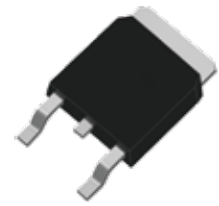


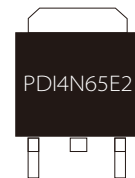
## FEATURES

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


**TO-252**

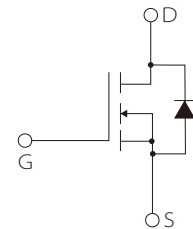
## APPLICATION

- | Switching Mode Power Supplies (SMPS)
- | PWM Motor Controls
- | LED Lighting
- | Adapter


**Marking**

## APPROVALS

|             |                                    |
|-------------|------------------------------------|
| <b>RoHS</b> | Compliance with 2011/65/EU         |
| <b>HF</b>   | Compliance with IEC61249-2-21:2003 |


**Schematic Symbol**

## ABSOLUTE MAXIMUM RATINGS (T<sub>A</sub>=25°C)

| Parameter  | Symbol                            | Value                 | Unit               |
|--|-----------------------------------|-----------------------|--------------------|
| Drain-Source Voltage                                 | V <sub>DSS</sub>                  | 650                   | V                  |
| Continuous Drain Current                             | I <sub>D</sub>                    | T <sub>C</sub> =25°C  | 4 <sup>(1)</sup>   |
|  |                                   | T <sub>C</sub> =100°C | 2.5 <sup>(1)</sup> |
| Drain current pulsed <sup>(2)</sup>                  | I <sub>DM</sub>                   | 16 <sup>(1)</sup>     | A                  |
| Gate-Source Voltage                                  | V <sub>GS</sub>                   | ±30                   | V                  |
| Single pulsed Avalanche Energy <sup>(3)</sup>        | E <sub>AS</sub>                   | 54                    | mJ                 |
| Peak diode Recovery dv/dt <sup>(4)</sup>             | dv/dt                             | 5                     | V/ns               |
| Total power dissipation (@T <sub>C</sub> =25°C)      | P <sub>D</sub>                    | 173                   | W                  |
| Derating Factor above 25°C                           | P <sub>D</sub>                    | 1.38                  | W/°C               |
| Operating Junction Temperature & Storage Temperature | T <sub>STG</sub> , T <sub>J</sub> | -55 to +150           | °C                 |
| Maximum lead temperature for soldering purpose       | T <sub>L</sub>                    | 260                   | °C                 |
| Thermal resistance, Junction to case (Maximum)       | R <sub>thjc</sub>                 | 0.72                  | °C/W               |
| Thermal resistance, Junction to ambient (Maximum)    | R <sub>thja</sub>                 | 100                   | °C/W               |

**Notes**

1. Drain current is limited by maximum junction temperature.  
 3. L = 12mH, I<sub>AS</sub> = 3A, V<sub>DD</sub> = 50V, R<sub>G</sub>=25Ω, Starting at T<sub>J</sub> = 25°C

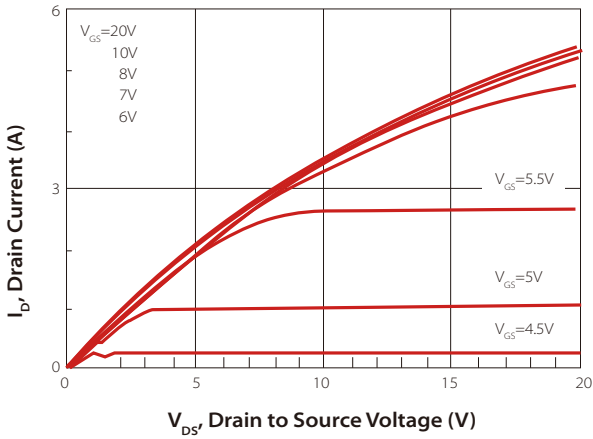
2. Repetitive rating : pulse width limited by junction temperature.  
 4. I<sub>SD</sub> ≤ I<sub>D</sub>, di/dt = 100A/us, V<sub>DD</sub> ≤ BV<sub>DSS</sub>, Starting at T<sub>J</sub> = 25°C

