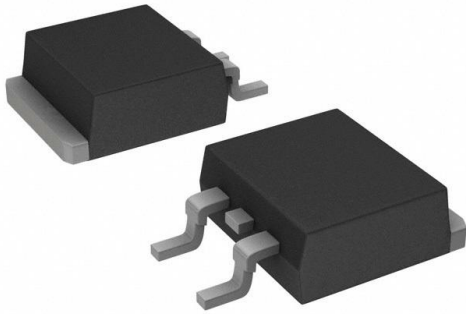


# FDB390N15A Datasheet

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<https://www.DiGi-Electronics.com>

|                              |   |
|------------------------------|---|
| DiGi Electronics Part Number | FDB390N15A-DG   |
| Manufacturer                 | <a href="#">onsemi</a>  |
| Manufacturer Product Number  | FDB390N15A  |
| Description                  | MOSFET N-CH 150V 27A D2PAK                                      |
| Detailed Description         | N-Channel 150 V 27A (Tc) 75W (Tc) Surface Mount T O-263 (D2PAK) |



Tel: +00 852-30501935

RFQ Email: [Info@DiGi-Electronics.com](mailto:Info@DiGi-Electronics.com)

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## Purchase and inquiry

Manufacturer Product Number:

FDB390N15A

Series:

PowerTrench®

FET Type:

N-Channel

Drain to Source Voltage (Vdss):

150 V

Drive Voltage (Max Rds On, Min Rds On):

10V

Vgs(th) (Max) @ Id:

4V @ 250µA

Vgs (Max):

±20V

FET Feature:

-

Operating Temperature:

-55°C ~ 175°C (Tj)

Supplier Device Package:

TO-263 (D2PAK)

Base Product Number:

FDB390

Manufacturer:

onsemi

Product Status:

Active

Technology:

MOSFET (Metal Oxide)

Current - Continuous Drain (Id) @ 25°C:

27A (Tc)

Rds On (Max) @ Id, Vgs:

39mOhm @ 27A, 10V

Gate Charge (Qg) (Max) @ Vgs:

18.6 nC @ 10 V

Input Capacitance (Ciss) (Max) @ Vds:

1285 pF @ 75 V

Power Dissipation (Max):

75W (Tc)

Mounting Type:

Surface Mount

Package / Case:

TO-263-3, D2PAK (2 Leads + Tab), TO-263AB

## Environmental & Export classification

RoHS Status:

ROHS3 Compliant

REACH Status:

REACH Unaffected

HTSUS:

8541.29.0095

Moisture Sensitivity Level (MSL):

1 (Unlimited)

ECCN:

EAR99





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April 2015

# FDB390N15A

## N-Channel PowerTrench<sup>®</sup> MOSFET

150 V, 27 A, 39 mΩ

### Features

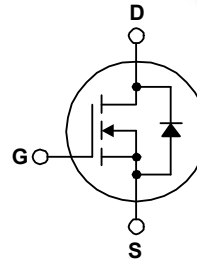
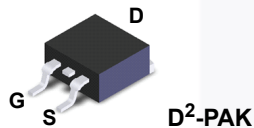
- $R_{DS(on)} = 33.5 \text{ m}\Omega$  (Typ.) @  $V_{GS} = 10 \text{ V}$ ,  $I_D = 27 \text{ A}$
- Fast Switching Speed
- Low Gate Charge,  $Q_G = 14.3 \text{ nC}$  (Typ.)
- High Performance Trench Technology for Extremely Low  $R_{DS(on)}$
- High Power and Current Handling Capability
- RoHS Compliant

### Description

This N-Channel MOSFET is produced using Fairchild Semiconductor's advanced PowerTrench<sup>®</sup> process that has been tailored to minimize the on-state resistance while maintaining superior switching performance.

### Applications

- Consumer Appliances
- LED TV
- Synchronous Rectification
- Uninterruptible Power Supply
- Micro Solar Inverter



### Absolute Maximum Ratings $T_C = 25^\circ\text{C}$ unless otherwise noted.

| Symbol         | Parameter   | FDB390N15A  | Unit             |
|----------------|---|---|------------------|
| $V_{DSS}$      | Drain to Source Voltage   | 150   | V                |
| $V_{GSS}$      | Gate to Source Voltage  | - DC  | $\pm 20$         |
|                |   | - AC (f > 1 Hz)   | $\pm 30$         |
| $I_D$          | Drain Current   | - Continuous ( $T_C = 25^\circ\text{C}$ , Silicon Limited)  | 27               |
|                |   | - Continuous ( $T_C = 100^\circ\text{C}$ , Silicon Limited) | 19               |
| $I_{DM}$       | Drain Current   | - Pulsed (Note 1)   | 108              |
| $E_{AS}$       | Single Pulsed Avalanche Energy  | (Note 2)  | 78               |
| dv/dt          | Peak Diode Recovery dv/dt   | (Note 3)  | 6.0              |
| $P_D$          | Power Dissipation   | ( $T_C = 25^\circ\text{C}$ )                                | 75               |
|                |   | - Derate Above $25^\circ\text{C}$                           | 0.5              |
| $T_J, T_{STG}$ | Operating and Storage Temperature Range                               | -55 to +175   | $^\circ\text{C}$ |
| $T_L$          | Maximum Lead Temperature for Soldering, 1/8" from Case for 5 Seconds. | 300   | $^\circ\text{C}$ |

