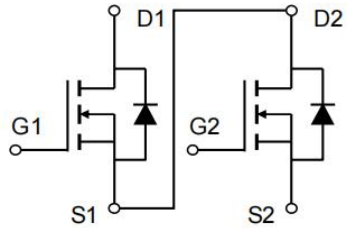
# APG045N04G2DH

**N-Channel Enhancement Mosfet**

**DATA SHEET**

## Features

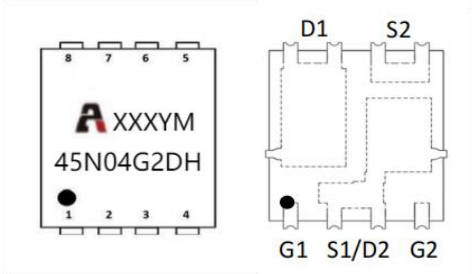
- 40V,79A
  $R_{DS(ON)}$ <4.5mΩ @$V_{GS}$=10V TYP:3.9mΩ
- Split Gate Trench Technology
- Lead free product is acquired
- Excellent $R_{DS(ON)}$ and Low Gate Charge




**Schematic Diagram**

## Applications

- General Automotive Applications
- Motor Drivers
- DC-DC Power




**Marking and pin Assignment**

## Package Marking and Ordering Information

| Device Marking | Device | Device Package | Reel Size | Tape width | Quantity (PCS) |
|---|---|---|---|---|---|
| 45N04G2DH | APG045N04G2DH | PDFN5X6-D | - | - | 5000 |

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

| Parameter | Symbol | Value | Unit |
|---|---|---|---|
| Drain-Source Voltage | $V_{DS}$ | 40 | V |
| Gate-Source Voltage | $V_{GS}$ | ±20 | V |
| Continuous Drain Current (Tc=25℃) (1) | $I_D$ | 79 | A |
| Continuous Drain Current (Tc=100℃) | $I_D$ | 56 | A |
| Pulsed Drain Current (1) | $I_{DM}$ | 271 | A |
| Drain Power Dissipation | $P_D$ | 40 | W |
| Single Pulsed Avalanche Energy (2) | $E_{AS}$ | 130 | mJ |
| Thermal Resistance from Junction to Ambient (3) | $R_{\theta JA}$ | 54 | ℃/W |
| Thermal Resistance from Junction to Case | $R_{\theta JC}$ | 3.1 | ℃/W |
| Junction Temperature | $T_J$ | -55~ +150 | ℃ |
| Storage Temperature | $T_{STG}$ | -55~ +150 | ℃ |

**Notes:**

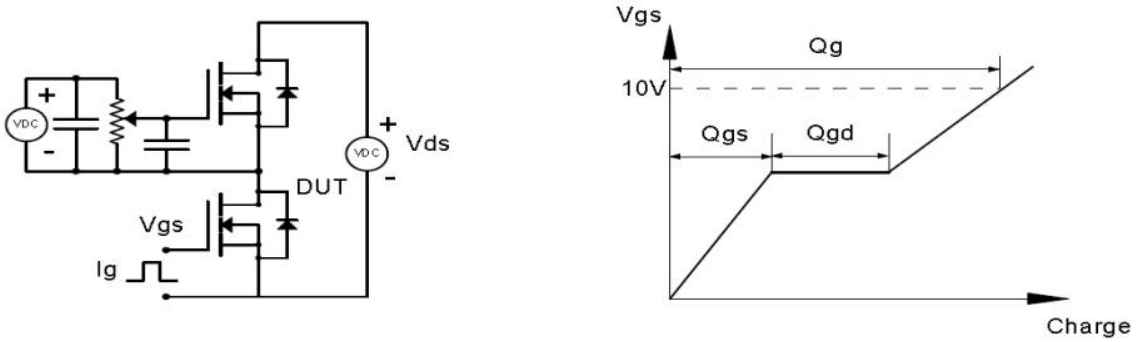
1) Repetitive Rating: pulse width limited by maximum junction temperature
2) EAS condition : $T_J$=25℃, $V_{DD}$=20V, $V_G$=10V, L=0.5mH, $R_g$=25Ω, $I_{AS}$=22.8A
3) The value of RθJA Mounted on FR4 Board（25.4mm*25.4mm*t1.6mm）With 2oz Copper TA=25℃

