



# 100V 3.2mΩ N-Ch Power MOSFET

## Features

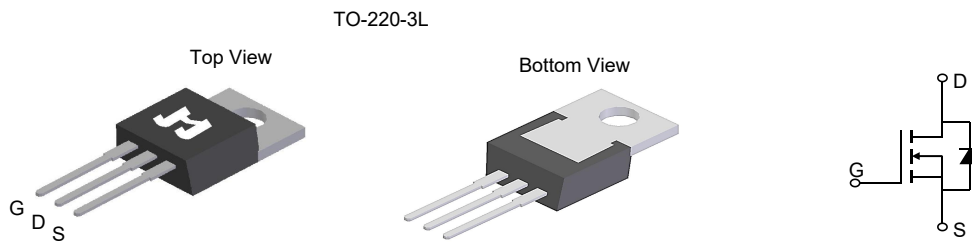
- Ultra-low  $R_{DS(ON)}$
- Low Gate Charge
- 100% UIS Tested, 100%  $R_g$  Tested
- Pb-free Lead Plating
- Halogen-free and RoHS-compliant

## Product Summary

| Parameter                                | Value | Unit |
|--|-------|------|
| $V_{DS}$                                 | 100   | V    |
| $V_{GS(th)}$                             | 3.0   | V    |
| $I_D$ (@ $V_{GS} = 10V$ ) <sup>(1)</sup> | 169   | A    |
| $R_{DS(ON)}$ (@ $V_{GS} = 10V$ )         | 3.2   | mΩ   |

## Applications

- Motor Driving in Power Tool, E-vehicle, Robotics
- Current Switching in DC/DC & AC/DC (SR) Sub-systems
- Power Management in Telecom., Industrial Automation, CE

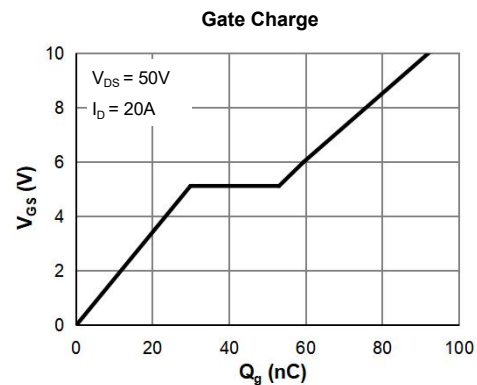
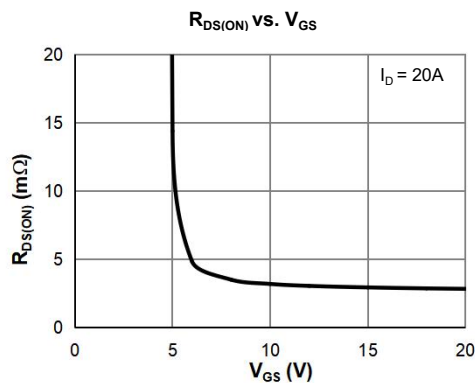


## Ordering Information

| Device  | Package   | # of Pins | Marking | MSL | $T_J$ (°C) | Media | Quantity (pcs) |
|---------|-----------|-----------|---------|-----|------------|-------|----------------|
| JVC103K | TO-220-3L | 3         | VC103K  | N/A | -55 to 150 | Tube  | 50             |

## Absolute Maximum Ratings (@ $T_A = 25^\circ C$ unless otherwise specified)

| Parameter                               | Symbol         | Value               | Unit |
|---|----------------|---------------------|------|
| Drain-to-Source Voltage                 | $V_{DS}$       | 100                 | V    |
| Gate-to-Source Voltage                  | $V_{GS}$       | ±20                 | V    |
| Continuous Drain Current <sup>(1)</sup> | $I_D$          | $T_C = 25^\circ C$  | 169  |
|   |                | $T_C = 100^\circ C$ | 107  |
| Pulsed Drain Current <sup>(2)</sup>     | $I_{DM}$       | 676                 | A    |
| Avalanche Energy <sup>(3)</sup>         | $E_{AS}$       | 726                 | mJ   |
| Power Dissipation <sup>(4)</sup>        | $P_D$          | $T_C = 25^\circ C$  | 208  |
|   |                | $T_C = 100^\circ C$ | 83   |
| Junction & Storage Temperature Range    | $T_J, T_{STG}$ | -55 to 150          | °C   |



