# Lonten N-channel 650V, 100A, 0.031Ω LonFET™ Power MOSFET

## Description

LonFET™ Power MOSFET is fabricated using **advanced super junction** technology. The resulting device has extremely low on resistance, making it especially suitable for applications which require superior power density and outstanding efficiency.

## Features

- Ultra low $R_{DS(on)}$
- Ultra low gate charge (typ. $Q_g$ = 172nC)
- 100% UIS tested
- RoHS compliant

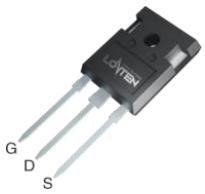
## Applications

- Power factor correction (PFC).
- Switched mode power supplies (SMPS).
- Uninterruptible power supply (UPS).

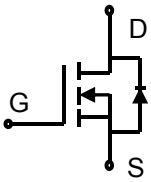
## Product Summary

| | |
|---|---|
| $V_{DS}$ @ $T_{j,max}$ | 700V |
| $R_{DS(on),max}$ | 0.031Ω |
| $I_{DM}$ | 300A |
| $Q_{g,typ}$ | 172 nC |

## Pin Configuration




**TO-247**




N-Channel MOSFET

## Absolute Maximum Ratings

| Parameter | Symbol | Value | Unit |
|---|---|---|---|
| Drain-Source Voltage | $V_{DSS}$ | 650 | V |
| Continuous drain current ( $T_C$ = 25°C ) | $I_D$ | 100 | A |
| ( $T_C$ = 100°C ) | | 63 | A |
| Pulsed drain current [1] | $I_{DM}$ | 300 | A |
| Gate-Source voltage | $V_{GSS}$ | ±30 | V |
| Avalanche energy, single pulse [2] | $E_{AS}$ | 2031 | mJ |
| Power Dissipation | $P_D$ | 735 | W |
| Operating and Storage Temperature Range | $T_J$, $T_{STG}$ | -55 to +150 | °C |
| Continuous diode forward current | $I_S$ | 100 | A |
| Diode pulse current | $I_{S,pulse}$ | 300 | A |

## Thermal Characteristics

| Parameter | Symbol | Value | Unit |
|---|---|---|---|
| Thermal Resistance, Junction-to-Case | $R_{\theta JC}$ | 0.17 | °C/W |
| Thermal Resistance, Junction-to-Ambient[3] | $R_{\theta JA}$ | 75 | °C/W |

## Package Marking and Ordering Information

| Device | Device Package | Marking | Units/Tube |
|---|---|---|---|
| LSB65R031HF | TO-247 | LSB65R031HF | 30 |

## Electrical Characteristics

$T_c$ = 25°C unless otherwise noted

| Parameter | Symbol | Test Condition | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| **Static characteristics** | | | | | | |
| Drain-source breakdown voltage | $BV_{DSS}$ | $V_{GS}$=0 V, $I_D$=0.25 mA | 650 | - | - | V |
| Gate threshold voltage | $V_{GS(th)}$ | $V_{DS}$=$V_{GS}$, $I_D$=0.25mA | 3.0 | 3.5 | 4.5 | V |
| Drain cut-off current | $I_{DSS}$ | $V_{DS}$=650 V, $V_{GS}$=0 V,$T_j$ = 25°C | - | - | 5 | μA |
| Gate leakage current, Forward | $I_{GSSF}$ | $V_{GS}$=30 V, $V_{DS}$=0 V | - | - | 100 | nA |
| Gate leakage current, Reverse | $I_{GSSR}$ | $V_{GS}$=-30 V, $V_{DS}$=0 V | - | - | -100 | nA |
| Drain-source on-state resistance | $R_{DS(on)}$ | $V_{GS}$=10 V, $I_D$=50 A | - | | | |
| | | $T_j$ = 25°C | - | 0.028 | 0.031 | Ω |
| | | $T_j$ = 150°C | - | 0.07 | - | |
| Gate resistance | $R_G$ | f=1 MHz, open drain | - | 2.1 | - | Ω |
| **Dynamic characteristics** | | | | | | |
| Input capacitance | $C_{iss}$ | $V_{DS}$ = 100 V, $V_{GS}$ = 0 V, | - | 8960 | - | pF |
| Output capacitance | $C_{oss}$ | f = 250 kHz | - | 312 | - | |
| Reverse transfer capacitance | $C_{rss}$ | | - | 0.34 | - | |
| Turn-on delay time | $t_{d(on)}$ | $V_{DD}$ = 400V, $I_D$ = 50A | - | 49 | - | ns |
| Rise time | $t_r$ | $R_G$ = 10Ω, $V_{GS}$=15V | - | 120.8 | - | |
| Turn-off delay time | $t_{d(off)}$ | | - | 304 | - | |
| Fall time | $t_f$ | | - | 5.8 | - | |
| **Gate charge characteristics** | | | | | | |
| Gate to source charge | $Q_{gs}$ | $V_{DD}$=520 V, $I_D$=50A, | - | 44 | - | nC |
| Gate to drain charge | $Q_{gd}$ | $V_{GS}$=0 to 10 V | - | 42.8 | - | |
| Gate charge total | $Q_g$ | | - | 172.4 | - | |
| Gate plateau voltage | $V_{plateau}$ | | - | 5.4 | - | V |
| **Reverse diode characteristics** | | | | | | |
| Diode forward voltage | $V_{SD}$ | $V_{GS}$=0 V, $I_F$=50A | - | - | 1.2 | V |
| Reverse recovery time | $t_{rr}$ | $V_R$=400 V, $I_F$=50A, | - | 191 | - | ns |
| Reverse recovery charge | $Q_{rr}$ | $dI_F/dt$=100 A/μs | - | 1.7 | - | μC |
| Peak reverse recovery current | $I_{rrm}$ | | - | 17.8 | - | A |

