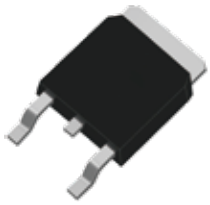
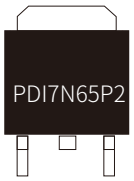
# FEATURES

- Low Gate Charge
- Low ON Resistance
- Improved dv/dt Capability
- 100% Avalanche Tested



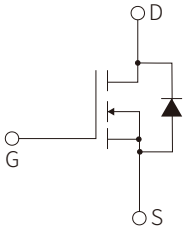
TO-252




Marking

# APPLICATION

- Switching Mode Power Supplies (SMPS)
- PWM Motor Controls
- AC to DC Converters
- LED Lighting
- Adapter




Schematic Symbol

# APPROVALS

| | |
|---|---|
| **RoHS** | Compliance with 2011/65/EU |
| **HF** | Compliance with IEC61249-2-21:2003 |

# ABSOLUTE MAXIMUM RATINGS ($T_A$=25°C )

| Parameter | | Symbol | Value | Unit |
|---|---|---|---|---|
| Drain-Source Voltage | | $V_{DSS}$ | 650 | V |
| Continuous Drain Current | $T_C$=25°C | $I_D$ | 7(1) | A |
| | $T_C$=100°C | | 4.4(1) | A |
| Drain current pulsed (2) | | $I_{DM}$ | 28(1) | A |
| Gate-Source Voltage | | $V_{GS}$ | ±30 | V |
| Single pulsed Avalanche Energy (3) | | $E_{AS}$ | 343 | mJ |
| Peak diode Recovery dv/dt (4) | | dv/dt | 5 | V/ns |
| Total power dissipation (@$T_C$=25°C) | | $P_D$ | 265 | W |
| Derating Factor above 25°C | | $P_D$ | 2.1 | W/°C |
| Operating Junction Temperature & Storage Temperature | | $T_{STG}$, $T_J$ | -55 to +150 | °C |
| Maximum lead temperature for soldering purpose | | $T_L$ | 260 | °C |
| Thermal resistance, Junction to case (Maximum) | | $R_{thjc}$ | 0.47 | °C/W |
| Thermal resistance, Junction to ambient (Maximum) | | $R_{thja}$ | 110 | °C/W |

Notes
1. Drain current is limited by maximum junction temperature.
2. Repetitive rating : pulse width limited by junction temperature.
3 . L = 12mH, $I_{AS}$ = 3A, $V_{DD}$ = 50V, $R_G$=25Ω, Starting at $T_J$ = 25°C
4. $I_{SD}$ ⩽ $I_D$, di/dt = 100A/us, $V_{DD}$ ⩽ $BV_{DSS}$, Starting at $T_J$ =25°C