**Electrical Characteristics** (@  $T_J = 25^\circ\text{C}$  unless otherwise specified)

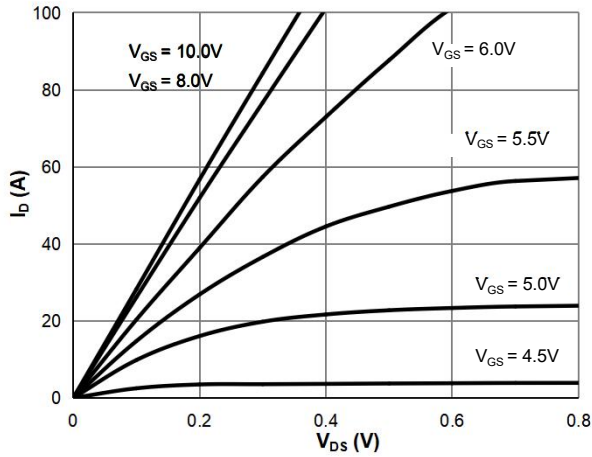
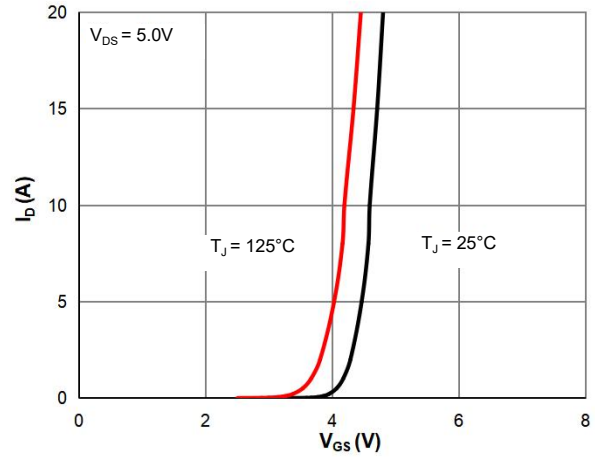
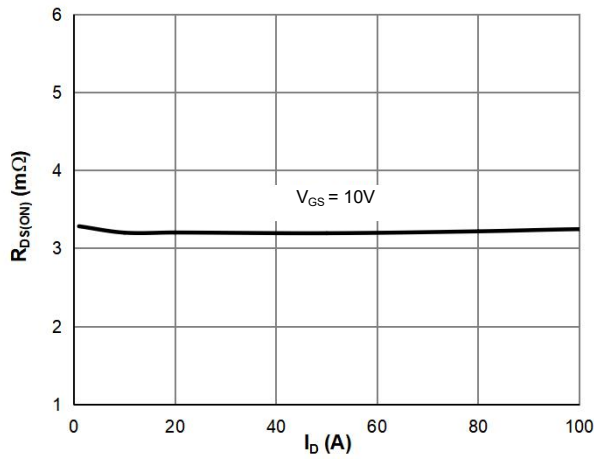
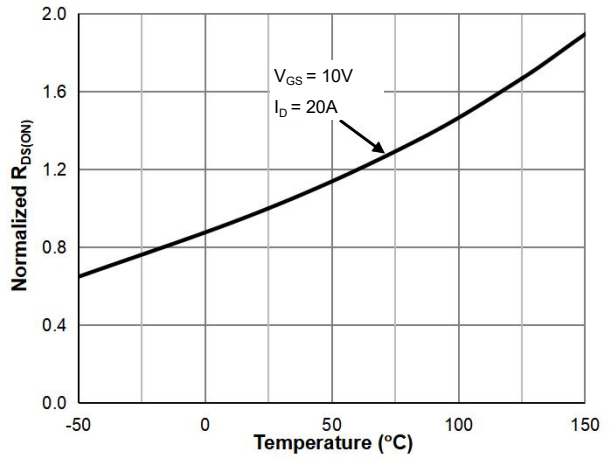
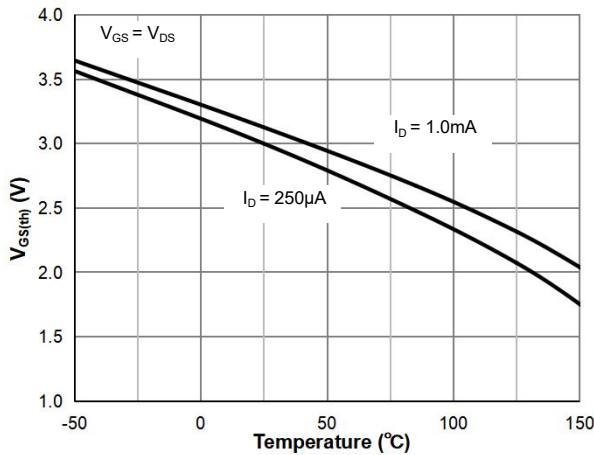
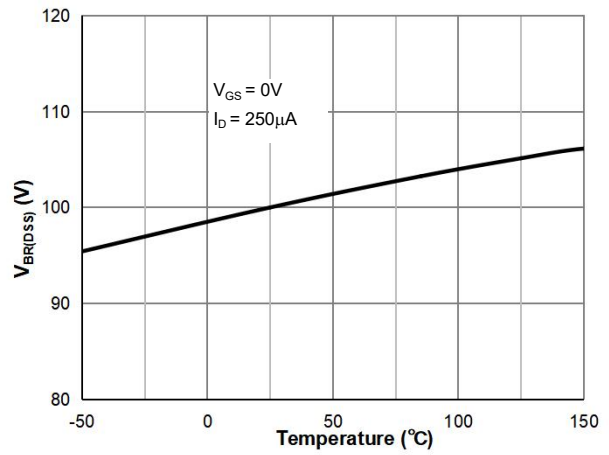
| Parameter                                     | Symbol        | Conditions   | Min. | Typ. | Max.       | Unit             |
|---|---------------|--|------|------|------------|------------------|
| <b>STATIC PARAMETERS</b>                      |               |  |      |      |            |                  |
| Drain-Source Breakdown Voltage                | $V_{(BR)DSS}$ | $I_D = 250\mu\text{A}$ , $V_{GS} = 0\text{V}$  | 100  |      |            | V                |
| Zero Gate Voltage Drain Current               | $I_{DSS}$     | $V_{DS} = 80\text{V}$ , $V_{GS} = 0\text{V}$<br>$T_J = 55^\circ\text{C}$                 |      |      | 1.0<br>5.0 | $\mu\text{A}$    |
| Gate-Body Leakage Current                     | $I_{GSS}$     | $V_{DS} = 0\text{V}$ , $V_{GS} = \pm 20\text{V}$   |      |      | $\pm 100$  | nA               |
| Gate Threshold Voltage                        | $V_{GS(th)}$  | $V_{DS} = V_{GS}$ , $I_D = 250\mu\text{A}$   | 2.0  | 3.0  | 4.0        | V                |
| Static Drain-Source ON-Resistance             | $R_{DS(ON)}$  | $V_{GS} = 10\text{V}$ , $I_D = 20\text{A}$   |      | 3.2  | 3.8        | $\text{m}\Omega$ |
| Forward Transconductance                      | $g_{FS}$      | $V_{DS} = 5\text{V}$ , $I_D = 20\text{A}$  |      | 50   |            | S                |
| Diode Forward Voltage                         | $V_{SD}$      | $I_S = 1\text{A}$ , $V_{GS} = 0\text{V}$   |      | 0.66 | 1.0        | V                |
| Diode Continuous Current                      | $I_S$         | $T_C = 25^\circ\text{C}$   |      |      | 169        | A                |
| <b>DYNAMIC PARAMETERS <sup>(5)</sup></b>      |               |  |      |      |            |                  |
