

# Enhancement Mode N-Channel Power MOSFET

## Features

- ◆ Low  $R_{DS(on)}$  & FOM
- ◆ Extremely low switching loss
- ◆ Excellent stability and uniformity
- ◆ Fast switching and soft recovery

## Applications

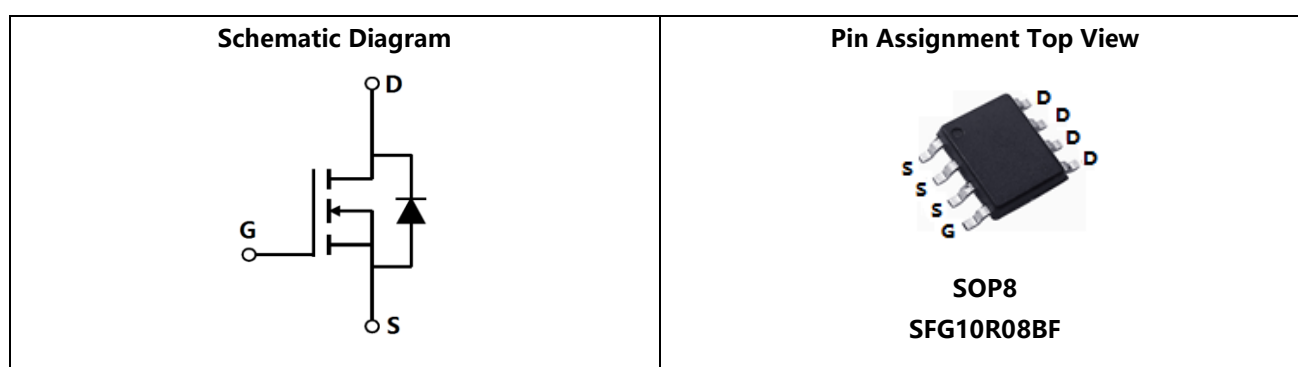
- ◆ Consumer electronic power supply
- ◆ Motor control
- ◆ Synchronous-rectification
- ◆ Isolated DC/DC convertor
- ◆ Invertors

## ■ General Description

SFG10R10BF uses advanced SFGMOS™ technology to provide low  $R_{DS(ON)}$ , low gate charge, fast switching and excellent avalanche characteristics. This device is specially designed to get better ruggedness and suitable to use in Synchronous-rectification applications.

|                                   |         |
|-----------------------------------|---------|
| ◆ $V_{DS, min}$                   | 100 V   |
| ◆ $I_{D, pulse}$                  | 64 A    |
| ◆ $R_{DS(ON), max @ V_{GS}=10 V}$ | 8 mΩ    |
| ◆ $Q_g$                           | 60.7 nC |

## ■ Schematic and Package Information



## ■ Absolute Maximum Ratings at $T_j=25^\circ\text{C}$ unless otherwise noted

| Parameter   | Symbol         | Value      | Unit |
|---|----------------|------------|------|
| Drain source voltage  | $V_{DS}$       | 100        | V    |
| Gate source voltage   | $V_{GS}$       | ±20        | V    |
| Continuous drain current <sup>1)</sup> , $T_C=25^\circ\text{C}$ | $I_D$          | 16         | A    |
| Pulsed drain current <sup>2)</sup> , $T_C=25^\circ\text{C}$     | $I_{D, pulse}$ | 64         | A    |
| Power dissipation <sup>3)</sup> , $T_C=25^\circ\text{C}$        | $P_D$          | 4          | W    |
| Single pulsed avalanche energy <sup>5)</sup>                    | $E_{AS}$       | 130        | mJ   |
| Operation and storage temperature                               | $T_{stg}, T_j$ | -55 to 150 | °C   |

## ■ Thermal Characteristics

| Parameter  | Symbol          | Value | Unit |
|--|-----------------|-------|------|
| Thermal resistance, junction-ambient <sup>4)</sup> | $R_{\theta JA}$ | 31    | °C/W |

