# BSS123K

## N-Channel Enhancement Mode Trench Power MOSFET

Pb-Free RoHS COMPLIANT

| **Voltage:** | 100 | Volts | **Current:** | 0.17 | Amperes | **Package:** | SOT-23 |
|---|---|---|---|---|---|---|---|

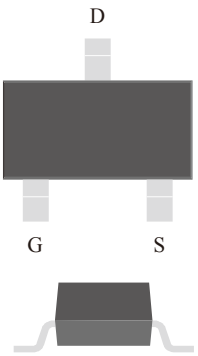
### Features

- NH'S Advanced Trench Technology
- Low Rds(on) For Low On-State Loss
- High EAS For High Reliability
- Excellent Qg*Rds(on) Product(FOM）
- Buolt-in ESD Protected

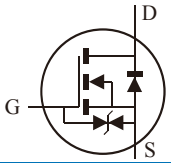
### Typical Applications

- DC-DC Converter
- Battery Management System(BMS)
- Printed Circuit Board For Control Circuit
- Uninterrupible Power Supplies(UPS)

**Diagram:**




**Polarity:**




### Product Summary

| | | |
|---|---|---|
| VDS Min.@$T_j$ | 100 | **V** |
| $I_D$ Min.@Ta | 0.17 | **A** |
| RDS(ON)(TYP)@10V | 4000 | **mΩ** |

***100% UIS TESTED**

***100% ΔVDS TESTED**

### Absolute Maximum Ratings (Ta=25℃ Unless Otherwise Specified )

| Parameter | Test Conditions | Symbol | Ratings | Unit |
|---|---|---|---|---|
| Drain-Source Voltage | | $V_{DS}$ | 100 | V |
| Gate-Source Voltage | | $V_{GS}$ | ±20 | V |
| Continuous Drain Current (Note 1) | Ta= 25 ℃<br>Ta= 100 ℃ | $I_D$ | 0.17<br>0.11 | A |
| Drain Current-Pulse (Note 1) | $T_J$< 150 ℃ | $I_{DM}$ | 0.68 | A |
| Maximum Power Dissipation Power<br>Dissipation Derating Factor Above 25℃ | Ta= 25 ℃<br>Ta= 100 ℃ | $P_D$ | 350<br>140 | mW |
| Derating Factor | | $D_F$ | 2.80 | mW/℃ |

### Thermal Characteristcs (Ta=25℃ Unless Otherwise Specified)

| Parameter | Test Conditions | Symbol | Typ. | Unit |
|---|---|---|---|---|
| Junction Temperature | | $T_J$ | -55 to 150 | ℃ |
| Storage Temperature Range | | $T_{STD}$ | -55 to 150 | ℃ |
| Thermal Resistance Junction To Ambient<br>With Steady-State | Still Air Environment<br>With Ta=25℃ | $R_{\theta JA}$ | 357 | ℃/W |

Notes: 1.Pulse Width Limited By Max. Junction Temperature. (See Fig.14)

# BSS123K

N-Channel Enhancement Mode Trench Power MOSFET

Pb-Free RoHS COMPLIANT

## Electrical Characteristcs (Ta=25℃ Unless Otherwise Specified )

| Parameter | Test Conditions | Symbol | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| **Static Off Characteristics** | | | | | | |
| Drain-Source Breakdown Voltage | VGS=0V,ID=250uA | $BV_{DSS}$ | 100 | -- | -- | V |
| Bvdss Temperature Coefficient | ID=250uA,Reference25℃ | $\Delta BV_{DSS}/\Delta T_J$ | -- | 0.11 | -- | V/℃ |
| Drain-Source Leakage Current | VDS= 100 V,VGS=0V | $I_{DSS}$ | -- | -- | 1 | uA |
| Gate-Body Leakage Current | VGS= ±20 V,VDS=0V | $I_{GSS}$ | -- | -- | ±10 | uA |
| **Static On Characteristics** | | | | | | |
| Gate Threshold Voltage | VGS= VDS ID=250uA | $V_{GS(TH)}$ | 1.5 | 2 | 2.5 | V |
| Drain-Source On Resistance | ID= 0.1 A,VGS= 10.0 V<br>ID= 0.1 A,VGS= 5.0 V | $R_{DS(ON)}$ | --<br>-- | 4000<br>5800 | 6000<br>9000 | mΩ |
| **Dynamic Characteristics** | | | | | | |
| Input Capacitance | VDS= 50 V<br>VGS= 0 V<br>F= 1 MHZ | $C_{iss}$ | -- | 60 | -- | pF |
| Output Capacitance | | $C_{oss}$ | -- | 15 | -- | pF |
| Reverse Transfer Capacitance | | $C_{rss}$ | -- | 36 | -- | pF |
| **Switching Paramters With Inductive Load(Test Circuit & Waveform See Fig.15)** | | | | | | |
| Turn-On Delay Time | VDS= 50 V<br>VGS= 10.0 V<br>RG= 10.0 Ω | $t_{d(on)}$ | -- | 8 | -- | ns |
| Turn-On Rise Time | | $t_r$ | -- | 8 | -- | ns |
| Turn-Off Delay Time | | $t_{d(off)}$ | -- | 13 | -- | ns |
| Turn-Off Rise Time | | $t_f$ | -- | 16 | -- | ns |
| **Gate Charge Paramters (Test Circuit & Waveform See Fig.16)** | | | | | | |
| Total Gate Charge | VDS= 50 V<br>VGS= 10.0 V<br>ID= 0.2 A | $Q_g$ | -- | 2 | -- | nC |
| Gate-Source Charge | | $Q_{gs}$ | -- | 0.25 | -- | nC |
| Gate-Drain Charge | | $Q_{gd}$ | -- | 0.4 | -- | nC |
| **Drain-Source Diode Characteristics And Maximum Ratings (Test Circuit & Waveform See Fig.18)** | | | | | | |
| Max. Diode Forward Current | | $I_S$ | -- | -- | 0.17 | A |
| Max. Pulsed Forward Current | | $I_{SM}$ | -- | -- | 1 | A |
| Diode Forward Voltage | ID= 0.1 A,VGS=0V | $V_{SD}$ | -- | 0.7 | 1.3 | V |