# ELECTRICAL CHARACTERISTICS ($T_A$=25°C )

| Parameter | Symbol | Test Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| **Off Characteristics** | | | | | | |
| Drain-source Breakdown Voltage | $V_{(BR)DSS}$ | $V_{GS}$=0V, $I_D$=250μA | 650 | | | V |
| Breakdown voltage temperature coefficient | $\Delta BV_{DSS}$ / $\Delta T_J$ | $I_D$=250uA, referenced to25°C | | 0.65 | | V/°C |
| Zero Gate Voltage Drain current | $I_{DSS}$ | $V_{DS}$=650V, $V_{GS}$=0V | | | 1 | μA |
| | | $V_{DS}$=520V, $T_C$=125°C | | | 50 | μA |
| Gate Leakage Current | $I_{GSS}$ | $V_{GS}$=30V ,$V_{DS}$=0V | | | 100 | nA |
| | | $V_{GS}$=-30V ,$V_{DS}$=0V | | | -100 | nA |
| **Off Characteristics** | | | | | | |
| Gate Threshold Voltage | $V_{GS(th)}$ | $V_{DS}$=$V_{GS}$, $I_D$=250μA | 2.5 | 3.5 | 4.5 | V |
| Drain-Source On-Resistance (note2) | $R_{DS(on)}$ | $V_{GS}$=10V, $I_D$=3.5A | | 1.05 | 1.3 | Ω |
| Forward Tran conductance | gFS | $V_{DS}$=30V, $I_D$=3.5A | | 8.5 | | S |
| **Dynamic Characteristics** | | | | | | |
| Input capacitance | $C_{ISS}$ | $V_{DS}$ = 25V, $V_{GS}$ = 0V, f=1MHz | | 1243 | | pF |
| Output capacitance | $C_{OSS}$ | | | 87 | | pF |
| Reverse Transfer capacitance | $C_{rss}$ | | | 6.5 | | pF |
| Turn-on Delay Time | td(on) | $V_{DS}$=320V,$I_D$=7A, $R_G$=25Ω $V_{GS}$=10V | | 21 | | ns |
| Rising time | tf | | | 23 | | ns |
| Turn-off Delay Time | td(off) | | | 70 | | ns |
| Input capacitance | tf | | | 23 | | ns |
| Total gate charge | $Q_g$ | $V_{DS}$=520V,$I_D$=7A,$V_{GS}$=10V | | 26 | | nC |
| Gate-source charge | $Q_{gs}$ | | | 6 | | nC |
| Gate-drain charge | $Q_{gd}$ | | | 8.8 | | nC |
| Gate Resistance | $R_g$ | $V_{DS}$=0V,Scan F mode | | 2.6 | | Ω |
| Continuous source current | $I_S$ | Integral reverse p-n Junction diode in the MOSFET | | | 7 | A |
| Pulsed source current | $I_{SM}$ | | | | 28 | A |
| Diode forward voltage drop. | $V_{SD}$ | $I_S$=7A, $V_{GS}$=0V | | | 13 | V |
| Reverse recovery time | Trr | $I_S$=7A, $V_{GS}$=0V, $dI_F/dt$=100A/us | | 395 | | ns |
| Reverse recovery Charge | Qrr | | | 2.6 | | uC |
| Peak Reverse Recovery Current | Irrm | $I_S$=7A, $dI_F/dt$=100A/us | | 13.5 | | A |

