Diode
Rapid Switching Emitter Controlled Diode

IDW75D65D1
Emitter Controlled Diode Rapid 1 Dual Anode Series
Rapid Switching Emitter Controlled Diode

Features:

- Qualified according to JEDEC for target applications
- 650V Emitter Controlled technology
- Temperature stable behaviour of key parameters
- Low forward voltage ($V_F$)
- Ultra fast recovery
- Low reverse recovery charge ($Q_{rr}$)
- Low reverse recovery current ($I_{rrm}$)
- 175°C junction operating temperature
- Pb-free lead plating
- RoHS compliant

Applications:

- AC/DC converters
- Boost diode in PFC stages
- Free wheeling diodes in inverters and motor drives
- General purpose inverters
- Switch mode power supplies

Package pin definition:

- Pin 1 - anode
- Pin 2 and backside - cathode
- Pin 3 - anode

Key Performance and Package Parameters

<table>
<thead>
<tr>
<th>Type</th>
<th>$V_{rrm}$</th>
<th>$I_t$</th>
<th>$V_F, T_{vj}=25°C$</th>
<th>$T_{vjmax}$</th>
<th>Marking</th>
<th>Package</th>
</tr>
</thead>
<tbody>
<tr>
<td>IDW75D65D1</td>
<td>650V</td>
<td>75A</td>
<td>1.35V</td>
<td>175°C</td>
<td>D75ED1</td>
<td>PG-TO247-3</td>
</tr>
</tbody>
</table>
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Maximum Ratings

For optimum lifetime and reliability, Infineon recommends operating conditions that do not exceed 80% of the maximum ratings stated in this datasheet.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Repetitive peak reverse voltage, $T_{vj} \geq 25^\circ C$</td>
<td>$V_{RRM}$</td>
<td>650</td>
<td>V</td>
</tr>
<tr>
<td>Diode forward current, limited by $T_{vj\text{max}}$</td>
<td>$I_F$</td>
<td>150.0</td>
<td>A</td>
</tr>
<tr>
<td>$T_C = 25^\circ C$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$T_C = 100^\circ C$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diode pulsed current, $t_p$ limited by $T_{vj\text{max}}$</td>
<td>$I_{F\text{puls}}$</td>
<td>225.0</td>
<td>A</td>
</tr>
<tr>
<td>Diode surge non repetitive forward current</td>
<td>$I_{F\text{SM}}$</td>
<td>580.0</td>
<td>A</td>
</tr>
<tr>
<td>$T_C = 25^\circ C$, $t_p = 10.0\text{ms}$, sine halfwave</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Power dissipation</td>
<td>$P_{tot}$</td>
<td>326.0</td>
<td>W</td>
</tr>
<tr>
<td>$T_C = 25^\circ C$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$T_C = 100^\circ C$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operating junction temperature</td>
<td>$T_{vj}$</td>
<td>-40...+175</td>
<td>°C</td>
</tr>
<tr>
<td>Storage temperature</td>
<td>$T_{stg}$</td>
<td>-55...+150</td>
<td>°C</td>
</tr>
<tr>
<td>Soldering temperature, wave soldering 1.6mm (0.063in.) from case for 10s</td>
<td></td>
<td>260</td>
<td>°C</td>
</tr>
<tr>
<td>Mounting torque, M3 screw</td>
<td>$M$</td>
<td>0.6</td>
<td>Nm</td>
</tr>
<tr>
<td>Maximum of mounting processes: 3</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Thermal Resistances

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Conditions</th>
<th>Max. Value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Characteristic</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diode thermal resistance, $^3)$ junction - case</td>
<td>$R_{th(j-c)}$</td>
<td></td>
<td>0.46</td>
<td>K/W</td>
</tr>
<tr>
<td>Thermal resistance junction - ambient</td>
<td>$R_{th(j-a)}$</td>
<td></td>
<td>40</td>
<td>K/W</td>
</tr>
</tbody>
</table>

Electrical Characteristics, at $T_{vj} = 25^\circ C$, unless otherwise specified

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Conditions</th>
<th>Value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Static Characteristic</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diode forward voltage</td>
<td>$V_F$</td>
<td>$I_F = 75.0\text{A}$</td>
<td>-</td>
<td>1.35</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$T_{vj} = 25^\circ C$</td>
<td>-</td>
<td>1.32</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$T_{vj} = 125^\circ C$</td>
<td>-</td>
<td>1.28</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$T_{vj} = 175^\circ C$</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Reverse leakage current</td>
<td>$I_R$</td>
<td>$V_R = 650\text{V}$</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$T_{vj} = 25^\circ C$</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$T_{vj} = 175^\circ C$</td>
<td>-</td>
<td>3000.0</td>
</tr>
</tbody>
</table>

1) Maximum current for pin 1 and pin 3 is 80A (value limited by bondwire).
2) For a balanced current flow through pins 1 and 3.
3) Please be aware that in nonstandard load conditions, due to high $R_{th(j-c)}$, $T_{vj}$ close to $T_{vj\text{max}}$ can be reached.
Electrical Characteristic, at $T_{jm} = 25^\circ\text{C}$, unless otherwise specified

