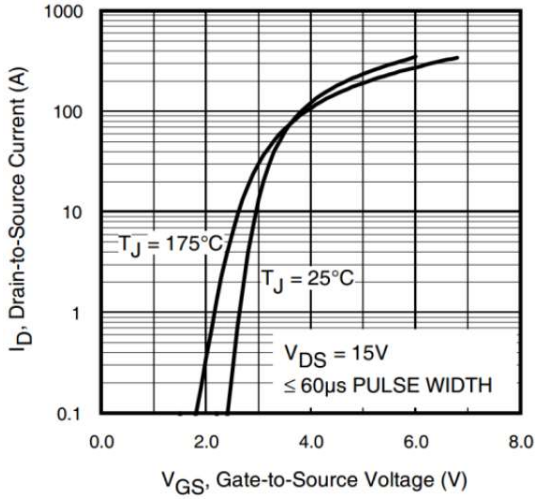



Figure 4： On-Resistance vs. Drain Current and Gate Voltage Figuer

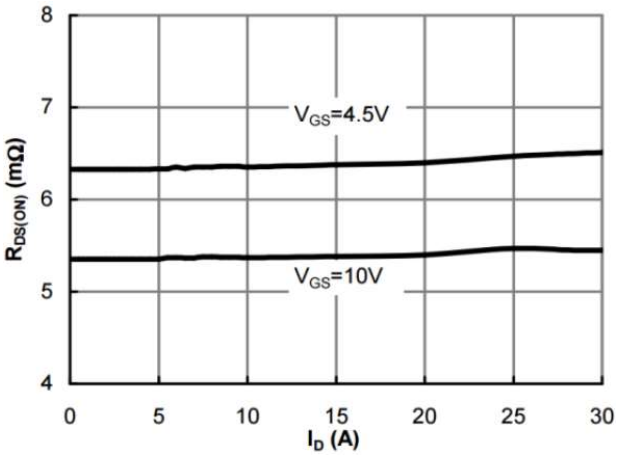



Figure 5： On-Resistance vs. Junction Temperature

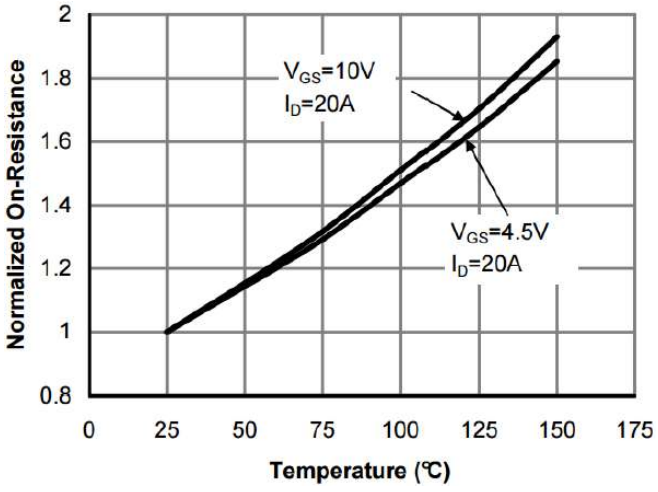
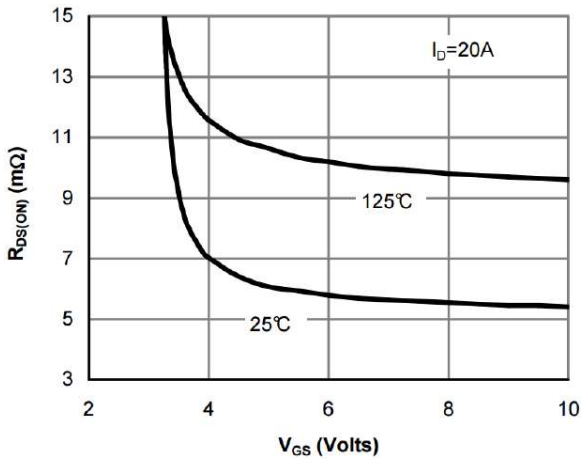



Figure 6： On-Resistance vs. Gate-Source Voltage (Junction Temperature)



## Typical Operating Characteristics (Cont.)

Figure 7:Body-Diode Characteristics(Junction Temperature)