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

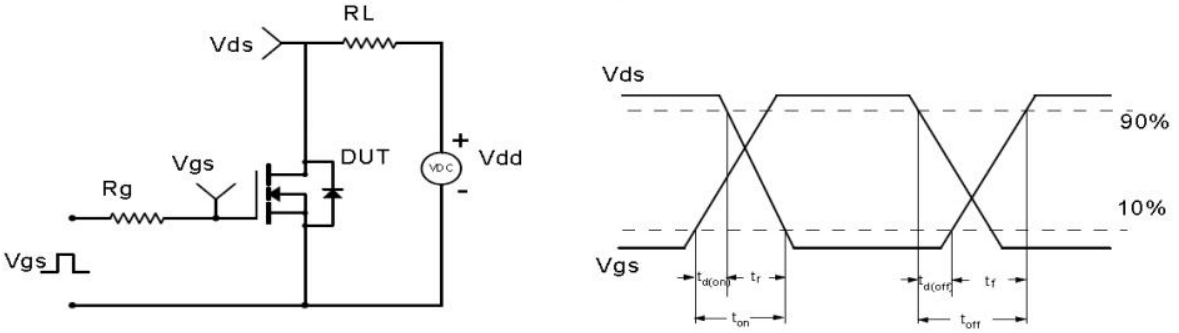
| Parameter | Symbol | Test Condition | Min | Type | Max | Unit |
|---|---|---|---|---|---|---|
| **Static Characteristics** | | | | | | |
| Drain-source breakdown voltage | $V_{(BR)DSS}$ | $V_{GS}$ = 0V, $I_D$ =250μA | 40 | - | - | V |
| Zero gate voltage drain current | $I_{DSS}$ | $V_{DS}$ =40V, $V_{GS}$ = 0V | - | - | 1 | μA |
| Gate-body leakage current | $I_{GSS}$ | $V_{GS}$ =±20V, $V_{DS}$ = 0V | - | - | ±100 | nA |
| Gate threshold voltage | $V_{GS(th)}$ | $V_{DS}$ =$V_{GS}$, $I_D$ =250μA | 2.0 | 3.0 | 4.0 | V |
| Drain-source on-resistance | $R_{DS(on)}$ | $V_{GS}$ =10V, $I_D$ =20A | - | 3.9 | 4.5 | mΩ |
| Forward transconductance | $R_g$ | $V_{GS}$= 0V, $V_{DS}$= 0V, f=1.0MHz | - | 3.2 | - | Ω |
| **Dynamic characteristics** | | | | | | |
| Input Capacitance | $C_{iss}$ | $V_{DS}$ =20V, VGS=0V, f=1MHz | - | 997 | - | pF |
| Output Capacitance | $C_{oss}$ | | - | 488 | - | |
| Reverse Transfer Capacitance | $C_{rss}$ | | - | 29 | - | |
| **Switching characteristics** | | | | | | |
| Turn-on delay time | $t_{d(on)}$ | $V_{DD}$=20V, $I_D$=20A, $R_G$=3Ω, $V_{GS}$=10V | - | 7.4 | - | ns |
| Turn-on rise time | $t_r$ | | - | 80 | - | |
| Turn-off delay time | $t_{d(off)}$ | | - | 14 | - | |
| Turn-off fall time | $t_f$ | | - | 59 | - | |
| Total Gate Charge | Qg | $V_{DS}$=20V, $I_D$=20A, $V_{GS}$=10V | - | 13.4 | - | nC |
| Gate-Source Charge | Qgs | | - | 5.3 | - | |
| Gate-Drain Charge | Qgd | | - | 2.0 | - | |
| **Source-Drain Diode characteristics** | | | | | | |
| Diode Forward voltage | $V_{SD}$ | $T_J$=25℃, $V_{GS}$ =0V, $I_S$=20A | - | 0.8 | 1.2 | V |
| Diode Forward current | $I_S$ | $T_C$=25℃ | - | - | 79 | A |
| Body Diode Reverse Recovery Time | trr | $T_J$=25℃, $I_F$=20A,di/dt=100A/us | - | 26 | - | ns |
| Body Diode Reverse Recovery Charge | Qrr | | - | 9.9 | - | nC |

