# 40V N-channel Shielding Gate MOSFET

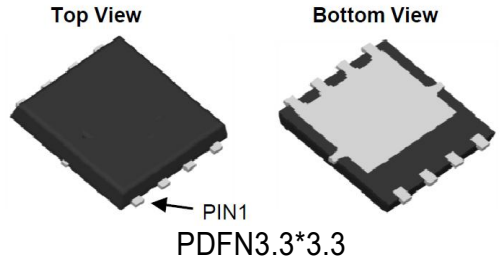
## General Description

| Features | | | Applications |
|---|---|---|---|
| VDS（max） | ID (max) | Typ.RDS(on) | ▯ Battery protection |
| 40V | 45A | 5.5mΩ@VGS=10 V | ▯ Battery Powered Systems |
| ▯ N-channel, optimized for high speed smooth switching | | | ▯ Portable Power Equipment |
| ▯ Excellent Gate charge×RDS(on) (FOM) | | | ▯ DC-DC conversion |
| ▯ Very low on-resistance RDS(on) | | | ▯ Hard switching and high speed circuit |
| ▯ 100% UIS Tested | | | |

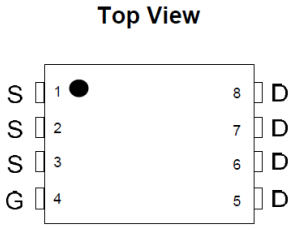
## Ordering Information

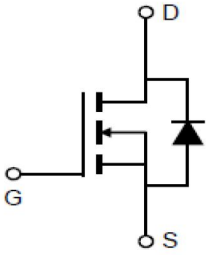
| Device | Package | Pin count | Marking |
|---|---|---|---|
| PAS40N055P | PDFN3*3 | 8 | PAS40N055P |

## Pin Configurations




PDFN3.3*3.3




## Main Parameters

| Symbol | Parameter | Value | Units |
|---|---|---|---|
| VDS | Drain-Source Voltage | 40 | V |
| ID | Drain Current - Continuous (TC= 25°C) | 45 | A |
| | - Continuous (TC= 100°C) | 30* | A |
| IDM | Drain Current - Pulsed (Note 1) | 180* | A |
| VGS | Gate-Source Voltage | ± 20 | V |

| | | | |
|---|---|---|---|
| $E_{AS}$ | Single Pulsed Avalanche Energy (Note 2) | 115 | mJ |
| $P_D$ | Power Dissipation (TC = 25°C) | 20 | W |
| $T_j$ , $T_{stg}$ | Operating and Storage Temperature Range | -55 to +175 | °C |

* Drain current limited by maximum junction temperature

# Thermal Characteristics

| Symbol | Parameter | Value | Units |
|---|---|---|---|
| $R_{\theta JC}$ | Thermal Resistance, Junction-to-Case | 6.2 | °C/W |
| $R_{\theta JA}$ | Thermal Resistance, Junction-to-Ambient | 47 | °C/W |