| Input Capacitance                             | $C_{iss}$     | $V_{GS} = 0\text{V}$ , $V_{DS} = 50\text{V}$ , $f = 1\text{MHz}$                         |      | 5693 |            | pF               |
| Output Capacitance                            | $C_{oss}$     |  |      | 877  |            | pF               |
| Reverse Transfer Capacitance                  | $C_{rss}$     |  |      | 21   |            | pF               |
| Gate Resistance                               | $R_g$         | $V_{GS} = 0\text{V}$ , $V_{DS} = 0\text{V}$ , $f = 1\text{MHz}$                          |      | 2.3  |            | $\Omega$         |
| <b>SWITCHING PARAMETERS <sup>(5)</sup></b>    |               |  |      |      |            |                  |
| Total Gate Charge (@ $V_{GS} = 10\text{V}$ )  | $Q_g$         | $V_{GS} = 0$ to $10\text{V}$<br>$V_{DS} = 50\text{V}$ , $I_D = 20\text{A}$               |      | 92   |            | nC               |
| Total Gate Charge (@ $V_{GS} = 6.0\text{V}$ ) | $Q_g$         |  |      | 59   |            | nC               |
| Gate Source Charge                            | $Q_{gs}$      |  |      | 30   |            | nC               |
| Gate Drain Charge                             | $Q_{gd}$      |  |      | 23   |            | nC               |
| Turn-On DelayTime                             | $t_{D(on)}$   | $V_{GS} = 10\text{V}$ , $V_{DS} = 50\text{V}$<br>$R_L = 2.5\Omega$ , $R_{GEN} = 3\Omega$ |      | 25   |            | ns               |
| Turn-On Rise Time                             | $t_r$         |  |      | 35   |            | ns               |
| Turn-Off DelayTime                            | $t_{D(off)}$  |  |      | 54   |            | ns               |
| Turn-Off Fall Time                            | $t_f$         |  |      | 24   |            | ns               |
| Body Diode Reverse Recovery Time              | $t_{rr}$      | $I_F = 20\text{A}$ , $dI_F/dt = 100\text{A}/\mu\text{s}$                                 |      | 74   |            | ns               |
| Body Diode Reverse Recovery Charge            | $Q_{rr}$      | $I_F = 20\text{A}$ , $dI_F/dt = 100\text{A}/\mu\text{s}$                                 |      | 165  |            | nC               |

