

## FGHL75T65MQDT-VB Datasheet

### 600V Trench and Fieldstop IGBT

| PRODUCT SUMMARY   |                               |                                |
|-------------------|-------------------------------|--------------------------------|
| $V_{CE}$ (V)      | 600                           |                                |
| $I_C$ (A)         | 90 ( $T_C=25^\circ\text{C}$ ) | 75 ( $T_C=100^\circ\text{C}$ ) |
| $V_{CE(sat)}$ (V) | 1.7                           |                                |
| $Q_g$ (nC)        | 175                           |                                |
| $I_{CM}$ (A)      | 225                           |                                |

#### FEATURES

- Very Low  $V_{CEsat}$
- Low turn-off losses
- High speed switching
- Maximum junction temperature  $175^\circ\text{C}$
- Ultra low gate charge ( $Q_g$ )
- Avalanche energy rated (UIS)



**RoHS**  
COMPLIANT  
HALOGEN  
**FREE**

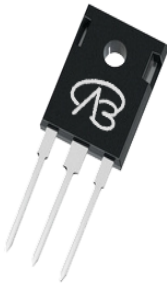
#### APPLICATIONS

- Telecommunications
  - Server and telecom power supplies
- Lighting
  - High-intensity discharge (HID)
  - Fluorescent ballast lighting
- Consumer and computing
  - ATX power supplies
- Industrial
  - Welding
  - Battery chargers
- Renewable energy
  - Solar (PV inverters)
- Switch mode power supplies (SMPS)

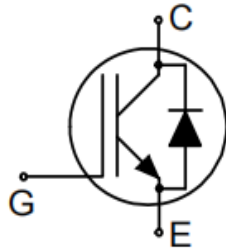
#### Package pin definition

- Pin1 G - Gate
- Pin2 C & backside - Collector
- Pin3 E - Emitter

TO-247



Top View



| ABSOLUTE MAXIMUM RATINGS (T <sub>C</sub> = 25 °C, unless otherwise noted) |                                               |                         |                                   |             |      |
|---------------------------------------------------------------------------|-----------------------------------------------|-------------------------|-----------------------------------|-------------|------|
| PARAMETER                                                                 |                                               |                         | SYMBOL                            | LIMIT       | UNIT |
| Collector-Emitter Voltage                                                 |                                               |                         | V <sub>CE</sub>                   | 600         | V    |
| Gate-Emitter Voltage                                                      |                                               |                         | V <sub>GE</sub>                   | ±30         |      |
| Continuous Collector Current (T <sub>J</sub> = 150 °C)                    | V <sub>GE</sub> at 15 V                       | T <sub>C</sub> = 25 °C  | I <sub>C</sub>                    | 150         | A    |
|                                                                           |                                               | T <sub>C</sub> = 100 °C |                                   | 75          |      |
| Pulsed Collector Current <sup>a</sup>                                     |                                               |                         | I <sub>CM</sub>                   | 225         |      |
| Diode Forward Current <sup>b</sup>                                        |                                               |                         | I <sub>F</sub>                    | 90          | A    |
| Maximum Power Dissipation                                                 |                                               | T <sub>C</sub> = 25 °C  | P <sub>D</sub>                    | 400         | W    |
|                                                                           |                                               | T <sub>C</sub> = 100 °C |                                   | 220         | W    |
| Operating Junction and Storage Temperature Range                          |                                               |                         | T <sub>J</sub> , T <sub>stg</sub> | -55 to +175 | °C   |
| Short Circuit Withstand Time <sup>TC=150°C</sup>                          | V <sub>GE</sub> = 15V, V <sub>CE</sub> ≤ 400V |                         | t <sub>sc</sub>                   | 3           | μs   |
| Short Circuit Withstand Time <sup>TC=100°C</sup>                          | V <sub>GE</sub> = 15V, V <sub>CE</sub> ≤330V  |                         |                                   | 5           |      |
| Soldering Recommendations (Peak Temperature) <sup>c</sup>                 |                                               | for 10 s                |                                   | 260         | °C   |

#### Notes

- Repetitive rating; pulse width limited by maximum junction temperature.
- Current limited by maximum junction temperature.
- 1.6 mm from case.