# Electrical Characteristics TC = 25°C unless otherwise noted

| Symbol | Parameter | Test Conditions | Min | Typ | Max | Units |
|---|---|---|---|---|---|---|
| **Off Characteristics** | | | | | | |
| $BV_{DSS}$ | Drain-Source Breakdown Voltage | $V_{GS}$ = 0 V, $I_D$ = 250μA | 40 | | | V |
| $I_{DSS}$ | Zero Gate Voltage Drain Current | $V_{DS}$ =40 V, $V_{GS}$ = 0 V | | | 1 | μA |
| $I_{GSSF}$ | Gate Leakage Current, Forward | $V_{GS}$ = 20 V, $V_{DS}$ = 0 V | | | 100 | nA |
| $I_{GSSR}$ | Gate Leakage Current, Reverse | $V_{GS}$ = -20 V, $V_{DS}$ = 0 V | | | -100 | nA |
| **On Characteristics** | | | | | | |
| $V_{GS(TH)}$ | Gate Threshold voltage | $V_{DS}$ = $V_{GS}$, $I_D$ = 250 uA | 1.0 | 1.6 | 2.0 | V |
| $R_{DS(On)}$ | Drain-Source on-state resistance | $V_{GS}$ = 10 V, $I_D$ =20 A | | 5.4 | 6.8 | mΩ |
| | | $V_{GS}$ =4.5V, $I_D$ = 20 A | | 7.5 | 9.4 | mΩ |
| $g_{FS}$ | Forward Transconductance | $V_{DS}$ = 5 V, $I_D$ = 20 A (Note 3) | 30 | | | S |
| **Dynamic Characteristics** | | | | | | |
| $C_{iss}$ | Input capacitance | $V_{DS}$=20V, $V_{GS}$=0V, F=1.0Mhz | | 1031 | | pF |
| $C_{oss}$ | Output capacitance | | | 318 | | pF |
| $C_{rss}$ | Reverse transfer capacitance | | | 24 | | pF |
| **Switching Characteristics** | | | | | | |
| $t_{d(on)}$ | Turn On Delay Time | $V_{DD}$=20V, $I_D$=20A, $V_{GS}$=10V, Rg=1.6Ohm (Note 3, 4) | | 6 | | ns |
| $t_r$ | Rising Time | | | 2.8 | | ns |
| $t_{d(off)}$ | Turn Off Delay Time | | | 23 | | ns |

| | | | | | | |
|---|---|---|---|---|---|---|
| $t_f$ | Fall Time | | | 3 | | ns |
| $Q_g$ | Total Gate Charge | $V_{DD}$=20V, $I_D$=20A, $V_{GS}$=10V (Note 3, 4) | | 36 | | nC |
| $Q_{gs}$ | Gate-Source Charge | | | 18.5 | | nC |
| $Q_{gd}$ | Gate-Drain Charge | | | 4.5 | | nC |
| **Drain-Source Diode Characteristics and Maximum Ratings** | | | | | | |
| $I_S$ | Maximum Continuous Drain-Source Diode Forward Current | | | | 45 | A |
| $I_{SM}$ | Maximum Pulsed Drain-Source Diode Forward Current | | | | 180 | A |
| $V_{SD}$ | Diode Forward Voltage | $V_{GS}$= 0 V, $I_S$ =20 A | | | 1.2 | V |
| $T_{rr}$ | Reverse recovery time | $I_F$=50A, di/dt=100A/μS | | 38 | | ns |
| $Q_{rr}$ | Reverse recovery charge | | | 28 | | nC |

**NOTE:**

1. REPETITIVE RATING: PULSE WIDTH LIMITED BY MAXIMUM JUNCTION TEMPERATURE.
2. SURFACE MOUNTED ON FR4 BOARD, T ≤ 10 SEC.
3. PULSE TEST: PULSE WIDTH ≤ 300μS, DUTY CYCLE ≤ 2%.
4. GUARANTEED BY DESIGN, NOT SUBJECT TO PRODUCTION
5. EAS CONDITION : TJ=25 ,V