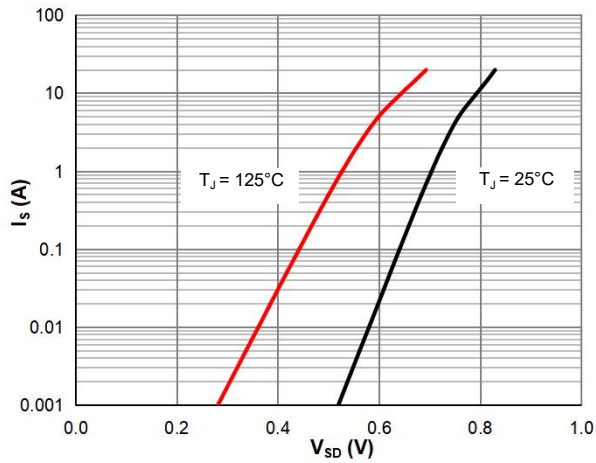
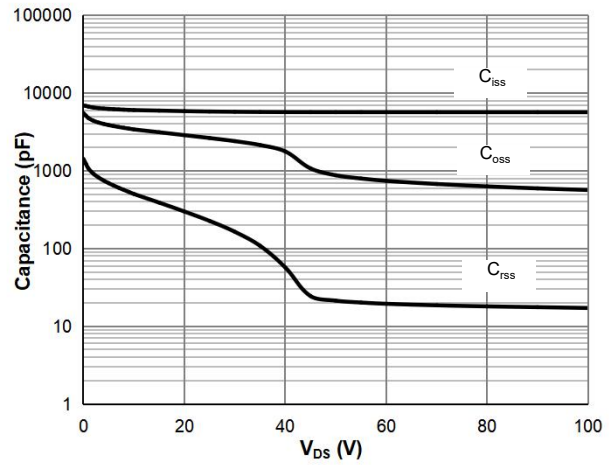
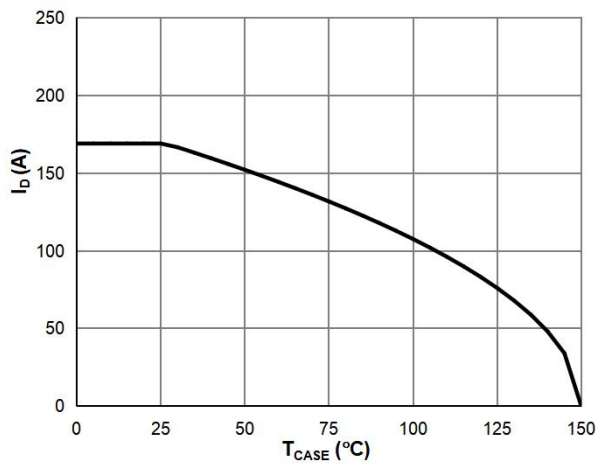
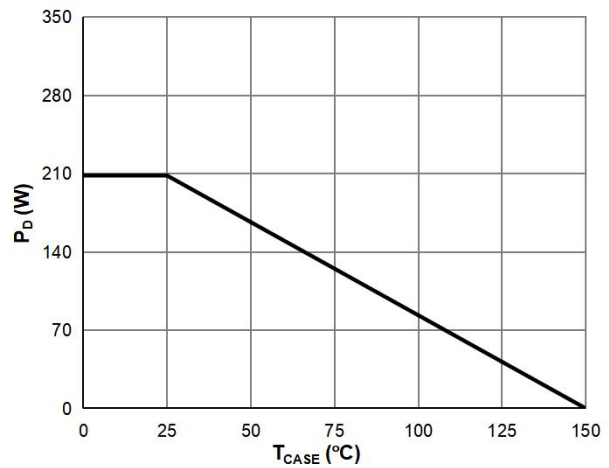
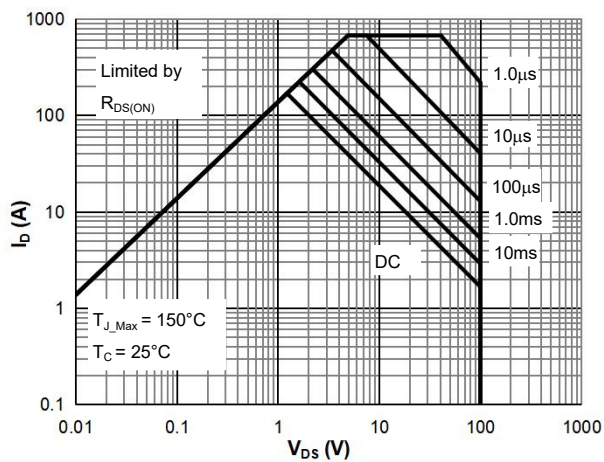
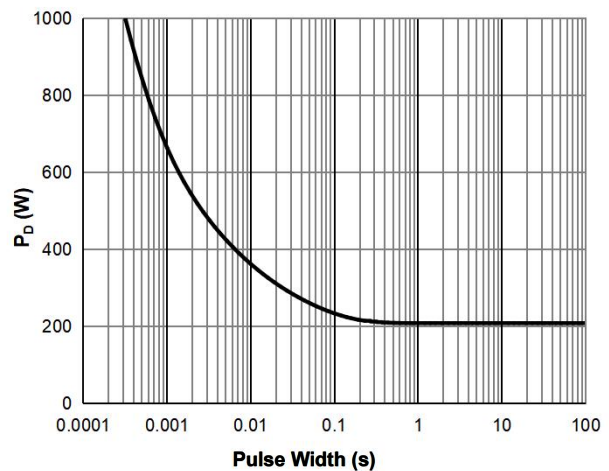
**Thermal Performance**