Notes:

1. Limited by maximum junction temperature, maximum duty cycle is 0.75.

2. $I_{AS}$ = 9.5A, L=45mH,$V_{DD}$ = 60V, Starting $T_j$= 25°C.

3: The value of $R_{thJA}$ is measured by placing the device in a still air box which is one cubic foot.

## Electrical Characteristics Diagrams

Figure 1. Typ. Output Characteristics

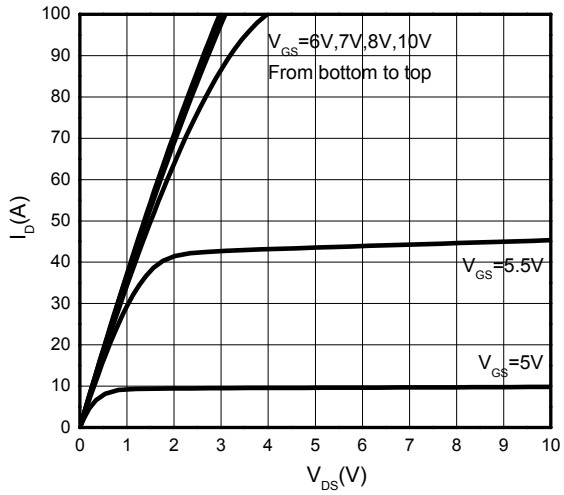