℃ DD=20V,VG=10V,L=0.5MH,RG=25Ω

## Typical Electrical and Thermal Characteristics

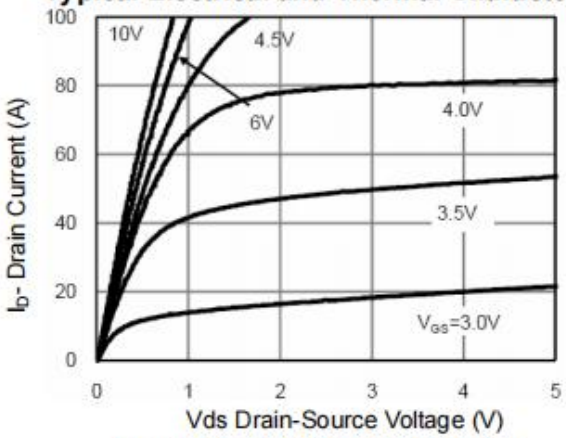



**Figure 1 Output Characteristics**

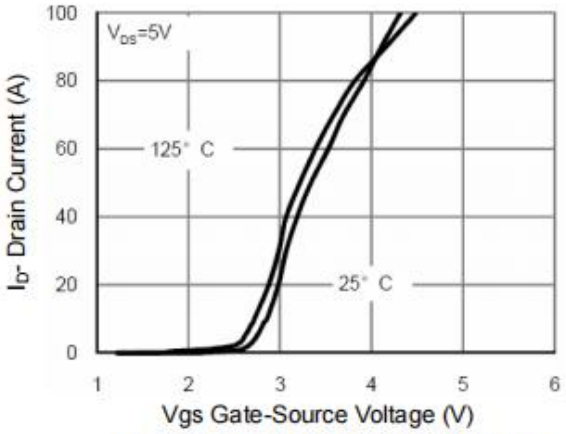



**Figure 2 Transfer Characteristics**

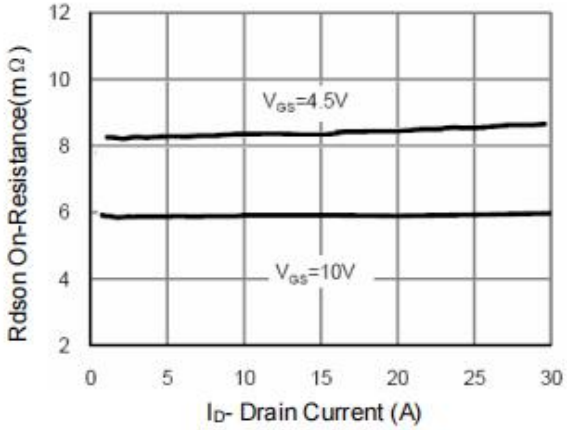