BSS123K

N-Channel Enhancement Mode Trench Power MOSFET

Pb-Free RoHS COMPLIANT

## Typical Characteristics Curves

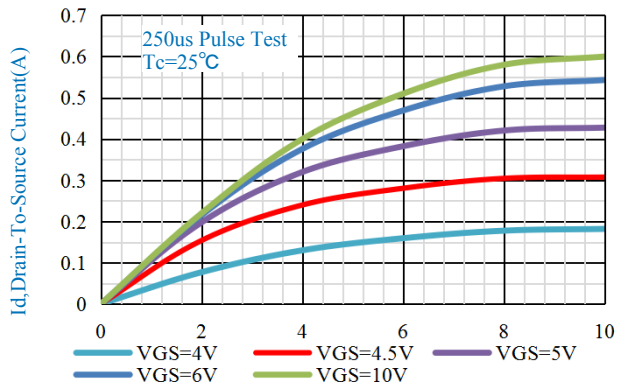



Fig.1-Output Characteristic

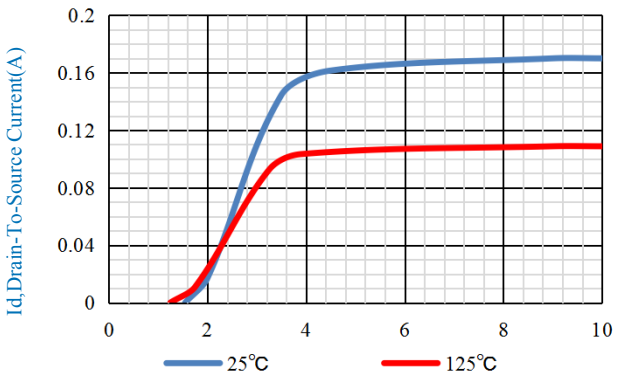



Fig.2-Transfer Characteristic

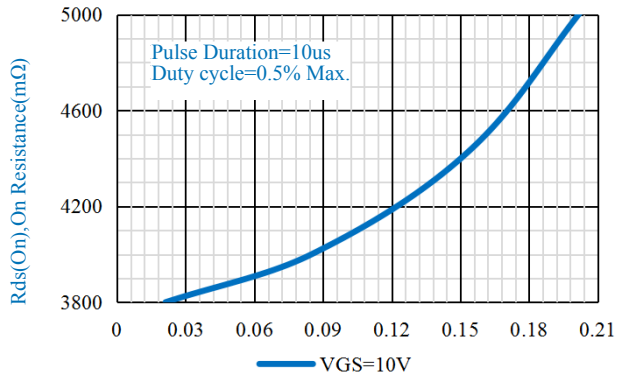



Fig.3-On Resistance Vs. Drain Current

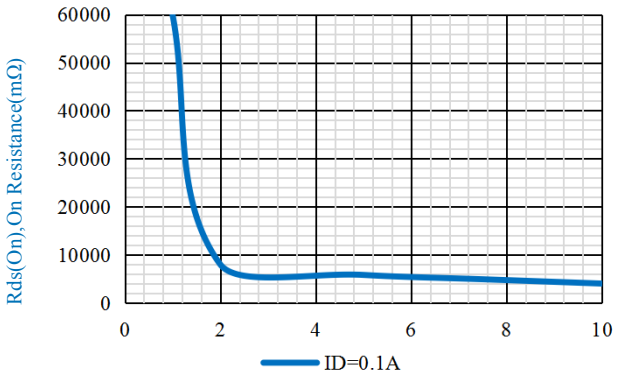



Fig.4-On Resistance Vs. Gate Source Voltage

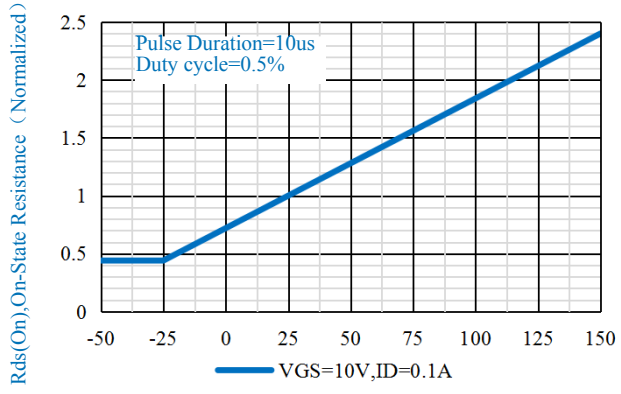