## ELECTRICAL CHARACTERISTICS (T<sub>A</sub>=25°C)

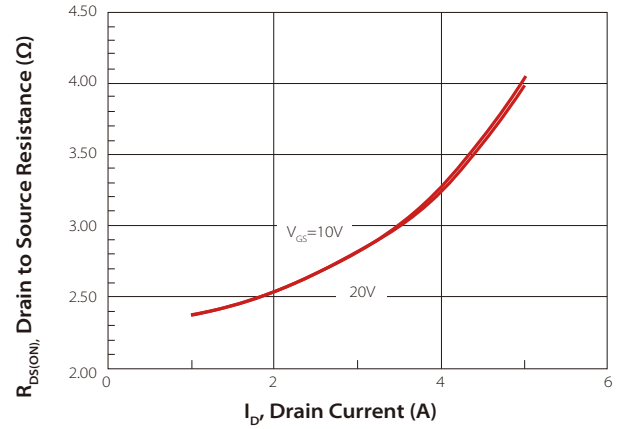
| Parameter                                 | Symbol                               | Test Conditions  | Min. | Typ. | Max. | Unit |
|---|--------------------------------------|--|------|------|------|------|
| <b>Off Characteristics</b>                |                                      |  |      |      |      |      |
| Drain-source Breakdown Voltage            | V <sub>(BR)DSS</sub>                 | V <sub>GS</sub> =0V, I <sub>D</sub> =250μA   | 650  |      |      | V    |
| Breakdown voltage temperature coefficient | ΔBV <sub>DSS</sub> / ΔT <sub>J</sub> | I <sub>D</sub> =250uA, referenced to 25°C  |      | 0.7  |      | V/°C |
| Zero Gate Voltage Drain current           | I <sub>DSS</sub>                     | V <sub>DS</sub> =650V, V <sub>GS</sub> =0V   |      |      | 1    | uA   |
|   |                                      | V <sub>DS</sub> =520V, T <sub>C</sub> =125°C   |      |      | 10   | uA   |
| Gate Leakage Current                      | I <sub>GSS</sub>                     | V <sub>GS</sub> =30V, V <sub>DS</sub> =0V  |      |      | 100  | nA   |
|   |                                      | V <sub>GS</sub> =-30V, V <sub>DS</sub> =0V   |      |      | -100 | nA   |
| <b>Off Characteristics</b>                |                                      |  |      |      |      |      |
| Gate Threshold Voltage                    | V <sub>GS(th)</sub>                  | V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250μA                               | 2.5  | 3.5  | 4.5  | V    |
| Drain-Source On-Resistance (note2)        | R <sub>DS(on)</sub>                  | V <sub>GS</sub> =10V, I <sub>D</sub> =2A   |      | 2.5  | 3.0  | Ω    |
| Forward Tran conductance                  | gFS                                  | V <sub>DS</sub> =10V, I <sub>D</sub> =2A   |      | 3    |      | S    |
| <b>Dynamic Characteristics</b>            |                                      |  |      |      |      |      |
| Input capacitance                         | C <sub>ISS</sub>                     | V <sub>DS</sub> = 25V, V <sub>GS</sub> = 0V, f=1MHz                                    |      | 506  |      | pF   |
| Output capacitance                        | C <sub>OSS</sub>                     |  |      | 42.5 |      | pF   |
| Reverse Transfer capacitance              | C <sub>rss</sub>                     |  |      | 3.5  |      | pF   |
| Turn-on Delay Time                        | td(on)                               | V <sub>DS</sub> =325V, I <sub>D</sub> =4A, R <sub>G</sub> =25Ω<br>V <sub>GS</sub> =10V |      | 19.3 |      | ns   |
| Rising time                               | tf                                   |  |      | 12   |      | ns   |
| Turn-off Delay Time                       | td(off)                              |  |      | 35.3 |      | ns   |
| Input capacitance                         | tf                                   |  |      | 13   |      | ns   |
| Total gate charge                         | Q <sub>g</sub>                       | V <sub>DS</sub> =325V, I <sub>D</sub> =4A, V <sub>GS</sub> =10V                        |      | 11.2 |      | nC   |
| Gate-source charge                        | Q <sub>gs</sub>                      |  |      | 2.7  |      | nC   |
| Gate-drain charge                         | Q <sub>gd</sub>                      |  |      | 4.3  |      | nC   |
| Continuous source current                 | I <sub>S</sub>                       | Integral reverse p-n Junction diode in the MOSFET                                      |      |      | 4    | A    |
| Pulsed source current                     | I <sub>SM</sub>                      |  |      |      | 16   | A    |
| Diode forward voltage drop.               | V <sub>SD</sub>                      | I <sub>S</sub> =4A, V <sub>GS</sub> =0V  |      | 0.9  | 1.3  | V    |
| Reverse recovery time                     | T <sub>rr</sub>                      | I <sub>S</sub> =4A, V <sub>GS</sub> =0V,<br>di <sub>F</sub> /dt=100A/us                |      | 335  |      | ns   |
| Reverse recovery Charge                   | Q <sub>rr</sub>                      |  |      |      | 1.84 |      |

