IGLD60R070D1

600V CoolGaN™ enhancement-mode Power Transistor

Features
- Enhancement mode transistor – Normally OFF switch
- Ultra fast switching
- No reverse-recovery charge
- Capable of reverse conduction
- Low gate charge, low output charge
- Superior commutation ruggedness
- Qualified for industrial applications according to JEDEC Standards (JESD47 and JESD22)

Benefits
- Improves system efficiency
- Improves power density
- Enables higher operating frequency
- System cost reduction savings
- Reduces EMI

Applications
Industrial, telecom, datacenter SMPS based on the half-bridge topology (half-bridge topologies for hard and soft switching such as Totem pole PFC, high frequency LLC).
For other applications: review CoolGaN™ reliability white paper and contact Infineon regional support

<table>
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<tr>
<th>Table 1</th>
<th>Key Performance Parameters at $T_j = 25 , ^\circ C$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter</td>
<td>Value</td>
</tr>
<tr>
<td>$V_{DS,max}$</td>
<td>600</td>
</tr>
<tr>
<td>$R_{DS(on),max}$</td>
<td>70</td>
</tr>
<tr>
<td>$Q_{G,typ}$</td>
<td>5.8</td>
</tr>
<tr>
<td>$I_{D,pulse}$</td>
<td>60</td>
</tr>
<tr>
<td>$Q_{oss @ 400 , V}$</td>
<td>41</td>
</tr>
<tr>
<td>$Q_{rr}$</td>
<td>0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Table 2</th>
<th>Ordering Information</th>
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<tbody>
<tr>
<td>Type / Ordering Code</td>
<td>Package</td>
</tr>
<tr>
<td>IGLD60R070D1</td>
<td>PG-LSON-8-1</td>
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</table>
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1 Maximum ratings

at $T_j = 25 \, ^\circ C$, unless otherwise specified.

Continuous application of maximum ratings can deteriorate transistor lifetime. For further information, contact your local Infineon sales office.

Table 3 Maximum ratings

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Values</th>
<th>Unit</th>
<th>Note/Test Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drain Source Voltage $^1$</td>
<td>$V_{DS,max}$</td>
<td>-</td>
<td>-</td>
<td>$V_{GS} = 0 , V$</td>
</tr>
<tr>
<td>Continuous current, drain source</td>
<td>$I_D$</td>
<td>-</td>
<td>-</td>
<td>$15 , A$</td>
</tr>
<tr>
<td>Pulsed current, drain source $^2$ $^3$</td>
<td>$I_{D,pulse}$</td>
<td>-</td>
<td>-</td>
<td>$60 , A$</td>
</tr>
<tr>
<td>Pulsed current, drain source $^3$ $^4$</td>
<td>$I_{D,pulse}$</td>
<td>-</td>
<td>-</td>
<td>$35 , A$</td>
</tr>
<tr>
<td>Gate current, continuous $^3$ $^4$ $^5$</td>
<td>$I_{G,avg}$</td>
<td>-</td>
<td>-</td>
<td>$20 , mA$</td>
</tr>
<tr>
<td>Gate current, pulsed $^3$ $^5$</td>
<td>$I_{G,pulse}$</td>
<td>-</td>
<td>-</td>
<td>$2000 , mA$</td>
</tr>
<tr>
<td>Gate source voltage, continuous $^5$</td>
<td>$V_{GS}$</td>
<td>-</td>
<td>-</td>
<td>$-10 , V$</td>
</tr>
<tr>
<td>Gate source voltage, pulsed $^6$</td>
<td>$V_{GS,pulse}$</td>
<td>-</td>
<td>-</td>
<td>$-25 , V$</td>
</tr>
<tr>
<td>Power dissipation</td>
<td>$P_{tot}$</td>
<td>-</td>
<td>-</td>
<td>$114 , W$</td>
</tr>
<tr>
<td>Operating temperature</td>
<td>$T_j$</td>
<td>-</td>
<td>-</td>
<td>$-55$ to $150 , ^\circ C$</td>
</tr>
<tr>
<td>Storage temperature</td>
<td>$T_{stg}$</td>
<td>-</td>
<td>-</td>
<td>$-55$ to $150 , ^\circ C$</td>
</tr>
<tr>
<td>Drain-source voltage slew-rate</td>
<td>$dV/dt$</td>
<td>-</td>
<td>-</td>
<td>$200 , V/\text{ns}$</td>
</tr>
</tbody>
</table>