## Test Circuit & Waveform

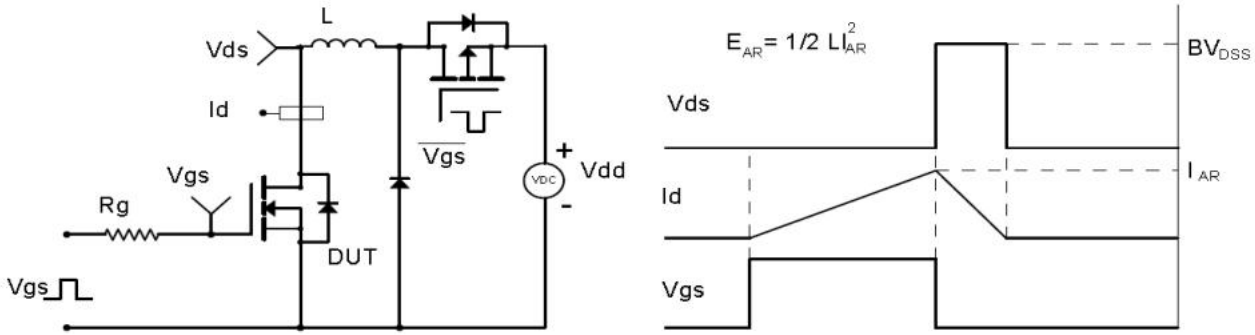
Gate Charge Test Circuit & Waveform



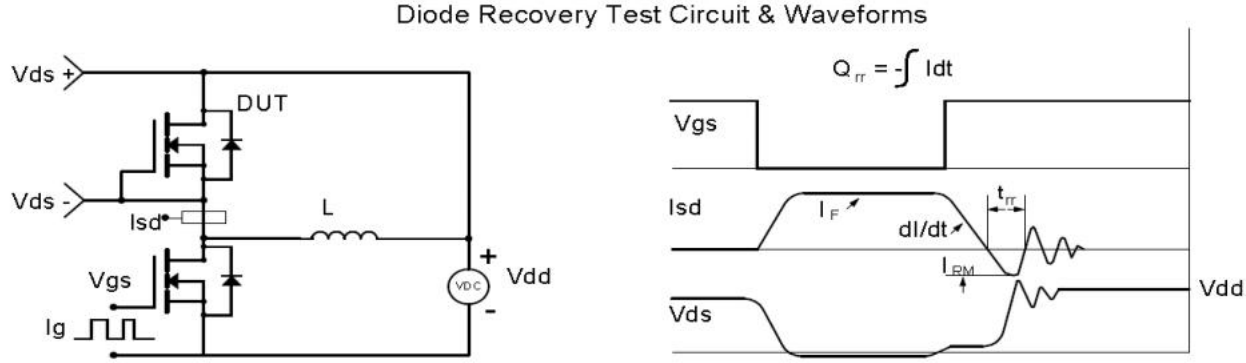

Resistive Switching Test Circuit & Waveforms




Unclamped Inductive Switching (UIS) Test Circuit & Waveforms




Diode Recovery Test Circuit & Waveforms



