

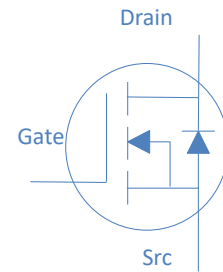
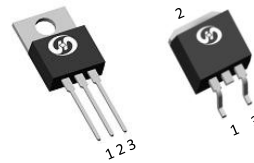
**120V N-Ch Power MOSFET**
**Feature**

- ◇ High Speed Power Switching
- ◇ Enhanced Body diode dv/dt capability
- ◇ Enhanced Avalanche Ruggedness
- ◇ 100% UIS Tested, 100% Rg Tested
- ◇ Lead Free, Halogen Free

|                         |        |      |            |
|-------------------------|--------|------|------------|
| $V_{DS}$                |        | 120  | V          |
| $R_{DS(on),typ}$        | TO-263 | 10   | m $\Omega$ |
| $R_{DS(on),typ}$        | TO-220 | 10.3 | m $\Omega$ |
| $I_D$ (Silicon Limited) |        | 74   | A          |

**Application**

- ◇ Synchronous Rectification in SMPS
- ◇ Hard Switching and High Speed Circuit
- ◇ DC/DC in Telecoms and Industrial

**TO-220 TO-263**


| Part Number | Package | Marking   |
|-------------|---------|-----------|
| HGB130N12S  | TO-263  | GB130N12S |
| HGP130N12S  | TO-220  | GP130N12S |

**Absolute Maximum Ratings at  $T_J=25^{\circ}\text{C}$  (unless otherwise specified)**

| Parameter                                  | Symbol         | Conditions                               | Value      | Unit               |
|--|----------------|--|------------|--------------------|
| Continuous Drain Current (Silicon Limited) | $I_D$          | $T_C=25^{\circ}\text{C}$                 | 74         | A                  |
|  |                | $T_C=100^{\circ}\text{C}$                | 52         |                    |
| Drain to Source Voltage                    | $V_{DS}$       | -  | 120        | V                  |
| Gate to Source Voltage                     | $V_{GS}$       | -  | $\pm 20$   | V                  |
| Pulsed Drain Current                       | $I_{DM}$       | -  | 260        | A                  |
| Avalanche Energy, Single Pulse             | $E_{AS}$       | $L=0.4\text{mH}, T_C=25^{\circ}\text{C}$ | 320        | mJ                 |
| Power Dissipation                          | $P_D$          | $T_C=25^{\circ}\text{C}$                 | 150        | W                  |
| Operating and Storage Temperature          | $T_J, T_{stg}$ | -  | -55 to 175 | $^{\circ}\text{C}$ |

**Absolute Maximum Ratings**

| Parameter                           | Symbol          | Max | Unit                 |
|-------------------------------------|-----------------|-----|----------------------|
| Thermal Resistance Junction-Ambient | $R_{\theta JA}$ | 46  | $^{\circ}\text{C/W}$ |
| Thermal Resistance Junction-Case    | $R_{\theta JC}$ | 1   | $^{\circ}\text{C/W}$ |

