# Lonten N-channel 650V, 11A[1], 0.38Ω 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. $Q_g$ = 21nC)
- 100% UIS tested
- RoHS compliant

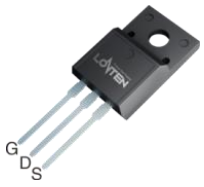
## Applications

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

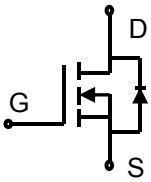
## Product Summary

| | |
|---|---|
| $V_{DS}$ @ $T_{j,max}$ | 700V |
| $R_{DS(on),max}$ | 0.38Ω |
| $I_{DM}$ | 18A |
| $Q_{g,typ}$ | 21nC |

## Pin Configuration




**TO-220F**




N-Channel MOSFET

## Absolute Maximum Ratings

| Parameter | Symbol | Value | Unit |
|---|---|---|---|
| Drain-Source Voltage | $V_{DSS}$ | 650 | V |
| Continuous drain current ( $T_C$ = 25°C ) | $I_D$ | 6 | A |
| ( $T_C$ = 100°C ) | | 3.8 | A |
| Pulsed drain current [2] | $I_{DM}$ | 18 | A |
| Gate-Source voltage | $V_{GSS}$ | ±30 | V |
| Avalanche energy, single pulse [3] | $E_{AS}$ | 270 | mJ |
| Power Dissipation | $P_D$ | 30 | W |
| Operating and Storage Temperature Range | $T_J$, $T_{STG}$ | -55 to +150 | °C |
| Continuous diode forward current | $I_S$ | 6 | A |
| Diode pulse current | $I_{S,pulse}$ | 18 | A |

## Thermal Characteristics

| Parameter | Symbol | Value | Unit |
|---|---|---|---|
| Thermal Resistance, Junction-to-Case | $R_{\theta JC}$ | 4.2 | °C/W |
| Thermal Resistance, Junction-to-Ambient [4] | $R_{\theta JA}$ | 60 | °C/W |

## Package Marking and Ordering Information

| Device | Device Package | Marking | Units/Tube |
|---|---|---|---|
| LSD65R380GF | TO-220F | LSD65R380GF | 50 |

## 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 | 2.5 | 3.5 | 5.0 | 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, $I_D$=5.5A | - | | | |
| | | $T_j$ = 25°C | - | 0.34 | 0.38 | Ω |
| | | $T_j$ = 150°C | - | 0.75 | - | |
| Gate resistance | $R_G$ | f=1 MHz, open drain | - | 6 | - | Ω |
| **Dynamic characteristics** | | | | | | |
| Input capacitance | $C_{iss}$ | $V_{DS}$ = 100 V, $V_{GS}$ = 0 V, | - | 920 | - | pF |
| Output capacitance | $C_{oss}$ | f = 250 kHz | - | 35.4 | - | |
| Reverse transfer capacitance | $C_{rss}$ | | - | 0.86 | - | |
| Turn-on delay time | $t_{d(on)}$ | $V_{DD}$ = 400V, $I_D$ = 5.5A | - | 19.6 | - | ns |
| Rise time | $t_r$ | $R_G$ = 10Ω, $V_{GS}$=10V | - | 36.5 | - | |
| Turn-off delay time | $t_{d(off)}$ | | - | 39 | - | |
| Fall time | $t_f$ | | - | 9.5 | - | |
| **Gate charge characteristics** | | | | | | |
| Gate to source charge | $Q_{gs}$ | $V_{DD}$=520 V, $I_D$=5.5A, | - | 3.6 | - | nC |
| Gate to drain charge | $Q_{gd}$ | $V_{GS}$=0 to 10 V | - | 6.3 | - | |
| Gate charge total | $Q_g$ | | - | 21 | - | |
| Gate plateau voltage | $V_{plateau}$ | | - | 4 | - | V |
| **Reverse diode characteristics** | | | | | | |
| Diode forward voltage | $V_{SD}$ | $V_{GS}$=0 V, $I_F$=11A | - | - | 1.1 | V |
| Reverse recovery time | $t_{rr}$ | $V_R$=50 V, $I_F$=11A, | - | 140 | - | ns |
| Reverse recovery charge | $Q_{rr}$ | $dI_F/dt$=100 A/μs | - | 0.8 | - | μC |
| Peak reverse recovery current | $I_{rrm}$ | | - | 12 | - | A |

Notes:

1.The value reference TO-220 package.