## ■ Electrical Characteristics at $T_j=25\text{ °C}$ unless otherwise specified

| Parameter                        | Symbol       | Min. | Typ. | Max. | Unit          | Test condition                                     |
|----------------------------------|--------------|------|------|------|---------------|--|
| Drain-source breakdown voltage   | $BV_{DSS}$   | 100  |      |      | V             | $V_{GS}=0\text{ V}$ , $I_D=250\text{ }\mu\text{A}$ |
| Gate threshold voltage           | $V_{GS(th)}$ | 1.0  |      | 2.5  | V             | $V_{DS}=V_{GS}$ , $I_D=250\text{ }\mu\text{A}$     |
| Drain-source on-state resistance | $R_{DS(on)}$ |      | 6.5  | 8.0  | m $\Omega$    | $V_{GS}=10\text{ V}$ , $I_D=12\text{ A}$           |
| Drain-source on-state resistance | $R_{DS(on)}$ |      | 8.5  | 10.0 | m $\Omega$    | $V_{GS}=4.5\text{ V}$ , $I_D=9\text{ A}$           |
| Gate-source leakage current      | $I_{GSS}$    |      |      | 100  | nA            | $V_{GS}=20\text{ V}$                               |
|                                  |              |      |      | -100 |               | $V_{GS}=-20\text{ V}$                              |
| Drain-source leakage current     | $I_{DSS}$    |      |      | 1    | $\mu\text{A}$ | $V_{DS}=100\text{ V}$ , $V_{GS}=0\text{ V}$        |

## ■ Dynamic Characteristics

| Parameter                    | Symbol       | Min. | Typ.   | Max. | Unit | Test condition   |
|------------------------------|--------------|------|--------|------|------|--|
| Input capacitance            | $C_{iss}$    |      | 3530.0 |      | pF   | $V_{GS}=0\text{ V}$ ,<br>$V_{DS}=50\text{ V}$ ,<br>$f=1\text{ MHz}$                              |
| Output capacitance           | $C_{oss}$    |      | 560.1  |      | pF   |  |
| Reverse transfer capacitance | $C_{rss}$    |      | 9.0    |      | pF   |  |
| Turn-on delay time           | $t_{d(on)}$  |      | 22.5   |      | ns   | $V_{GS}=10\text{ V}$ ,<br>$V_{DS}=50\text{ V}$ ,<br>$R_G=2\text{ }\Omega$ ,<br>$I_D=10\text{ A}$ |
| Rise time                    | $t_r$        |      | 8.6    |      | ns   |  |
| Turn-off delay time          | $t_{d(off)}$ |      | 66.6   |      | ns   |  |
| Fall time                    | $t_f$        |      | 42.1   |      | ns   |  |

## ■ Gate Charge Characteristics

| Parameter            | Symbol               | Min. | Typ. | Max. | Unit | Test condition  |
|----------------------|----------------------|------|------|------|------|---|
| Total gate charge    | $Q_g$                |      | 60.7 |      | nC   | $I_D=10\text{ A}$ ,<br>$V_{DS}=50\text{ V}$ ,<br>$V_{GS}=10\text{ V}$ |
| Gate-source charge   | $Q_{gs}$             |      | 7.2  |      | nC   |   |
| Gate-drain charge    | $Q_{gd}$             |      | 14.6 |      | nC   |   |
| Gate plateau voltage | $V_{\text{plateau}}$ |      | 2.9  |      | V    |   |

## ■ Body Diode Characteristics

| Parameter                     | Symbol    | Min. | Typ.  | Max. | Unit | Test condition  |
|-------------------------------|-----------|------|-------|------|------|---|
| Diode forward current         | $I_S$     |      |       | 16   | A    | $V_{GS}<V_{th}$   |
| Pulsed source current         | $I_{SP}$  |      |       | 64   |      |   |
| Diode forward voltage         | $V_{SD}$  |      |       | 1.3  | V    | $I_S=16\text{ A}$ , $V_{GS}=0\text{ V}$                 |
| Reverse recovery time         | $t_{rr}$  |      | 67.0  |      | ns   | $I_S=10\text{ A}$ ,<br>$di/dt=100\text{ A}/\mu\text{s}$ |
| Reverse recovery charge       | $Q_{rr}$  |      | 160.0 |      | nC   |   |
| Peak reverse recovery current | $I_{rrm}$ |      | 3.90  |      | A    |   |