**Electrical Characteristics at  $T_j=25^\circ\text{C}$  (unless otherwise specified)**
**Static Characteristics**

| Parameter                         | Symbol        | Conditions                                      | Value |      |           | Unit      |
|-----------------------------------|---------------|---|-------|------|-----------|-----------|
|                                   |               |   | min   | typ  | max       |           |
| Drain to Source Breakdown Voltage | $V_{(BR)DSS}$ | $V_{GS}=0V, I_D=250\mu A$                       | 120   | -    | -         | V         |
| Gate Threshold Voltage            | $V_{GS(th)}$  | $V_{GS}=V_{DS}, I_D=250\mu A$                   | 2     | 3    | 4         |           |
| Zero Gate Voltage Drain Current   | $I_{DSS}$     | $V_{GS}=0V, V_{DS}=120V, T_j=25^\circ\text{C}$  | -     | -    | 1         | $\mu A$   |
|                                   |               | $V_{GS}=0V, V_{DS}=120V, T_j=100^\circ\text{C}$ | -     | -    | 100       |           |
| Gate to Source Leakage Current    | $I_{GSS}$     | $V_{GS}=\pm 20V, V_{DS}=0V$                     | -     | -    | $\pm 100$ | nA        |
| Drain to Source on Resistance     | $R_{DS(on)}$  | $V_{GS}=10V, I_D=20A$ TO-263                    | -     | 10   | 12.2      | $m\Omega$ |
| Drain to Source on Resistance     | $R_{DS(on)}$  | $V_{GS}=10V, I_D=20A$ TO-220                    | -     | 10.3 | 12.5      | $m\Omega$ |
| Transconductance                  | $g_{fs}$      | $V_{DS}=5V, I_D=20A$                            | -     | 55   | -         | S         |
| Gate Resistance                   | $R_G$         | $V_{GS}=0V, V_{DS}$ Open, $f=1\text{MHz}$       | -     | 2.2  | -         | $\Omega$  |

**Dynamic Characteristics**

|                               |              |  |   |      |   |      |
|-------------------------------|--------------|--|---|------|---|------|
| Input Capacitance             | $C_{iss}$    | $V_{GS}=0V, V_{DS}=60V, f=1\text{MHz}$           | - | 1986 | - | $pF$ |
| Output Capacitance            | $C_{oss}$    |  | - | 230  | - |      |
| Reverse Transfer Capacitance  | $C_{rss}$    |  | - | 8.6  | - |      |
| Total Gate Charge             | $Q_g(10V)$   | $V_{DD}=60V, I_D=20A, V_{GS}=10V$                | - | 26   | - | nC   |
| Gate to Source Charge         | $Q_{gs}$     |  | - | 9    | - |      |
| Gate to Drain (Miller) Charge | $Q_{gd}$     |  | - | 3.5  | - |      |
| Turn on Delay Time            | $t_{d(on)}$  | $V_{DD}=60V, I_D=20A, V_{GS}=10V, R_G=10\Omega,$ | - | 9    | - | ns   |
| Rise time                     | $t_r$        |  | - | 9    | - |      |
| Turn off Delay Time           | $t_{d(off)}$ |  | - | 15   | - |      |
| Fall Time                     | $t_f$        |  | - | 10   | - |      |

**Reverse Diode Characteristics**

|                         |          |  |   |     |     |    |
|-------------------------|----------|--|---|-----|-----|----|
| Diode Forward Voltage   | $V_{SD}$ | $V_{GS}=0V, I_F=20A$                   | - | 0.9 | 1.2 | V  |
| Reverse Recovery Time   | $t_{rr}$ | $V_R=60V, I_F=20A, di_F/dt=100A/\mu s$ | - | 50  | -   | ns |
| Reverse Recovery Charge | $Q_{rr}$ |  | - | 100 | -   | nC |