Fig.5-On Resistance Vs. Junction Temperature

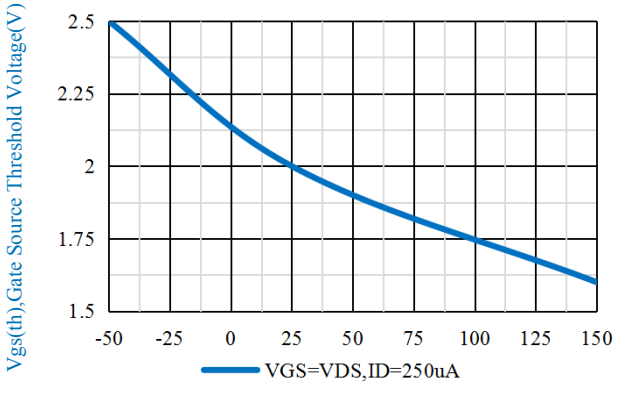



Fig.6-Gate Source Threshold Voltage Vs. Junction Temperature

BSS123K

N-Channel Enhancement Mode Trench Power MOSFET

Pb-Free RoHS COMPLIANT

## Typical Characteristics Curves

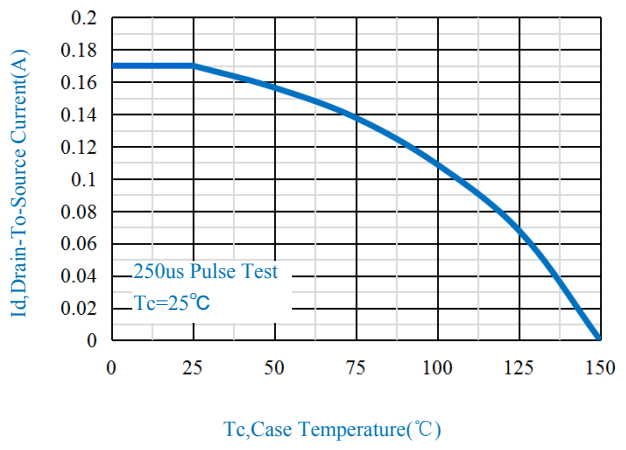



Fig.7-Maximum Continuous Drain Current Vs. Case Temperature

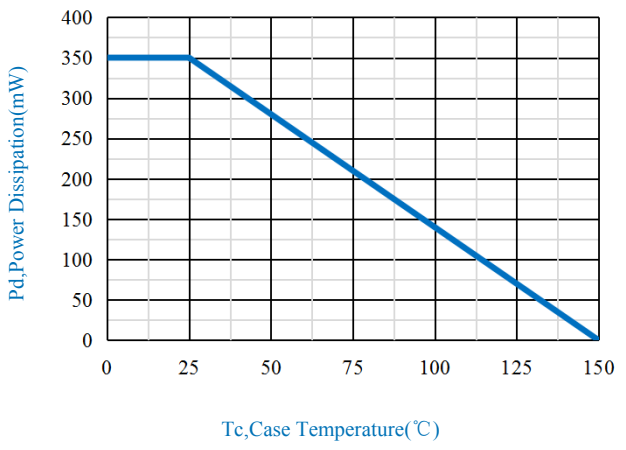



Fig.8-Maximum Power Dissipation Vs. Case Temperature

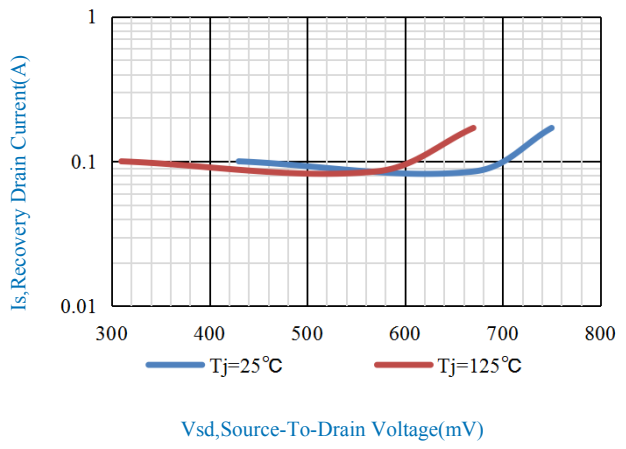