# CHARACTERISTIC CURVES

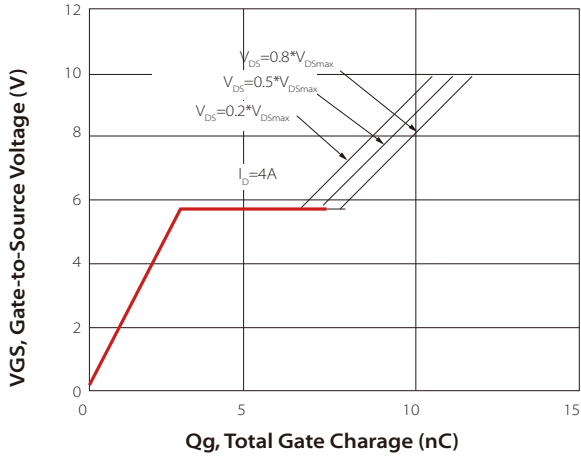
**Fig.1 Output characteristics**



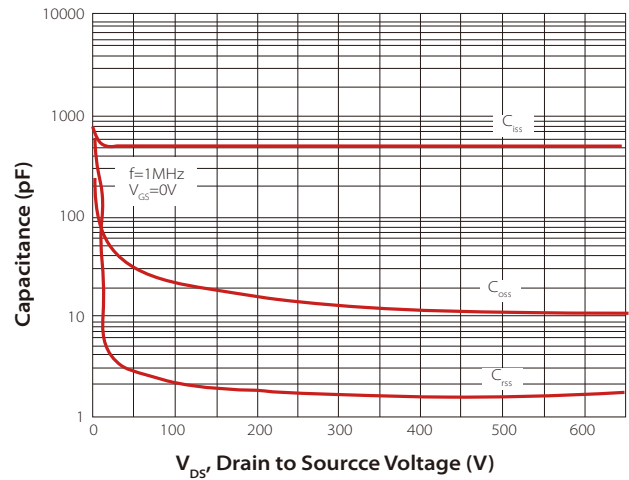
**Fig.2 Reverse Characteristics**



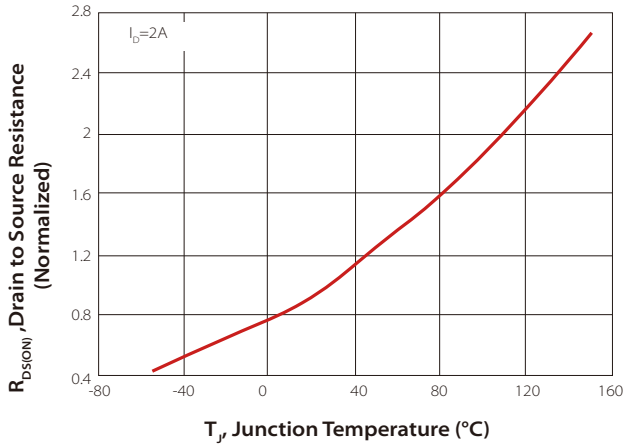
**Fig.3 Gate charge characteristics**



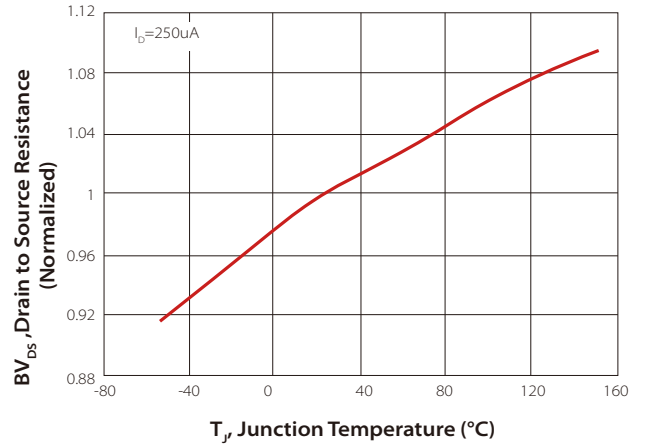