Figure 2. Transfer Characteristics

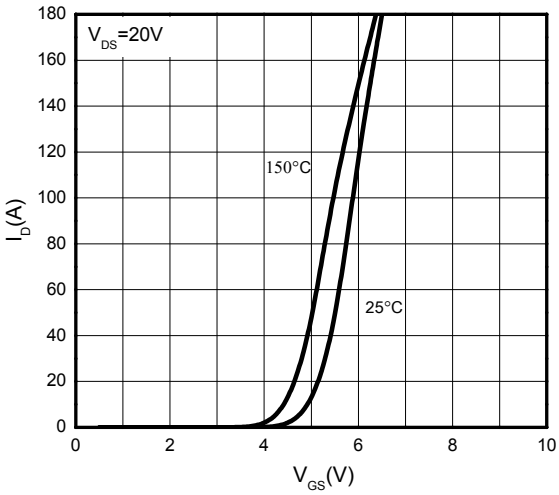



Figure 3. On-Resistance vs. Drain Current

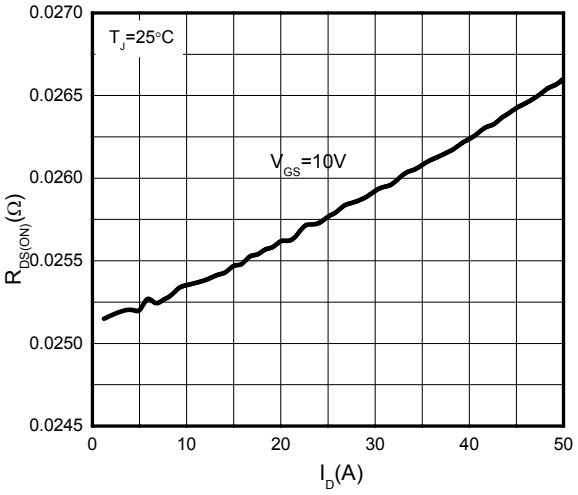



Figure 4.On-Resistance vs.Temperature

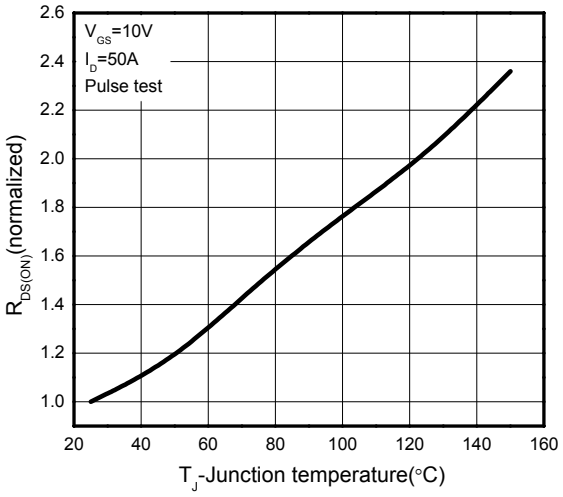



Figure 5.Breakdown Voltage vs.Temperature

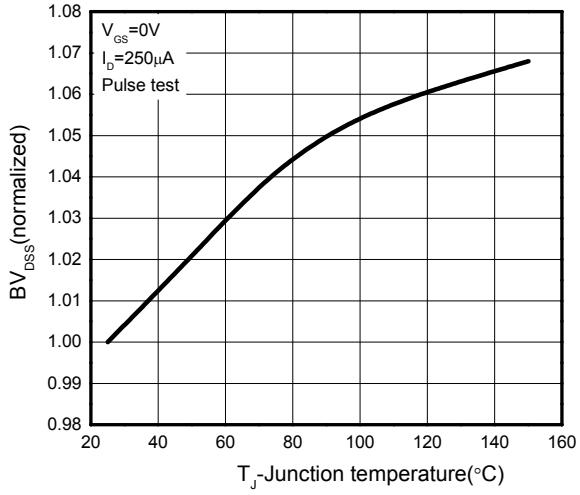



Figure 6.Threshold Voltage vs.Temperature