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

3. $I_{AS}$ = 3A, L=60mH,$V_{DD}$ = 60V, Starting $T_j$= 25°C.

4. 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

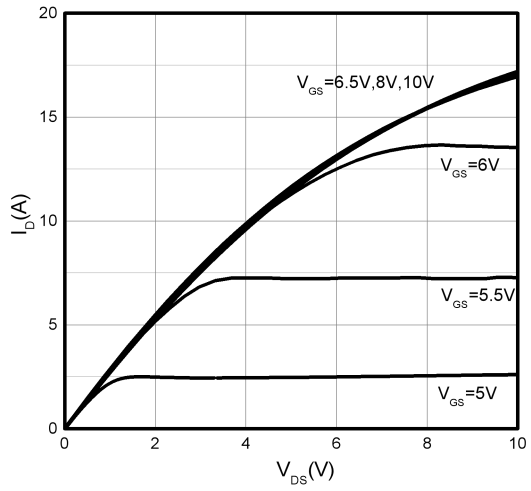



Figure 2. Transfer Characteristics

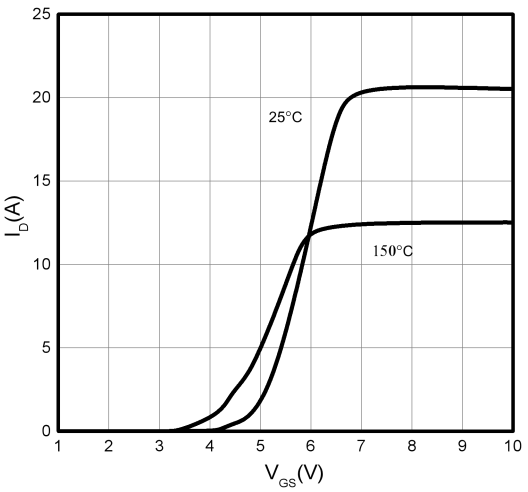