**Fig.4 Capacitance Characteristics**



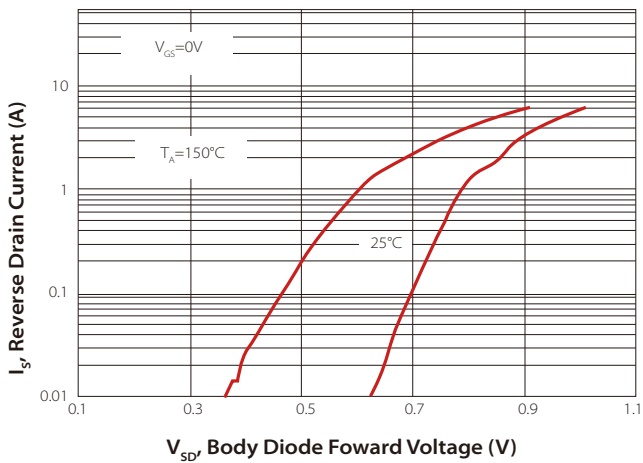
**Fig.5  $R_{DS(ON)}$  vs junction temperature**



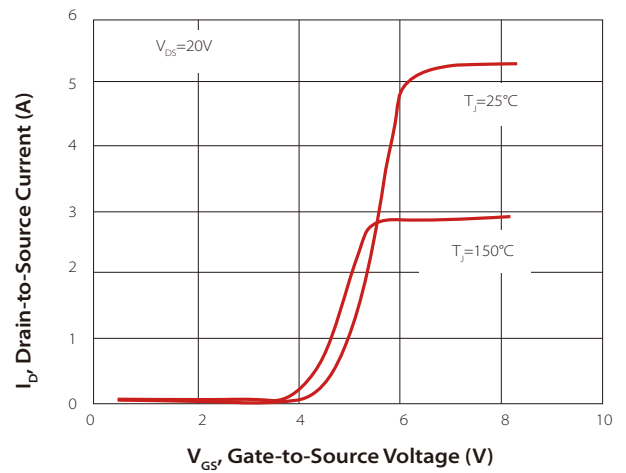
**Fig. 6  $BV_{DSS}$  vs junction temperature**