**Figure 3 Rdson- Drain Current**

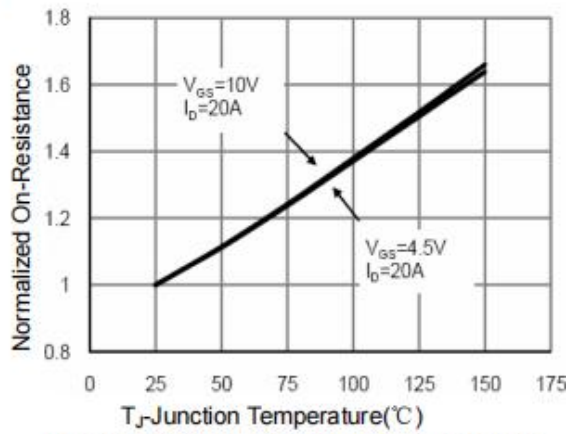



**Figure 4 Rdson-Junction Temperature**

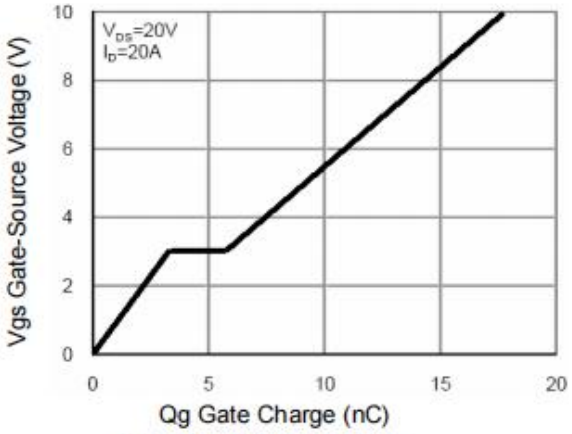



**Figure 5 Gate Charge**

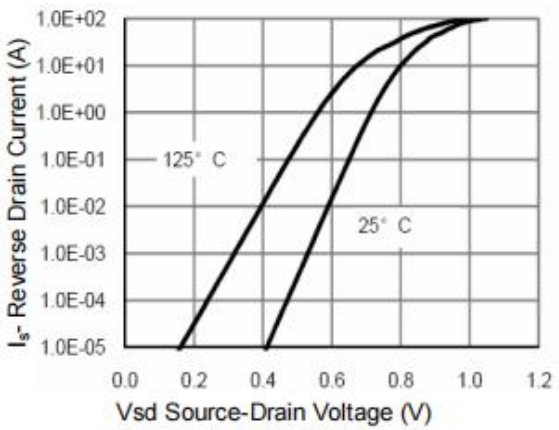



**Figure 6 Source- Drain Diode Forward**

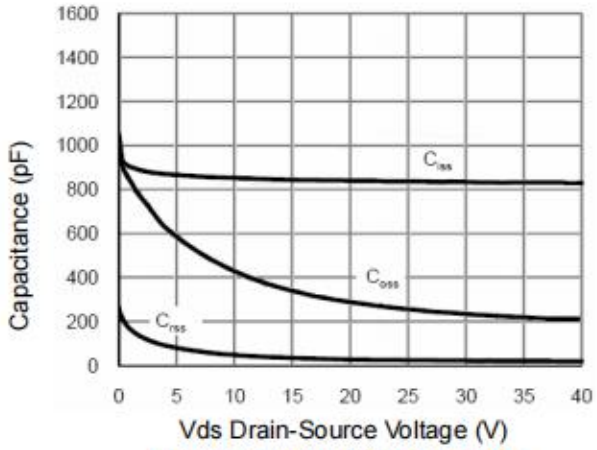