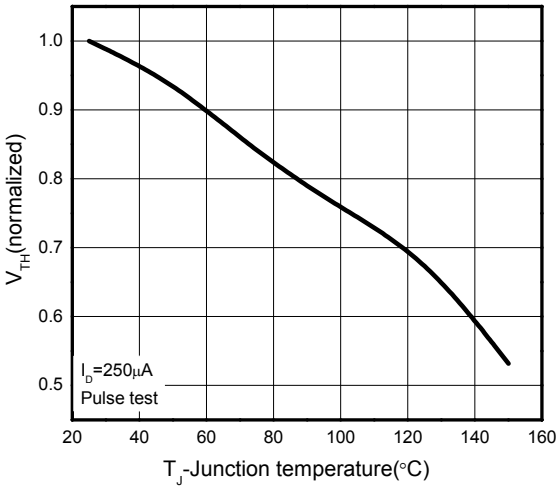


Figure 7.Body-Diode Characteristics

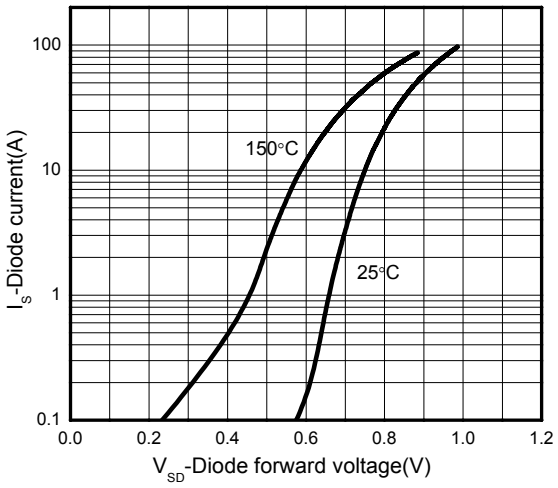



Figure 8.Capacitance Characteristics

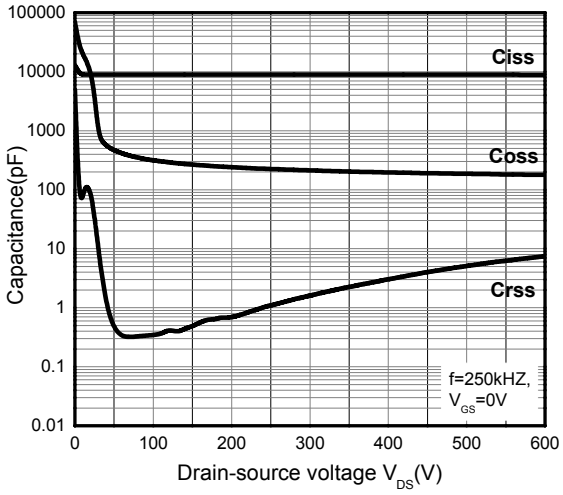



Figure 9.Gate Charge Characteristics

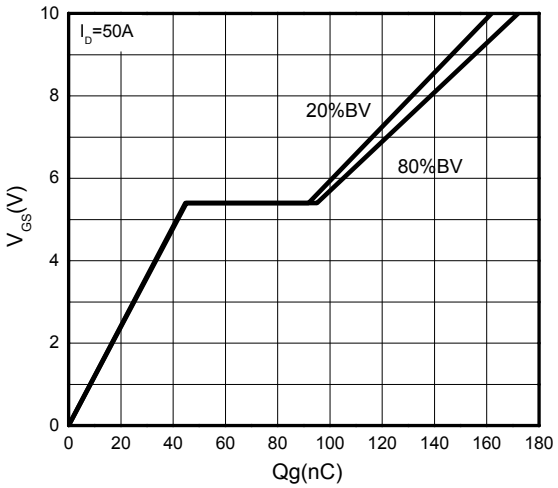



Figure 10.Drain Current Derating

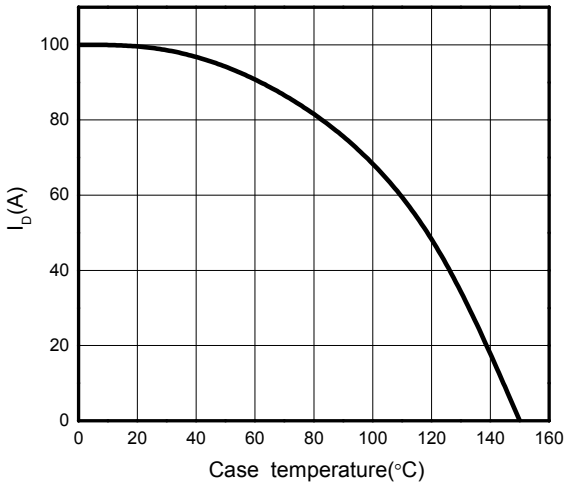



