# AP5N5P017PD

**N and P-Channel Enhancement Mosfet**

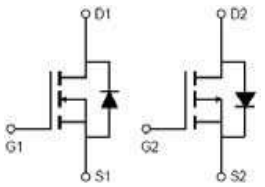
**DATA SHEET**

## Features

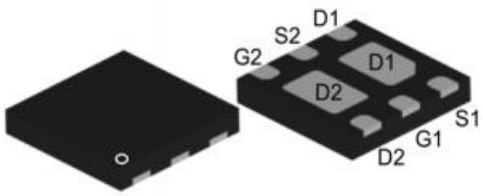
- **N-Channel**
  17V,5A
  $R_{DS(ON)}$ <42mΩ @$V_{GS}$=4.5V TYP:33mΩ
  $R_{DS(ON)}$ <60mΩ @$V_{GS}$=2.5V TYP:45mΩ

- **P-Channel**
  -17V,-5A
  $R_{DS(ON)}$ <60mΩ @$V_{GS}$=-4.5V TYP:46mΩ
  $R_{DS(ON)}$ <88mΩ @$V_{GS}$=-2.5V TYP:68mΩ

- Lead free product is acquired
- High power and current handing capability
- Surface mount package




**Schematic diagram**




## Applications

- PWM applications
- Motor control and drive
- LED Backlight

## Package Marking and Ordering Information

| Device Marking | Device | Device Package | Reel Size | Tape width | Quantity (PCS) |
|---|---|---|---|---|---|
| 5N5P | AP5N5P017PD | DFN2X2-6L | - | - | 3000 |

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

| Parameter | Symbol | N-Channel | P-Channel | Unit |
|---|---|---|---|---|
| Drain-Source Voltage | $V_{DS}$ | 17 | -17 | V |
| Gate-Source Voltage | $V_{GS}$ | ±12 | ±12 | V |
| Continuous Drain Current ($T_A$=25℃)(1) | $I_D$ | 5 | -5 | A |
| Continuous Drain Current ($T_A$=100℃)(1) | $I_D$ | 3 | -3 | A |
| Pulsed Drain Current (1) | $I_{DM}$ | 20 | -18 | A |
| Drain Power Dissipation(1) | $P_D$ | 1.9 | | W |
| Thermal Resistance- Junction to Ambient(1) | $R_{\theta JA}$ | 65 | | ℃/W |
| Junction Temperature | $T_J$ | -55~ +150 | | ℃ |
| Storage Temperature | $T_{STG}$ | -55~ +150 | | ℃ |

**Notes:**

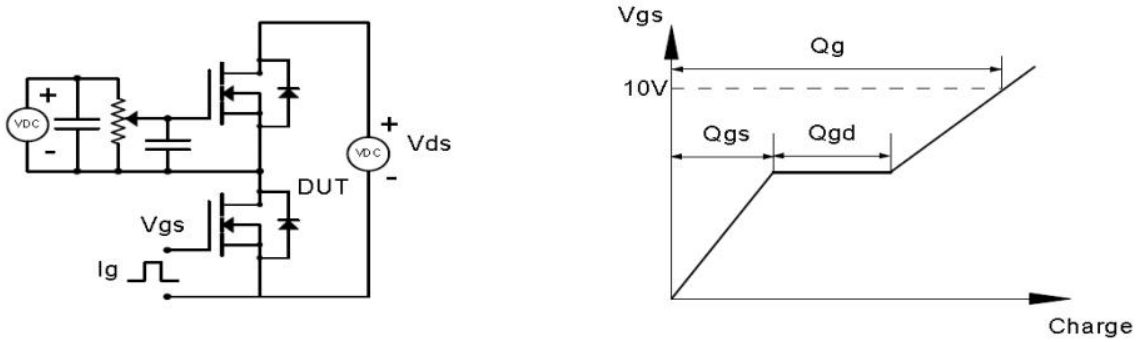
1) Repetitive Rating: pulse width limited by maximum junction temperature