# CHARACTERISTIC CURVES

Fig.1 Output characteristics

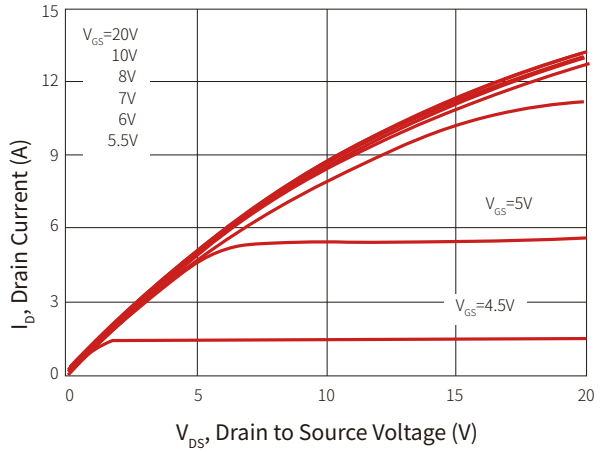



Fig.2 Reverse Characteristics

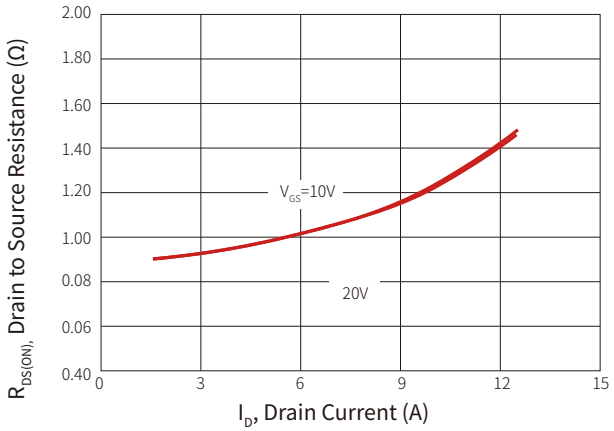



Fig.3 Gate charge characteristics

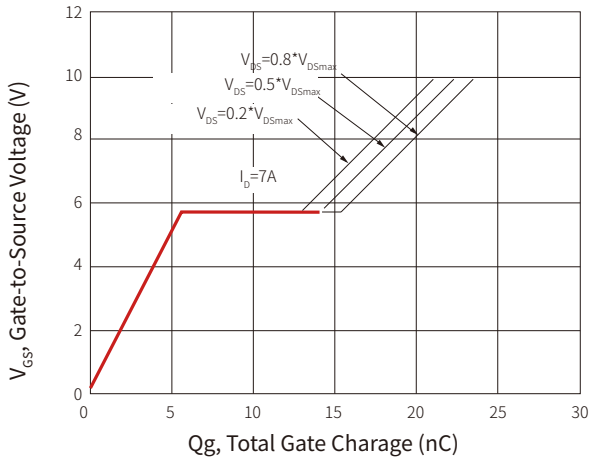



Fig.4 Capacitance Characteristics

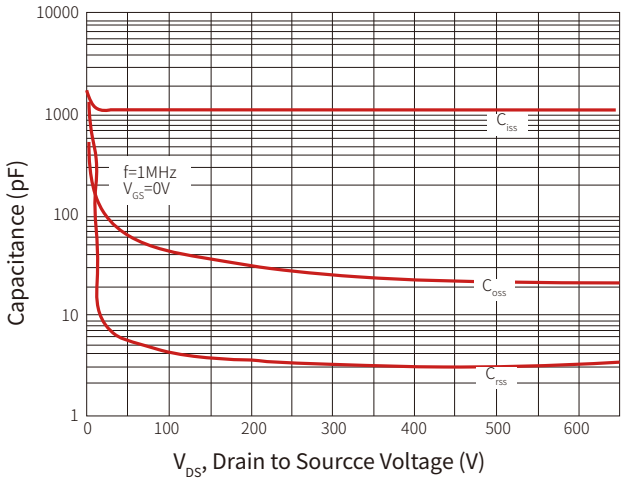