Figure 11.Power Dissipation vs.Temperature

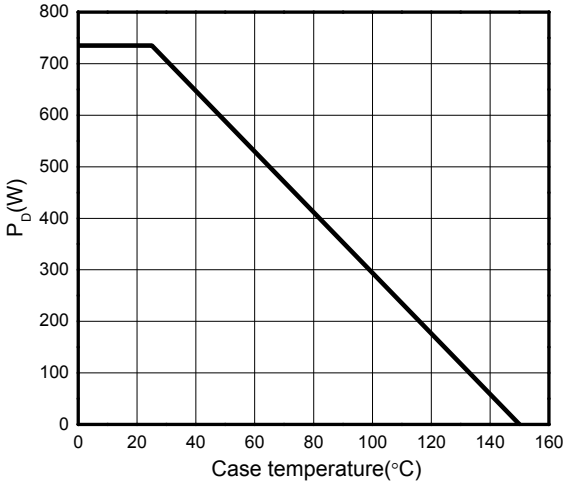



Figure 12: Safe Operating Area

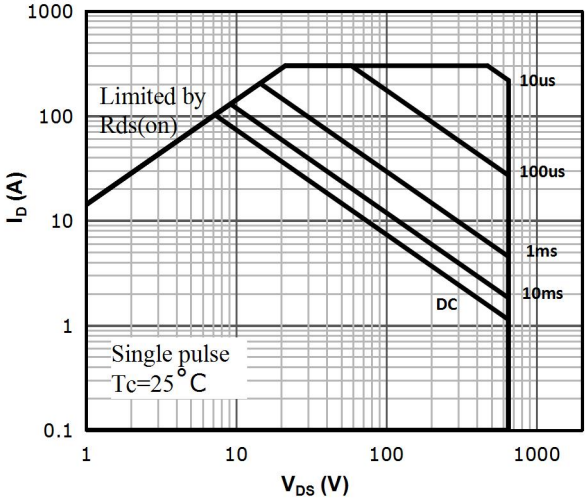
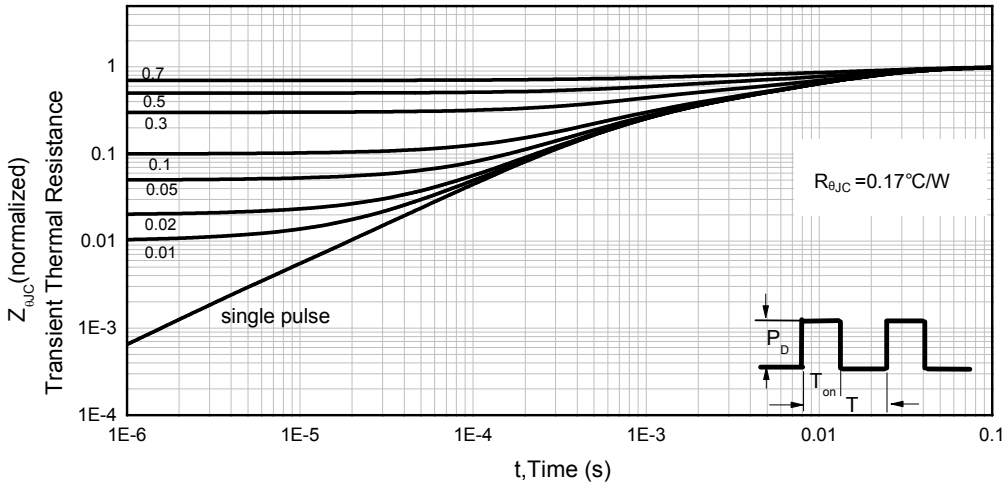
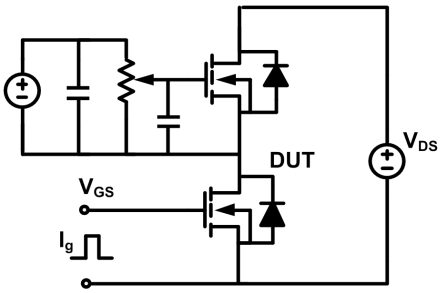


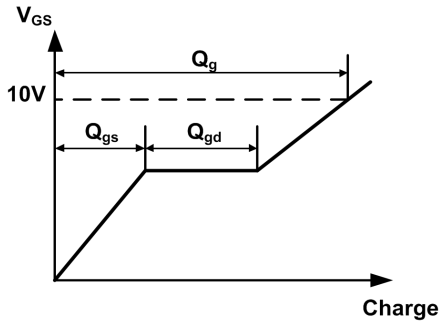
Figure 13. Normalized Maximum Transient Thermal Impedance (RthJC)