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Conditions</th>
<th>Value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dynamic Characteristic</td>
<td></td>
<td></td>
<td>min.</td>
<td>typ.</td>
</tr>
<tr>
<td>Internal emitter inductance$^1$ measured 5mm (0.197 in.) from case</td>
<td>$L_E$</td>
<td></td>
<td>-</td>
<td>7.0</td>
</tr>
</tbody>
</table>

Switching Characteristics, Inductive Load

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Conditions</th>
<th>Value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diode Characteristic, at $T_{jm} = 25^\circ\text{C}$</td>
<td></td>
<td></td>
<td>min.</td>
<td>typ.</td>
</tr>
<tr>
<td>Diode reverse recovery time</td>
<td>$t_{rr}$</td>
<td>$T_{jm} = 25^\circ\text{C}$, $V_R = 400\text{V}$, $I_F = 75.0\text{A}$, $di/dt = 1000\text{A/}\mu\text{s}$, $L_\sigma = 30\text{nH}$, $C_\sigma = 40\text{pF}$, switch IGZ100N65H5.</td>
<td>-</td>
<td>108</td>
</tr>
<tr>
<td>Diode reverse recovery charge</td>
<td>$Q_{rr}$</td>
<td>$V_R = 400\text{V}$, $I_F = 40.0\text{A}$, $di/dt = 200\text{A/}\mu\text{s}$, $L_\sigma = 30\text{nH}$, $C_\sigma = 40\text{pF}$, switch IGZ100N65H5.</td>
<td>-</td>
<td>1.25</td>
</tr>
<tr>
<td>Diode peak rate of fall of reverse recovery current during $t_b$</td>
<td>$di/dt$</td>
<td>$L_\sigma = 30\text{nH}$, $C_\sigma = 40\text{pF}$, switch IGZ100N65H5.</td>
<td>-</td>
<td>19.9</td>
</tr>
<tr>
<td>Diode reverse recovery time</td>
<td>$t_{rr}$</td>
<td>$T_{jm} = 25^\circ\text{C}$, $V_R = 400\text{V}$, $I_F = 75.0\text{A}$, $di/dt = 1000\text{A/}\mu\text{s}$, $L_\sigma = 30\text{nH}$, $C_\sigma = 40\text{pF}$, switch IGZ100N65H5.</td>
<td>-</td>
<td>127</td>
</tr>
<tr>
<td>Diode reverse recovery charge</td>
<td>$Q_{rr}$</td>
<td>$V_R = 400\text{V}$, $I_F = 40.0\text{A}$, $di/dt = 200\text{A/}\mu\text{s}$, $L_\sigma = 30\text{nH}$, $C_\sigma = 40\text{pF}$, switch IGZ100N65H5.</td>
<td>-</td>
<td>0.48</td>
</tr>
<tr>
<td>Diode peak rate of fall of reverse recovery current during $t_b$</td>
<td>$di/dt$</td>
<td>$L_\sigma = 30\text{nH}$, $C_\sigma = 40\text{pF}$, switch IGZ100N65H5.</td>
<td>-</td>
<td>6.4</td>
</tr>
<tr>
<td>Diode reverse recovery time</td>
<td>$t_{rr}$</td>
<td>$T_{jm} = 175^\circ\text{C}$, $V_R = 400\text{V}$, $I_F = 75.0\text{A}$, $di/dt = 1000\text{A/}\mu\text{s}$, $L_\sigma = 30\text{nH}$, $C_\sigma = 40\text{pF}$, switch IGZ100N65H5.</td>
<td>-</td>
<td>174</td>
</tr>
<tr>
<td>Diode reverse recovery charge</td>
<td>$Q_{rr}$</td>
<td>$V_R = 400\text{V}$, $I_F = 75.0\text{A}$, $di/dt = 1000\text{A/}\mu\text{s}$, $L_\sigma = 30\text{nH}$, $C_\sigma = 40\text{pF}$, switch IGZ100N65H5.</td>
<td>-</td>
<td>4.16</td>
</tr>
<tr>
<td>Diode peak reverse recovery current</td>
<td>$I_{rrm}$</td>
<td>$L_\sigma = 30\text{nH}$, $C_\sigma = 40\text{pF}$, switch IGZ100N65H5.</td>
<td>-</td>
<td>37.9</td>
</tr>
<tr>
<td>Diode peak rate of fall of reverse recovery current during $t_b$</td>
<td>$di/dt$</td>
<td>$L_\sigma = 30\text{nH}$, $C_\sigma = 40\text{pF}$, switch IGZ100N65H5.</td>
<td>-</td>
<td>-1170</td>
</tr>
</tbody>
</table>