### Thermal Characteristics

| Symbol          | Parameter  | FDB390N15A | Unit                      |
|-----------------|--|------------|---------------------------|
| $R_{\theta JC}$ | Thermal Resistance, Junction to Case, Max.   | 2.0        | $^\circ\text{C}/\text{W}$ |
| $R_{\theta JA}$ | Thermal Resistance, Junction to Ambient (Minimum Pad of 2-oz Copper), Max.           | 62.5       |                           |
|                 | Thermal Resistance, Junction to Ambient (1 in <sup>2</sup> Pad of 2-oz Copper), Max. | 40         |                           |

## Package Marking and Ordering Information

| Part Number | Top Mark   | Package             | Packing Method | Reel Size | Tape Width | Quantity  |
|-------------|------------|---------------------|----------------|-----------|------------|-----------|
| FDB390N15A  | FDB390N15A | D <sup>2</sup> -PAK | Tape and Reel  | 330 mm    | 24 mm      | 800 units |

## Electrical Characteristics $T_C = 25^\circ\text{C}$ unless otherwise noted.

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|--------|-----------|-----------------|------|------|------|------|
|--------|-----------|-----------------|------|------|------|------|

### Off Characteristics

|                                |   |  |     |     |           |                     |
|--------------------------------|---|--|-----|-----|-----------|---------------------|
| $BV_{DSS}$                     | Drain to Source Breakdown Voltage         | $I_D = 250 \mu\text{A}, V_{GS} = 0 \text{ V}$              | 150 | -   | -         | V                   |
| $\Delta BV_{DSS} / \Delta T_J$ | Breakdown Voltage Temperature Coefficient | $I_D = 250 \mu\text{A}$ , Referenced to $25^\circ\text{C}$ | -   | 0.1 | -         | V/ $^\circ\text{C}$ |
| $I_{DSS}$                      | Zero Gate Voltage Drain Current           | $V_{DS} = 120 \text{ V}, V_{GS} = 0 \text{ V}$             | -   | -   | 1         | $\mu\text{A}$       |
|                                |   | $V_{DS} = 120 \text{ V}, T_C = 150^\circ\text{C}$          | -   | -   | 500       | $\mu\text{A}$       |
| $I_{GSS}$                      | Gate to Body Leakage Current              | $V_{GS} = \pm 20 \text{ V}, V_{DS} = 0 \text{ V}$          | -   | -   | $\pm 100$ | nA                  |

### On Characteristics

|              |                                      |   |     |      |      |            |
|--------------|--------------------------------------|---|-----|------|------|------------|
| $V_{GS(th)}$ | Gate Threshold Voltage               | $V_{GS} = V_{DS}, I_D = 250 \mu\text{A}$    | 2.0 | -    | 4.0  | V          |
| $R_{DS(on)}$ | Static Drain to Source On Resistance | $V_{GS} = 10 \text{ V}, I_D = 27 \text{ A}$ | -   | 33.5 | 39.0 | m $\Omega$ |
| $g_{FS}$     | Forward Transconductance             | $V_{DS} = 10 \text{ V}, I_D = 27 \text{ A}$ | -   | 33   | -    | S          |

### Dynamic Characteristics

|               |                                    |   |          |      |      |          |
|---------------|------------------------------------|---|----------|------|------|----------|
| $C_{iss}$     | Input Capacitance                  | $V_{DS} = 75 \text{ V}, V_{GS} = 0 \text{ V},$<br>$f = 1 \text{ MHz}$   | -        | 965  | 1285 | pF       |
| $C_{oss}$     | Output Capacitance                 |   | -        | 96   | 130  | pF       |
| $C_{rss}$     | Reverse Transfer Capacitance       |   | -        | 5.8  | -    | pF       |
| $C_{oss(er)}$ | Energy Related Output Capacitance  | $V_{DS} = 75 \text{ V}, I_D = 27 \text{ A}$                             | -        | 169  | -    | pF       |
| $Q_{g(tot)}$  | Total Gate Charge at 10V           | $V_{DS} = 75 \text{ V}, I_D = 27 \text{ A},$<br>$V_{GS} = 10 \text{ V}$ | -        | 14.3 | 18.6 | nC       |
| $Q_{gs}$      | Gate to Source Gate Charge         |   | -        | 5.0  | -    | nC       |
| $Q_{gs2}$     | Gate Charge Threshold to Plateau   |   | -        | 2.0  | -    | nC       |
| $Q_{gd}$      | Gate to Drain "Miller" Charge      |   | (Note 4) | -    | 3.5  | -        |
| ESR           | Equivalent Series Resistance (G-S) | $f = 1 \text{ MHz}$   | -        | 1.4  | -    | $\Omega$ |