Fig 1. Typical Output Characteristics

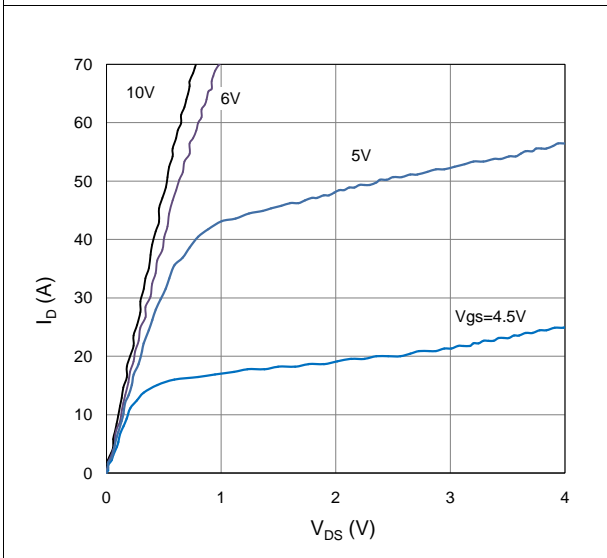


Figure 2. On-Resistance vs. Gate-Source Voltage

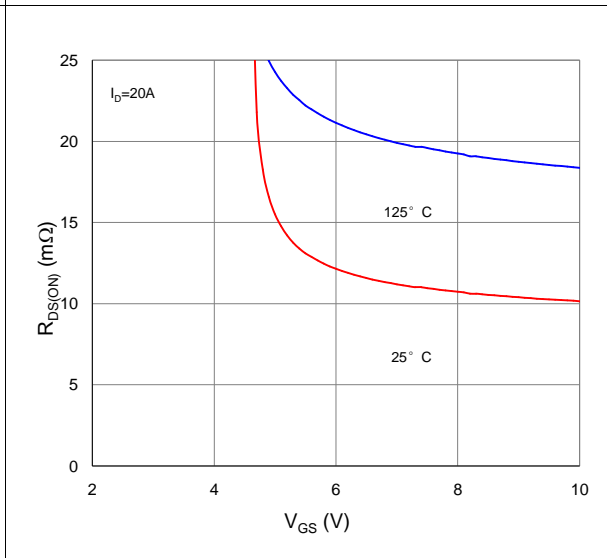


Figure 3. On-Resistance vs. Drain Current and Gate Voltage

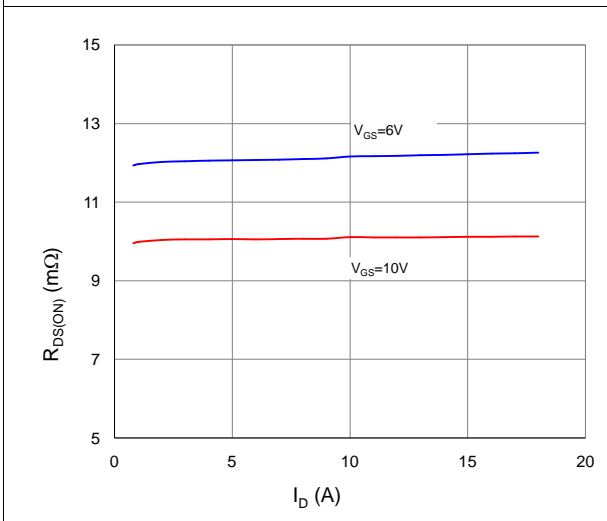


Figure 4. Normalized On-Resistance vs. Junction Temperature