Figure 3. On-Resistance vs. Drain Current

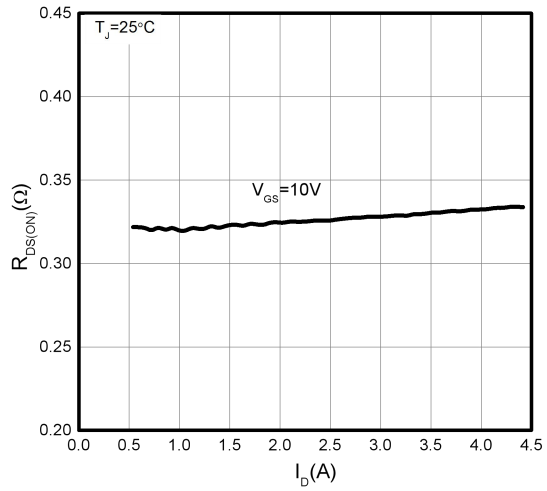



Figure 4.On-Resistance vs.Temperature

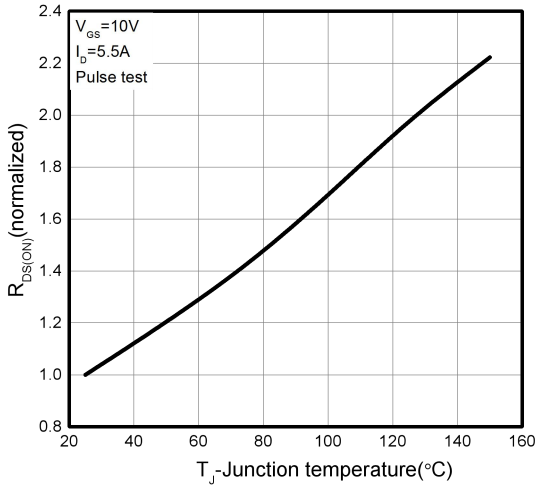



Figure 5.Breakdown Voltage vs.Temperature

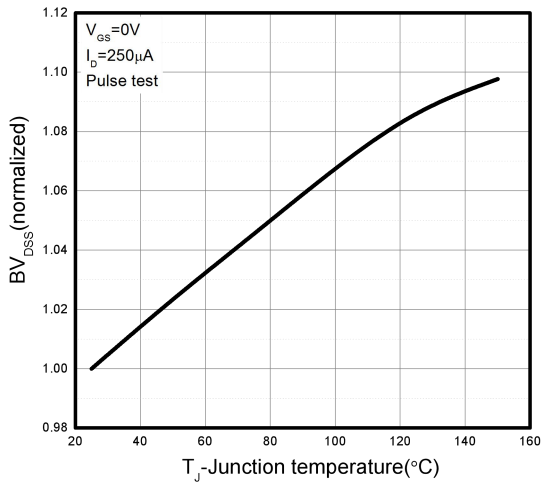



Figure 6.Threshold Voltage vs.Temperature

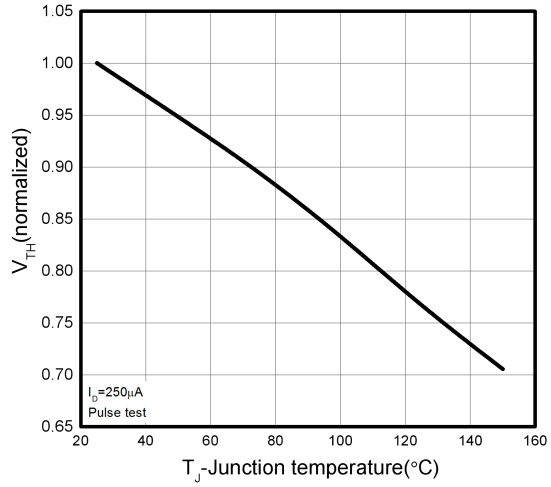