**THERMAL RESISTANCE RATINGS**

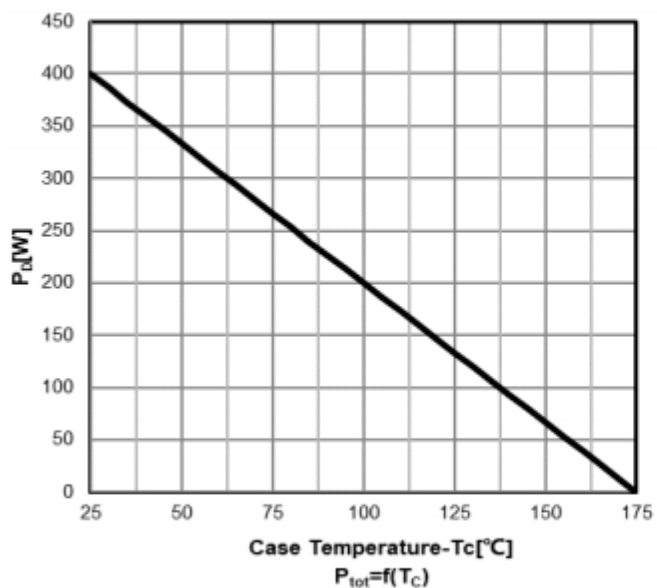
| PARAMETER                   | SYMBOL     | TYP. | MAX. | UNIT |
|-----------------------------|------------|------|------|------|
| Maximum Junction-to-Ambient | $R_{thJA}$ | -    | 40   | °C/W |
| Maximum Junction-to-Case    | $R_{thJC}$ | -    | 0.5  |      |