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

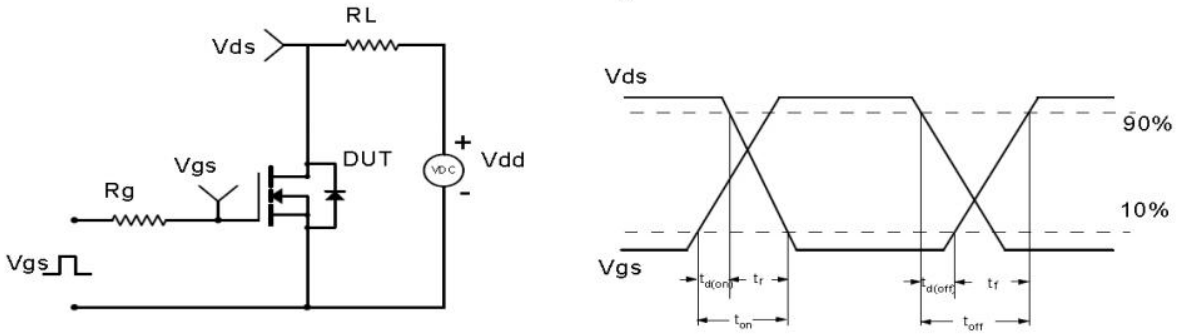
| Parameter | Symbol | Test Condition | Min | Type | Max | Unit |
|---|---|---|---|---|---|---|
| **Static Characteristics** | | | | | | |
| Drain-source breakdown voltage | $V_{(BR)DSS}$ | $V_{GS}$ = 0V, $I_D$ =250μA | 17 | - | - | V |
| Zero gate voltage drain current | $I_{DSS}$ | $V_{DS}$ =17V, $V_{GS}$ = 0V | - | - | 1 | μA |
| Gate-body leakage current | $I_{GSS}$ | $V_{GS}$ =±12V, $V_{DS}$ = 0V | - | - | ±100 | nA |
| Gate threshold voltage | $V_{GS(th)}$ | $V_{DS}$ =$V_{GS}$, $I_D$ =250μA | 0.4 | 0.7 | 1.2 | V |
| Drain-source on-resistance | $R_{DS(on)}$ | $V_{GS}$ =4.5V, $I_D$ =5A | - | 33 | 42 | mΩ |
| | | $V_{GS}$ =2.5V, $I_D$ =1A | - | 45 | 60 | |
| **Dynamic characteristics** | | | | | | |
| Input Capacitance | $C_{iss}$ | $V_{DS}$ =10V, VGS=0V, f=1MHz | - | 280 | - | pF |
| Output Capacitance | $C_{oss}$ | | - | 50 | - | |
| Reverse Transfer Capacitance | $C_{rss}$ | | - | 29 | - | |
| **Switching characteristics** | | | | | | |
| Turn-on delay time | $t_{d(on)}$ | $V_{DS}$=10V,, $R_G$=6Ω, $V_{GS}$=4.5V | - | 2.5 | - | nS |
| Turn-on rise time | $t_r$ | | - | 3.2 | - | |
| Turn-off delay time | $t_{d(off)}$ | | - | 21 | - | |
| Turn-off fall time | $t_f$ | | - | 3 | - | |
| Total Gate Charge | Qg | $V_{DS}$=10V, $I_D$=3A, $V_{GS}$=4.5V | - | 2.9 | - | nC |
| Gate-Source Charge | Qgs | | - | 0.4 | - | |
| Gate-Drain Charge | Qgd | | - | 0.6 | - | |
| **Source-Drain Diode characteristics** | | | | | | |
| Diode Forward voltage | $V_{SD}$ | $T_J$=25℃, $V_{GS}$ =0V, $I_S$=2A | - | - | 1.2 | V |
| Diode Forward current | $I_S$ | $T_C$=25℃ | - | - | 5 | A |