# Typical Characteristics

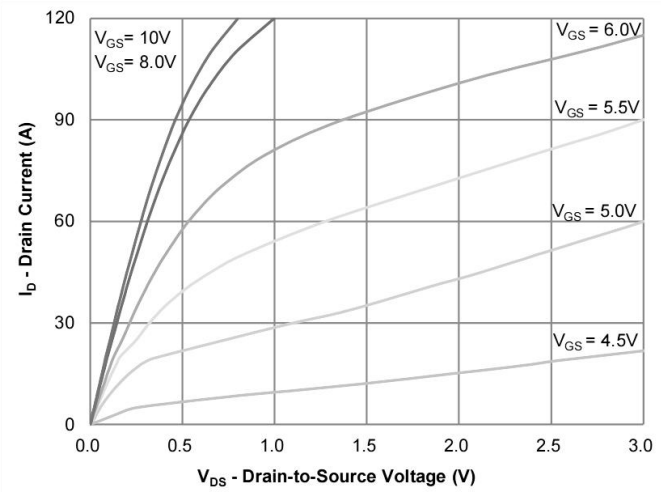



**Figure 1: Output Characteristics**

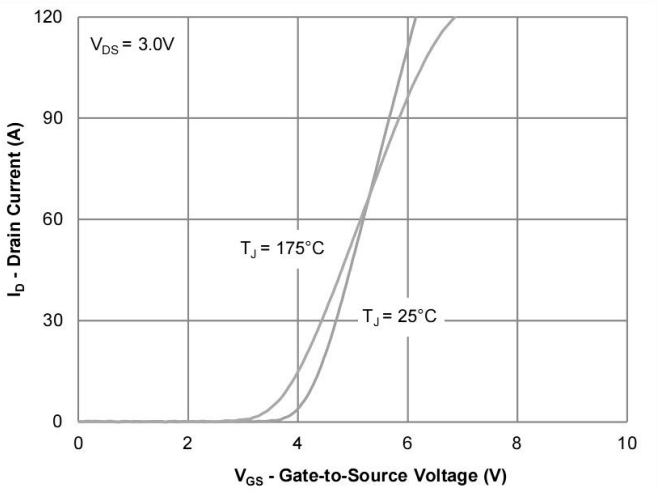



**Figure 2: Transfer Characteristics**

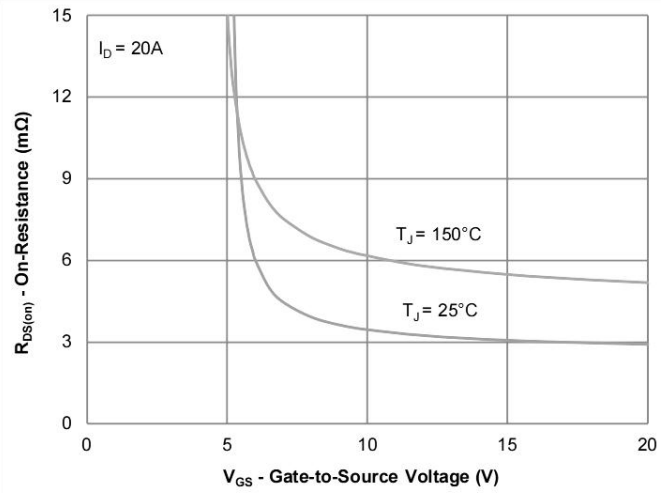



**Figure 3: On-Resistance vs. Gate-Source Voltage**

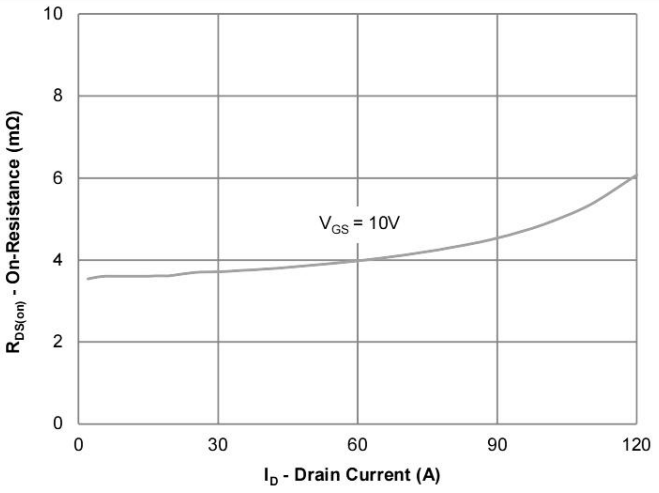