1 All devices are 100% tested at $I_{DS} = 12.2 \, mA$ to assure $V_{DS} \geq 800 \, V$
2 Limits derived from product characterization, parameter not measured during production
3 Ensure that average gate drive current, $I_{G,avg}$ is $\leq 20 \, mA$. Please see figure 27 for $I_{G,avg}$, $I_{G,pulse}$ and $I_{G}$ details
4 Parameter is influenced by rel-requirements. Please contact the local Infineon Sales Office to get an assessment of your application.
5 We recommend using an advanced driving technique to optimize the device performance. Please see gate drive application note for details.
## 2 Thermal characteristics

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Values</th>
<th>Unit</th>
<th>Note/Test Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thermal resistance, junction-case</td>
<td>$R_{thJC}$</td>
<td>-</td>
<td>1.1</td>
<td>°C/W</td>
</tr>
<tr>
<td>Reflow soldering temperature</td>
<td>$T_{sold}$</td>
<td>-</td>
<td>245</td>
<td>°C</td>
</tr>
</tbody>
</table>

Table 4  Thermal characteristics
## 3 Electrical characteristics

at $T_j = 25 \, ^\circ\mathrm{C}$, unless specified otherwise

### Table 5  Static characteristics

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Values</th>
<th>Unit</th>
<th>Note/Test Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gate threshold voltage</td>
<td>$V_{GS(th)}$</td>
<td>0.9</td>
<td>1.2</td>
<td>1.6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.7</td>
<td>1.0</td>
<td>1.4</td>
</tr>
<tr>
<td>Drain-Source leakage current</td>
<td>$I_{DSS}$</td>
<td>-</td>
<td>100</td>
<td>$\mu A$</td>
</tr>
<tr>
<td>Drain-Source leakage current at application conditions$^1$</td>
<td>$I_{DSS(app)}$</td>
<td>-</td>
<td>60</td>
<td>-</td>
</tr>
<tr>
<td>Gate-Source leakage current</td>
<td>$I_{GSS}$</td>
<td>-1</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Drain-Source on-state resistance</td>
<td>$R_{DS(on)}$</td>
<td>-0.055</td>
<td>0.070</td>
<td>-70</td>
</tr>
<tr>
<td>$I_G = 26.1 , mA; I_D = 8 , A; T_j = 25 , ^\circ\mathrm{C}$</td>
<td>$I_G = 26.1 , mA; I_D = 8 , A; T_j = 150 , ^\circ\mathrm{C}$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gate resistance</td>
<td>$R_{G,int}$</td>
<td>0.78</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>LCR impedance measurement; $f = f_{res};$ open drain;</td>
</tr>
</tbody>
</table>