## Test Circuit & Waveform

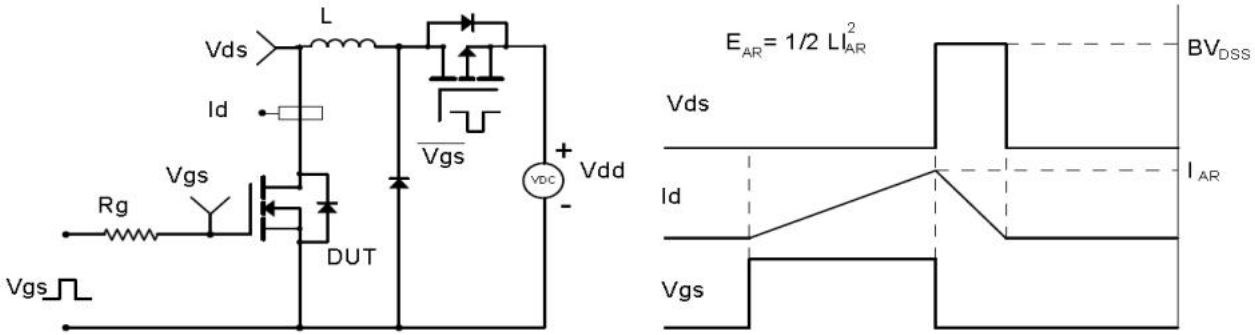
Gate Charge Test Circuit & Waveform



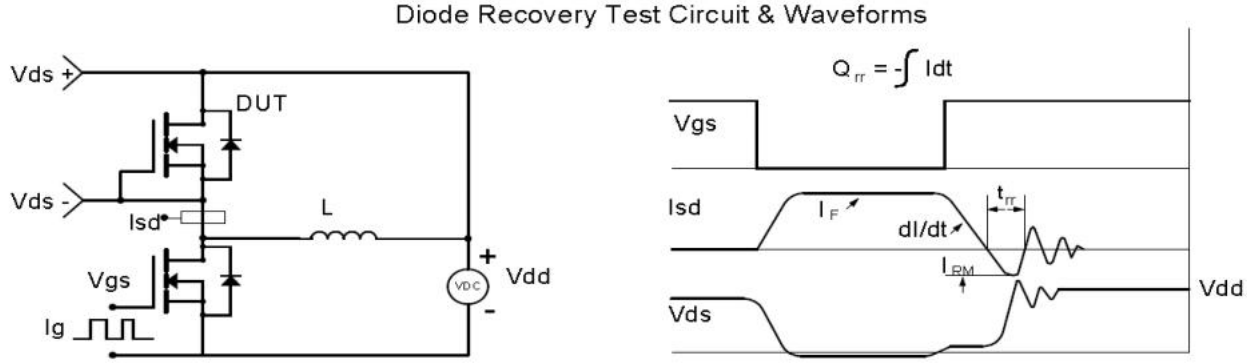

Resistive Switching Test Circuit & Waveforms




Unclamped Inductive Switching (UIS) Test Circuit & Waveforms




Diode Recovery Test Circuit & Waveforms



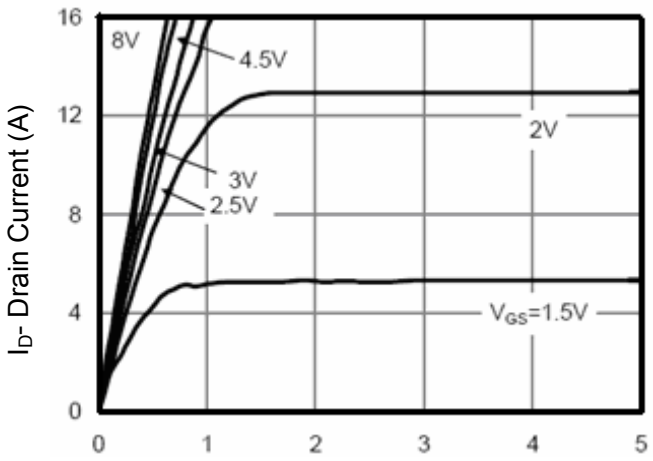



**Figure 1 Output Characteristics**

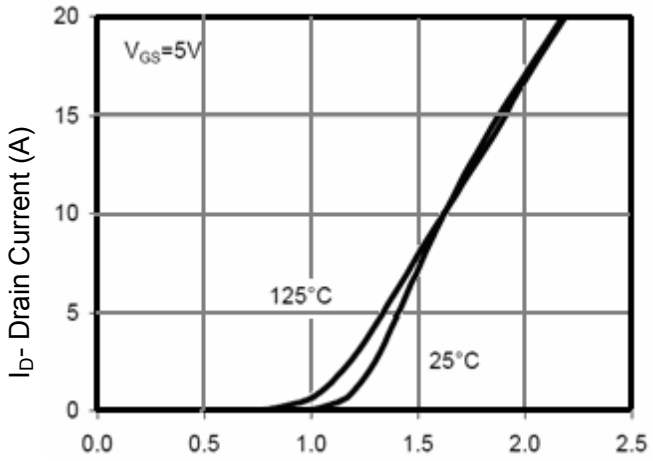



**Figure 2 Transfer Characteristics**

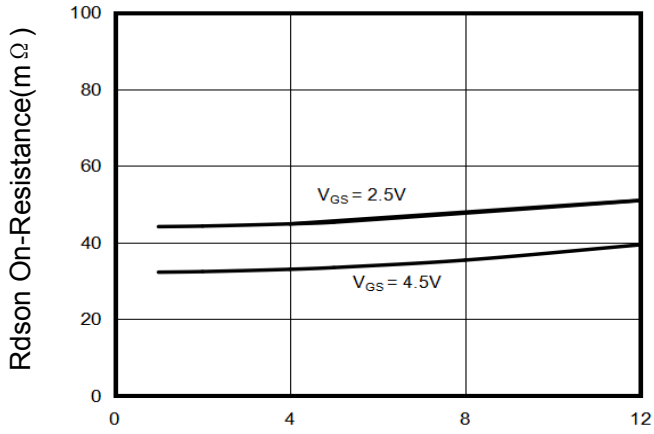



**Figure 3 Drain-Source On-Resistance**

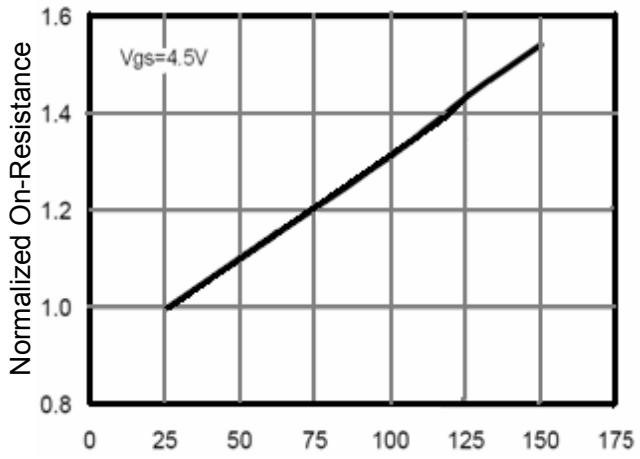



**Figure 4 Drain-Source On-Resistance**

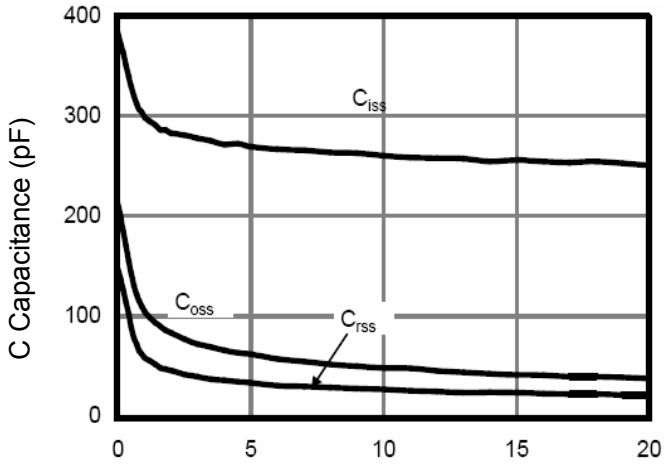



**Figure 5 Capacitance vs Vds**

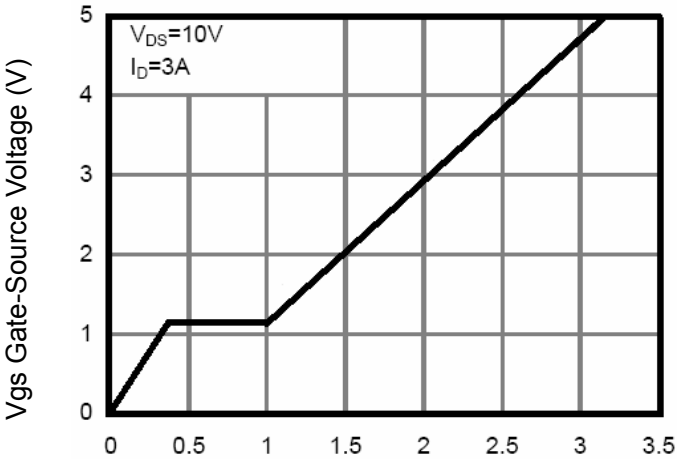



**Figure 6 Gate Charge**

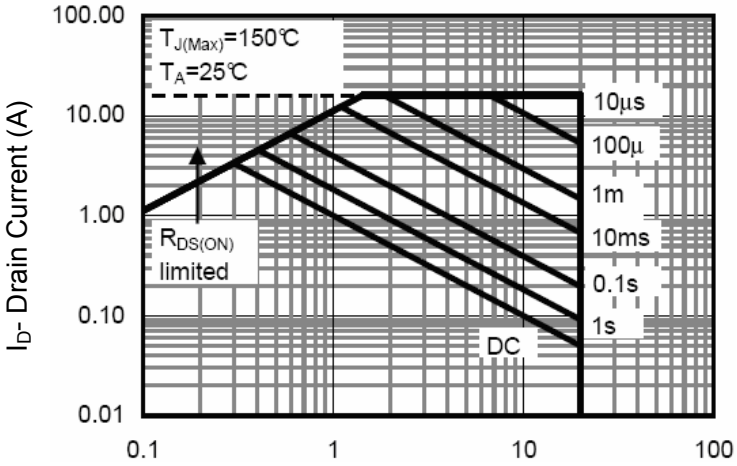



**Figure 7 Safe Operation Area**

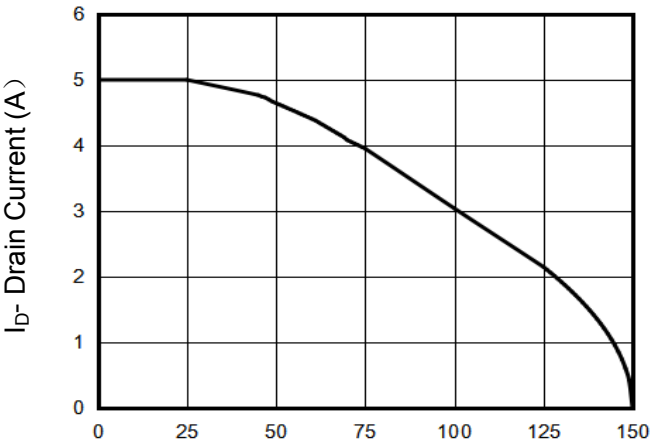