**Figure 4: On-Resistance vs. Gate-Source Voltage**

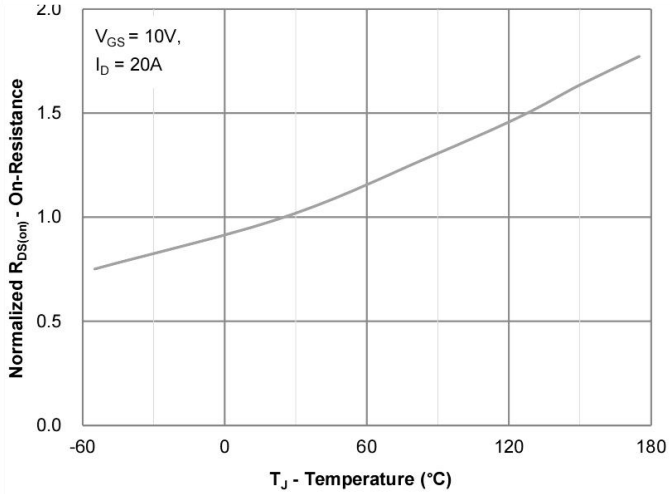



**Figure 5: On-Resistance vs. Junction Temperature**

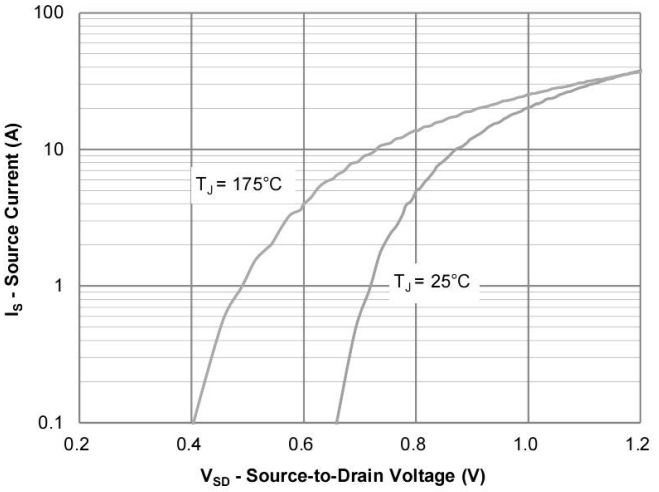



**Figure 6: Source-Drain Diode Forward Voltage**

# Typical Characteristics

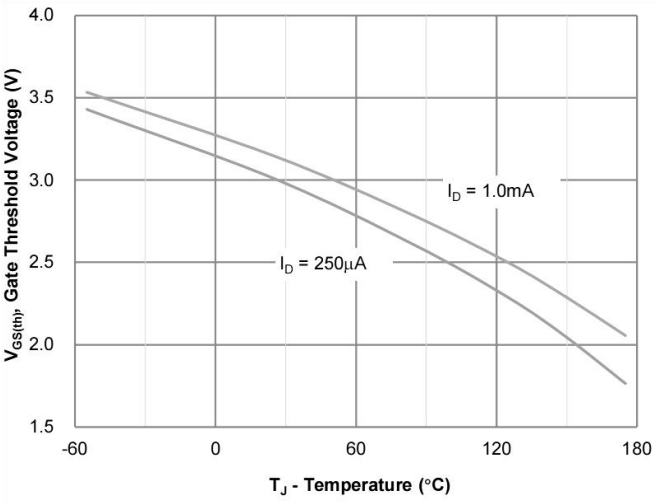