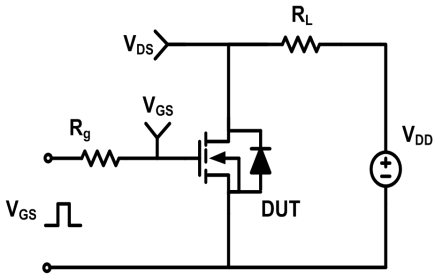
## Test Circuit & Waveforms

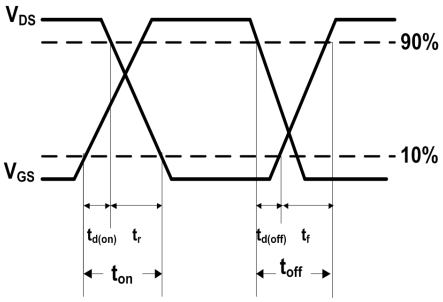
### Gate Charge Test Circuit & Waveform



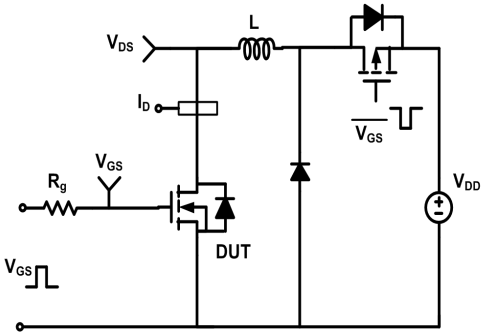



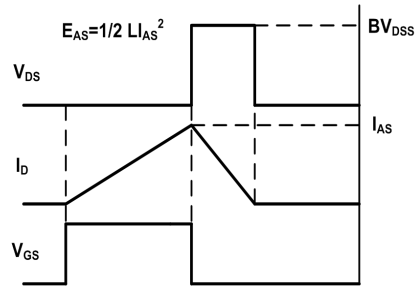

### Resistive Switching Test Circuit & Waveform



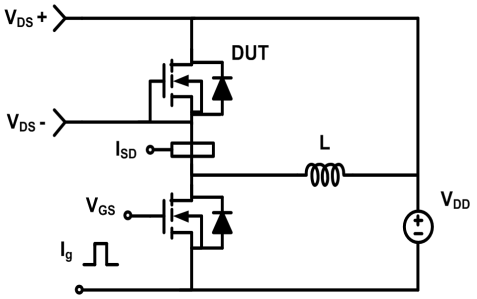



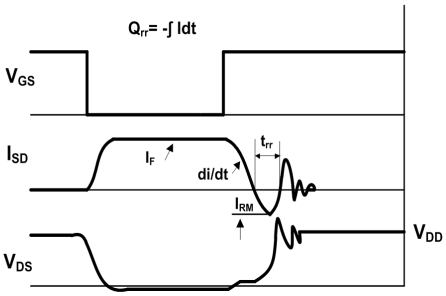

### Unclamped Inductive Switching (UIS) Test Circuit & Waveform



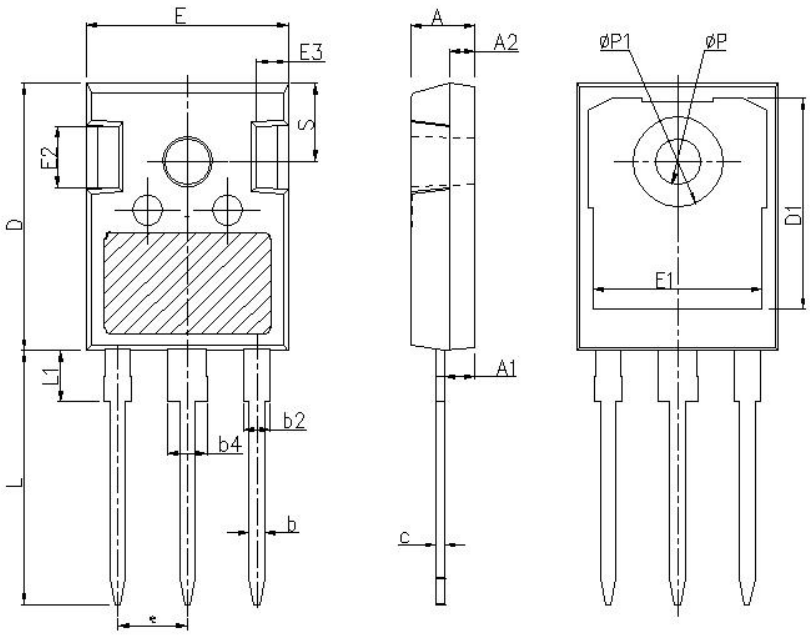




### Diode Recovery Test Circuit & Waveform



## Mechanical Dimensions for TO-247




| DIMENSIONS IN MILLITMETERS | | |
|---|---|---|
| SYMBOL | MIN | MAX |
| A | 4.8 | 5.21 |
| A1 | 2.21 | 2.61 |
| A2 | 1.85 | 2.16 |
| b | 1.07 | 1.36 |
| b2 | 1.91 | 2.41 |
| b4 | 2.87 | 3.38 |
| c | 0.51 | 0.75 |
| D | 20.7 | 21.3 |
| D1 | 16.25 | 17.65 |
| E | 15.5 | 16.13 |
| E1 | 13 | 13.6 |
| E2 | 3.68 | 5.2 |
| E3 | 1 | 2.7 |
| e | 5.44BSC | |
| L | 19.62 | 20.32 |
| L1 | - | 4.4 |
| ΦP | 3.4 | 3.8 |
| ΦP1 | - | 7.4 |
| S | 6.04 | 6.3 |

## Version Information

LSB65R031HF
**Revision:2021-09-02,Rev 1.1**

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