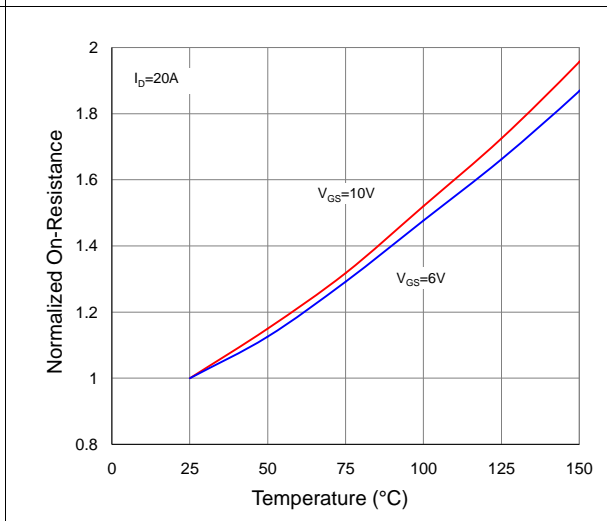


Figure 5. Typical Transfer Characteristics

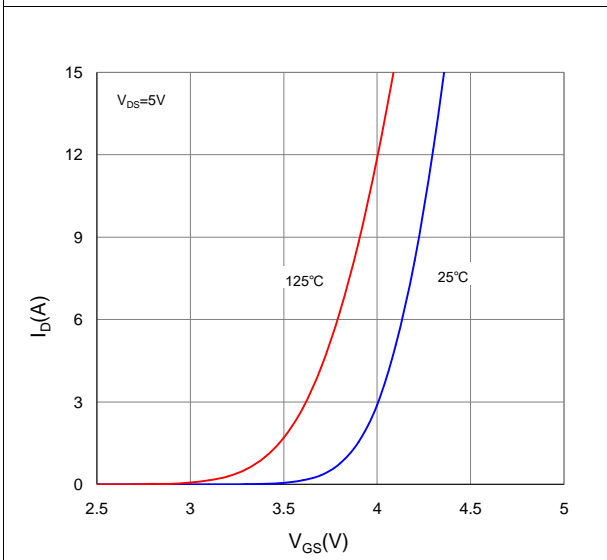


Figure 6. Typical Source-Drain Diode Forward Voltage

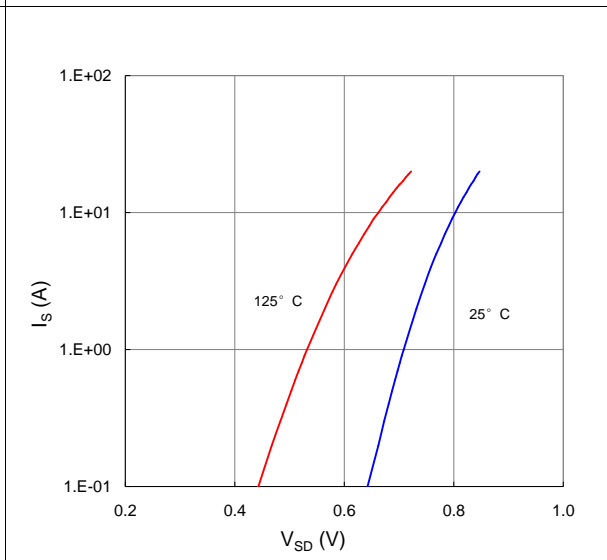


Figure 7. Typical Gate-Charge vs. Gate-to-Source Voltage

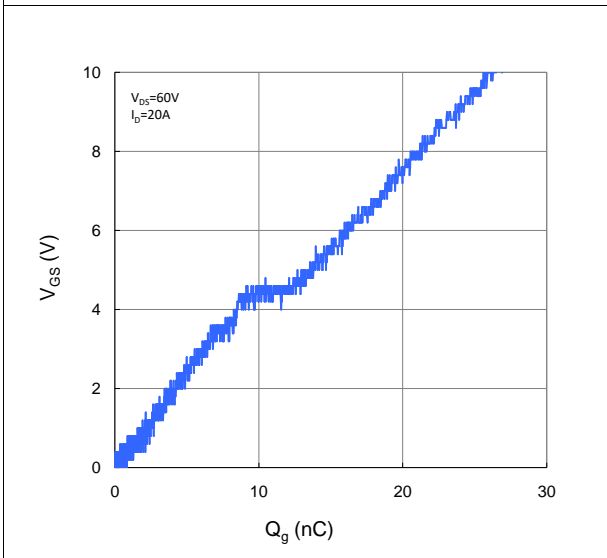


Figure 8. Typical Capacitance vs. Drain-to-Source Voltage