### Switching Characteristics

|              |                     |   |          |    |    |    |
|--------------|---------------------|---|----------|----|----|----|
| $t_{d(on)}$  | Turn-On Delay Time  | $V_{DD} = 75 \text{ V}, I_D = 27 \text{ A},$<br>$V_{GS} = 10 \text{ V}, R_G = 4.7 \Omega$ | -        | 14 | 38 | ns |
| $t_r$        | Turn-On Rise Time   |   | -        | 10 | 30 | ns |
| $t_{d(off)}$ | Turn-Off Delay Time |   | -        | 20 | 50 | ns |
| $t_f$        | Turn-Off Fall Time  |   | (Note 4) | -  | 5  | 20 |

### Drain-Source Diode Characteristics

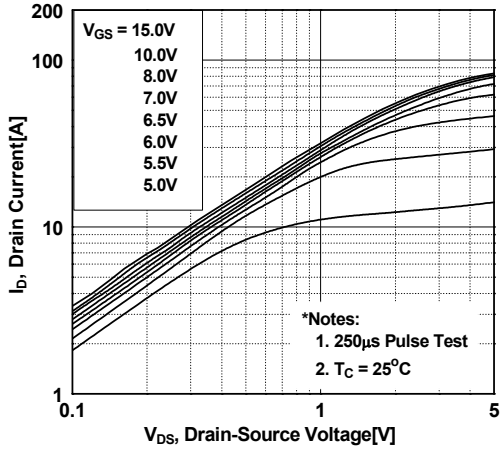
|          |  |  |   |     |      |    |
|----------|--|--|---|-----|------|----|
| $I_S$    | Maximum Continuous Drain to Source Diode Forward Current | -  | - | 27  | A    |    |
| $I_{SM}$ | Maximum Pulsed Drain to Source Diode Forward Current     | -  | - | 108 | A    |    |
| $V_{SD}$ | Drain to Source Diode Forward Voltage                    | $V_{GS} = 0 \text{ V}, I_{SD} = 27 \text{ A}$  | - | -   | 1.25 | V  |
| $t_{rr}$ | Reverse Recovery Time                                    | $V_{GS} = 0 \text{ V}, I_{SD} = 27 \text{ A}, V_{DD} = 75 \text{ V},$<br>$di_F/dt = 100 \text{ A}/\mu\text{s}$ | - | 63  | -    | ns |
| $Q_{rr}$ | Reverse Recovery Charge                                  |  | - | 131 | -    | nC |

#### Notes:

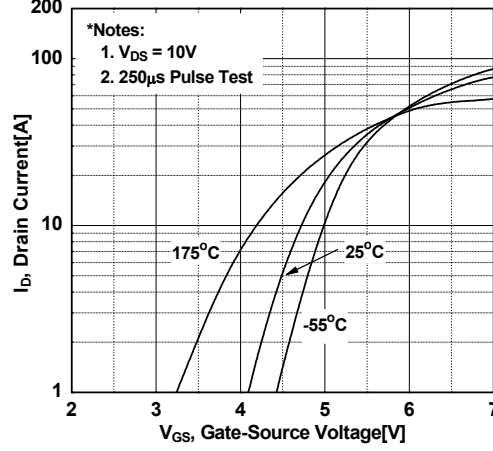
1. Repetitive rating: pulse-width limited by maximum junction temperature.
2. Starting  $T_J = 25^\circ\text{C}$ ,  $L = 3 \text{ mH}$ ,  $I_{SD} = 7.2 \text{ A}$ .
3.  $I_{SD} \leq 27 \text{ A}$ ,  $di/dt \leq 200 \text{ A}/\mu\text{s}$ ,  $V_{DD} \leq BV_{DSS}$ , starting  $T_J = 25^\circ\text{C}$ .
4. Essentially independent of operating temperature typical characteristics.