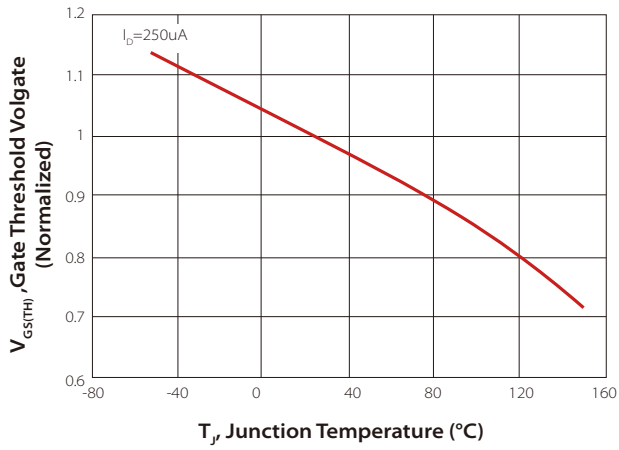
**Fig.7 Forward characteristics of reverse diode**



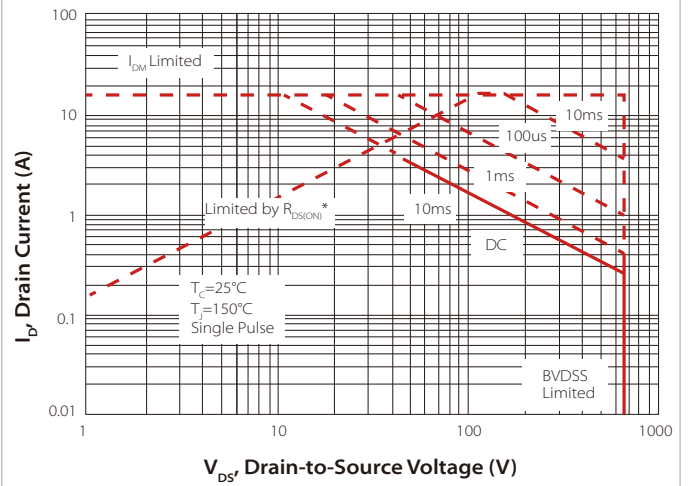
**Fig.8 Transfer characteristics**



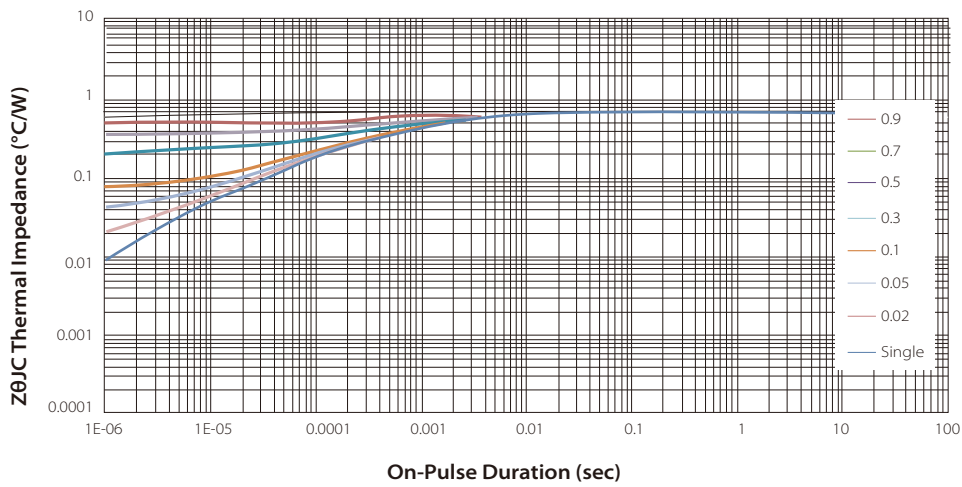
**Fig.9  $V_{GS(TH)}$  vs junction temperature**