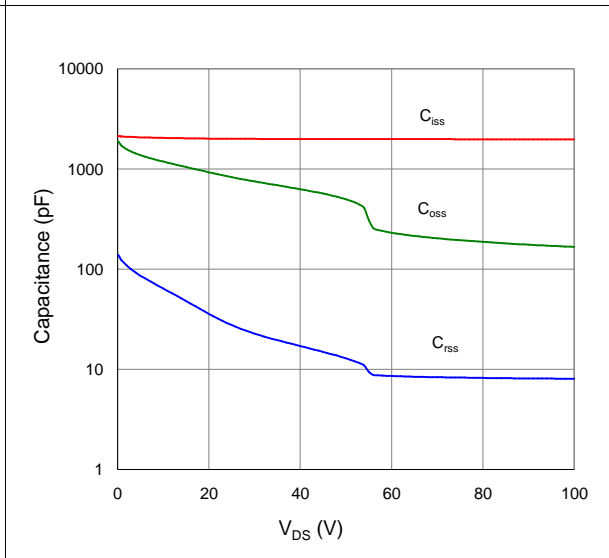


Figure 9. Maximum Safe Operating Area

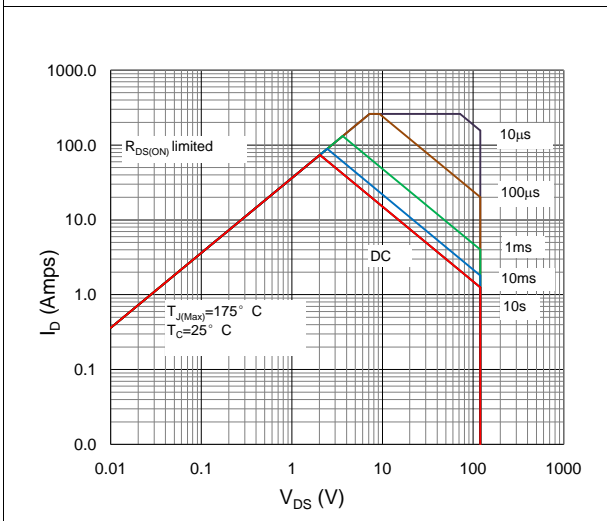


Figure 10. Maximum Drain Current vs. Case Temperature

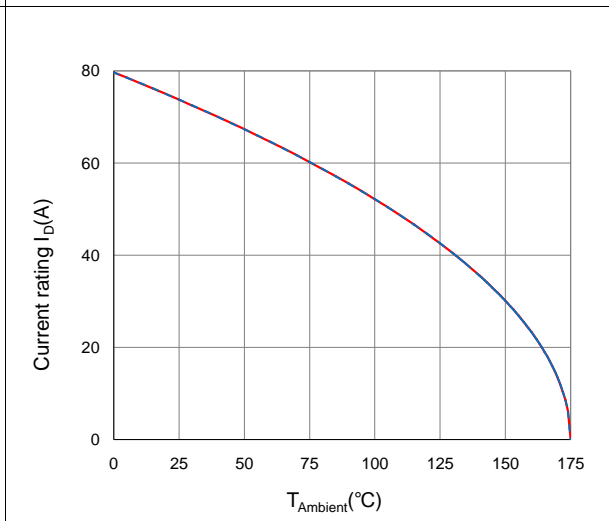
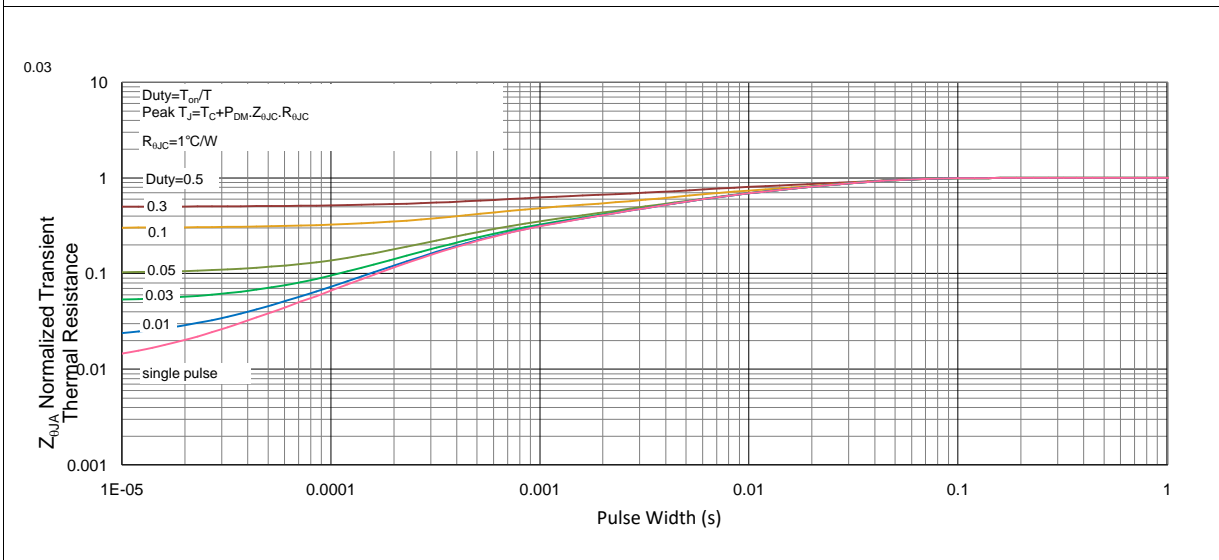
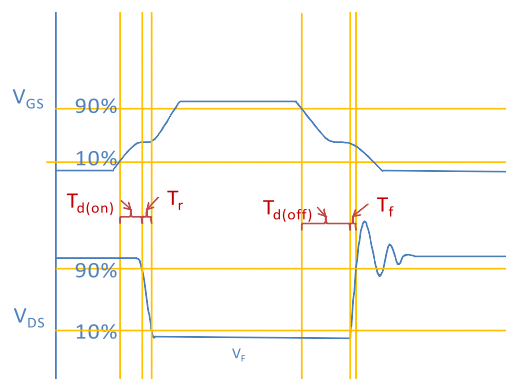
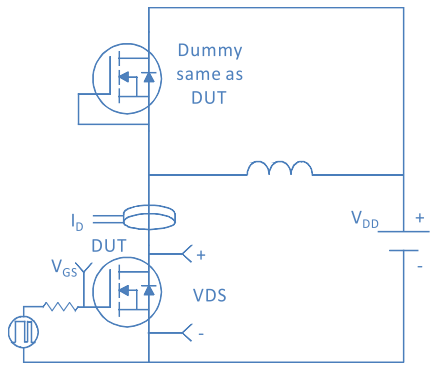