## Typical Performance Characteristics

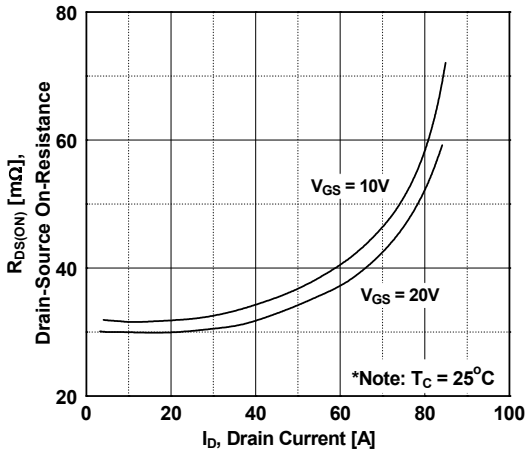
**Figure 1. On-Region Characteristics**



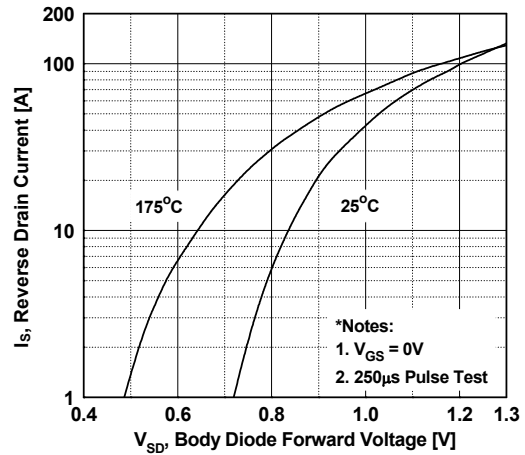
**Figure 2. Transfer Characteristics**



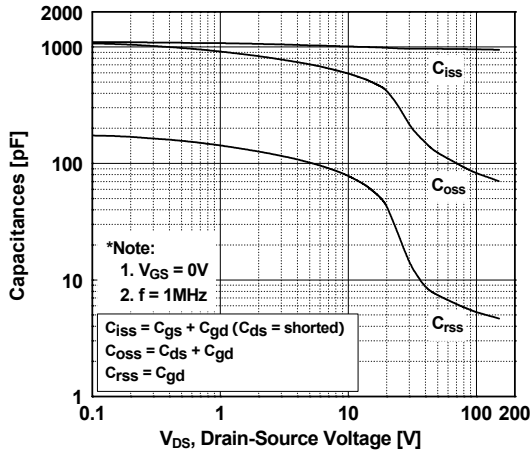
**Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage**



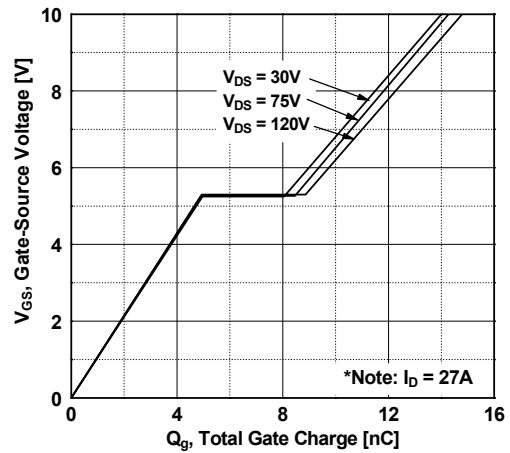
**Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature**



**Figure 5. Capacitance Characteristics**



**Figure 6. Gate Charge Characteristics**



Typical Performance Characteristics (Continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