| Parameter                               | Symbol     | Typ. | Max. | Unit                      |
|---|------------|------|------|---------------------------|
| Thermal Resistance, Junction-to-Ambient | $R_{thJA}$ | 45   | 55   | $^\circ\text{C}/\text{W}$ |
| Thermal Resistance, Junction-to-Case    | $R_{thJC}$ | 0.40 | 0.60 | $^\circ\text{C}/\text{W}$ |

**Notes:**

1. Computed continuous current assumes the condition of  $T_{J\_Max}$  while the actual continuous current depends on the thermal & electro-mechanical application board design.
2. This single-pulse measurement was taken under  $T_{J\_Max} = 150^\circ\text{C}$ .
3.  $E_{AS}$  of 726 mJ is based on starting  $T_J = 25^\circ\text{C}$ ,  $L = 3\text{mH}$ ,  $I_{AS} = 22\text{A}$ ,  $V_{GS} = 10\text{V}$ ,  $V_{DD} = 50\text{V}$ ; 100% test at  $L = 0.1\text{mH}$ ,  $I_{AS} = 75\text{A}$ .  
 $T_{J\_Max} = 150^\circ\text{C}$ .
4. The power dissipation  $P_D$  is based on  $T_{J\_Max} = 150^\circ\text{C}$ .
5. This value is guaranteed by design hence it is not included in the production test.