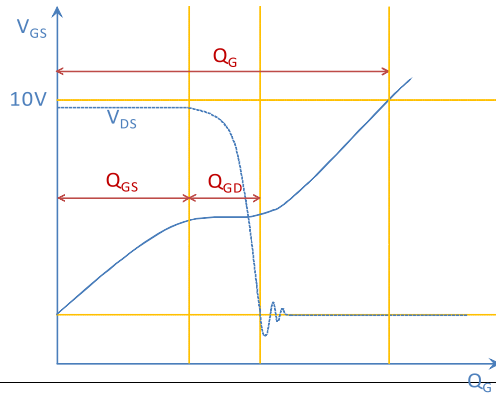
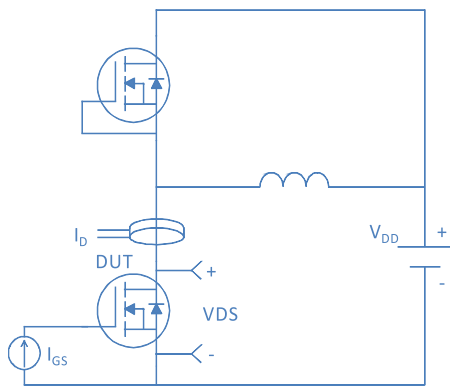
Figure 11. Normalized Maximum Transient Thermal Impedance, Junction-to-Ambient



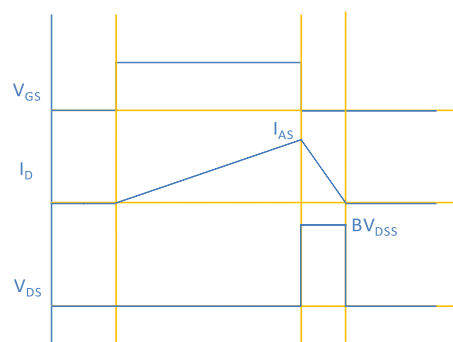
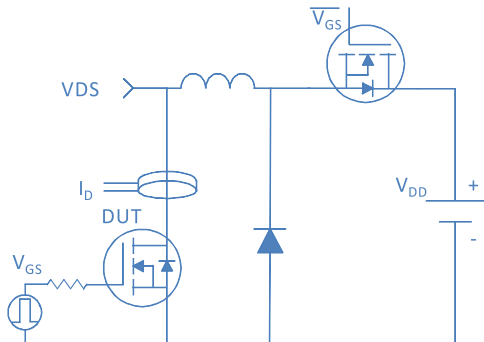
Inductive switching Test