**Figure 7: Gate Threshold Variation vs. Junction Temperature**

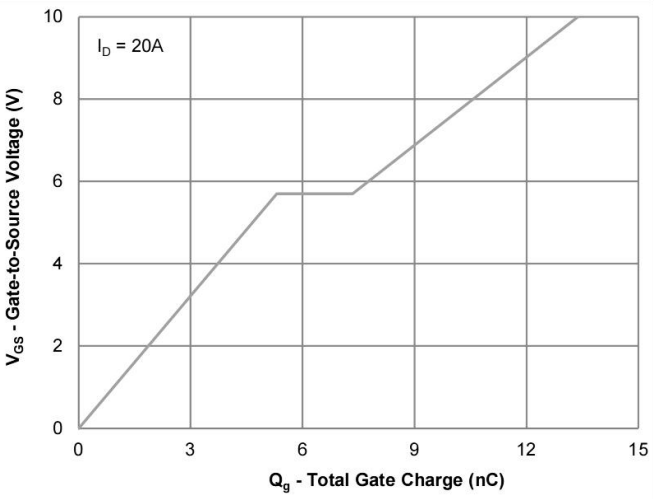



**Figure 8: Gate Charge Characteristics**

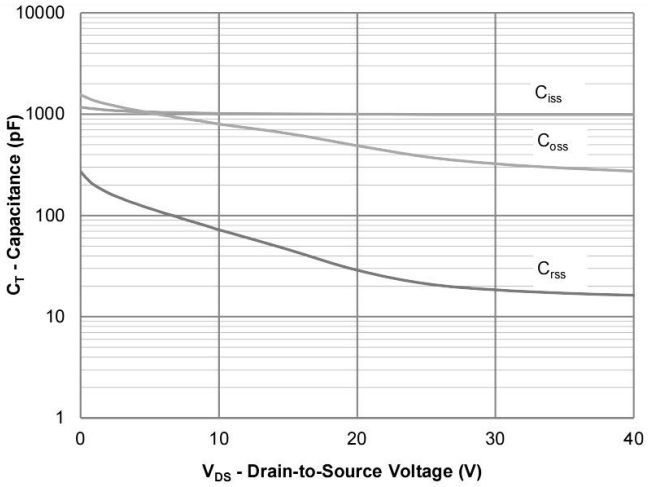



**Figure 9: Capacitance Characteristics**

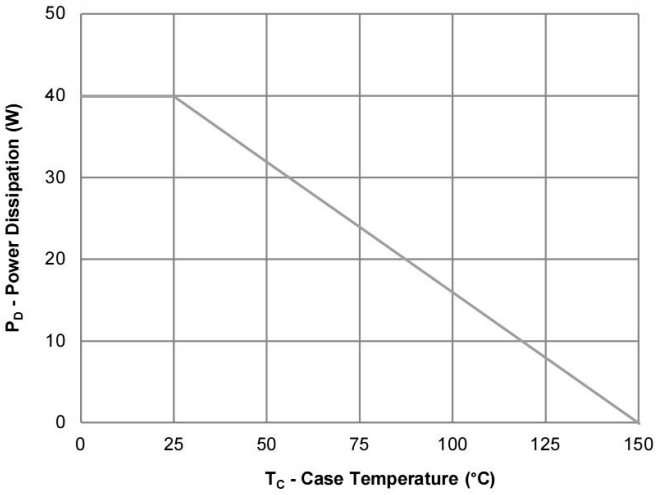