**Figure 8 Drain Current**

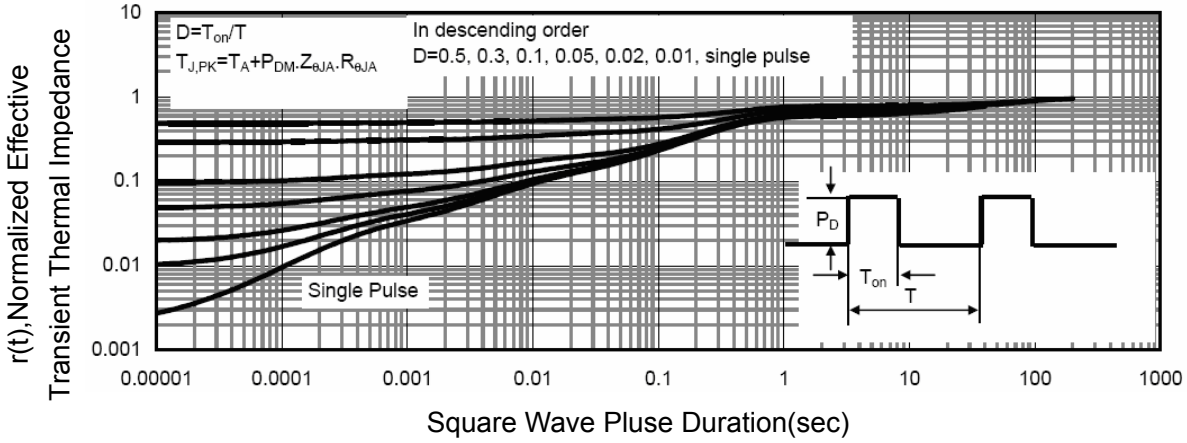


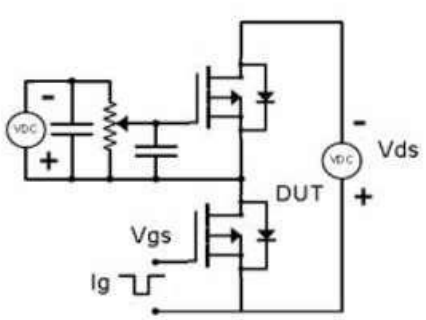

**Figure 9 Normalized Maximum Transient Thermal Impedance**

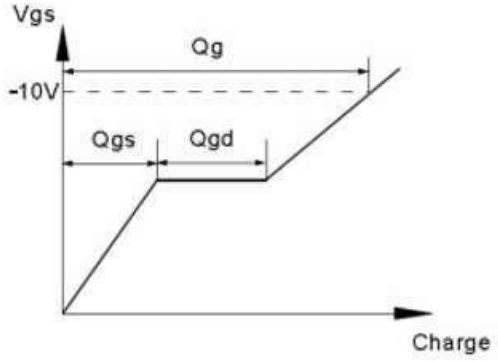
## P-CH ELECTRICAL CHARACTERISTICS($T_J$=25℃ unless otherwise noted)

| Parameter | Symbol | Test Condition | Min | Type | Max | Unit |
|---|---|---|---|---|---|---|
| **Static Characteristics** | | | | | | |
| Drain-source breakdown voltage | $V_{(BR)DSS}$ | $V_{GS}$ = 0V, $I_D$ =-250μA | -17 | - | - | V |
| Zero gate voltage drain current | $I_{DSS}$ | $V_{DS}$ =-17V, $V_{GS}$ = 0V | - | - | -1 | μA |
| Gate-body leakage current | $I_{GSS}$ | $V_{GS}$ =±12V, $V_{DS}$ = 0V | - | - | ±100 | nA |
| Gate threshold voltage | $V_{GS(th)}$ | $V_{DS}$ =$V_{GS}$, $I_D$ =-250μA | -0.4 | -0.8 | -1.2 | V |
| Drain-source on-resistance | $R_{DS(on)}$ | $V_{GS}$ =-4.5V, $I_D$ =-5A | - | 46 | 60 | mΩ |
| | | $V_{GS}$ =-2.5V, $I_D$ =-1A | - | 68 | 88 | |