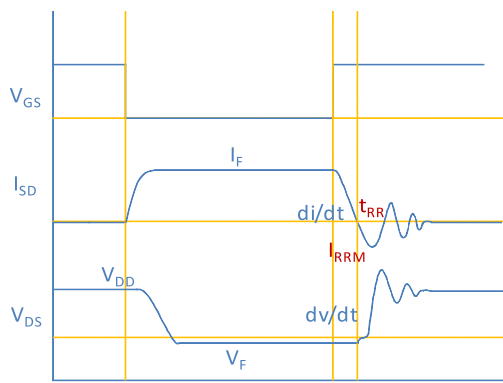
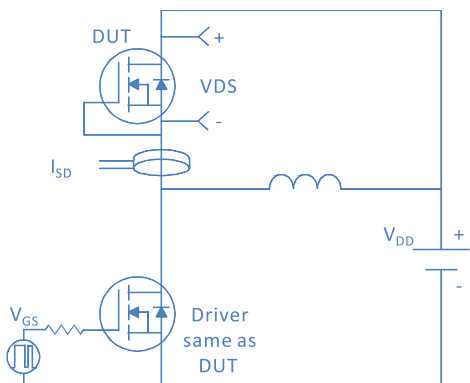
Gate Charge Test



Uclamped Inductive Switching (UIS) Test

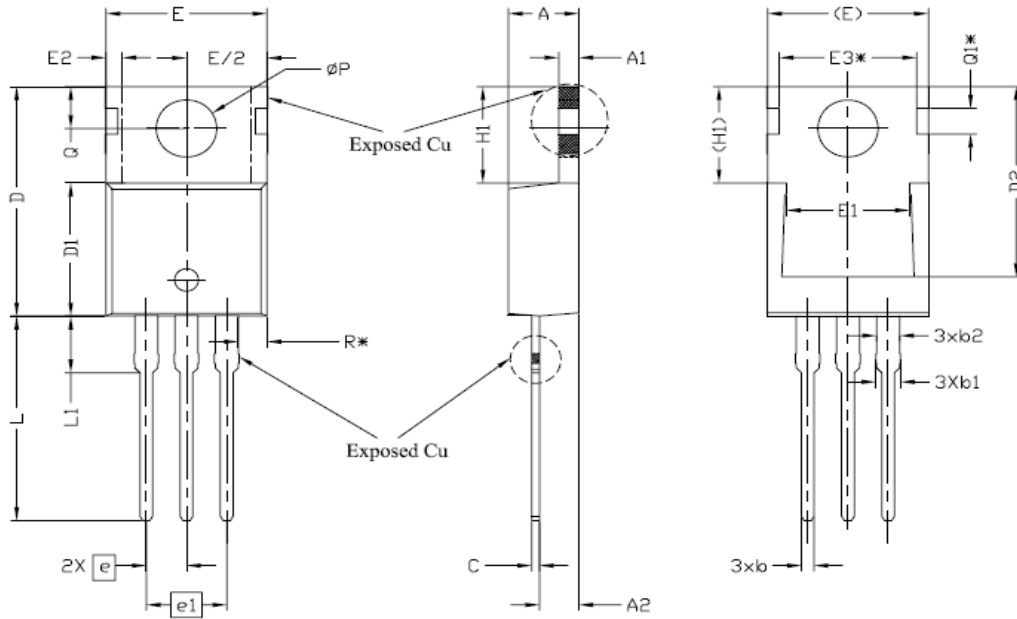


Diode Recovery Test



Package Outline

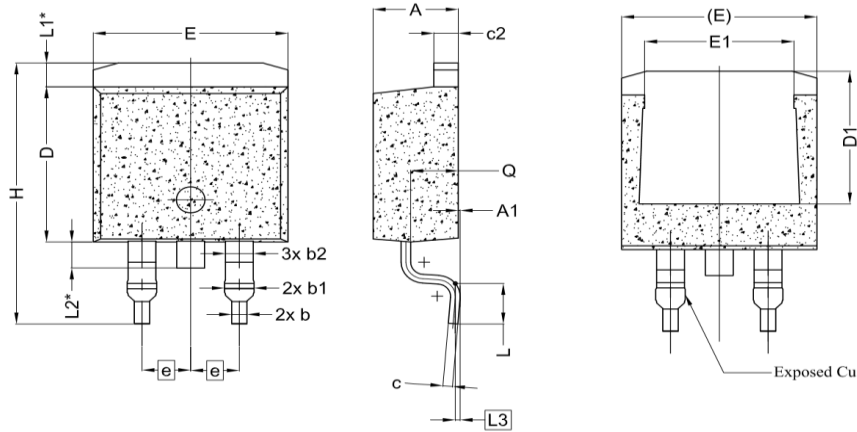
TO-220, 3 Leads



| SYMBOL   | DIMENSIONS |       |       | NOTES |
|----------|------------|-------|-------|-------|
|          | MIN.       | NOM.  | MAX.  |       |
| A        | 4,24       | 4,44  | 4,64  |       |
| A1       | 1,15       | 1,27  | 1,40  |       |
| A2       | 2,30       | 2,48  | 2,70  |       |
| b        | 0,70       | 0,80  | 0,90  |       |
| b1       | 1,20       | 1,55  | 1,75  |       |
| b2       | 1,20       | 1,45  | 1,70  |       |
| c        | 0,40       | 0,50  | 0,60  |       |
| D        | 14,70      | 15,37 | 16,00 | 4     |
| D1       | 8,82       | 8,92  | 9,02  |       |
| D2       | 12,63      | 12,73 | 12,83 | 5     |
| E        | 9,96       | 10,16 | 10,36 | 4,5   |
| E1       | 6,86       | 7,77  | 8,89  | 5     |
| E2       | -          | -     | 0,76  | 6     |
| E3*      | 8,70REF.   |       |       |       |
| e        | 2,54BSC    |       |       |       |
| e1       | 5,08BSC    |       |       |       |