**SPECIFICATIONS** ( $T_J = 25\text{ °C}$ , unless otherwise noted)

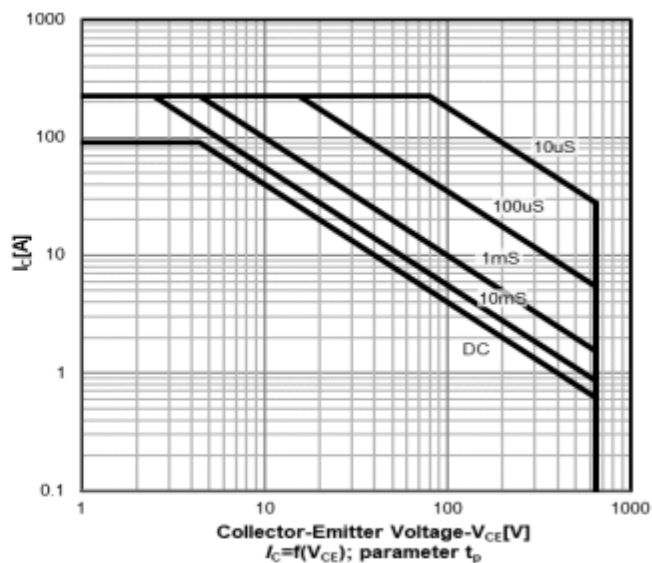
| PARAMETER                                 | SYMBOL        | TEST CONDITIONS                                                                                    | MIN.       | TYP.   | MAX.   | UNIT          |
|-------------------------------------------|---------------|----------------------------------------------------------------------------------------------------|------------|--------|--------|---------------|
| <b>Static</b>                             |               |                                                                                                    |            |        |        |               |
| Collector-Emitter Breakdown Voltage       | $BV_{CE}$     | $V_{GE} = 0\text{ V}, I_C = 250\text{ }\mu\text{A}$<br>$V_{GE} = 0\text{ V}, I_C = 1\text{ mA}$    | 600<br>600 | -<br>- | -<br>- | V             |
| Gate-Source Threshold Voltage (N)         | $V_{GE(th)}$  | $V_{CE} = V_{GE}, I_D = 250\text{ }\mu\text{A}$                                                    | 4          | 5      | 6      | V             |
| Zero Gate Voltage Collector Current       | $I_{CES}$     | $V_{CE} = 480\text{ V}, V_{GE} = 0\text{ V}, T_J = 25\text{ °C}$                                   | -          | 1      | 20     | $\mu\text{A}$ |
|                                           |               | $V_{CE} = 480\text{ V}, V_{GE} = 0\text{ V}, T_J = 150\text{ °C}$                                  | -          | 1000   | -      | $\mu\text{A}$ |
| Gate-Emitter Leakage Current              | $I_{GES}$     | $V_{CE} = 0\text{ V}, V_{GS} = \pm 20\text{ V}$                                                    | -          | -      | 100    | nA            |
| Collector-Emitter Saturation Voltage      | $V_{CE(sat)}$ | $V_{GE} = 15\text{ V}, I_C = 75\text{ A}$                                                          | -          | 1.7    | 2.1    | V             |
| Forward Transconductance                  | $g_{fs}$      | $V_{CE} = 20\text{ V}, I_C = 75\text{ A}$                                                          | -          | 40     | -      | S             |
| <b>Dynamic</b>                            |               |                                                                                                    |            |        |        |               |
| Input Capacitance                         | $C_{ies}$     | $V_{GE} = 0\text{ V}, V_{CE} = 25\text{ V},$<br>$f = 500\text{ KHz}$                               | -          | 4600   | -      | pF            |
| Output Capacitance                        | $C_{oes}$     |                                                                                                    | -          | 235    | -      |               |
| Reverse Transfer Capacitance              | $C_{res}$     |                                                                                                    | -          | 72     | -      |               |
| Turn-on Energy                            | $E_{on}$      | $V_{CE} = 400\text{ V}, V_{GE} = 0/15\text{ V},$<br>$I_C = 75\text{ A}, R_g = 10\Omega$            | -          | 0.62   | -      | ns            |
| Turn-off Energy                           | $E_{off}$     |                                                                                                    | -          | 0.31   | -      |               |
| Total Gate Charge                         | $Q_g$         | $V_{GE} = 15\text{ V}, I_C = 75\text{ A}, V_{CE} = 400\text{ V}$                                   | -          | 175    | -      | nC            |
| Gate-Emitter Charge                       | $Q_{ge}$      |                                                                                                    | -          | 14     | -      |               |
| Gate to Collector Charge                  | $Q_{gc}$      |                                                                                                    | -          | 33     | -      |               |
| Turn-On Delay Time                        | $t_{d(on)}$   | $V_{CE} = 400\text{ V}, V_{GE} = 0/15\text{ V},$<br>$I_C = 75\text{ A}, R_g = 10\Omega$            | -          | 60     | -      | ns            |
| Rise Time                                 | $t_r$         |                                                                                                    | -          | 43     | -      |               |
| Turn-Off Delay Time                       | $t_{d(off)}$  |                                                                                                    | -          | 184    | -      |               |
| Fall Time                                 | $t_f$         |                                                                                                    | -          | 30     | -      |               |
| Internal emitter inductance measured 5 mm | $L_E$         |                                                                                                    | -          | 13     | -      | nH            |
| <b>Diode Characteristics</b>              |               |                                                                                                    |            |        |        |               |
| Diode Forward Current                     | $I_F$         | IGBT symbol showing the<br>integral reverse junction diode                                         | -          | -      | 75     | A             |
| Pulsed Diode Forward Current              | $I_{FM}$      |                                                                                                    | -          | -      | 225    |               |
| Diode Forward Voltage                     | $V_F$         | $I_F = 30\text{ A}$                                                                                | -          | 1.65   | 2.0    | V             |
| Reverse Recovery Time                     | $t_{rr}$      | $T_J = 25\text{ °C}, I_F = 30\text{ A},$<br>$di/dt = 200\text{ A}/\mu\text{s}, V_R = 400\text{ V}$ | -          | 73     | -      | ns            |
| Reverse Recovery Charge                   | $Q_{rr}$      |                                                                                                    | -          | 85     | -      | $\mu\text{C}$ |
| Reverse Recovery Current                  | $I_{RRM}$     |                                                                                                    | -          | 13     | -      | A             |