Figure 7.Body-Diode Characteristics

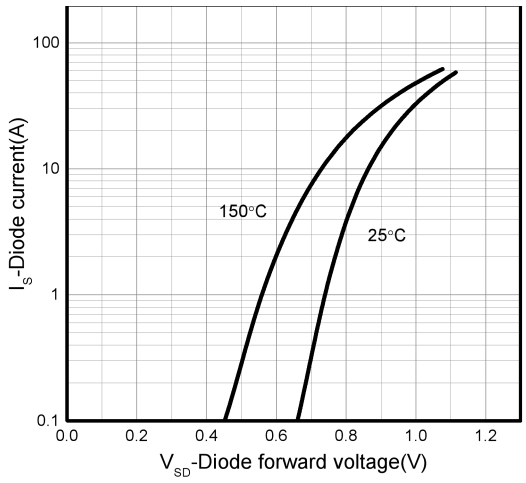



Figure 8.Capacitance Characteristics

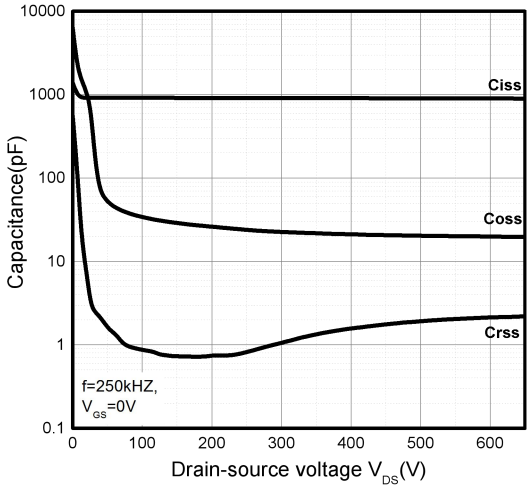



Figure 9.Gate Charge Characteristics

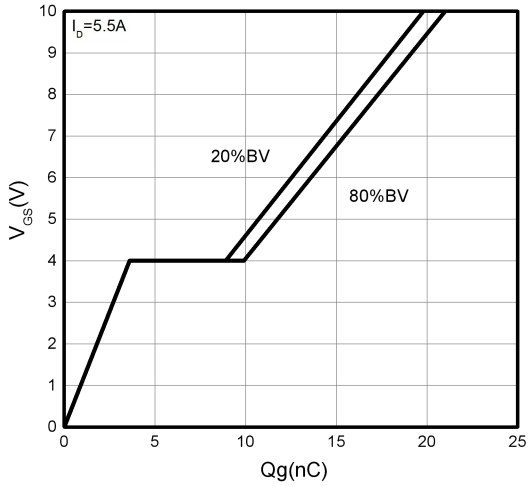



Figure 10.Drain Current Derating

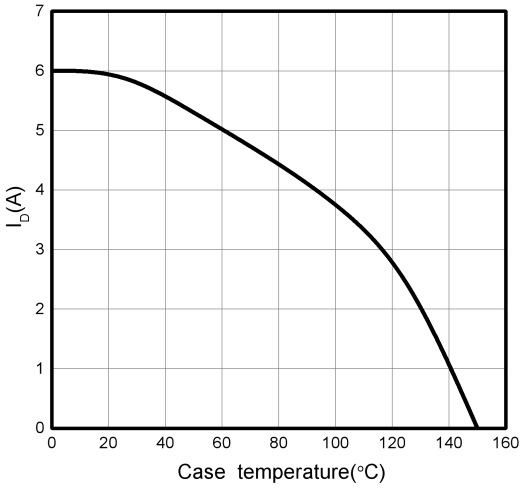