Fig.9-Source-To-Drain Diode Forward Voltage

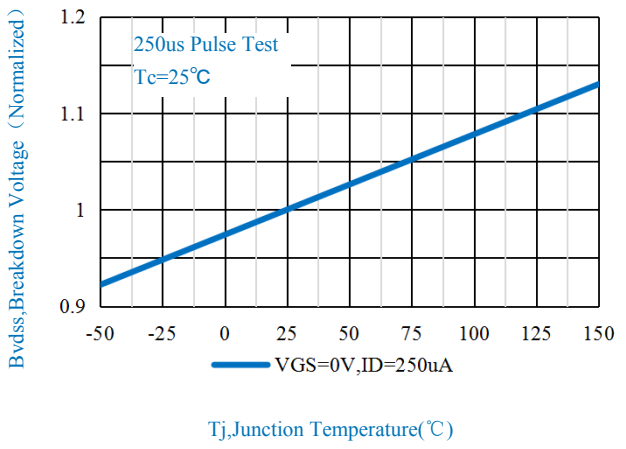



Fig.10-Breakdown Voltage Vs. Junction Temperature

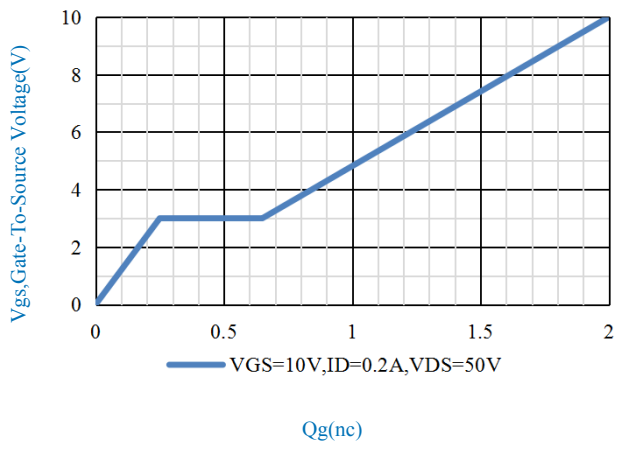



Fig.11-Gate Charge Waveform

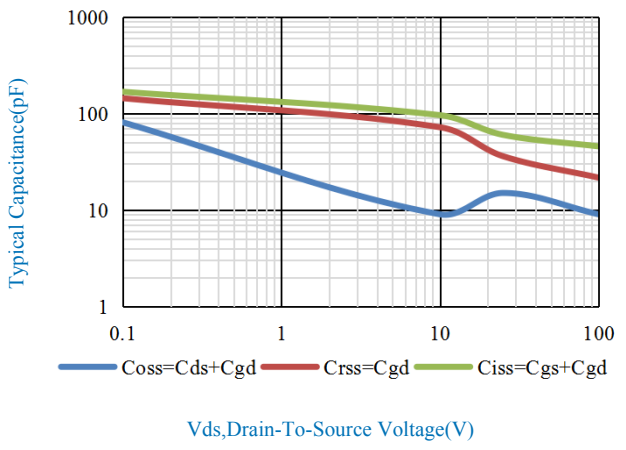



Fig.12-Typical Capacitance Vs. Drain-To-Source Voltage

BSS123K

N-Channel Enhancement Mode Trench Power MOSFET

Pb-Free RoHS COMPLIANT

## Typical Characteristics Curves

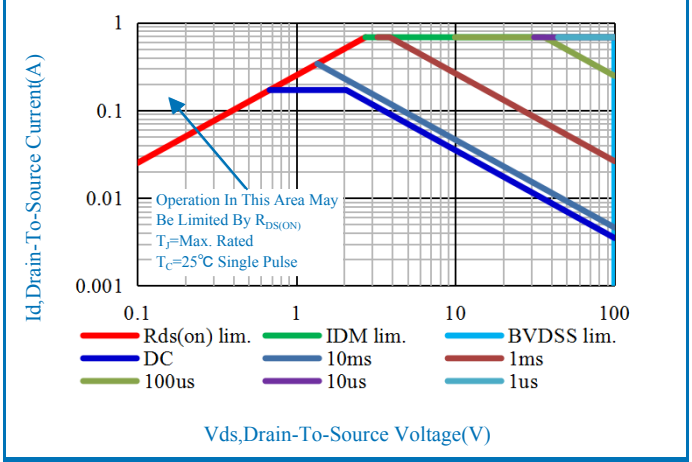



Fig.13-Maximum Safe Operating Area(SOA)