**TYPICAL CHARACTERISTICS** (25 °C, unless otherwise noted)

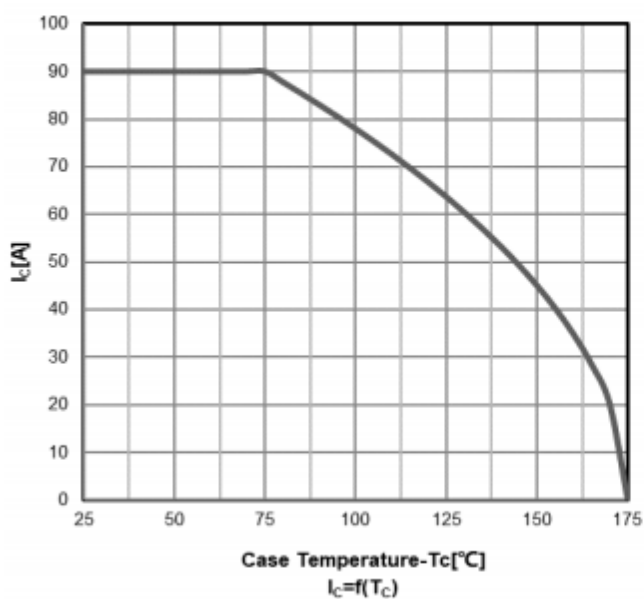
Power dissipation



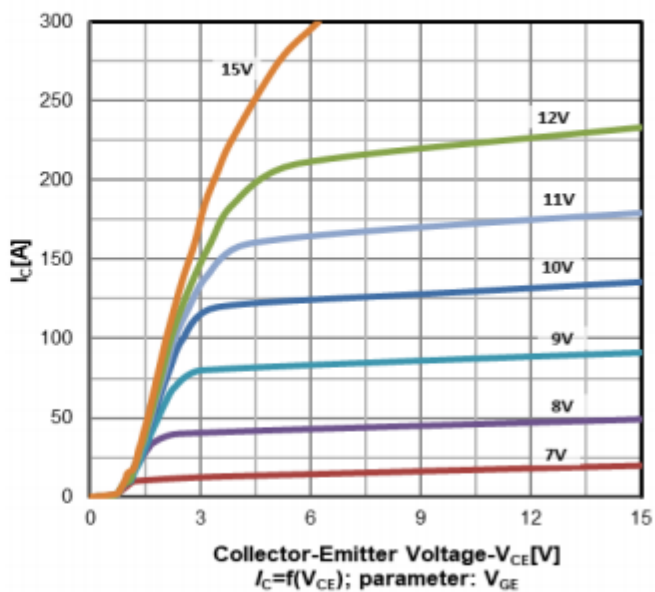
Safe operating area Ta=25 °C



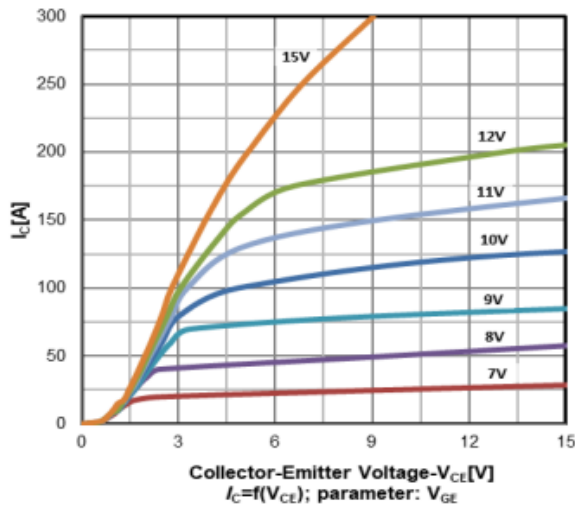
Collector current as a function of  
Case temperature