**Typical Electrical & Thermal Characteristics**

**Figure 1: Saturation Characteristics**

**Figure 2: Transfer Characteristics**

**Figure 3:  $R_{DS(ON)}$  vs. Drain Current**

**Figure 4:  $R_{DS(ON)}$  vs. Junction Temperature**

**Figure 5:  $V_{GS(th)}$  vs. Junction Temperature**

**Figure 6:  $V_{BR(DSS)}$  vs. Junction Temperature**

**Typical Electrical & Thermal Characteristics**

**Figure 7: Body-Diode Characteristics**

**Figure 8: Capacitance Characteristics**

**Figure 9: Current De-rating**

**Figure 10: Power De-rating**

**Figure 11: Maximum Safe Operating Area**

**Figure 12: Single Pulse Power Rating, Junction-to-Case**



### Typical Electrical & Thermal Characteristics

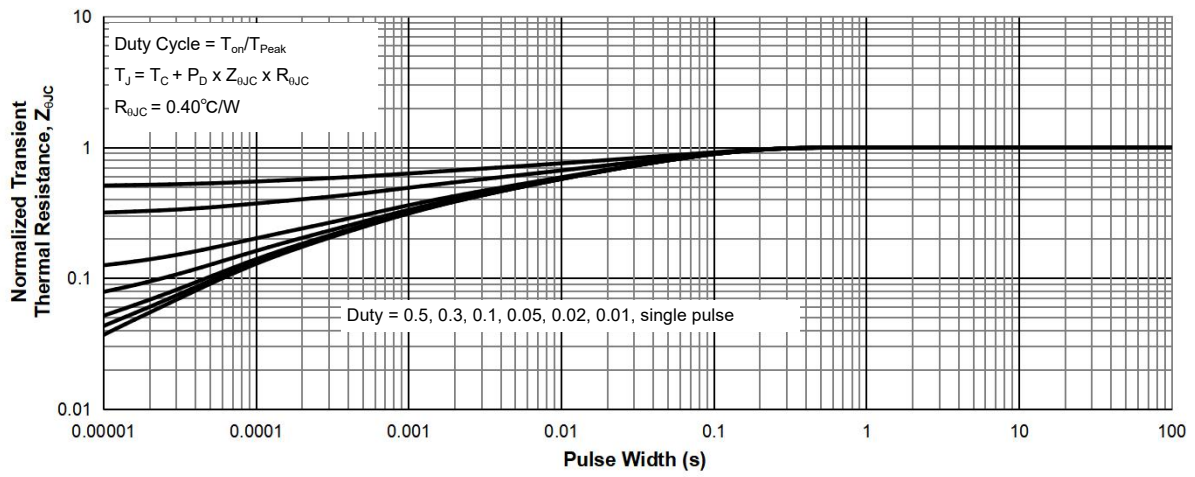
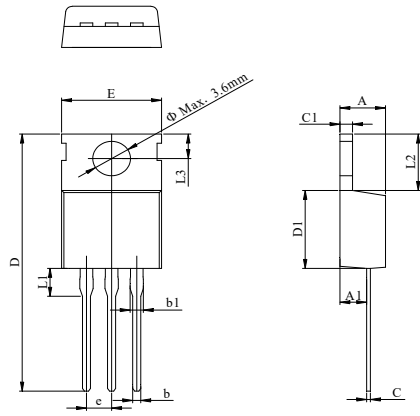


Figure 13: Normalized Maximum Transient Thermal Impedance

**TO-220-3L Package Information**
**Package Outline**


| DIM. | MILLIMETER |          |       |
|------|------------|----------|-------|
|      | MIN.       | NOM.     | MAX.  |
| A    | 4.24       |          | 4.70  |
| A1   | 2.20       |          | 3.00  |
| b    | 0.70       |          | 0.95  |
| b1   | 1.14       |          | 1.70  |
| C    | 0.40       |          | 0.60  |
| C1   | 1.15       |          | 1.40  |
| D    | 28.00      |          | 29.80 |
| D1   | 8.80       |          | 9.90  |
| E    | 9.70       |          | 10.50 |
| L1   |            |          | 3.80  |
| L2   | 6.25       |          | 6.90  |
| L3   | 2.40       |          | 3.00  |
| e    |            | 2.54 BSC |       |