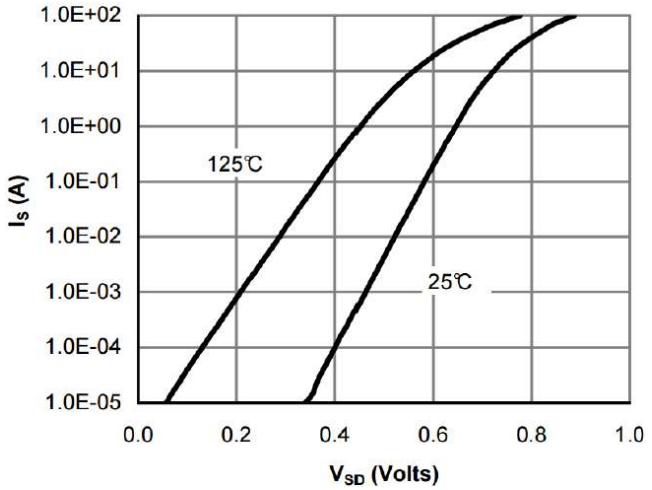



Figure 8:Gate-Charge Characteristics

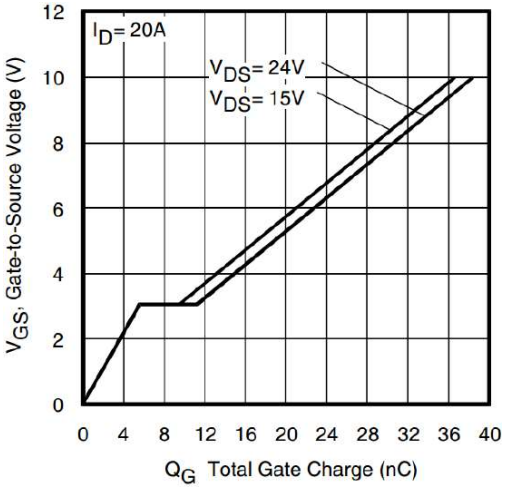



Figure 9: Capacitance Characteristics

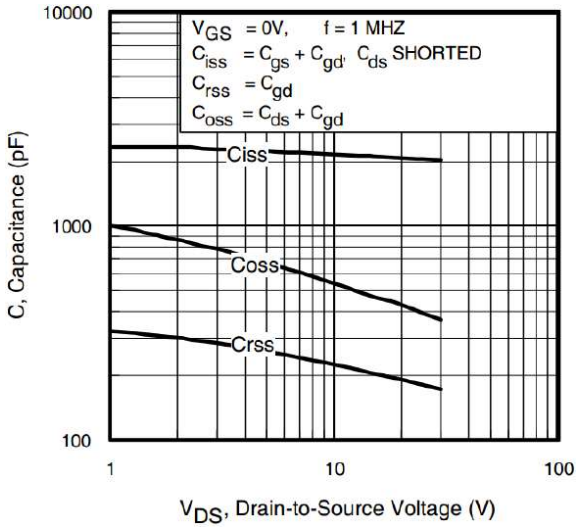
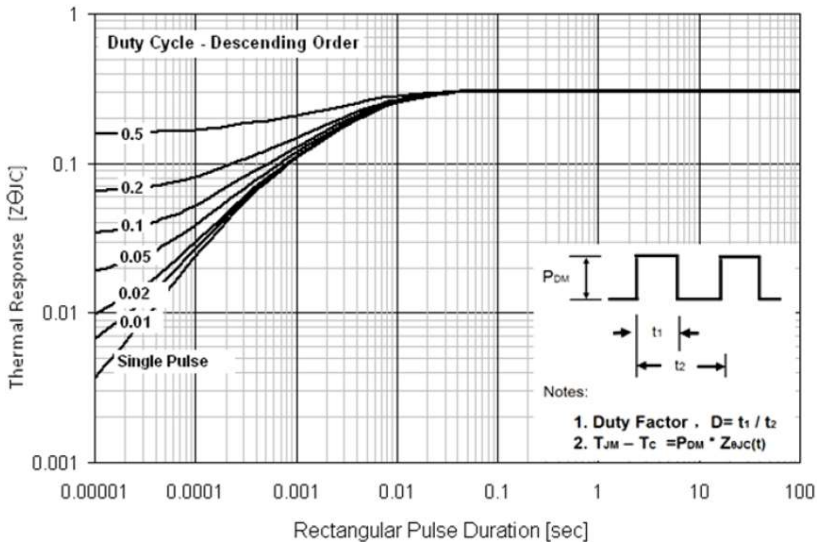
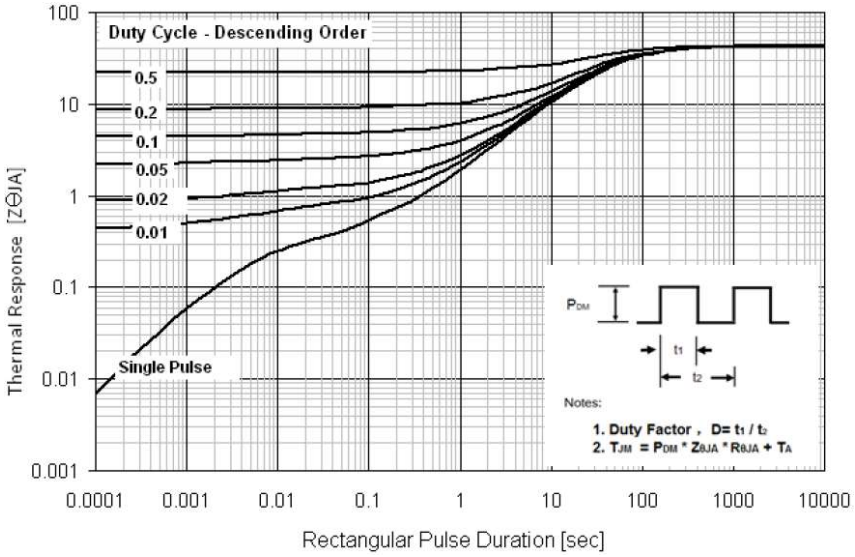