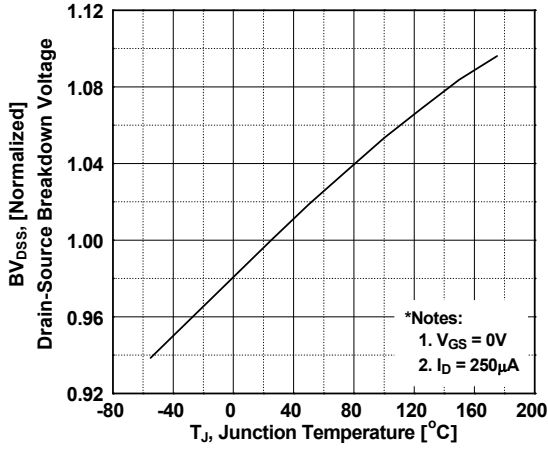


Figure 8. On-Resistance Variation vs. Temperature

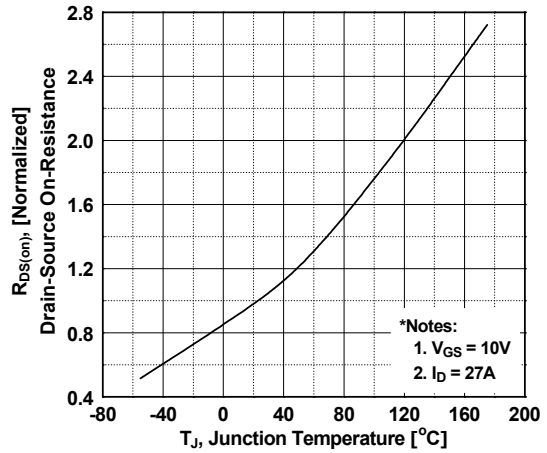


Figure 9. Maximum Safe Operating Area

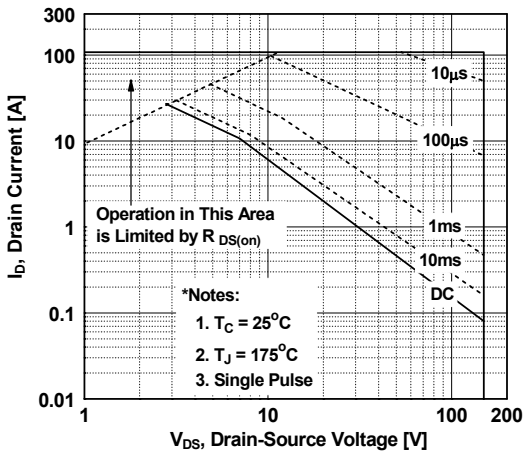


Figure 10. Maximum Drain Current vs. Case Temperature

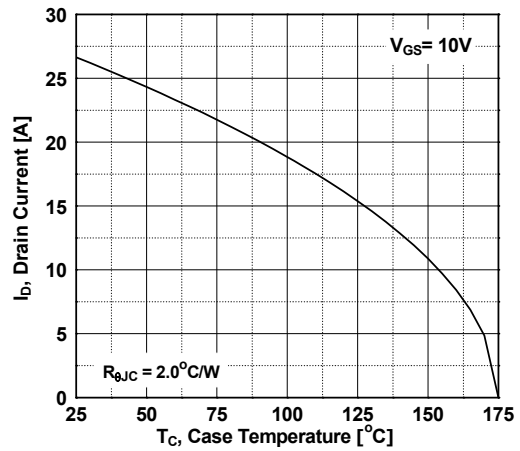


Figure 11. E\_oss vs. Drain to Source Voltage

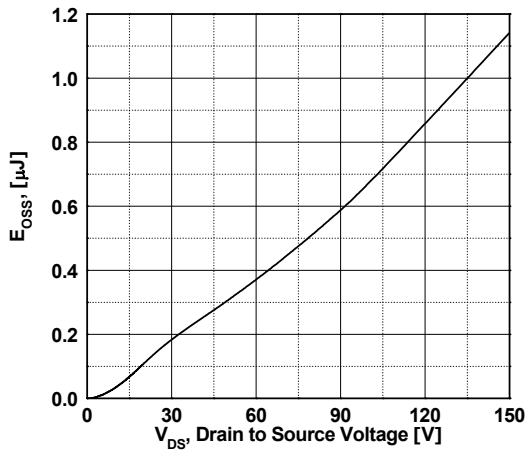
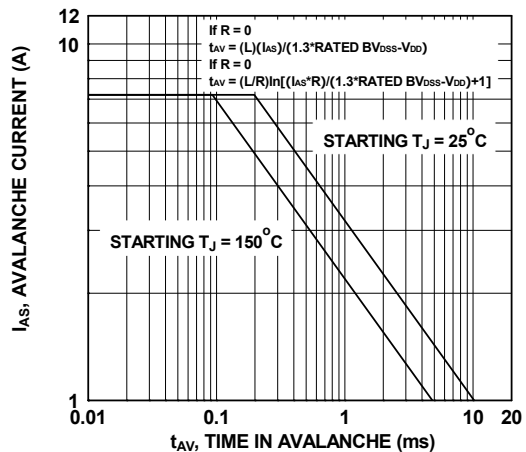
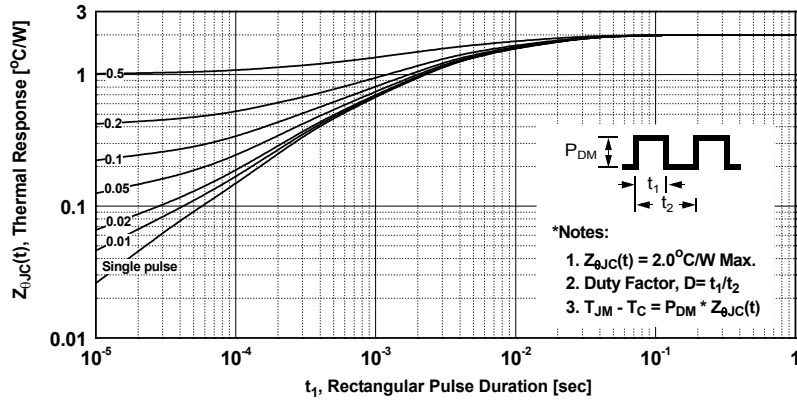