| H1       | 6,30       | 6,45  | 6,60  | 5,6   |
| L        | 13,47      | 13,72 | 13,97 |       |
| L1       | 3,60       | 3,80  | 4,00  |       |
| $\phi P$ | 3,75       | 3,84  | 3,93  |       |
| Q        | 2,60       | 2,80  | 3,00  |       |
| Q1*      | 1,73REF.   |       |       |       |
| R*       | 1,82REF.   |       |       |       |

Package Outline

TO-263, 3 Leads



| SYMBOL | DIMENSIONS |       |       |
|--------|------------|-------|-------|
|        | MIN.       | NOM.  | MAX.  |
| A      | 4.24       | 4.44  | 4.64  |
| A1     | 0.00       | 0.10  | 0.25  |
| b      | 0.70       | 0.80  | 0.90  |
| b1     | 1.20       | 1.55  | 1.75  |
| b2     | 1.20       | 1.45  | 1.70  |
| c      | 0.40       | 0.50  | 0.60  |
| c2     | 1.15       | 1.27  | 1.40  |
| D      | 8.82       | 8.92  | 9.02  |
| D1     | 6.86       | 7.65  | ---   |
| E      | 9.96       | 10.16 | 10.36 |
| E1     | 6.89       | 7.77  | 7.89  |
| e      | 2.54 BSC   |       |       |
| H      | 14.61      | 15.00 | 15.88 |
| L      | 1.78       | 2.32  | 2.79  |
| L1     | 1.36 REF.  |       |       |
| L2     | 1.50 REF.  |       |       |
| L3     | 0.25 BSC   |       |       |
| Q      | 2.30       | 2.48  | 2.70  |