Figure 11.Power Dissipation vs.Temperature

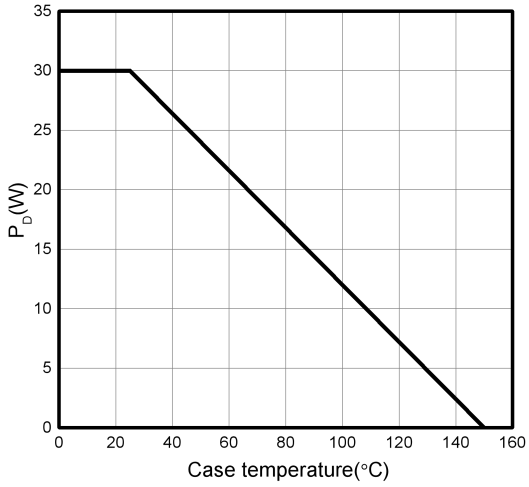



Figure 12. Safe Operating Area

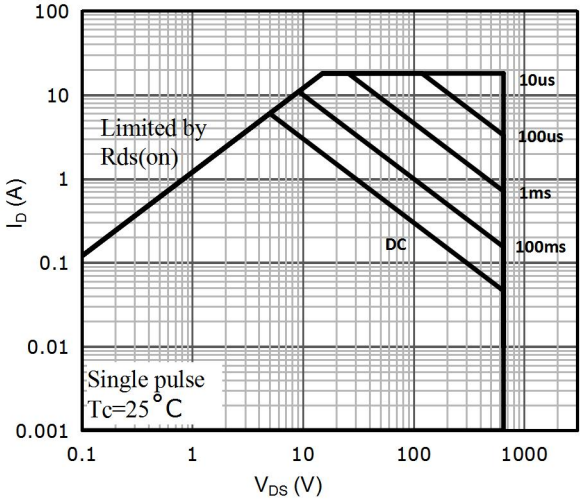
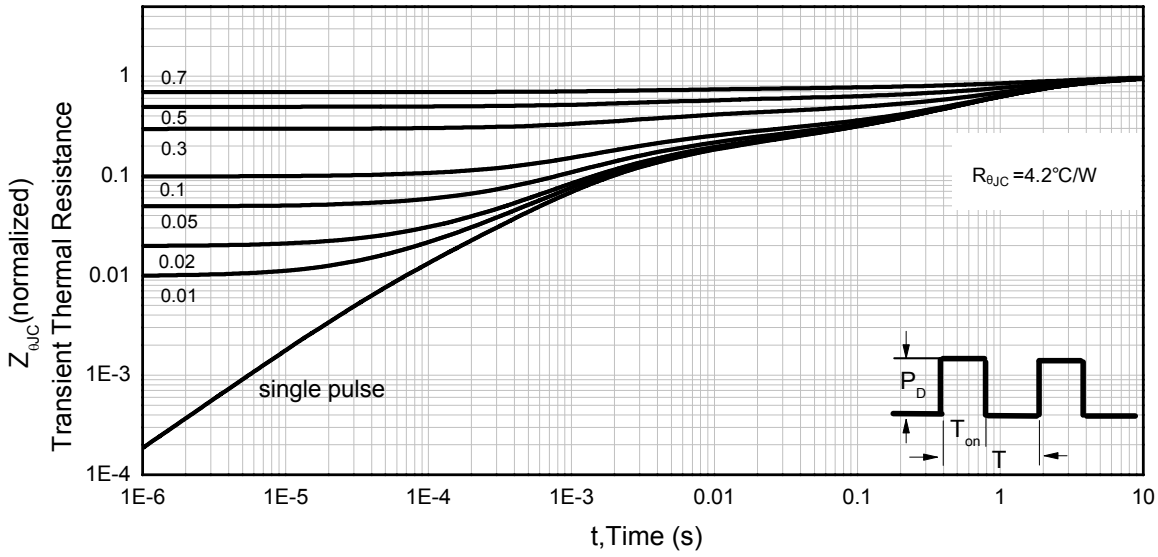
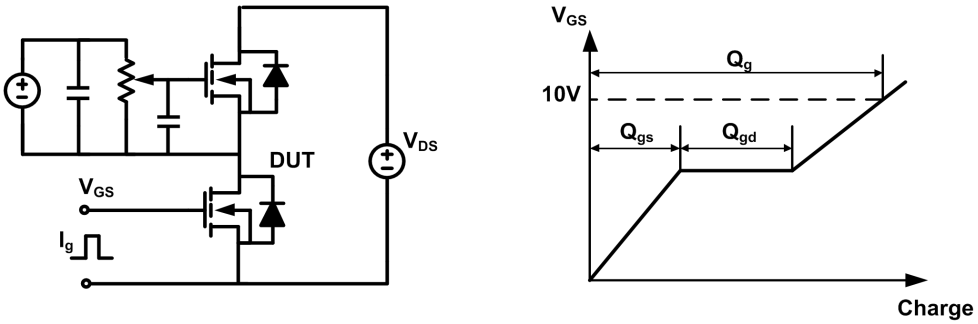


Figure 13. Normalized Maximum Transient Thermal Impedance (RthJC)