## ■ Note

- 1) Calculated continuous current based on maximum allowable junction temperature.
- 2) Repetitive rating; pulse width limited by max. junction temperature.
- 3)  $P_d$  is based on max. junction temperature, using junction-case thermal resistance.
- 4) The value of  $R_{\theta JA}$  is measured with the device mounted on 1 in 2 FR-4 board with 2oz. Copper, in a still air environment with  $T_a=25\text{ }^\circ\text{C}$ .
- 5)  $V_{DD}=50\text{ V}$ ,  $R_G=50\text{ }\Omega$ ,  $L=0.3\text{ mH}$ , starting  $T_j=25\text{ }^\circ\text{C}$ .

■ **Electrical Characteristics Diagrams**

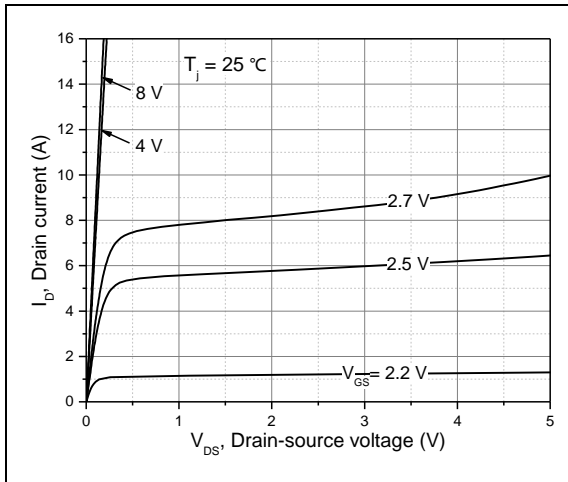


Figure 1, Typ. output characteristics

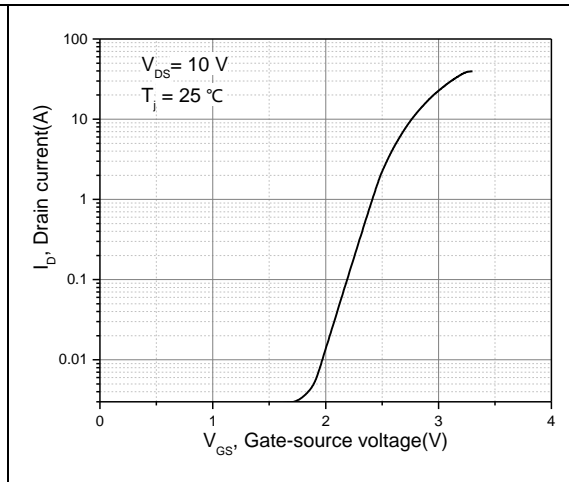


Figure 2, Typ. transfer characteristics

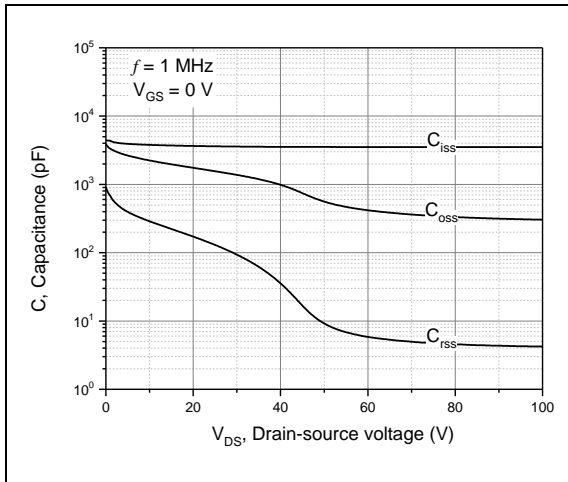


Figure 3, Typ. capacitances

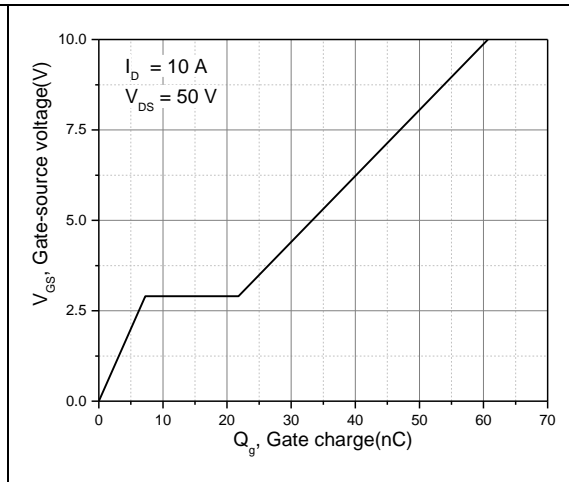


Figure 4, Typ. gate charge

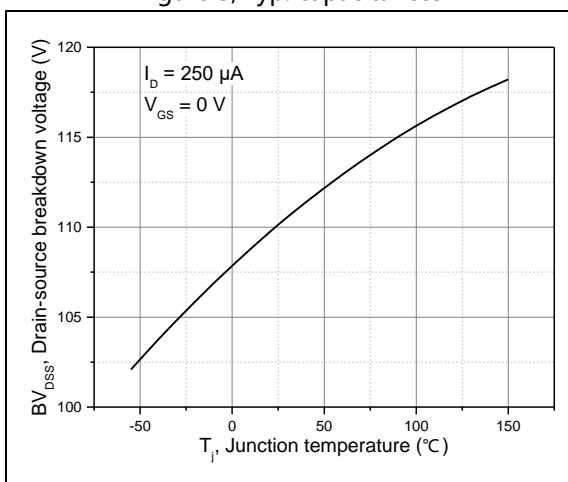


Figure 5, Drain-source breakdown voltage

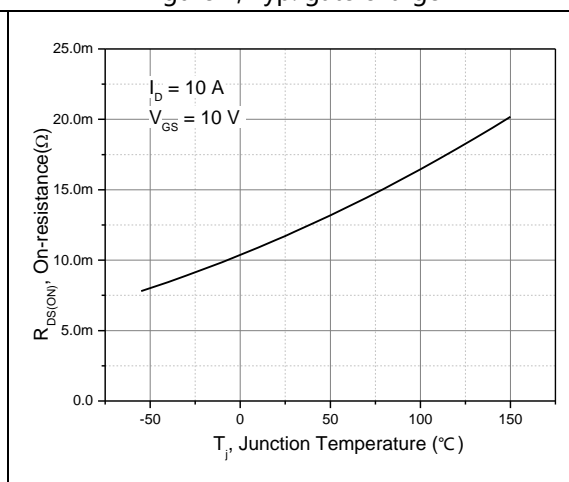


Figure 6, Drain-source on-state resistance