Figure 12. Unclamped Inductive Switching Capability



Typical Performance Characteristics (Continued)

Figure 13. Transient Thermal Response Curve





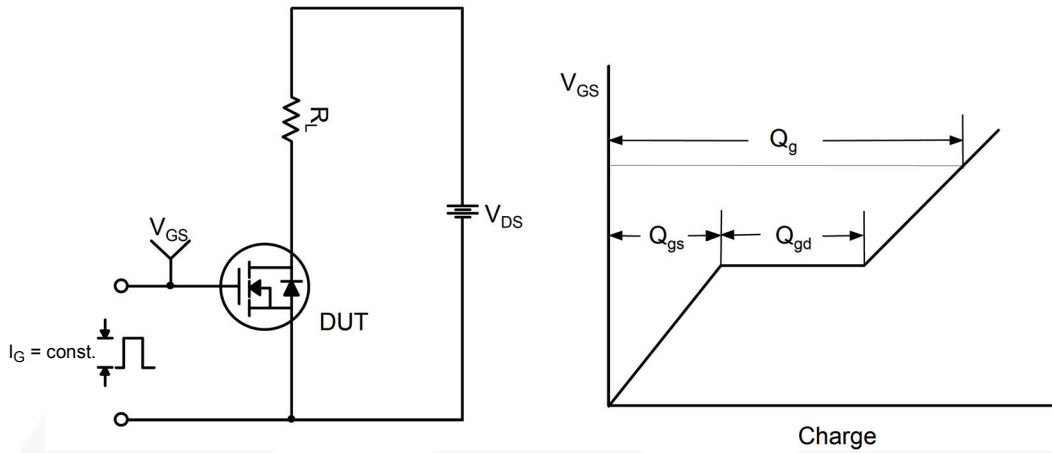


Figure 14. Gate Charge Test Circuit & Waveform

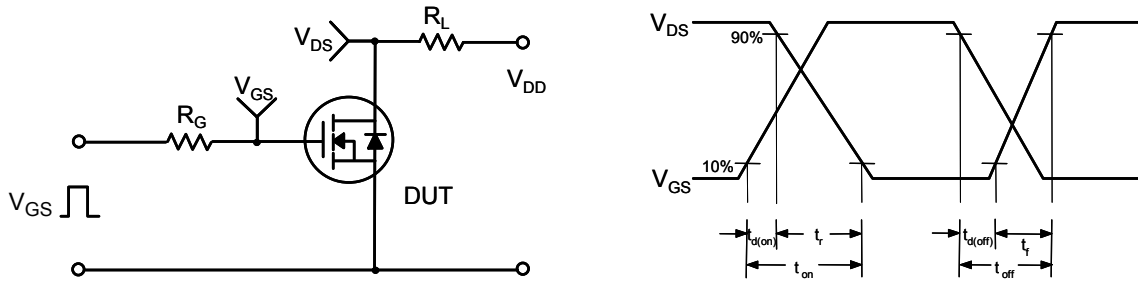