### Table 6  Dynamic characteristics

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Values</th>
<th>Unit</th>
<th>Note/Test Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input capacitance</td>
<td>$C_{iss}$</td>
<td>-</td>
<td>380</td>
<td>- pF</td>
</tr>
<tr>
<td>Output capacitance</td>
<td>$C_{oss}$</td>
<td>-</td>
<td>72</td>
<td>- pF</td>
</tr>
<tr>
<td>Reverse Transfer capacitance</td>
<td>$C_{rss}$</td>
<td>-</td>
<td>0.3</td>
<td>- pF</td>
</tr>
<tr>
<td>Effective output capacitance, energy related$^2$</td>
<td>$C_{o(er)}$</td>
<td>-</td>
<td>80</td>
<td>- pF</td>
</tr>
<tr>
<td>Effective output capacitance, time related$^3$</td>
<td>$C_{o(tr)}$</td>
<td>-</td>
<td>102.5</td>
<td>- pF</td>
</tr>
<tr>
<td>Output charge</td>
<td>$Q_{oss}$</td>
<td>-</td>
<td>41</td>
<td>- nC</td>
</tr>
<tr>
<td>Turn- on delay time</td>
<td>$t_{d(on)}$</td>
<td>-</td>
<td>15</td>
<td>- ns</td>
</tr>
<tr>
<td>Turn- off delay time</td>
<td>$t_{d(off)}$</td>
<td>-</td>
<td>15</td>
<td>- ns</td>
</tr>
<tr>
<td>Rise time</td>
<td>$t_r$</td>
<td>-</td>
<td>9</td>
<td>- ns</td>
</tr>
<tr>
<td>Fall time</td>
<td>$t_f$</td>
<td>-</td>
<td>13</td>
<td>- ns</td>
</tr>
</tbody>
</table>

$^1$ Parameter represents end of use leakage in applications

$^2$ $C_{o(er)}$ is a fixed capacitance that gives the same stored energy as $C_{oss}$ while $V_{DS}$ is rising from 0 to 400 V

$^3$ $C_{o(tr)}$ is a fixed capacitance that gives the same charging time as $C_{oss}$ while $V_{DS}$ is rising from 0 to 400 V
### Table 7  Gate charge characteristics

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Values</th>
<th>Unit</th>
<th>Note/Test Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gate charge</td>
<td>$Q_G$</td>
<td>-</td>
<td>5.8</td>
<td>nC</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>$I_{GS} = 0$ to $10$ mA; $V_{DS} = 400$ V; $I_D = 8$ A</td>
</tr>
</tbody>
</table>

### Table 8  Reverse conduction characteristics

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Values</th>
<th>Unit</th>
<th>Note/Test Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Source-Drain reverse voltage</td>
<td>$V_{SD}$</td>
<td>-</td>
<td>2.2</td>
<td>2.5 V</td>
</tr>
<tr>
<td>Pulsed current, reverse</td>
<td>$I_{S,pulse}$</td>
<td>-</td>
<td>-</td>
<td>60 A</td>
</tr>
<tr>
<td>Reverse recovery charge</td>
<td>$Q_{rr}^1$</td>
<td>-</td>
<td>0</td>
<td>- nC</td>
</tr>
<tr>
<td>Reverse recovery time</td>
<td>$t_{rr}$</td>
<td>-</td>
<td>0</td>
<td>- ns</td>
</tr>
<tr>
<td>Peak reverse recovery current</td>
<td>$I_{rrm}$</td>
<td>-</td>
<td>0</td>
<td>- A</td>
</tr>
</tbody>
</table>

$^1$ Excluding Qoss
4 Electrical characteristics diagrams

at $T_j = 25$ °C, unless specified otherwise

**Figure 1** Power dissipation

\[ P_{\text{tot}} = f(T_c) \]

\[ Z_{\text{thJC}} = f(t_p, D) \]

**Figure 2** Max. transient thermal impedance

**Figure 3** Safe operating area

\[ I_D = f(V_{DS}); \ T_C = 25 \text{ °C} \]

**Figure 4** Safe operating area

\[ I_D = f(V_{DS}); \ T_C = 125 \text{ °C} \]
**Figure 5** Repetitive safe operating area

![Figure 5](image1)

\[ I_D = f(V_{DS}, I_G); T_j = 25 \, ^\circ C \]

\[ I_D = f(V_{DS}, I_G); T_j = 125 \, ^\circ C \]

---

**Figure 6** Repetitive safe operating area

![Figure 6](image2)

\[ T_c = 25 \, ^\circ C; T_j \leq 150 \, ^\circ C \]

\[ T_c = 125 \, ^\circ C; T_j \leq 150 \, ^\circ C \]

---

**Figure 7** Typ. output characteristics

![Figure 7](image3)

\[ I_D = f(V_{DS}, I_G); T_j = 25 \, ^\circ C \]

\[ I_D = f(V_{DS}, I_G); T_j = 125 \, ^\circ C \]