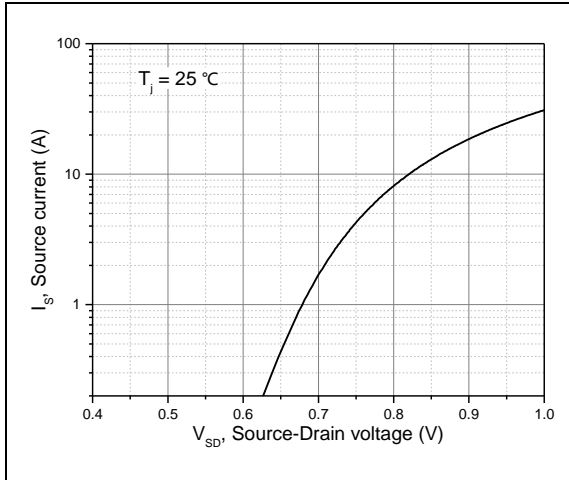


Figure 7, Forward characteristic of body diode

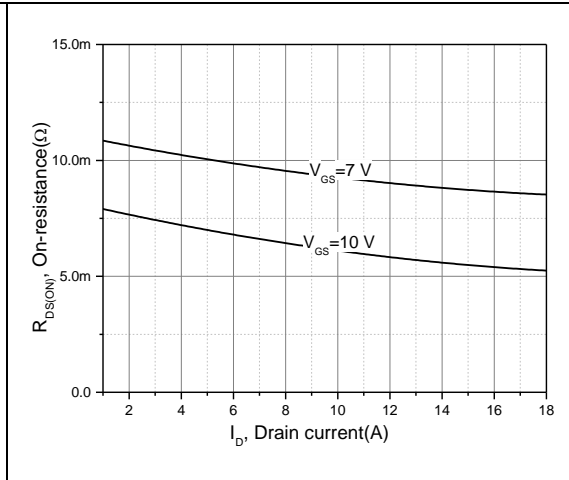


Figure 8, Drain-source on-state resistance

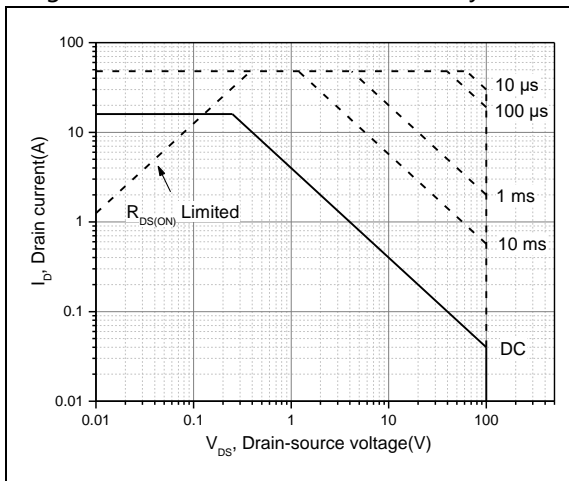


Figure 9, Safe operation area  $T_C = 25\text{ }^\circ\text{C}$

■ Test circuits and waveforms

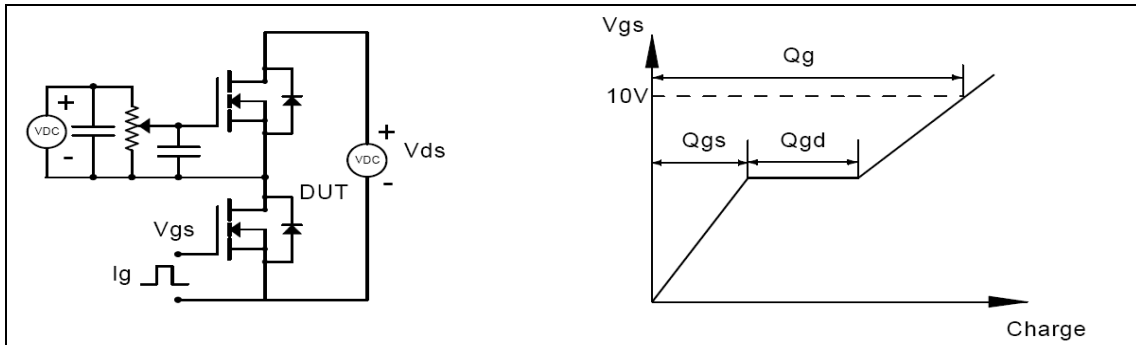


Figure 1, Gate charge test circuit & waveform

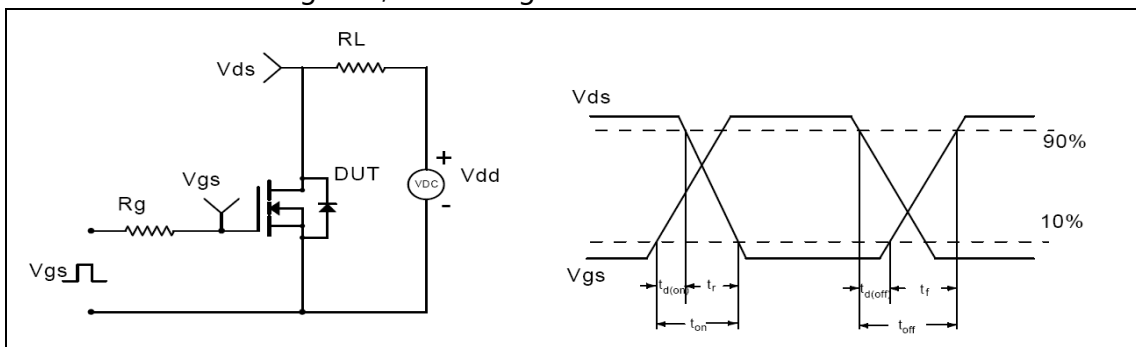


Figure 2, Switching time test circuit & waveforms