**Figure 10: Power Derating**

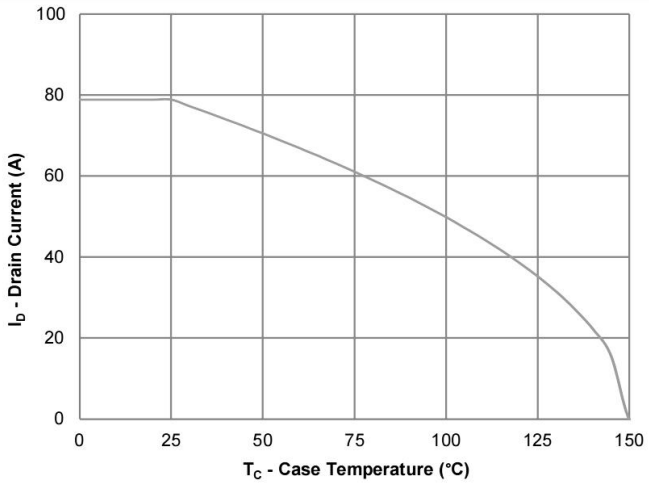



**Figure 11: Current Derating**

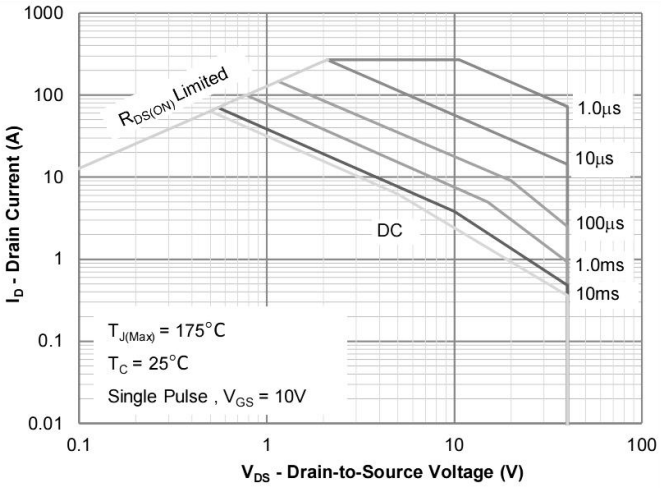



**Figure 12: Safe Operating Area**

# Typical Characteristics

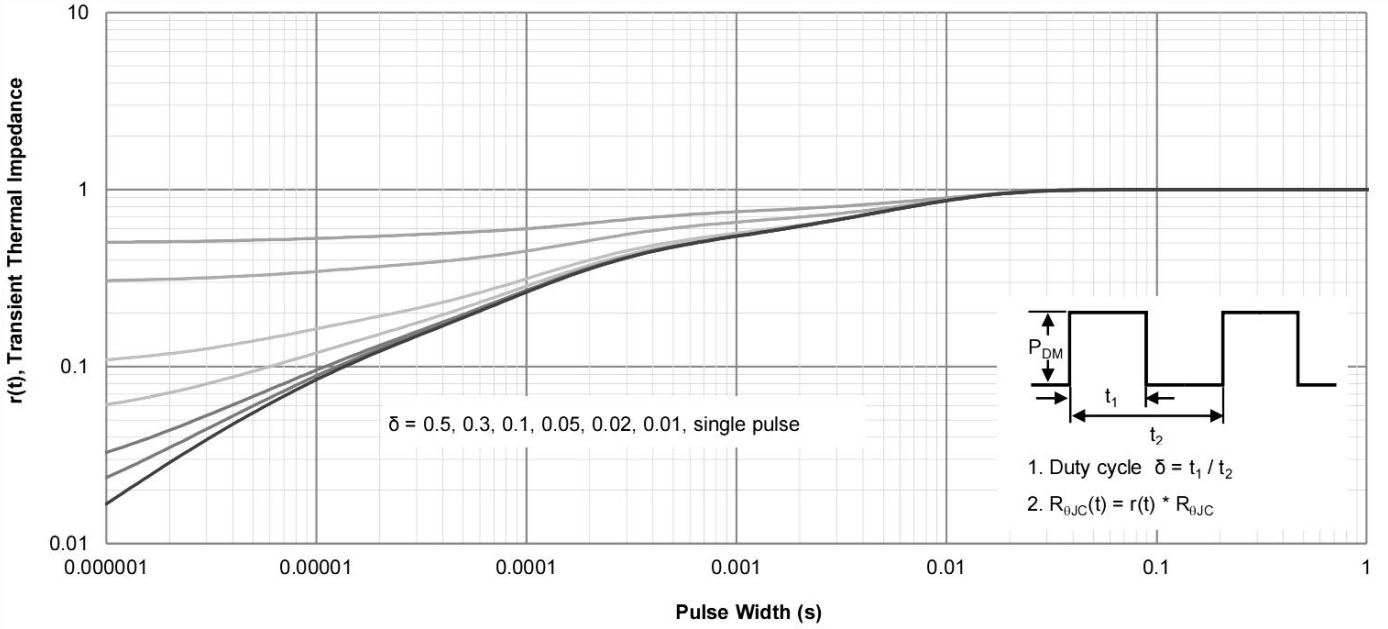
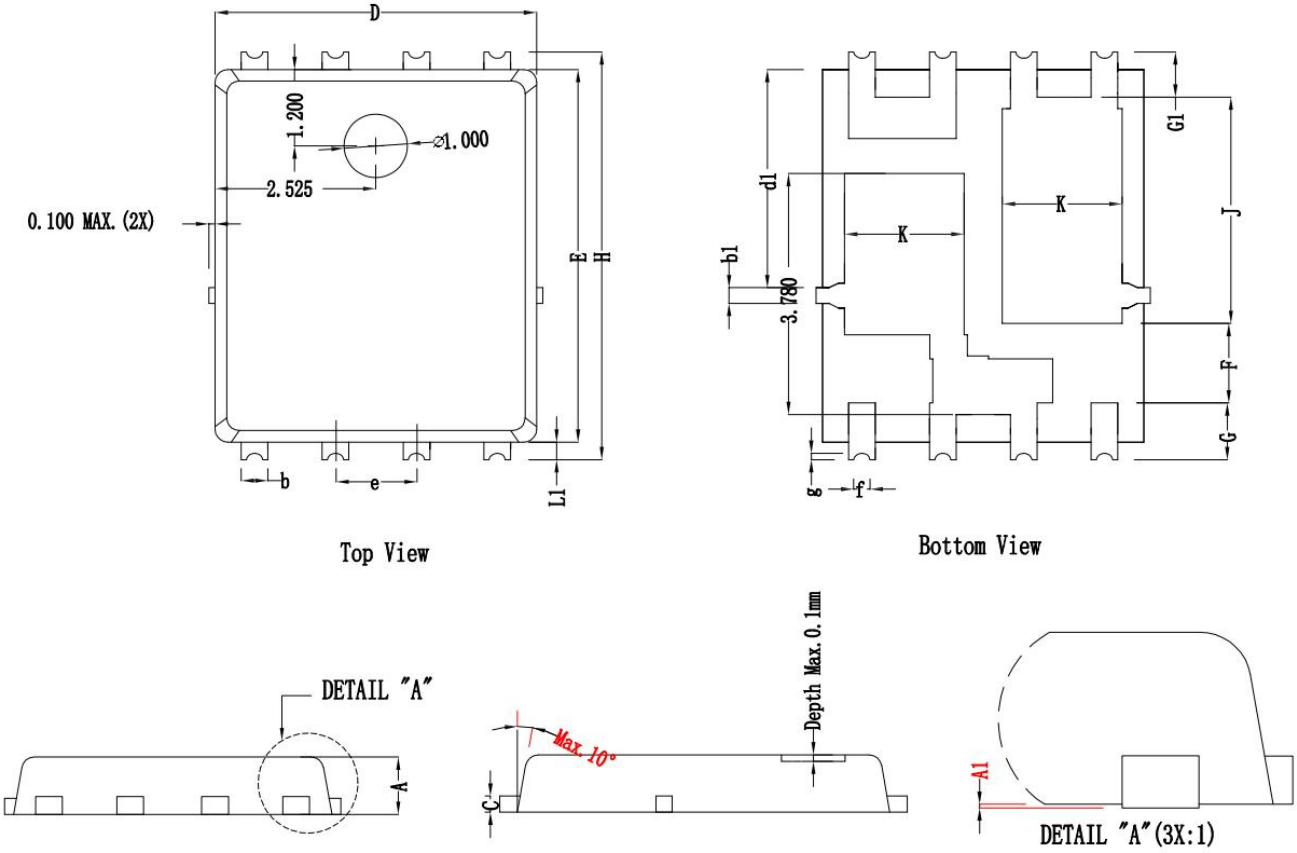