$^1$ For a balanced current flow through pins 1 and 3.
<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diode reverse recovery time</td>
<td>( t_{rr} )</td>
<td>- 184</td>
<td>ns</td>
</tr>
<tr>
<td>Diode reverse recovery charge</td>
<td>( Q_{rr} )</td>
<td>- 1.64</td>
<td>( \mu \text{C} )</td>
</tr>
<tr>
<td>Diode peak reverse recovery current</td>
<td>( I_{rrm} )</td>
<td>- 13.2</td>
<td>A</td>
</tr>
<tr>
<td>Diode peak rate of fall of reverse recovery current</td>
<td>( di/dt )</td>
<td>- 62</td>
<td>( \text{A}/\mu \text{s} )</td>
</tr>
</tbody>
</table>

**Conditions:**
- \( T_v = 125^\circ \text{C} \)
- \( V_R = 400 \text{V} \)
- \( I_k = 40.0 \text{A} \)
- \( di/dt = 200 \text{A}/\mu \text{s} \)
- \( L_\sigma = 30 \text{nH} \)
- \( C_\sigma = 40 \text{pF} \)
- Switch IGZ100N65H5.
Figure 1. Power dissipation as a function of case temperature ($T_{jc}=175^\circ C$)

Figure 2. Collector current as a function of case temperature ($V_{GE} \geq 15\,V, T_{jc}=175^\circ C$)

Figure 3. Diode transient thermal impedance as a function of pulse width ($D=t_p/T$)

Figure 4. Typical reverse recovery time as a function of diode current slope ($V_R=400\,V$)
Figure 5. Typical reverse recovery charge as a function of diode current slope
\((V_{R}=400\text{V})\)

Figure 6. Typical reverse recovery current as a function of diode current slope
\((V_{R}=400\text{V})\)

Figure 7. Typical diode peak rate of fall of reverse recovery current as a function of diode current slope
\((V_{R}=400\text{V})\)

Figure 8. Typical diode forward current as a function of forward voltage
Figure 9. Typical diode forward voltage as a function of junction temperature
# Emitter Controlled Diode Rapid 1 Dual Anode Series

**PG-TO247-3**

**DIM** | **MILLIMETERS** | **INCHES**
---|---|---
A | 4.83 - 5.21 | 0.190 - 0.205
A1 | 2.27 - 2.54 | 0.089 - 0.100
A2 | 1.85 - 2.16 | 0.073 - 0.085
b | 1.07 - 1.32 | 0.042 - 0.052
b1 | 1.90 | 0.075
b2 | 1.90 - 2.16 | 0.075 - 0.085
b3 | 3.87 | 0.151
b4 | 3.13 | 0.123
c | 0.65 - 0.88 | 0.026 - 0.035
D | 20.80 - 21.10 | 0.819 - 0.831
D1 | 16.25 - 17.65 | 0.640 - 0.695
D2 | 0.85 - 1.35 | 0.033 - 0.053
E | 15.70 - 16.13 | 0.618 - 0.635
E1 | 13.10 | 0.516
E2 | 3.68 - 5.10 | 0.145 - 0.201
E3 | 2.80 | 0.109
L | 19.80 - 20.32 | 0.780 - 0.800
L1 | 4.10 - 4.47 | 0.161 - 0.176
\( dP \) | 3.50 - 3.70 | 0.138 - 0.146
Q | 5.49 | 0.216
S | 6.04 - 6.30 | 0.238 - 0.248

**Dimensions**

- **A**: 4.83 - 5.21 mm (0.190 - 0.205 inches)
- **A1**: 2.27 - 2.54 mm (0.089 - 0.100 inches)
- **A2**: 1.85 - 2.16 mm (0.073 - 0.085 inches)
- **b**: 1.07 - 1.32 mm (0.042 - 0.052 inches)
- **b1**: 1.90 mm
- **b2**: 1.90 - 2.16 mm (0.075 - 0.085 inches)
- **b3**: 3.87 mm
- **b4**: 3.13 mm
- **c**: 0.65 - 0.88 mm (0.026 - 0.035 inches)
- **D**: 20.80 - 21.10 mm (0.819 - 0.831 inches)
- **D1**: 16.25 - 17.65 mm (0.640 - 0.695 inches)
- **D2**: 0.85 - 1.35 mm (0.033 - 0.053 inches)
- **E**: 15.70 - 16.13 mm (0.618 - 0.635 inches)
- **E1**: 13.10 mm
- **E2**: 3.68 - 5.10 mm (0.145 - 0.201 inches)
- **E3**: 2.80 mm
- **L**: 19.80 - 20.32 mm (0.780 - 0.800 inches)
- **L1**: 4.10 - 4.47 mm (0.161 - 0.176 inches)
- **dP**: 3.50 - 3.70 mm (0.138 - 0.146 inches)
- **Q**: 5.49 mm
- **S**: 6.04 - 6.30 mm (0.238 - 0.248 inches)
IDW75D65D1
Emitter Controlled Diode Rapid 1 Dual Anode Series

Figure A. Definition of switching times

Figure B. Definition of switching losses

Figure C. Definition of diode switching characteristics

Figure D. Thermal equivalent circuit

Figure E. Dynamic test circuit
Parasitic inductance $L_{par}$, parasitic capacitor $C_{par}$, relief capacitor $C_{rel}$ (only for ZVT switching)
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