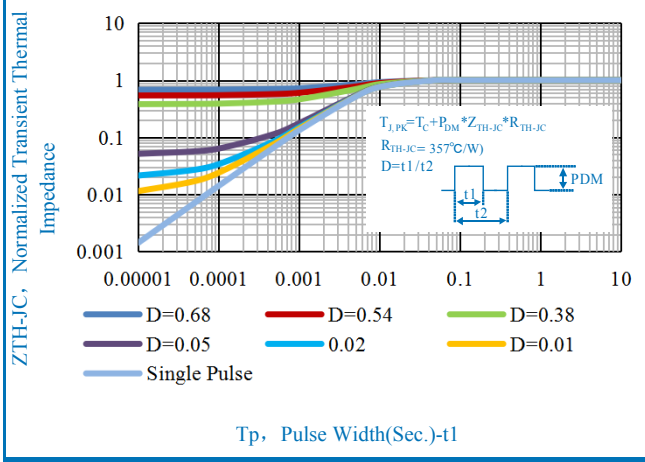
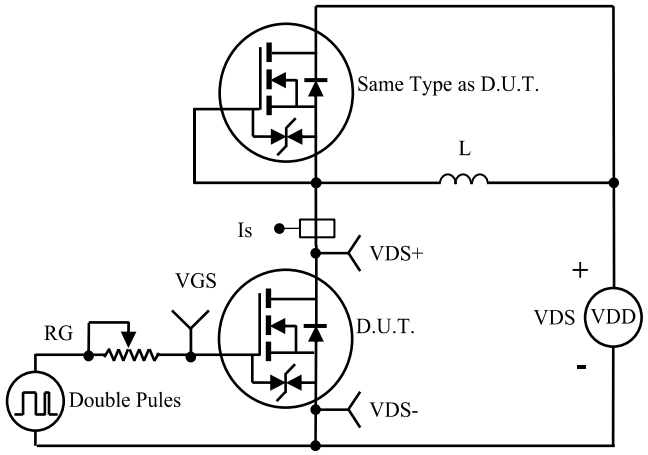



Fig.14- Normalized Maximum Transient Thermal Impedance Vs.Pulse Width

## Inductive Load Test Circuit & Waveform



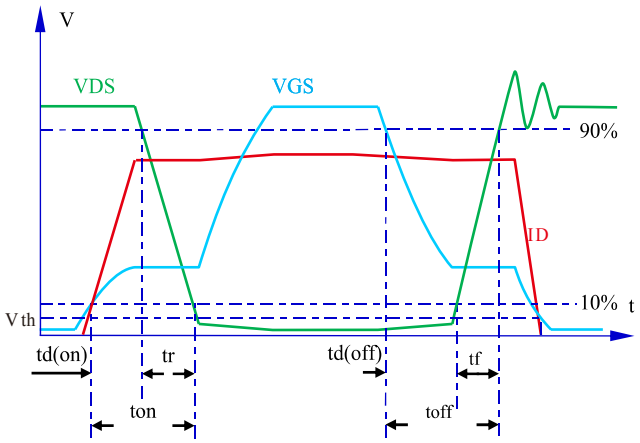



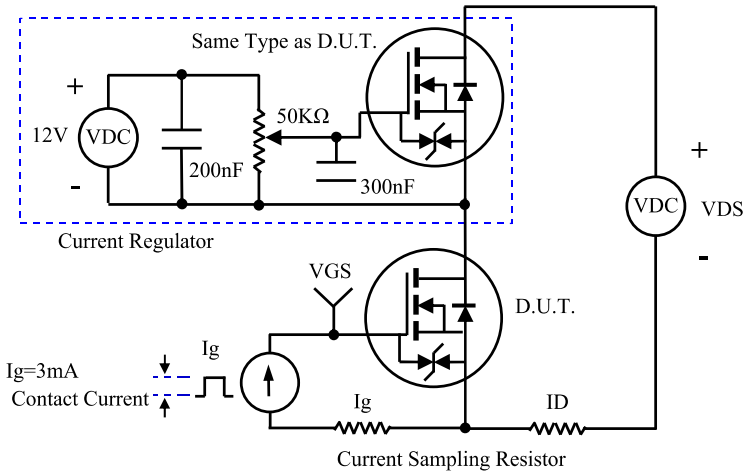

Fig.15- Inductive Switching Test Circuit & Waveform

BSS123K

N-Channel Enhancement Mode Trench Power MOSFET

Pb-Free RoHS COMPLIANT

## Test Circuit & Waveform



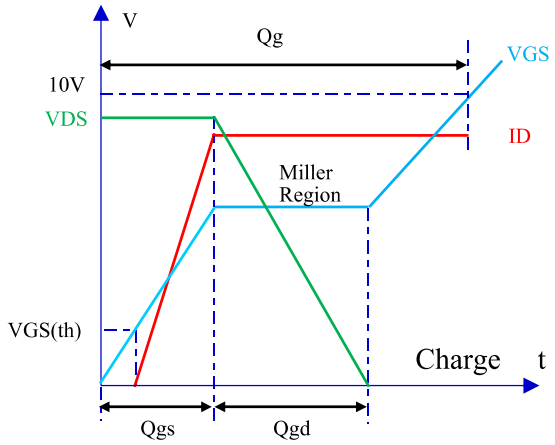
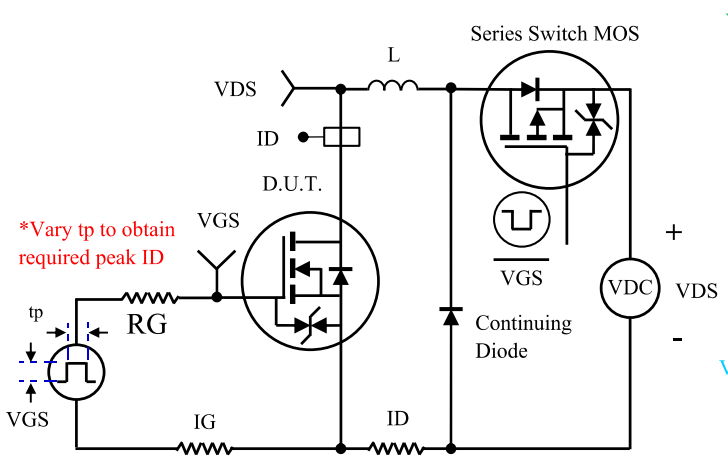