| **Dynamic characteristics** | | | | | | |
| Input Capacitance | $C_{iss}$ | $V_{DS}$ =-10V, VGS=0V, f=1MHz | - | 430 | - | pF |
| Output Capacitance | $C_{oss}$ | | - | 75 | - | |
| Reverse Transfer Capacitance | $C_{rss}$ | | - | 60 | - | |
| **Switching characteristics**( | | | | | | |
| Turn-on delay time | $t_{d(on)}$ | $V_{DS}$=-10V, $I_D$=-1A, $V_{GS}$=-4.5V | - | 6.4 | - | nS |
| Turn-on rise time | $t_r$ | | - | 21.5 | - | |
| Turn-off delay time | $t_{d(off)}$ | | - | 37.5 | - | |
| Turn-off fall time | $t_f$ | | - | 34 | - | |
| Total Gate Charge | Qg | $V_{DS}$=-10V, $I_D$=-3.7A, $V_{GS}$=-10V | - | 5.4 | - | nC |
| Gate-Source Charge | Qgs | | - | 1.15 | - | |
| Gate-Drain Charge | Qgd | | - | 1.24 | - | |
| **Source-Drain Diode characteristics** | | | | | | |
| Diode Forward voltage( | $V_{SD}$ | $T_J$=25℃, $V_{GS}$ =0V, $I_S$=-2A | - | - | -1.2 | V |
| Diode Forward current | $I_S$ | $T_C$=25℃ | - | - | -5 | A |