**Figure 13: Normalized Maximum Transient Thermal Impedance**

## PDFN5X6-D Package Information




| Dimensions In Millimeterer | | | |
|---|---|---|---|
| Symbol | MIN | TYP | MAX |
| A | 0.975 | 1.000 | 1.025 |
| A1 | 0.00 | 0.02 | 0.05 |
| b | 0.37 | 0.42 | 0.47 |
| b1 | 0.20 | 0.25 | 0.30 |
| c | | 0.254 REF | |
| D | 5.00 | 5.05 | 5.10 |
| d1 | | 3.424 REF | |
| F | | 1.25 REF | |
| E | 5.80 | 5.85 | 5.90 |
| e | | 1.27 BSC | |
| H | 6.30 | 6.40 | 6.50 |
| L1 | 0.245 | 0.275 | 0.305 |
| G | 0.79 | 0.89 | 0.99 |
| G1 | 0.61 | 0.71 | 0.81 |
| K | 1.78 | 1.88 | 1.98 |
| J | 3.45 | 3.55 | 3.65 |
| f | | 0.257 REF | |
| g | | 0.100 REF | |

## Revision History

| Revision | Release | Remark |
|---|---|---|
| V1.0 | 2024/10/05 | Initial Release |

## Disclaimer

The information given in this document describes the independent performance of the product,but similar performance is not guaranteed under other working conditions,and cannot be guaranteed when installed with other products or equipment.To achieve the required performance of the product in actual scenarios,the customer should conduct a complete application test to assess the functionality of the product.

Allpower assumes no responsibility for equipment failures result from using products at values that exceed the ratings,operating conditions,or other parameters listed in the product specifications.

The product described in this specification is not applicable for aerospace or other applications which
requires high reliability.Customers using or selling these products for use in medical,life-saving,or life-sustaining applications do so at their own risk and agree to fully indemnify.

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