**Fig.16-Gate Charge Test Circuit & Waveform**



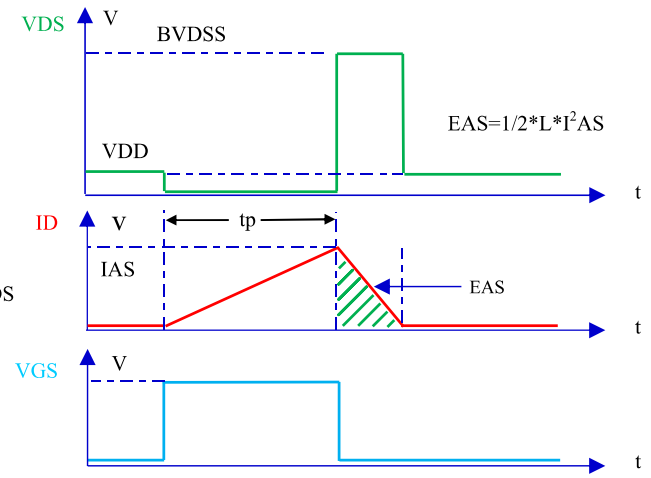
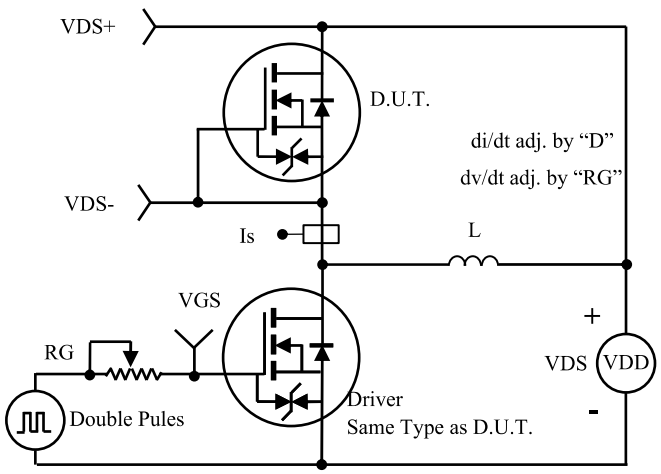