---

**Figure 8** Typ. output characteristics

![Figure 8](image4)

---

1 Parameter is influenced by rel-requirements. Please contact the local Infineon Sales Office to get an assessment of your application.
**Figure 9**  
Typ. Drain-source on-state resistance

\[
R_{\text{DS(on)}}(\text{m} \Omega) = f(I_D, I_G); T_j = 125 ^\circ \text{C}
\]

**Figure 10**  
Drain-source on-state resistance

\[
R_{\text{DS(on)}}(\text{m} \Omega) = f(T_j); I_D = 8 \text{ A}
\]

**Figure 11**  
Typ. gate characteristics forward

\[
I_G = f(V_{GS}); \text{open drain}
\]

**Figure 12**  
Typ. gate characteristics reverse

\[
I_G = f(V_{GS}); T_j = 25 ^\circ \text{C}
\]
**Figure 13**  Typ. transfer characteristics

\[ I_D, I_G = f(V_{GS}); \ V_{DS} = 8 \text{ V}; \ T_j = 25 \degree \text{C} \]

\[ I_D, I_G = f(V_{GS}); \ V_{DS} = 8 \text{ V}; \ T_j = 125 \degree \text{C} \]

**Figure 15**  Typ. channel reverse characteristics

\[ V_{DS} = f(I_D, V_{GS}); \ T_j = 25 \degree \text{C} \]

\[ V_{DS} = f(I_D, V_{GS}); \ T_j = 125 \degree \text{C} \]
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Figure 17  Typ. channel reverse characteristics

$I_D = f(V_{DS}, V_{GS})$; $T_J = 25 \, ^\circ C$

Figure 18  Typ. channel reverse characteristics

$I_D = f(V_{DS}, V_{GS})$; $T_J = 125 \, ^\circ C$

Figure 19  Typ. gate charge

$V_{GS} = f(Q_d)$; $V_{DCLINK} = 400 \, V$; $I_D = 8 \, A$

Figure 20  Typ. capacitances

$C_{iss} = f(V_{DS})$
Figure 21  Typ. output charge

\[ Q_{\text{OSS}} = f(V_{DS}) \]

Figure 22  Typ. Coss stored Energy

\[ E_{\text{OSS}} = f(V_{DS}) \]
5 Test Circuits

**Figure 23** Switching times with inductive load

\[ I_D = 8A, R_{ON} = 10 \, \Omega; \quad R_{OFF} = 10 \, \Omega; \quad R_{SS} = 820 \, \Omega; \quad C_G = 2 \, nF; \quad V_{DRV} = 12V \]

**Figure 24** Switching times waveform

The recovery charge is \( Q_{OSS} \) only, no additional \( Q_{rr} \)

**Figure 25** Reverse Channel Characteristics Test

**Figure 26** Typical Reverse Channel Recovery

**Figure 27** Gate current switching waveform
6 Package Outlines

Figure 28 PG-LSON-8-1 Package Outline, dimensions (mm)

All dimensions are in units mm
The drawing is in compliance with ISO 128-30, Projection Method 1\[ \text{[ISO 128-30]} \]
Appendix A

Table 9 Related links

- IFX CoolGaN™ webpage: www.infineon.com/why-coolgan
- IFX CoolGaN™ reliability white paper: www.infineon.com/gan-reliability
- IFX CoolGaN™ gate drive application note: www.infineon.com/driving-coolgan
- IFX CoolGaN™ applications information:
  - www.infineon.com/gan-in-server-telecom
  - www.infineon.com/gan-in-wirelesscharging
  - www.infineon.com/gan-in-audio
  - www.infineon.com/gan-in-adapter-charger
## 8 Revision History

Major changes since the last revision

<table>
<thead>
<tr>
<th>Revision</th>
<th>Date</th>
<th>Description of changes</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.0</td>
<td>2018-10-12</td>
<td>Final version release</td>
</tr>
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</table>
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