Figure 10: Normalized Maximum Transient Thermal Impedance (RthJC)



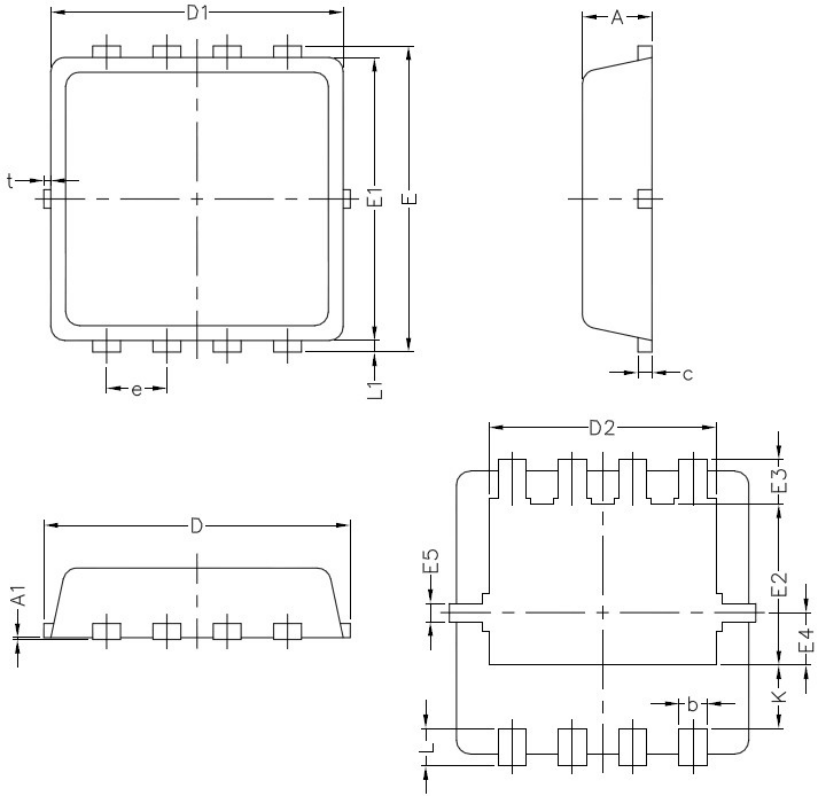
## Typical Operating Characteristics (Cont.)

Figure 11: Normalized Maximum Transient Thermal Impedance (RthJA)



## 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