**Fig.17- Unclamped Inductive Switching (UIS) Test Circuit & Waveform**



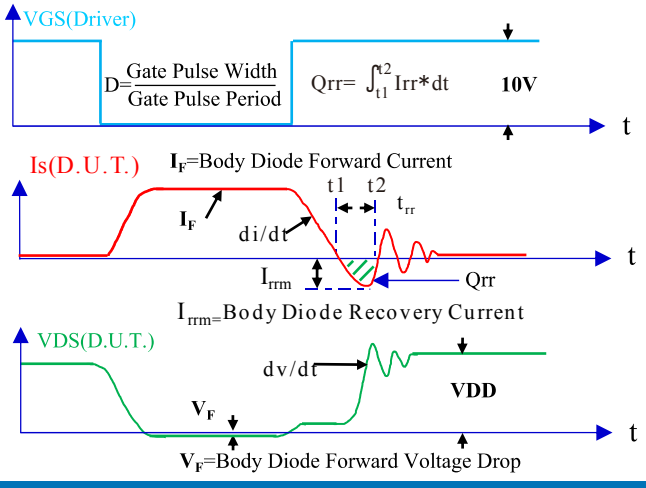



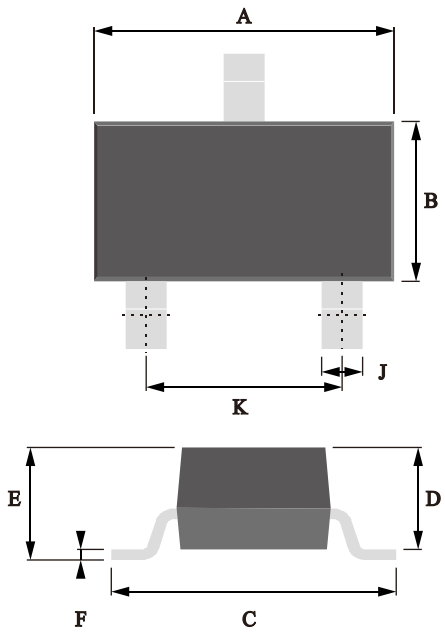

**Fig.18- Diode Recovery Test Circuit & Waveform**

BSS123K

N-Channel Enhancement Mode Trench Power MOSFET

Pb-Free RoHS COMPLIANT

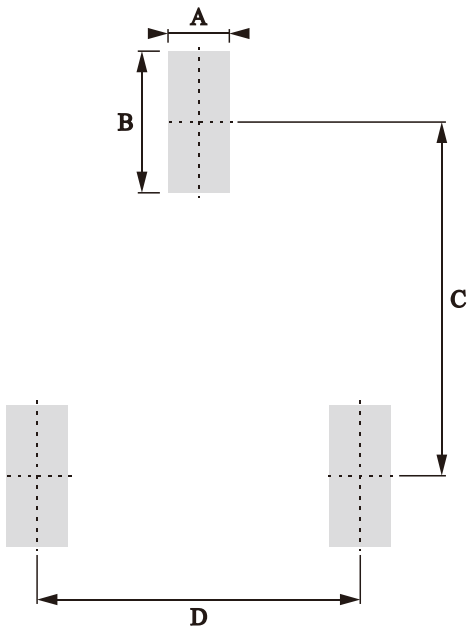
## OUTLINE DRAWINGS




## SOT-23

| OUTLINE DIMENSIONS | | | | | | |
|---|---|---|---|---|---|---|
| Dim. | Milimeters | | | Inches | | |
| | Min. | Typ. | Max. | Min. | Typ. | Max. |
| A | 2.80 | 3.00 | 3.20 | 0.1102 | - | 0.1260 |
| B | 1.15 | 1.30 | 1.45 | 0.0453 | - | 0.0571 |
| C | 2.25 | 2.45 | 2.65 | 0.0886 | - | 0.1043 |
| D | 0.85 | 1.00 | 1.15 | 0.0335 | - | 0.0453 |
| E | 0.90 | 1.05 | 1.20 | 0.0354 | - | 0.0472 |
| F | 0.08 | 0.13 | 0.18 | 0.0031 | - | 0.0071 |
| J | 0.30 | 0.40 | 0.50 | 0.0118 | - | 0.0197 |
| K | 1.70 | 1.90 | 2.10 | 0.0669 | - | 0.0827 |

## RECOMMEDNED LAYOUT DRAWINGS




## SOT-23

| OUTLINE DIMENSIONS | | | | | | |
|---|---|---|---|---|---|---|
| Dim. | Milimeters | | | Inches | | |
| | Min. | Typ. | Max. | Min. | Typ. | Max. |
| A | - | 0.60 | - | - | 0.0000 | - |
| B | - | 0.80 | - | - | 0.0315 | - |
| C | - | 2.00 | - | - | 0.0787 | - |
| D | - | 1.90 | - | - | 0.0748 | - |