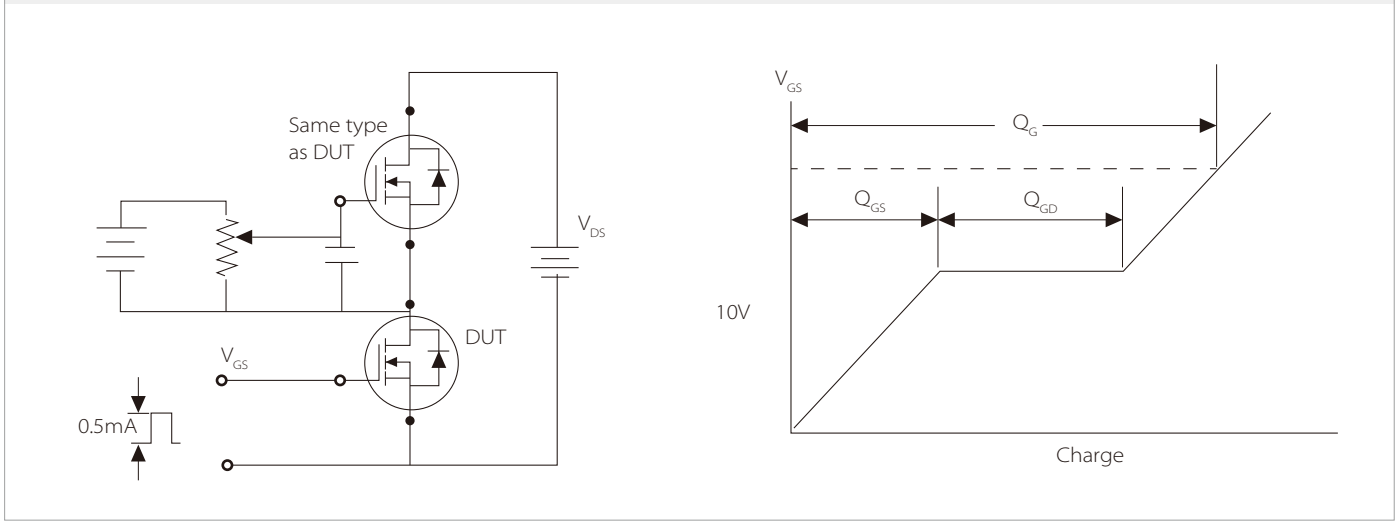
**Fig. 10 Safe operating area**



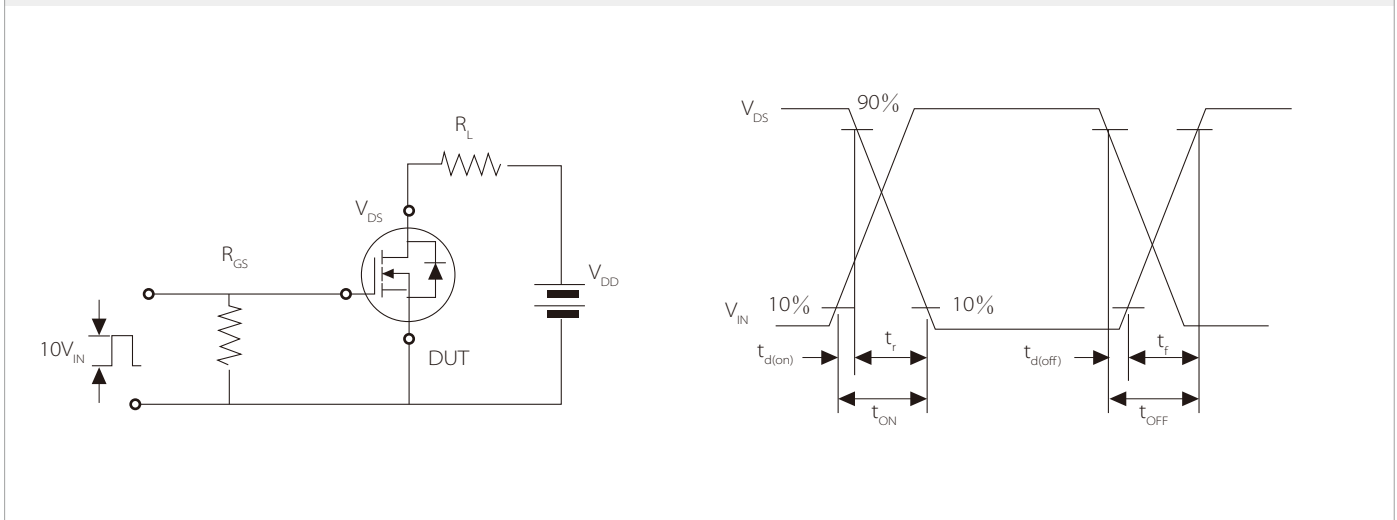
**Fig.11 Transient thermal impedance**