Fig.5 $R_{DS(ON)}$ vs junction temperature

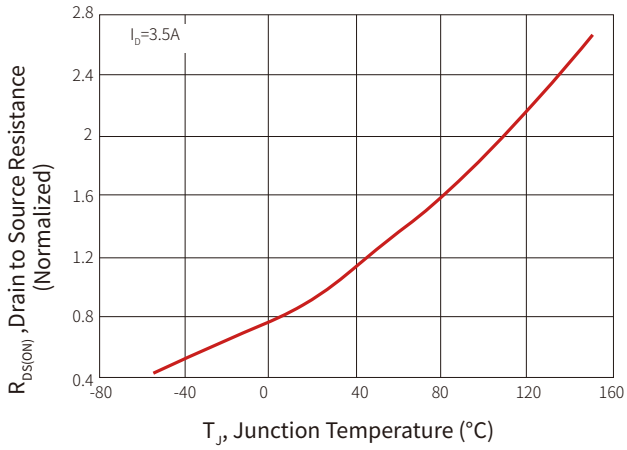



Fig. 6 $BV_{DSS}$ vs junction temperature

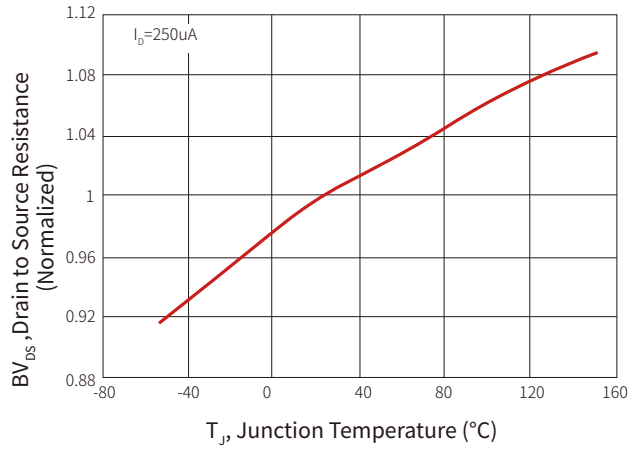



Fig.7 Forward characteristics of reverse diode

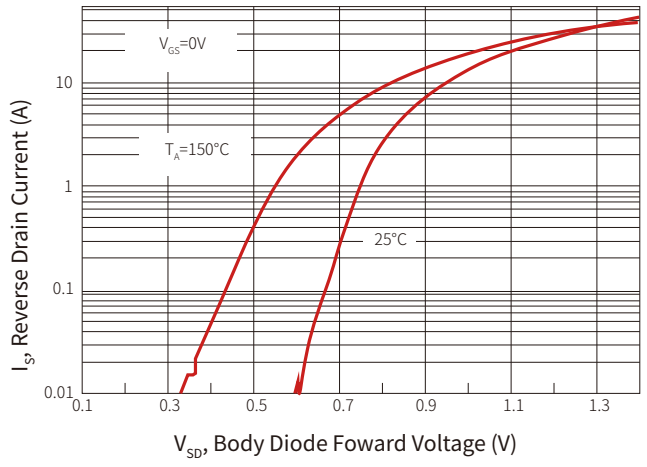



Fig.8 Transfer characteristics