# BSS123K

N-Channel Enhancement Mode Trench Power MOSFET

Pb-Free RoHS COMPLIANT

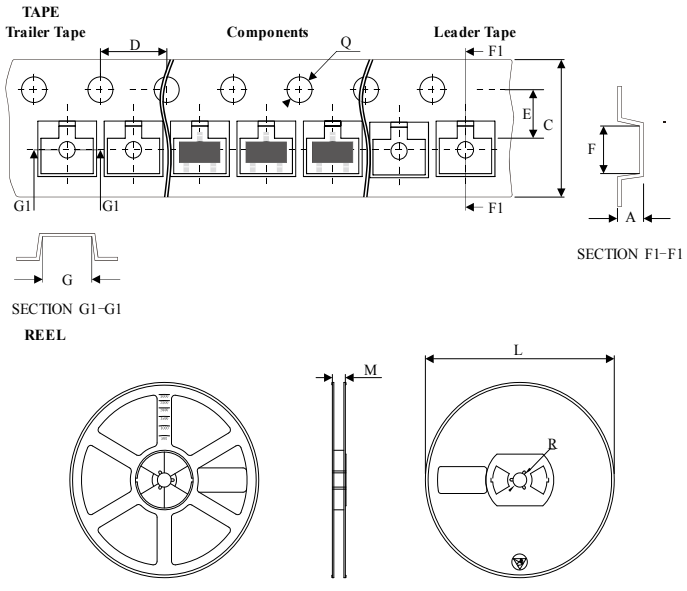
## MARKING INFORMATION




## MARKING INSTRUCTIONS

**123K=MarK**

## PACKAGING




## SOT-23

| OUTLINE DIMENSIONS | | | | | | |
|---|---|---|---|---|---|---|
| Dim. | Milimeters | | | Inches | | |
| | Min. | Typ. | Max. | Min. | Typ. | Max. |
| **TAPE** | | | | | | |
| A | 1.12 | - | 1.32 | 0.0441 | - | 0.0520 |
| C | 7.90 | - | 8.10 | 0.3110 | - | 0.3189 |
| D | 3.70 | - | 4.30 | 0.1457 | - | 0.1693 |
| E | 3.40 | - | 3.60 | 0.1339 | - | 0.1417 |
| F | 2.67 | - | 2.87 | 0.1051 | - | 0.1130 |
| G | 3.05 | - | 3.25 | 0.1201 | - | 0.1280 |
| Q Φ | 1.40 | - | 1.60 | 0.0551 | - | 0.0630 |
| **REEL** | | | | | | |
| L Φ | 176.00 | - | 180.00 | 6.929 | - | 7.087 |
| R | 12.00 | - | 14.00 | 0.4724 | - | 0.5512 |
| M | 11.00 | - | 13.00 | 0.4331 | - | 0.5118 |

## PACKING INFORMATION

| Package Type | Package Code | Productor Weight Approx(g/Pcs) | Package Method | Quantity (Pcs/Min. Pack.) | Quantity (Pcs/Inner Box) | Quantity (Pcs/Carton) |
|---|---|---|---|---|---|---|
| SOT-23 | P1 | 0.008 | 7" Reel | 3000 | 45000 | 180000 |

BSS123K

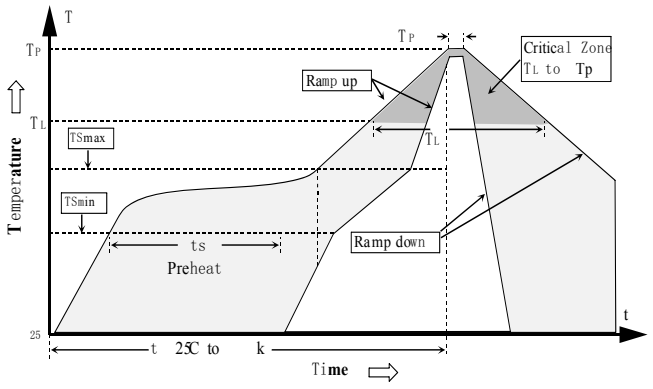
N-Channel Enhancement Mode Trench Power MOSFET

Pb Pb-Free RoHS COMPLIANT

## Recommended wave soldering condition

| Product | Peak Temperature | Soldering Time |
|---|---|---|
| Pb-free devices | 260 +0/-5 °C | 5 +1/-1 seconds |

## Recommended temperature profile for IR reflow




| Profile feature | Sn-Pb eutectic Assembly | Pb-free Assembly |
|---|---|---|
| Average ramp-up rate (Tsmax to Tp) | 3°C/second max. | 3°C/second max. |
| Preheat−Temperature Min (TS min)<br>−Temperature Max (TS max)<br>−Time(ts min to ts max) | 100°C<br>150°C<br>60-120 seconds | 150°C<br>200°C<br>60-180 seconds |
| Time maintained above:<br>−Temperature (TL)<br>− Time (tL) | 183°C<br>60-150 seconds | 217°C<br>60-150 seconds |
| Peak Temperature(TP) | 240 +0/-5 °C | 260 +0/-5 °C |
| Time within 5°C of actual peak temperature (tp) | 10-30 seconds | 20-40 seconds |
| Ramp down rate | 6°C/second max. | 6°C/second max. |
| Time 25 °C to peak temperature | 6 minutes max. | 8 minutes max. |

Note : All temperatures refer to topside of the package, measured on the package body surface.

## Disclaimer


- Reproducing and modifying informatiom of the document is prohibited without permission from Niuhang Electronics Technology Co., LTD
- Niuhang Electronics Technology Co., LTD. reserves the rights to make changes of the content herein the document anytime without notification.
- Niuhang Electronics Technology Co., LTD. disclaims any and all liability arising out of the application or use of any product including damages incidentally and consequentially occurred.
- Niuhang Electronics Technology Co., LTD. does not assume any and all implied warranties,including warranties of fitness for particular purpose,non-infringement and merchantability.
- Applications shown on the herein document are examples of standard use and operation.Customers are responsible in comprehending the suitable use in particular applications.Niuhang Electronics Technology Co., LTD.makes no representation or warranty that such applications will be suitable for the specified use without further testing or modification.
- The products shown herein are not designed and authorized for equipments requiring high level of reliability or relating to human life and for any applications concerning life-saving or life-sustaining,such as medical instruments.transportation equipment,aerospae machinery et cetera.Customers usin or selling these products for use in such applications do so at their own rish and agree to fully indemnify Niuhang Electronics Technology Co., LTD.for any damages resulting resulting from such improper use or sale.
- When the appearance of the product and chip size does not change, in order to product the customer. quality, change the internal structure and the production process Niuhang can not notify

BSS123K

N-Channel Enhancement Mode Trench Power MOSFET

Pb Pb-Free RoHS COMPLIANT

## Specification Revision History

| Rev. | Date | Changed Items | Pre-Changed Content | Changed Content |
|---|---|---|---|---|
| A/1 | 2014-10-20 | First Issue | | |

Blank Below