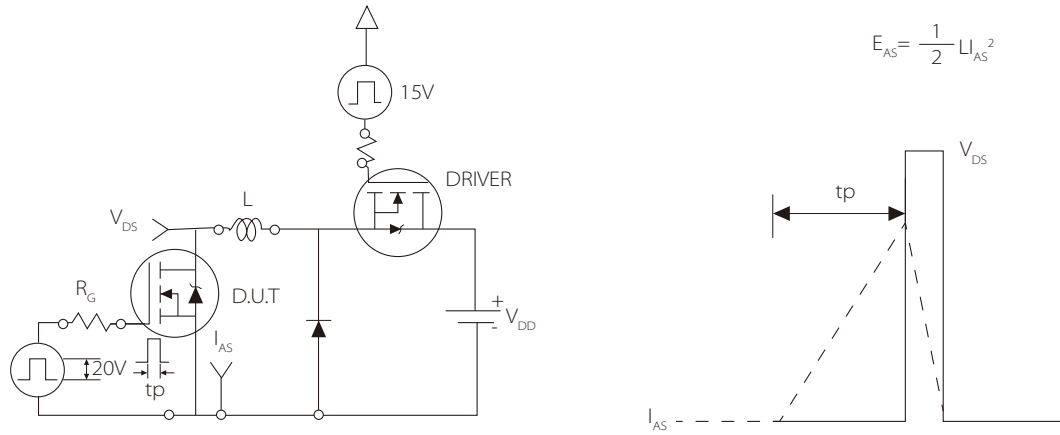
**Fig.12 Gate charge test circuit & waveform**



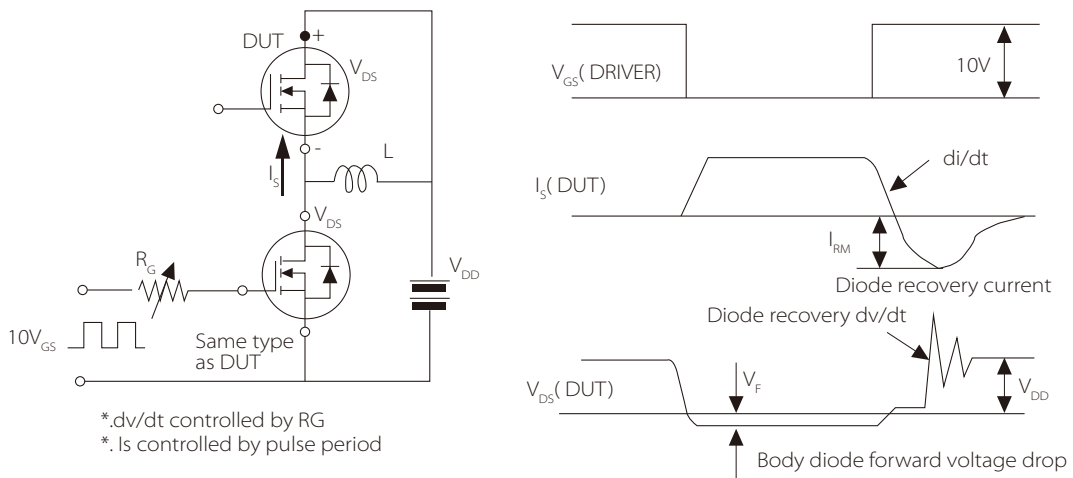
**Fig.13 Switching time test circuit & waveform**