**Figure 7 Capacitance vs Vds**

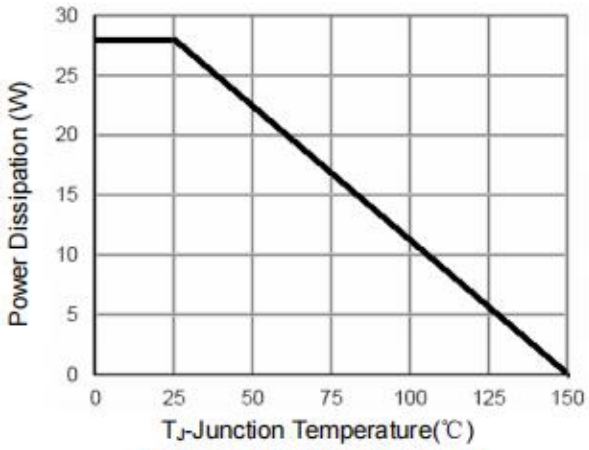



**Figure 9 Power De-rating**

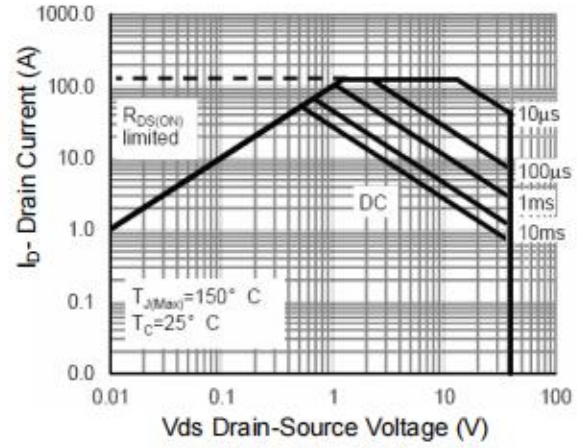



**Figure 8 Safe Operation Area**

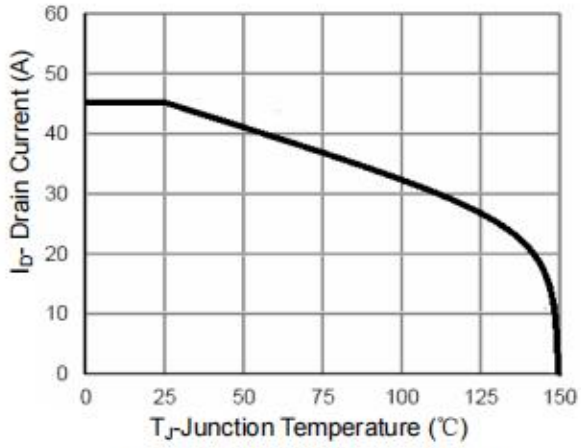



**Figure 10 Current De-rating**

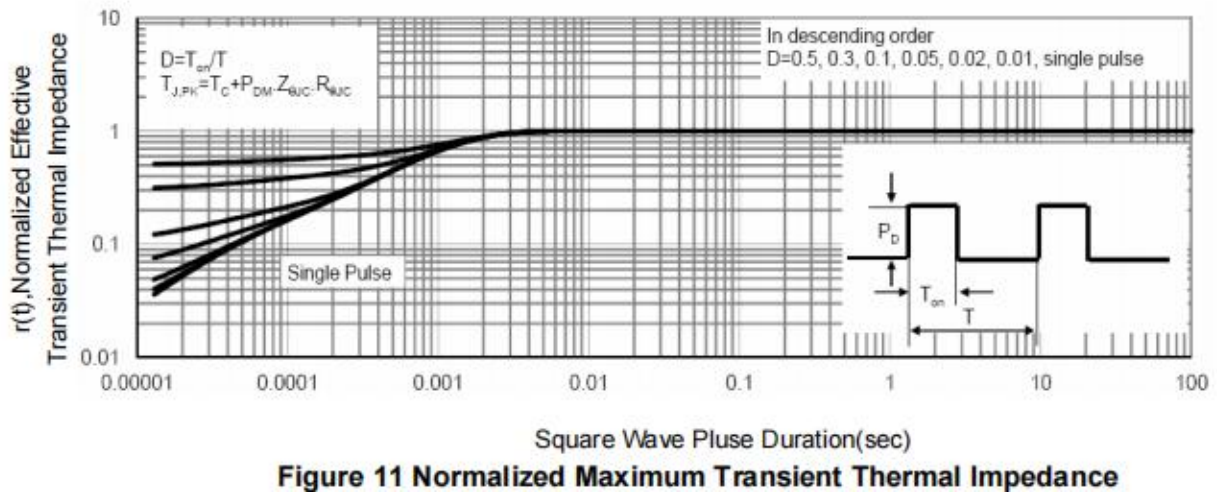
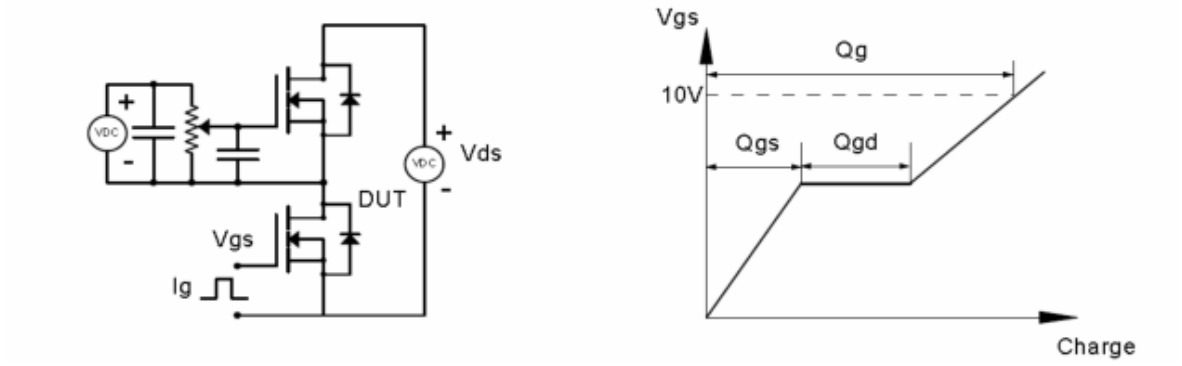