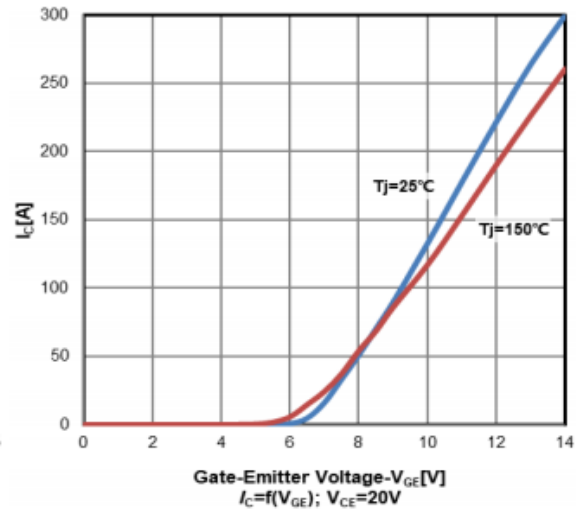
Typ. Output characteristics  
Tj=25 °C



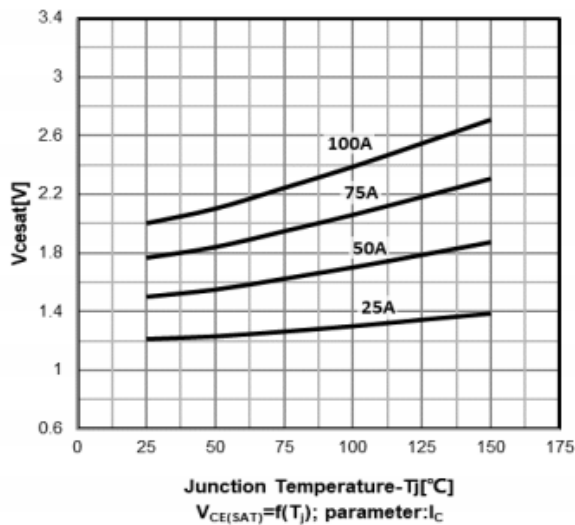
Typ. Output characteristics  
 $T_J = 150^\circ\text{C}$



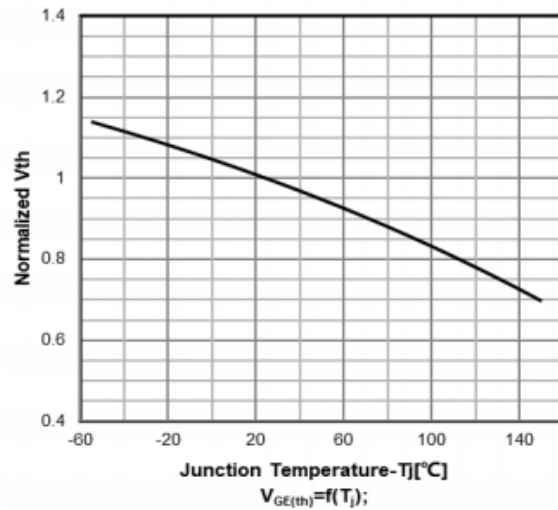
Typ. Transfer characteristics



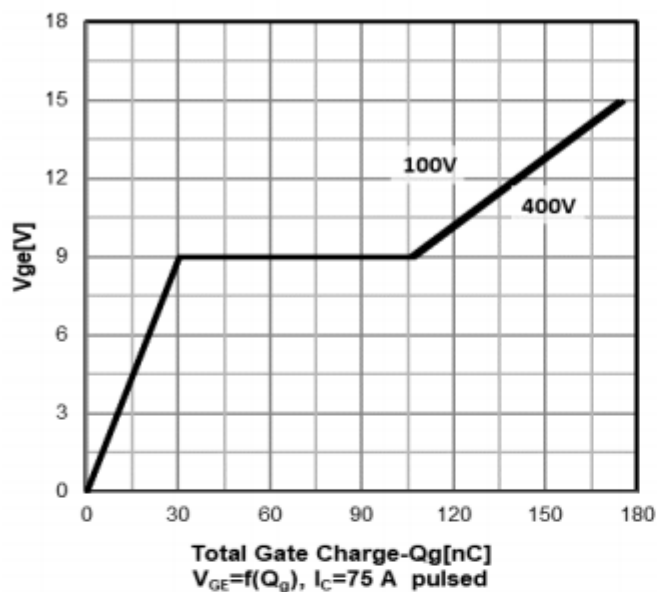
Typ. Collector-emitter saturation voltage as a function of junction temperature ( $V_{GE} = 15\text{V}$ )



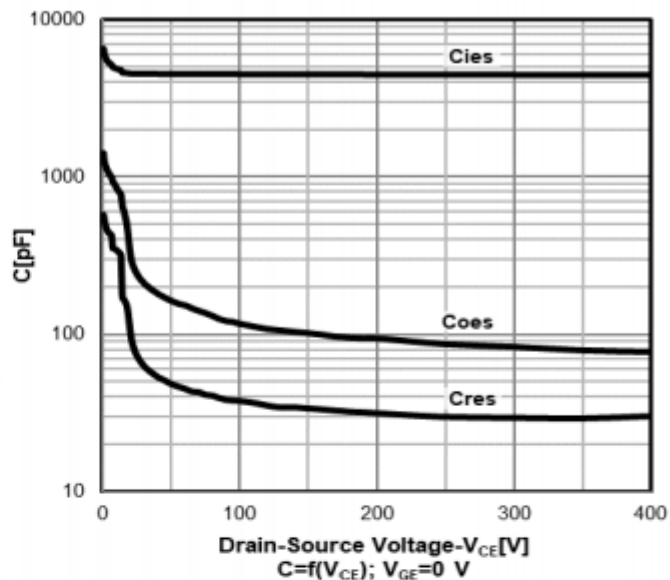
Normalized  $V_{GE(th)}$  vs. temperature