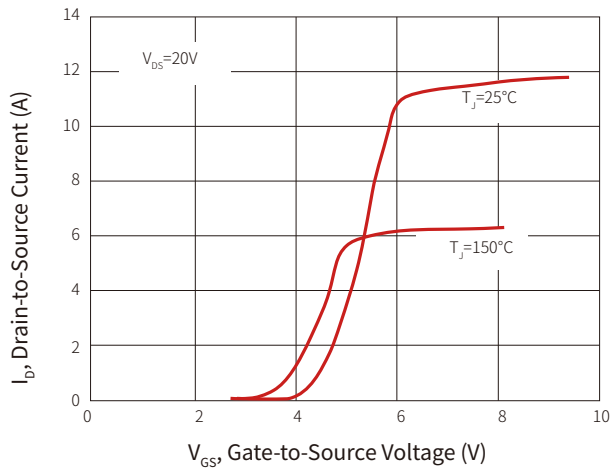


Fig.9 $V_{GS(TH)}$ vs junction temperature

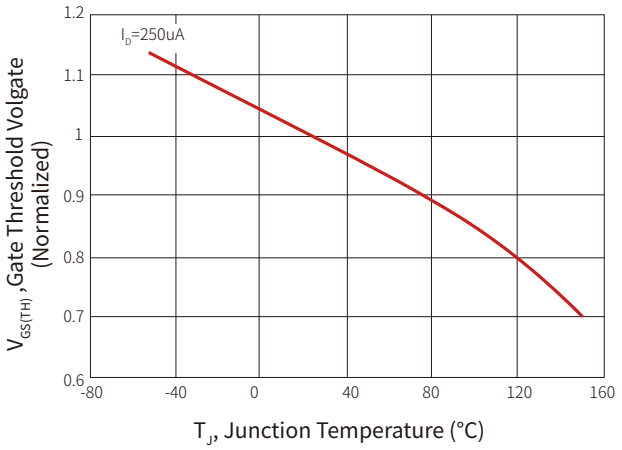



Fig. 10 Safe operating area

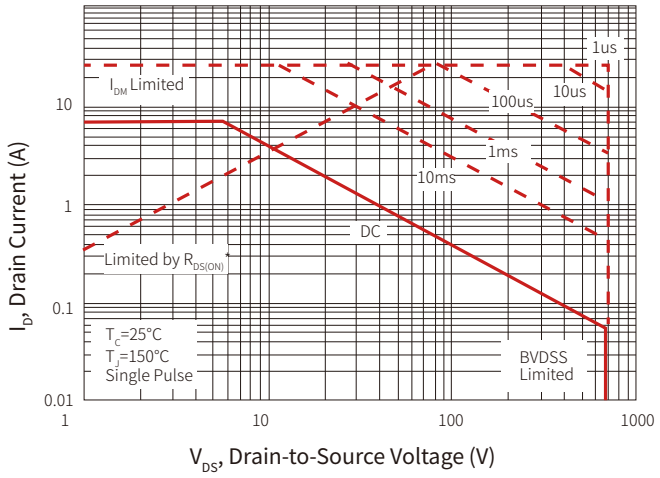



Fig.11 Transient thermal impedance

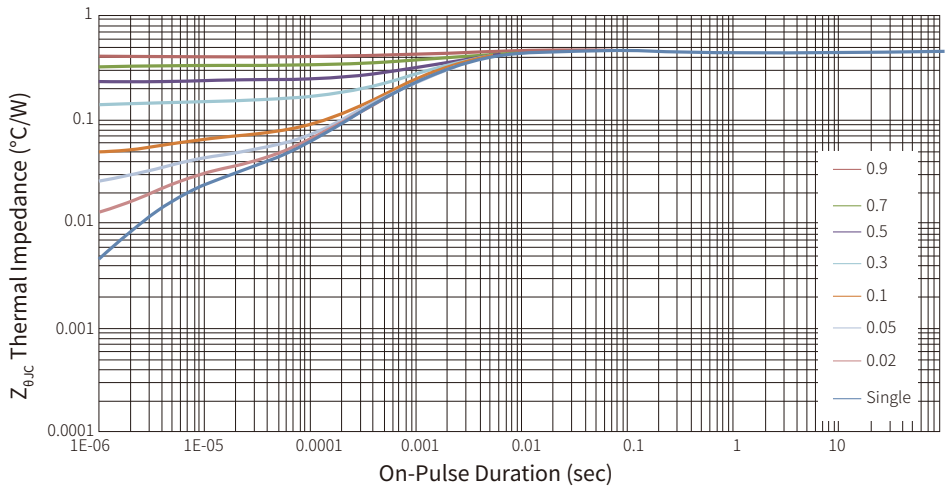


Fig.12 Gate charge test circuit & waveform