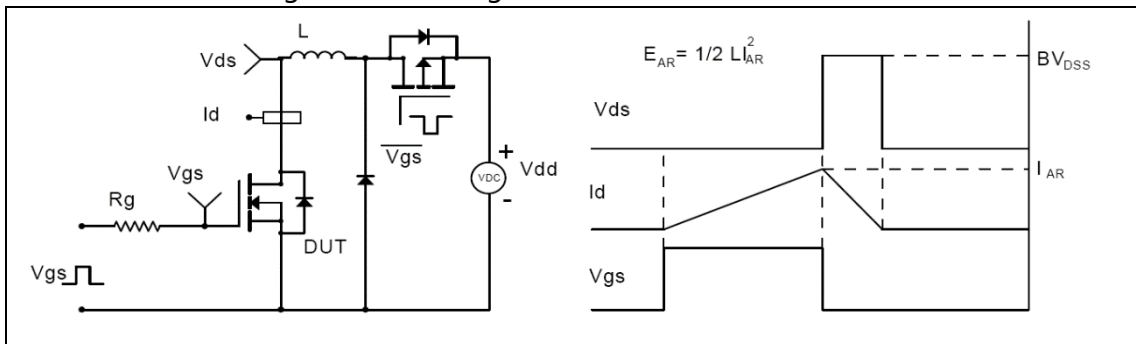


Figure 3, Unclamped inductive switching (UIS) test circuit & waveforms

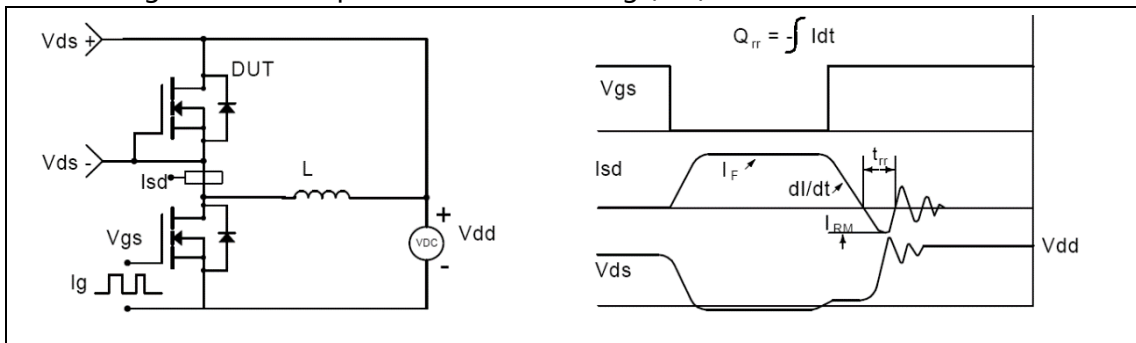
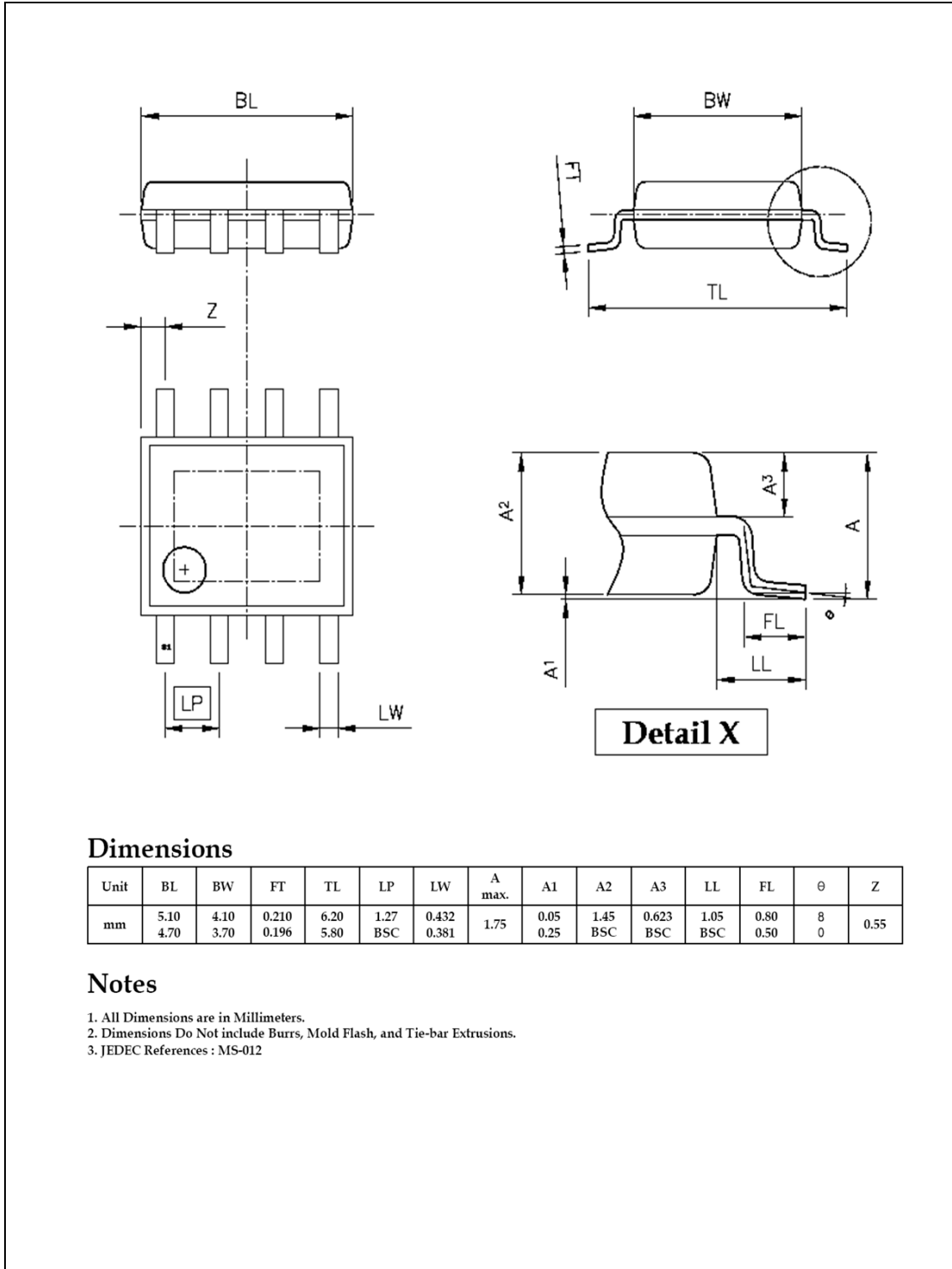


Figure 4, Diode reverse recovery test circuit & waveforms

■ **Package Information**

Figure1, SOP8 package outline dimension





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**■ Ordering Information**

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| Package | Units/Tape | Tapes/Inner Box | Units/Inner Box | Inner Box/Carton Box | Units/Carton Box |
|---------|------------|-----------------|-----------------|----------------------|------------------|
| SOP8    | 2500       | 2               | 5000            | 8                    | 40000            |

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**■ Product Information**

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| Product    | Package | Pb Free | RoHS | Halogen Free |
|------------|---------|---------|------|--------------|
| SFG10R08BF | SOP8    | yes     | yes  | yes          |