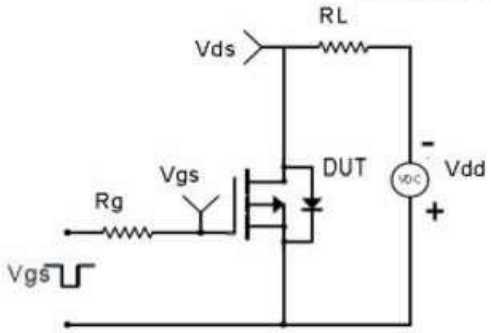
## Test Circuit & Waveform

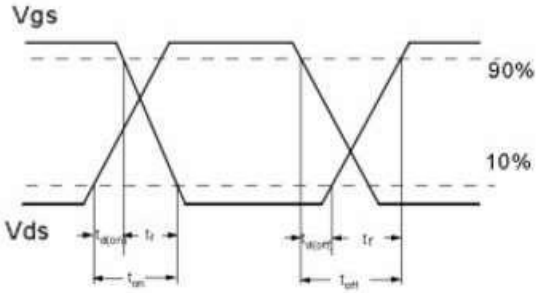
Gate Charge Test Circuit & Waveform



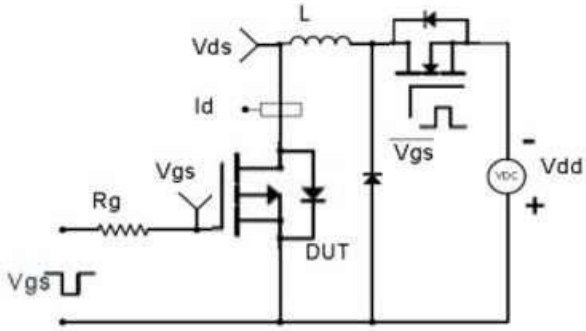



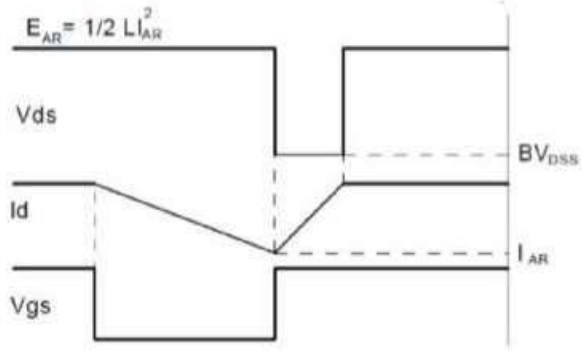

Resistive Switching Test Circuit & Waveforms



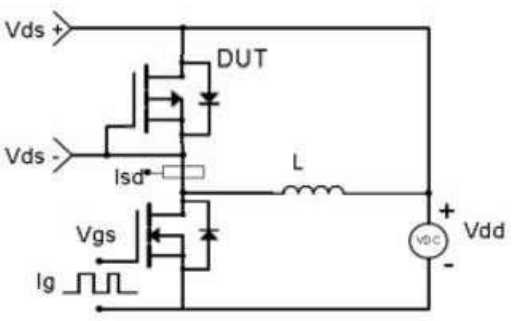



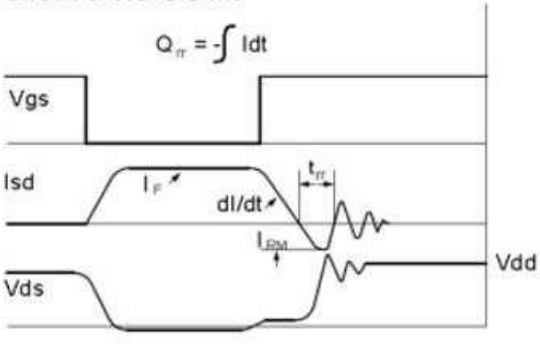

Unclamped Inductive Switching (UIS) Test Circuit & Waveforms




Diode Recovery Test Circuit & Waveforms



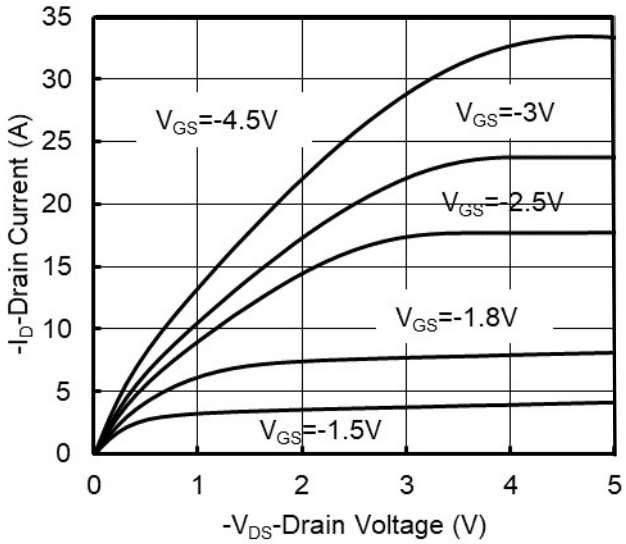



**Figure1. Output Characteristics**

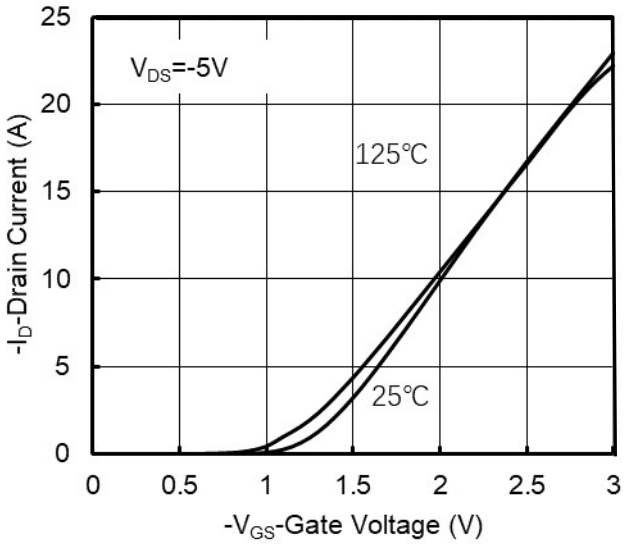



**Figure2. Transfer Characteristics**

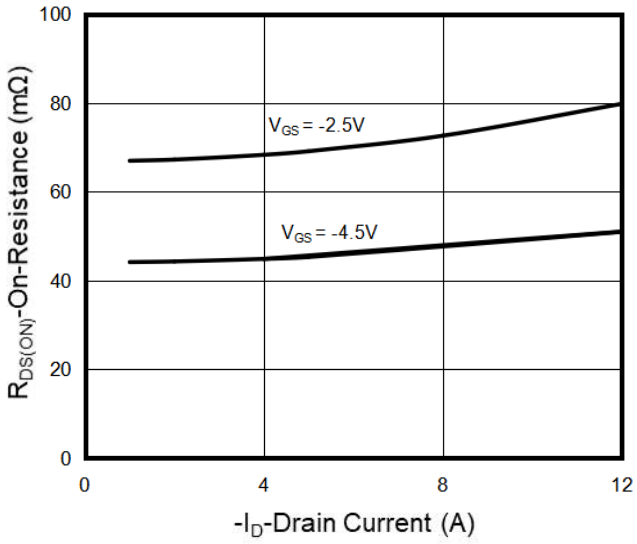



**Figure 3: On-Resistance vs. Drain Current and Gate Voltage**

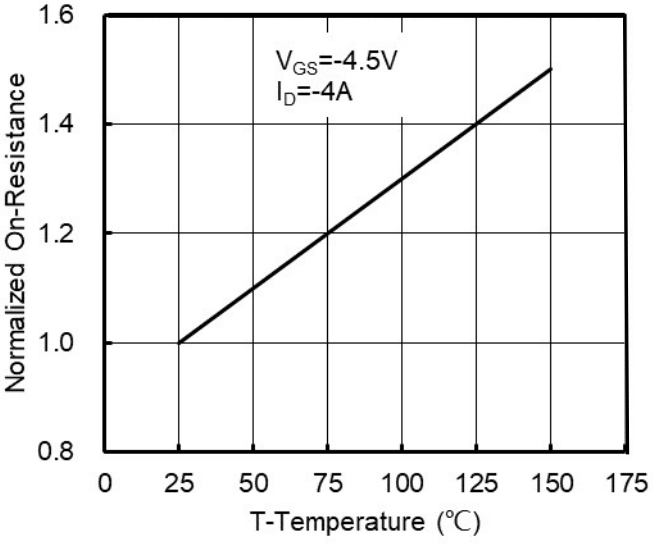