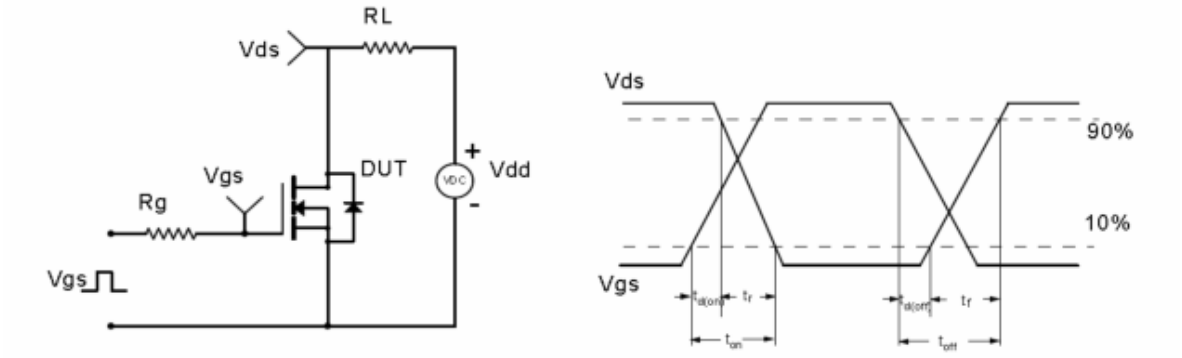

**Figure 11 Normalized Maximum Transient Thermal Impedance**

## Test Circuit & Waveform

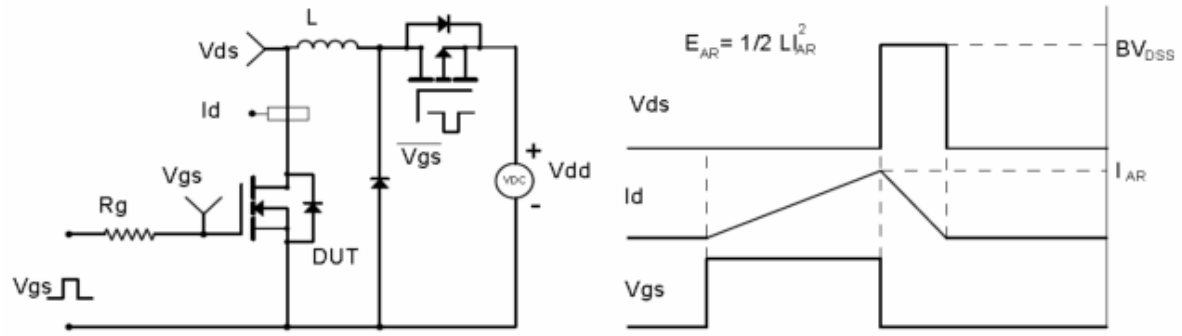
Gate Charge Test Circuit & Waveform



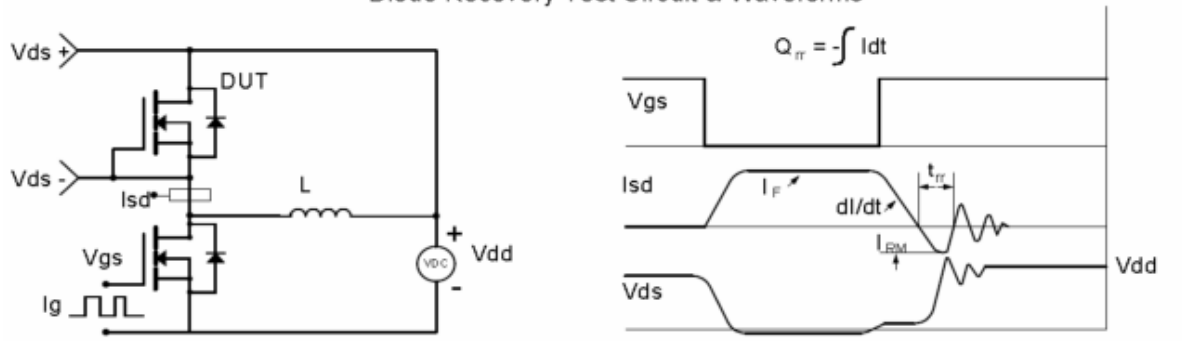

Resistive Switching Test Circuit & Waveforms



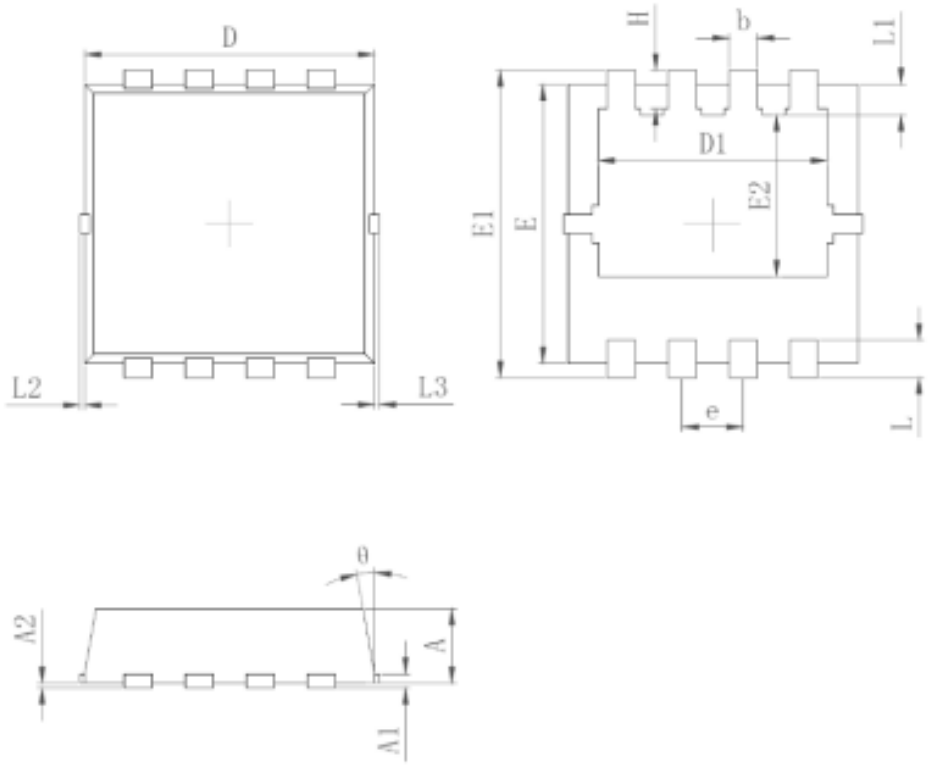

Unclamped Inductive Switching (UIS) Test Circuit & Waveforms




Diode Recovery Test Circuit & Waveforms



## Package Dimensions




| SYMBOL | MILLIMETER | |
|---|---|---|
| | MIN | MAX |
| A | 0.700 | 0.900 |
| A1 | 0.152 REF. | |
| A2 | 0~0.05 | |
| D | 3.000 | 3.200 |
| D1 | 2.300 | 2.600 |
| E | 2.900 | 3.100 |
| E1 | 3.150 | 3.450 |
| E2 | 1.535 | 1.935 |
| b | 0.200 | 0.400 |
| e | 0.550 | 0.750 |
| L | 0.300 | 0.500 |
| L1 | 0.180 | 0.480 |
| L2 | 0~0.100 | |
| L3 | 0~0.100 | |
| H | 0.315 | 0.515 |
| θ | 8° | 12° |

PDFN3*3-8L

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# Revision History

| Date | Version | Content of revision |
|---|---|---|
| 20211104 | V1.0 | Initial |
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