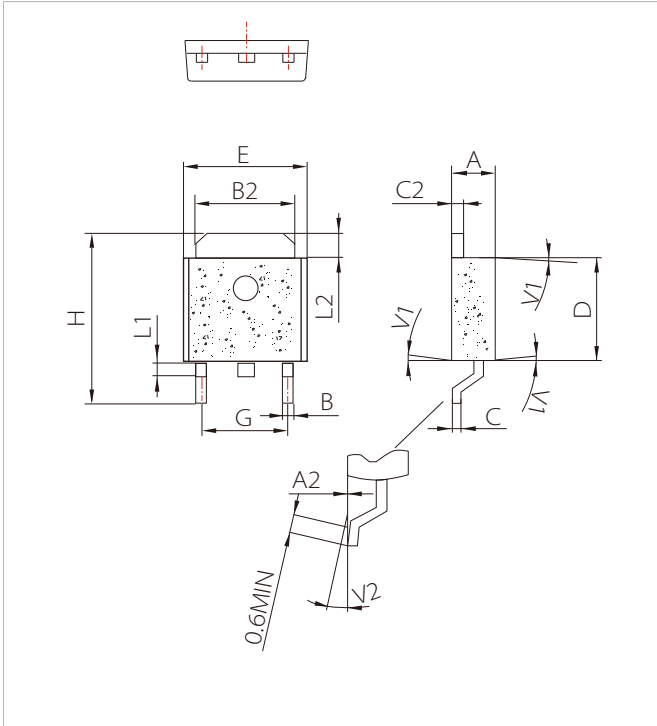
**Fig.14 Unclamped Inductive switching test circuit & waveform**



**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    | 2.20        |      | 2.40 | 0.086  |       | 0.095 |
| 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        |      | 6.70 | 0.252  |       | 0.264 |
| G    | 4.40        |      | 4.70 | 0.173  | 0.1   | 0.185 |
| H    | 9.35        |      | 10.6 | 0.368  |       | 0.417 |
| L1   | 1.30        |      | 1.70 | 0.051  | 0.143 | 0.067 |
| L2   | 1.37        |      | 1.50 | 0.054  |       | 0.059 |
| L1   |             | 4°   |      |        | 0.130 |       |
| V2   | 0°          |      | 8°   | 0°     |       | 8°    |

## ORDERING INFORMATION

| Part Number | Component Package | QTY/Reel | Reel Size |
|-------------|-------------------|----------|-----------|
| SNMD4N65    | TO-252            | 5000PCS  | 13"       |



**Headquarters**

No.3387 Shendu Road Pujiang  
I&E Park  
Minhang Shanghai China  
201000

**Hotline**

400-021-5756

**Web**

<https://www.semiware.com>

**Sales Center**

Tel: 86-21-3463-7458  
Email: [sales18@semiware.com](mailto:sales18@semiware.com)

**Customer Service**

Tel: 86-21-5484-1001  
Email: [sales17@semiware.com](mailto:sales17@semiware.com)

**Technical Support**

Tel: 86-21-3463-7654  
Email: [fae01@semiware.com](mailto:fae01@semiware.com)

**Complaint & Suggestions**

Tel: 86-21-3463-7172  
Ext: 8868  
Email: [cs03@semiware.com](mailto:cs03@semiware.com)

**By QR Code**

Website



Wechat

To find your local partner within Semiware's global network: [www.semiware.com](http://www.semiware.com)

© 2022 Semiware Semiconductor Inc.

The content of this document has been carefully checked and understood. However, neither Semiware nor its subsidiaries assume any liability whatsoever for any errors or inaccuracies of this document and the consequences thereof. Published specifications are subject to change without notice. Product suitability for any area of application must ultimately be determined by the customer. In all cases, products must never be operated outside their published specifications. Semiware does not guarantee the availability of all published products. This disclaimer shall be governed by substantive Swiss law and resulting disputes shall be settled by the courts at the place of business of Semiware. Latest publications and a complete disclaimer can be downloaded from the Semiware website. All trademarks recognized.