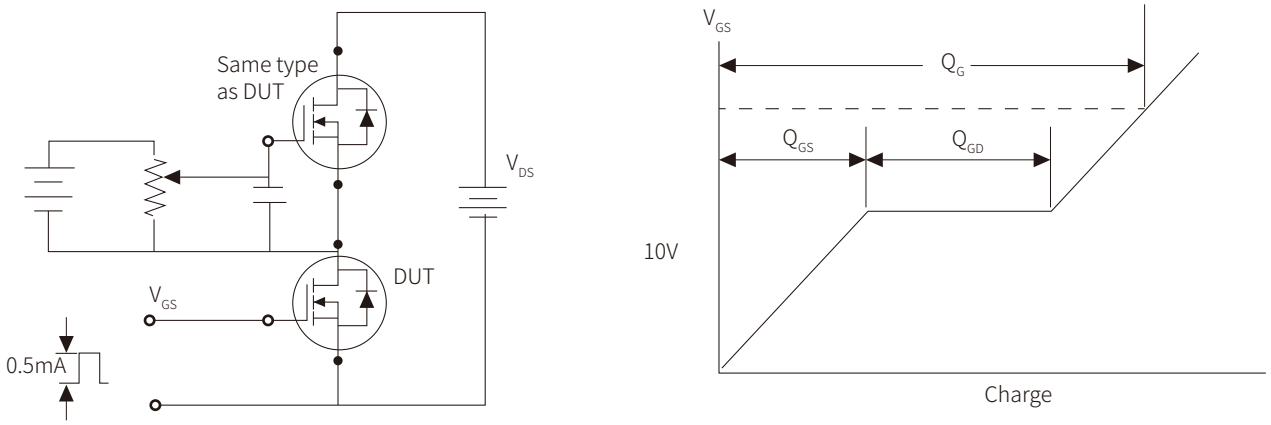



Fig.13 Switching time test circuit & waveform

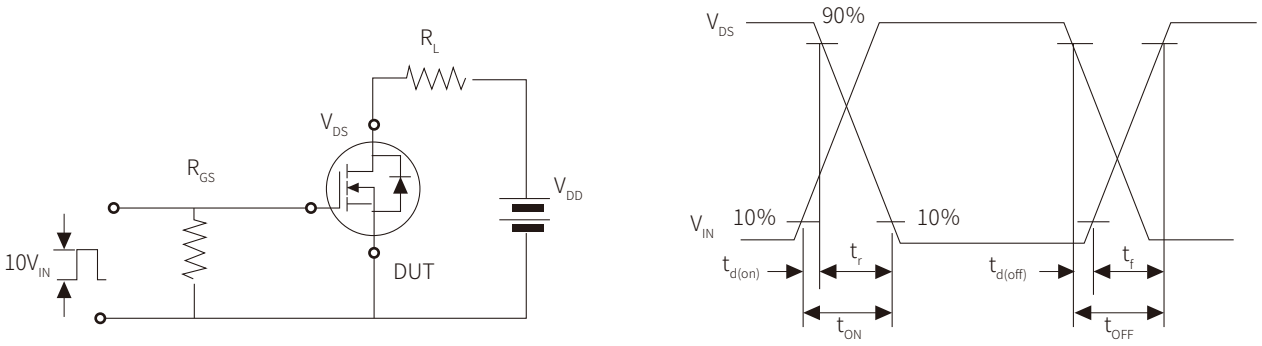


**Fig.14 Unclamped Inductive switching test circuit & waveform**

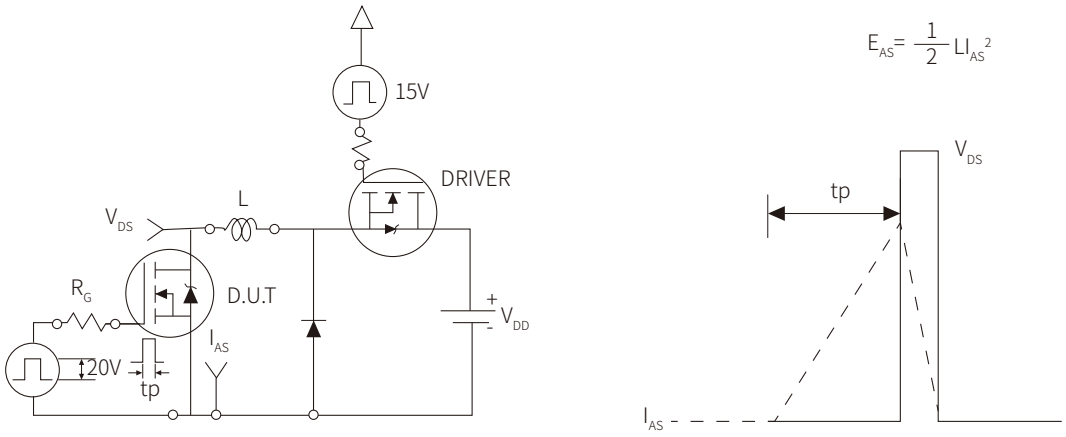
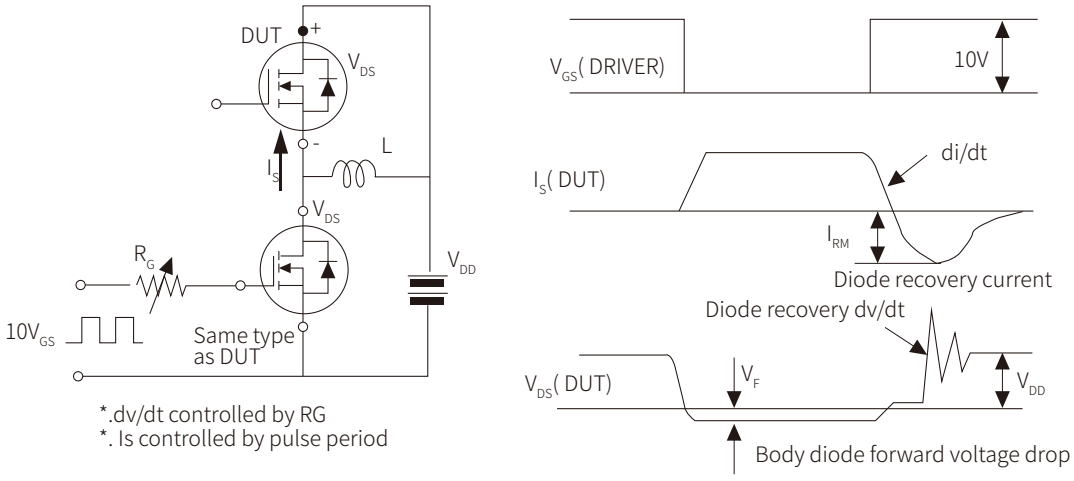
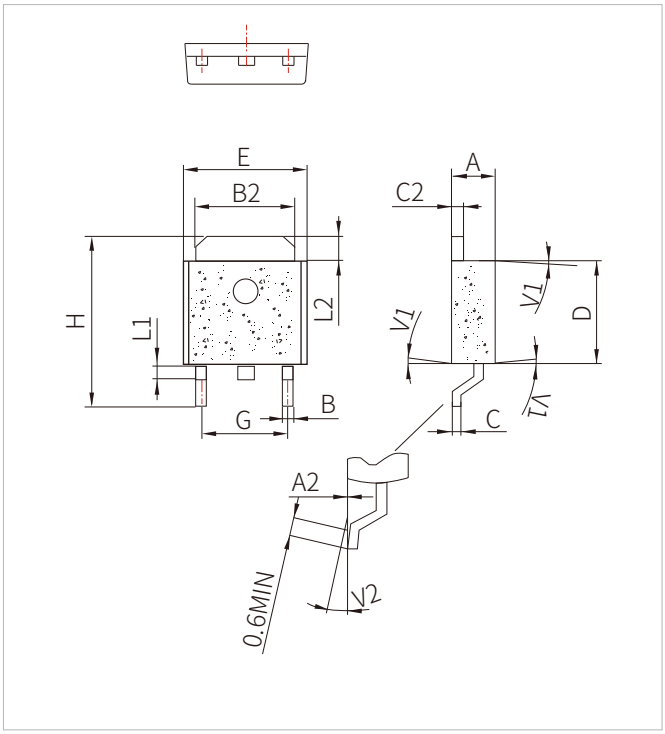