**Figure 4: On-Resistance vs. Junction Temperature**

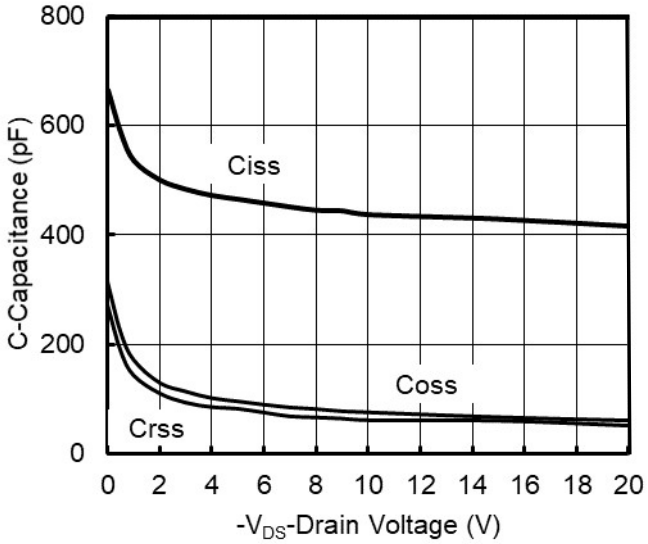



**Figure5. Capacitance Characteristics**

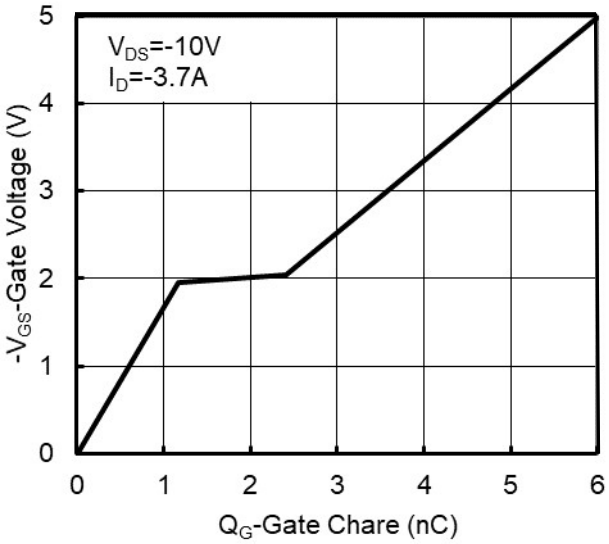



**Figure6. Gate Charge**

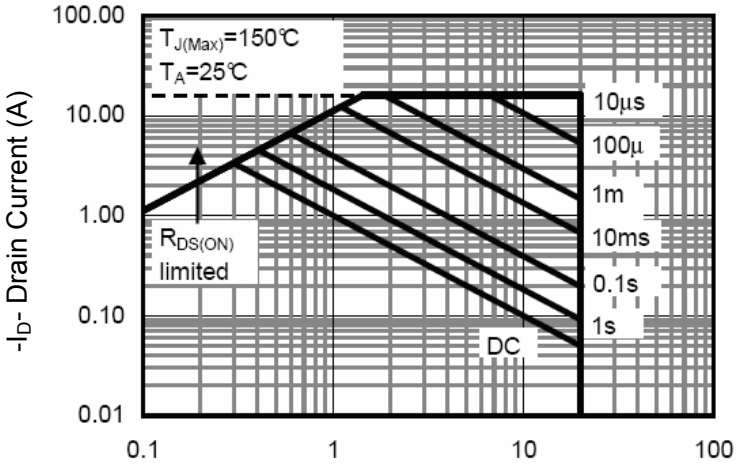



**Figure 7 Safe Operation Area**

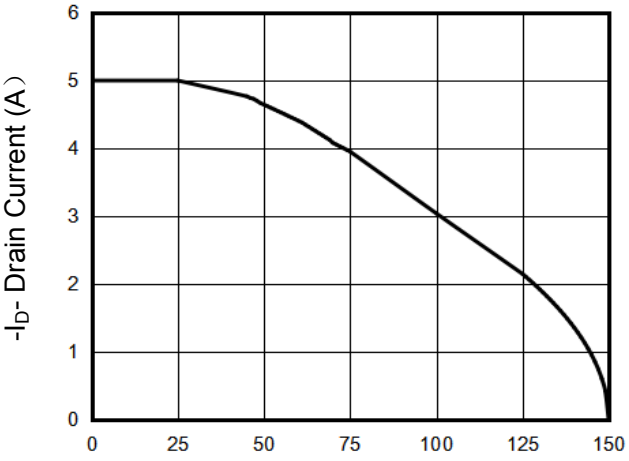



**Figure 8 Drain Current**

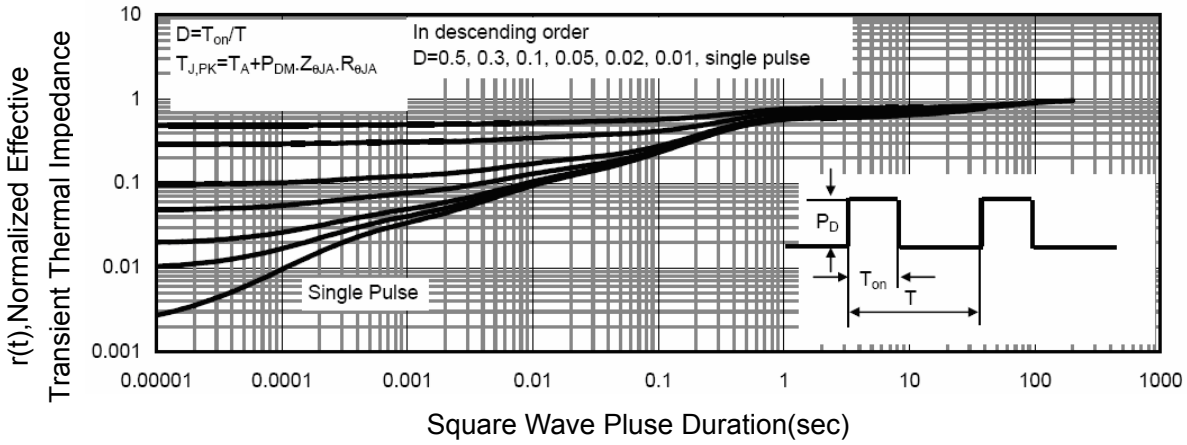
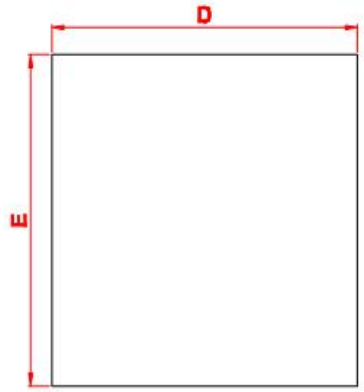
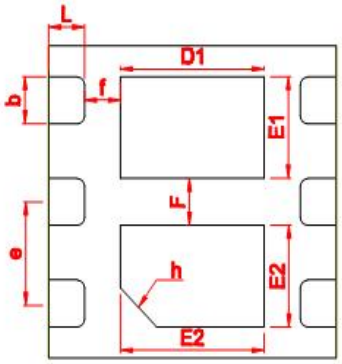



**Figure 9 Normalized Maximum Transient Thermal Impedance**

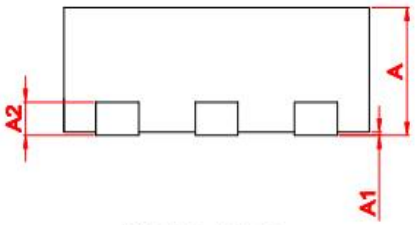
## Package Dimensions of DFN2X2-6L Package




TOP VIEW




BOTTOM VIEW




SIDE VIEW

| SYMBOL | MILLIMETER | | |
|---|---|---|---|
| | MIN | NOM | MAX |
| A | 0.700 | 0.750 | 0.800 |
| * A1 | 0.000 | 0.020 | 0.050 |
| * b | 0.275 | 0.300 | 0.325 |
| * A2 | 0.190 | 0.210 | 0.230 |
| * D | 1.900 | 2.000 | 2.100 |
| * E | 1.900 | 2.000 | 2.100 |
| * E1 | 0.570 | 0.620 | 0.670 |
| * E2 | 0.570 | 0.620 | 0.670 |
| * D1 | 0.950 | 1.000 | 1.050 |
| * D2 | 0.950 | 1.000 | 1.050 |
| * e | 0.600 | 0.650 | 0.700 |
| h | 0.300 | 0.350 | 0.400 |
| * L | 0.200 | 0.250 | 0.300 |
| * F | 0.250 | 0.300 | 0.350 |
| * f | 0.200 | 0.250 | 0.300 |

## Revision History

| Revision | Release | Remark |
|---|---|---|
| V1.0 | 2024/08/02 | 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.

Due to product or technical improvements,the information described or contained herein may be changed without prior notice.