Figure 15. Resistive Switching Test Circuit & Waveforms

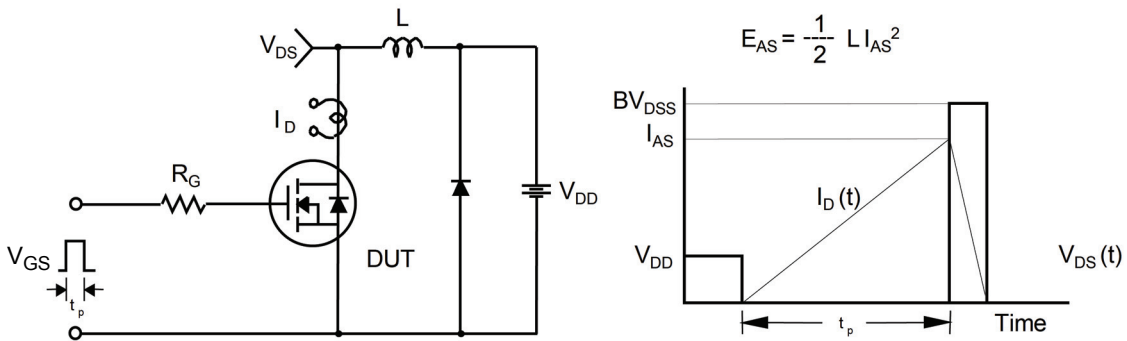


Figure 16. Unclamped Inductive Switching Test Circuit & Waveforms

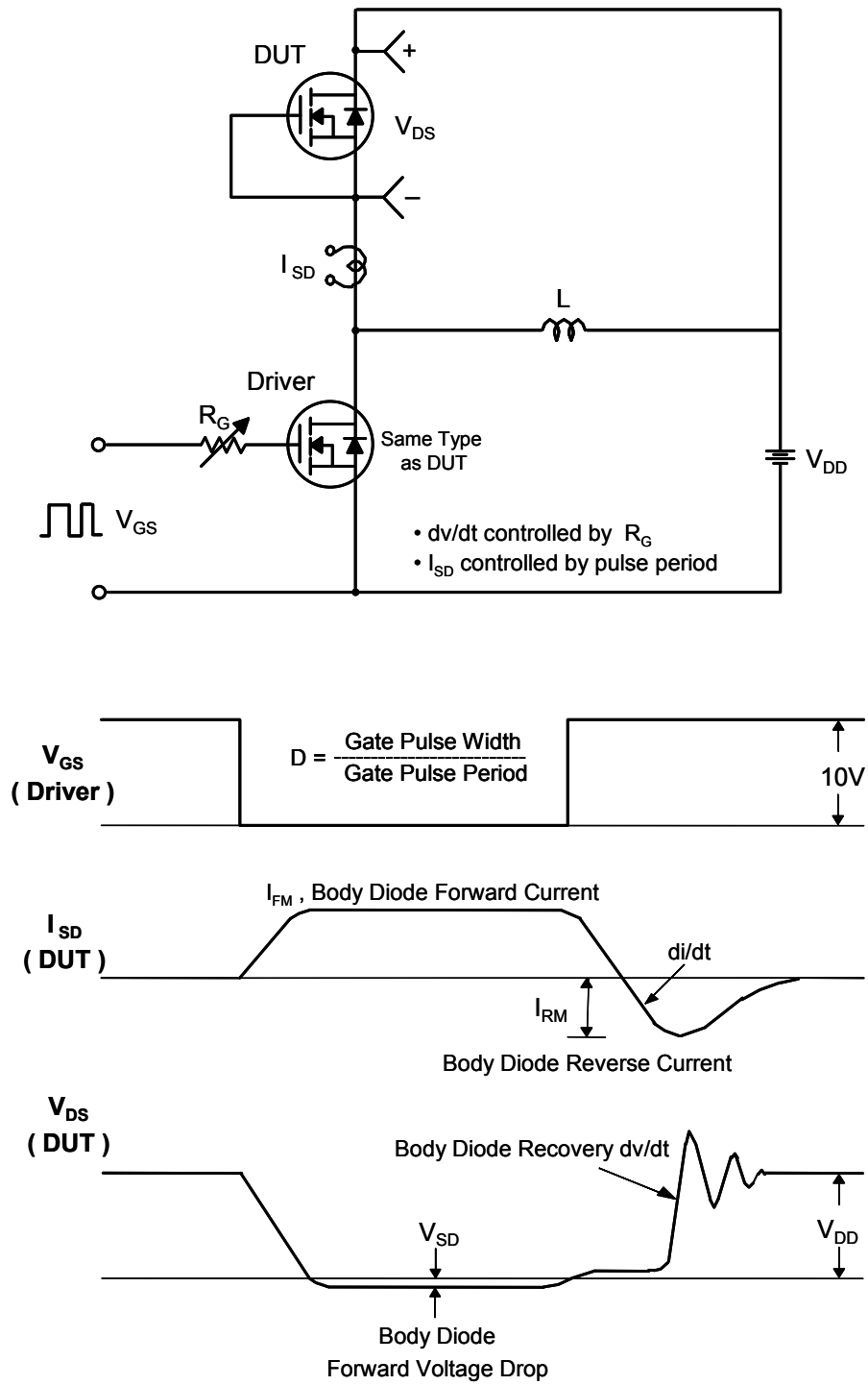
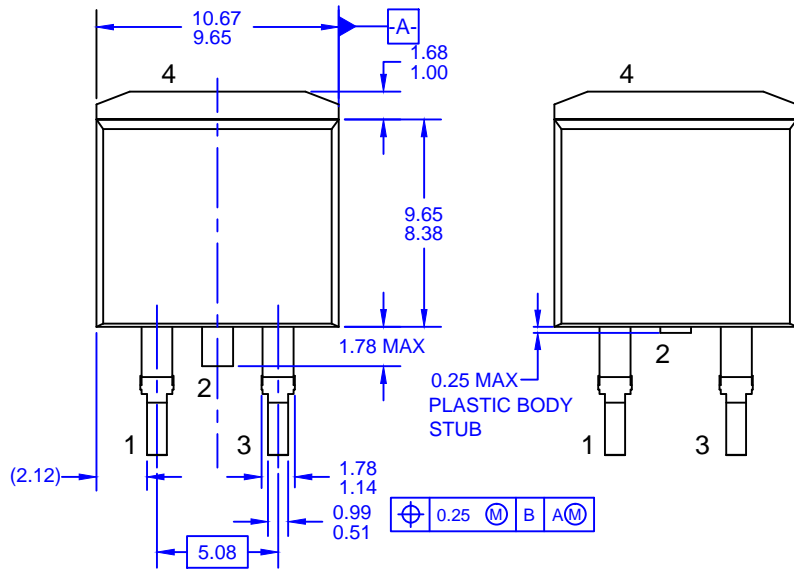
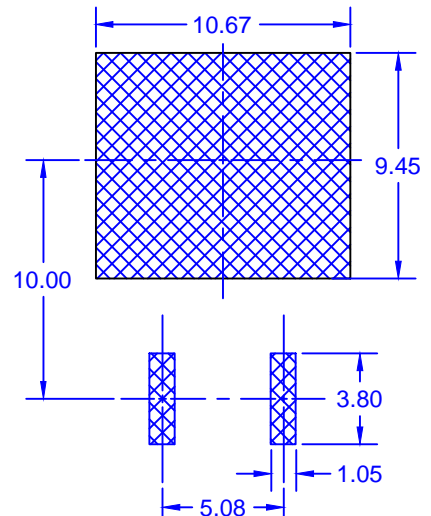