**Fig.15 Peak diode recovery dv/dt test circuit & waveform**



# TO-252 PACKAGE MECHANICAL DATA




| Ref. | Dimensions | | | | | |
|---|---|---|---|---|---|---|
| | Millimeters | | | Inches | | |
| | Min. | Typ. | Max. | Min. | Typ. | Max. |
| A | 2.10 | | 2.50 | 0.083 | | 0.098 |
| A2 | 0.03 | | 0.23 | 0.001 | | 0.009 |
| B | 0.55 | | 0.65 | 0.022 | | 0.026 |
| B2 | 5.10 | | 5.40 | 0.200 | | 0.213 |
| C | 0.45 | | 0.62 | 0.018 | | 0.024 |
| C2 | 0.48 | | 0.62 | 0.019 | | 0.024 |
| D | 6.00 | | 6.20 | 0.236 | | 0.244 |
| E | 6.40 | | 6.80 | 0.252 | | 0.268 |
| G | 4.40 | | 4.70 | 0.173 | 0.1 | 0.185 |
| H | 9.35 | | 10.7 | 0.368 | | 0.421 |
| L1 | 1.30 | | 1.70 | 0.051 | 0.143 | 0.067 |
| L2 | 1.37 | | 1.50 | 0.054 | | 0.059 |
| V1 | | 4° | | | 0.130 | |
| V2 | 0° | | 8° | 0° | | 8° |

# ORDERING INFORMATION

| Part Number | Component Package | QTY/Reel | Reel Size |
|---|---|---|---|
| SNMD7N65 | TO-252 | 5000PCS | 13” |

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