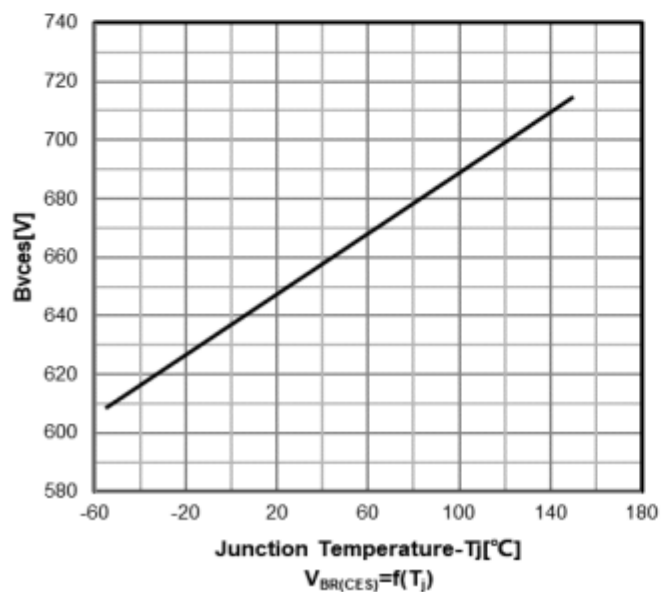
Gate charge characteristics



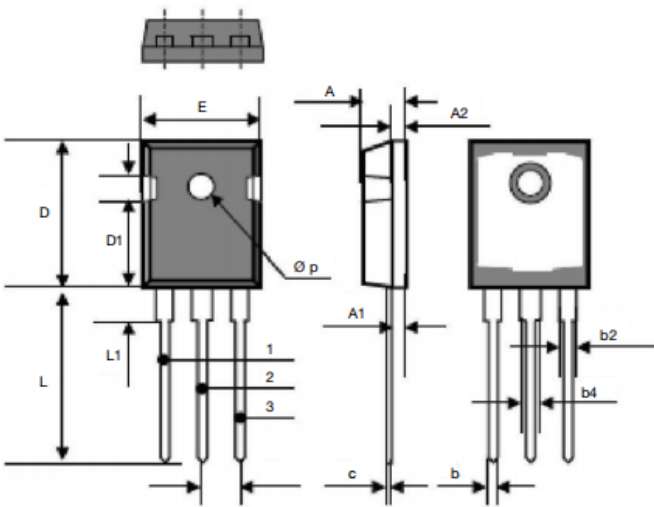
Capacitance characteristics



Collector-emitter breakdown voltage  
vs. temperature



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| DIM. | MILLIMETERS |       | INCHES    |       |
|------|-------------|-------|-----------|-------|
|      | MIN.        | MAX.  | MIN.      | MAX.  |
| A    | 4.70        | 5.31  | 0.185     | 0.209 |
| A1   | 2.21        | 2.59  | 0.087     | 0.102 |
| A2   | 1.50        | 2.49  | 0.059     | 0.098 |
| b    | 0.99        | 1.40  | 0.039     | 0.055 |
| b2   | 1.65        | 2.41  | 0.065     | 0.095 |
| b4   | 2.59        | 3.43  | 0.102     | 0.135 |
| c    | 0.61 BSC    |       | 0.024 BSC |       |
| D    | 20.80       | 21.46 | 0.819     | 0.845 |
| D1   | 3.68        | 5.49  | 0.145     | 0.216 |
| (e)  | 5.46 BSC    |       | 0.215 BSC |       |
| E    | 15.49       | 16.26 | 0.610     | 0.640 |
| L    | 19.81       | 20.32 | 0.780     | 0.800 |
| L1   | 4.06        | 4.50  | 0.160     | 0.177 |
| Ø p  | 3.51        | 3.66  | 0.138     | 0.144 |

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