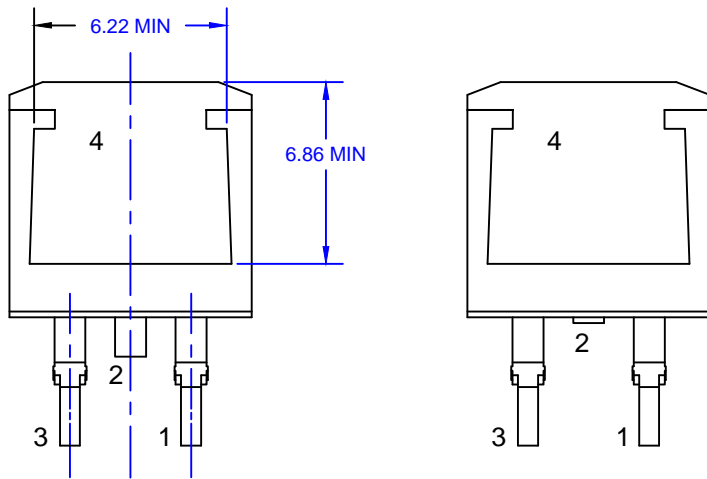
Figure 17. Peak Diode Recovery  $dv/dt$  Test Circuit & Waveforms



FRONT VIEW - DIODE PRODUCTS VERSION  
ALTERNATIVE SUPPLIER DETAIL



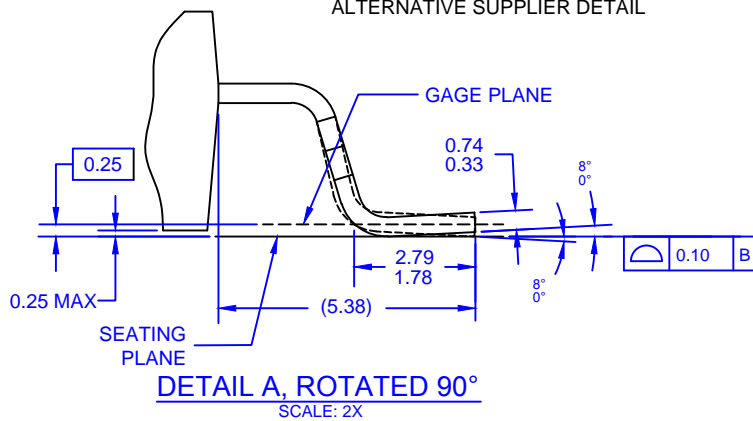
LAND PATTERN RECOMMENDATION  
UNLESS NOTED, ALL DIMS TYPICAL



BACK VIEW - DIODE PRODUCTS VERSION  
ALTERNATIVE SUPPLIER DETAIL


NOTES: UNLESS OTHERWISE SPECIFIED

- A) ALL DIMENSIONS ARE IN MILLIMETERS.
- B) REFERENCE JEDEC, TO-263, VARIATION AB.
- C) DIMENSIONING AND TOLERANCING PER DIMENSIONING AND TOLERANCING PER ASME Y14.5 - 2009.
- D) LOCATION OF THE PIN HOLE MAY VARY (LOWER LEFT CORNER, LOWER CENTER AND CENTER OF THE PACKAGE).
- E) LANDPATTERN RECOMMENDATION PER IPC TO254P1524X482-3N
- F) FILENAME: TO263A02REV8



DETAIL A, ROTATED 90°  
SCALE: 2X



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