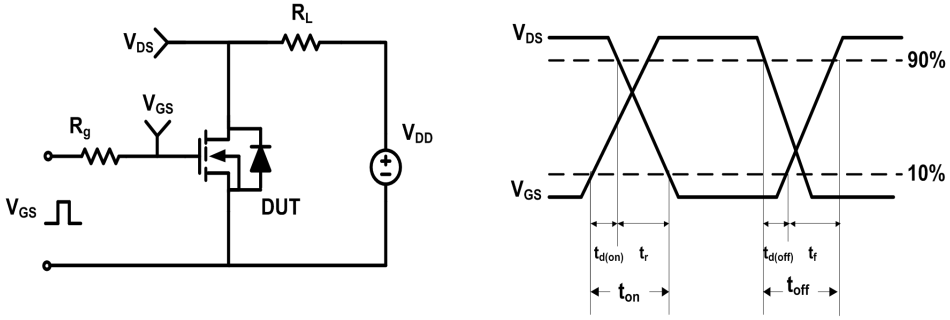


## Test Circuit & Waveforms

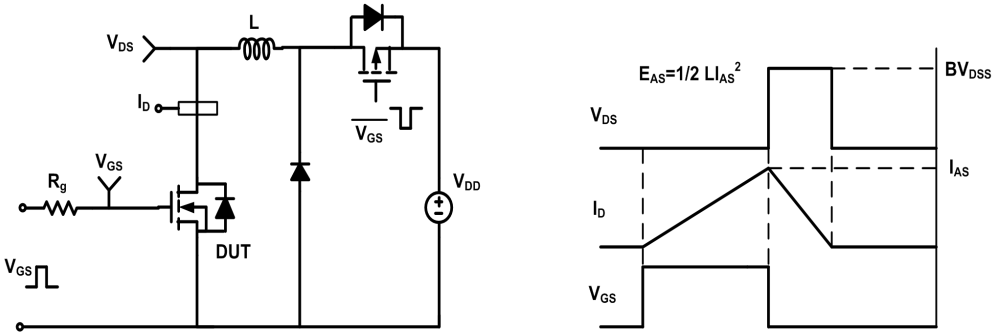
### Gate Charge Test Circuit & Waveform



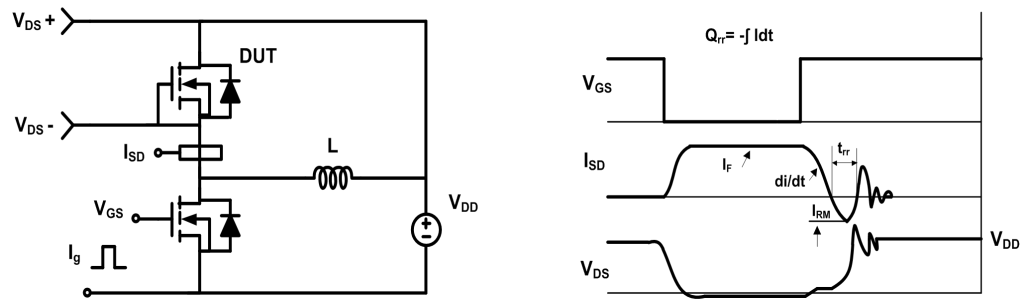

### Resistive Switching Test Circuit & Waveform



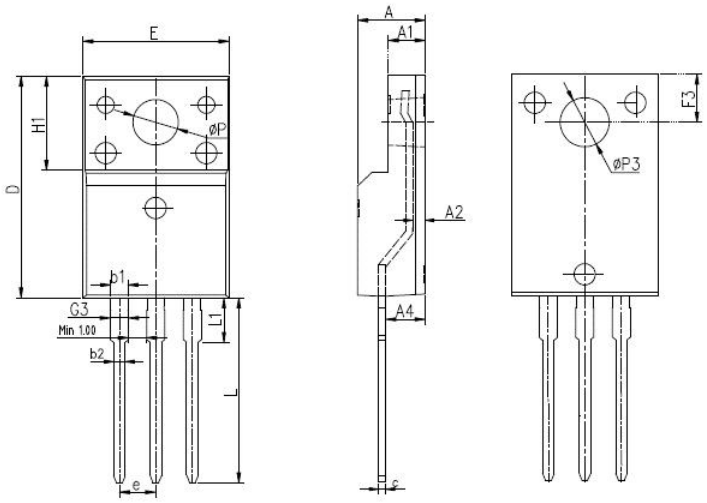

### Unclamped Inductive Switching (UIS) Test Circuit & Waveform




### Diode Recovery Test Circuit & Waveform



## Mechanical Dimensions for TO-220F




| DIMENSIONS IN MILLITMETERS | | |
|---|---|---|
| SYMBOL | MIN | MAX |
| A | 4.4 | 4.9 |
| A1 | 2.34 | 2.74 |
| A2 | 0.3 | 0.7 |
| A4 | 2.5 | 2.96 |
| c | 0.4 | 0.7 |
| D | 15.57 | 16.4 |
| E | 9.96 | 10.4 |
| H1 | 6.48 | 6.95 |
| e | 2.54BSC | |
| L | 12.68 | 14.2 |
| L1 | 2.88 | 3.6 |
| ΦP | 3 | 3.38 |
| ΦP3 | 3.15 | 3.65 |
| F3 | 3.15 | 3.45 |
| G3 | 1.15 | 1.58 |
| b1 | 1.18 | 1.43 |
| b2 | 0.7 | 1 |

## Version Information

LSD65R380GF
**Revision:2022-05-12,Rev 1.0**

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