

## Diode

Rapid Switching Emitter Controlled Diode

## IDW80C65D2

Emitter Controlled Diode Rapid 2 Common Cathode Series

Data sheet

Industrial Power Control

## Rapid Switching Emitter Controlled Diode

### Features:

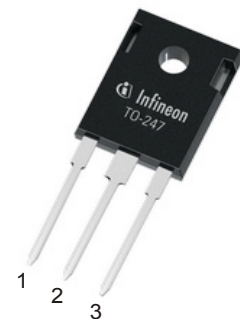
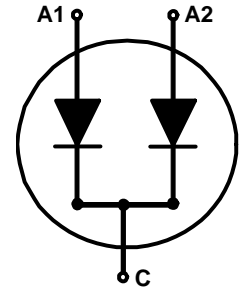
- Qualified according to JEDEC for target applications
- 650V Emitter Controlled technology
- Fast recovery
- Soft switching
- Low reverse recovery charge ( $Q_{rr}$ )
- Low forward voltage ( $V_F$ ) and stable over temperature
- 175°C junction operating temperature
- Easy paralleling
- Pb-free lead plating
- RoHS compliant

### Applications:

- Boost diode in CCM PFC

### Package pin definition:

- Pin 1 - anode (A1)
- Pin 2 and backside - cathode (C)
- Pin 3 - anode (A2)



### Key Performance and Package Parameters

| Type       | $V_{rrm}$ | $I_f$  | $V_f, T_{vj}=25^\circ\text{C}$ | $T_{vjmax}$ | Marking | Package    |
|------------|-----------|--------|--------------------------------|-------------|---------|------------|
| IDW80C65D2 | 650V      | 2x 40A | 1.6V                           | 175°C       | C80ED2  | PG-TO247-3 |



**Table of Contents**

Description ..... 2

Table of Contents ..... 3

Maximum Ratings (per leg) ..... 4

Thermal Resistances (per leg) ..... 4

Electrical Characteristics ..... 4

Electrical Characteristics Diagrams ..... 6

Package Drawing ..... 8

Testing Conditions ..... 9

Revision History ..... 10

Disclaimer ..... 10

**Maximum Ratings (per leg)**

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

| Parameter   | Symbol      | Value         | Unit               |
|---|-------------|---------------|--------------------|
| Repetitive peak reverse voltage, $T_{vj} \geq 25^{\circ}\text{C}$   | $V_{RRM}$   | 650           | V                  |
| Diode forward current, limited by $T_{vjmax}$<br>$T_C = 25^{\circ}\text{C}$<br>$T_C = 100^{\circ}\text{C}$      | $I_F$       | 80.0<br>40.0  | A                  |
| Diode pulsed current, $t_p$ limited by $T_{vjmax}$  | $I_{Fpuls}$ | 120.0         | A                  |
| Diode surge non repetitive forward current<br>$T_C = 25^{\circ}\text{C}$ , $t_p = 8.3\text{ms}$ , sine halfwave | $I_{FSM}$   | 250.0         | A                  |
| Power dissipation $T_C = 25^{\circ}\text{C}$<br>Power dissipation $T_C = 100^{\circ}\text{C}$                   | $P_{tot}$   | 180.0<br>90.0 | W                  |
| Operating junction temperature  | $T_{vj}$    | -40...+175    | $^{\circ}\text{C}$ |
| Storage temperature   | $T_{stg}$   | -55...+150    | $^{\circ}\text{C}$ |
| Soldering temperature,<br>wave soldering 1.6mm (0.063in.) from case for 10s                                     |             | 260           | $^{\circ}\text{C}$ |
| Mounting torque, M3 screw<br>Maximum of mounting processes: 3   | $M$         | 0.6           | Nm                 |

**Thermal Resistances (per leg)**

| Parameter  | Symbol        | Conditions | Max. Value | Unit |
|--|---------------|------------|------------|------|
| <b>Characteristic</b>                                      |               |            |            |      |
| Diode thermal resistance, <sup>1)</sup><br>junction - case | $R_{th(j-c)}$ |            | 0.84       | K/W  |
| Thermal resistance<br>junction - ambient                   | $R_{th(j-a)}$ |            | 40         | K/W  |

**Electrical Characteristics (per leg), at  $T_{vj} = 25^{\circ}\text{C}$ , unless otherwise specified**

| Parameter                             | Symbol | Conditions  | Value       |                      |                | Unit          |
|---------------------------------------|--------|---|-------------|----------------------|----------------|---------------|
|                                       |        |   | min.        | typ.                 | max.           |               |
| <b>Static Characteristic</b>          |        |   |             |                      |                |               |
| Diode forward voltage                 | $V_F$  | $I_F = 40.0\text{A}$<br>$T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 175^{\circ}\text{C}$ | -<br>-<br>- | 1.60<br>1.65<br>1.65 | 2.20<br>-<br>- | V             |
| Reverse leakage current <sup>2)</sup> | $I_R$  | $V_R = 650\text{V}$<br>$T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 175^{\circ}\text{C}$                                    | -<br>-      | -<br>1600.0          | 40.0<br>-      | $\mu\text{A}$ |

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

| Parameter  | Symbol | Conditions | Value |      |      | Unit |
|--|--------|------------|-------|------|------|------|
|  |        |            | min.  | typ. | max. |      |
| <b>Dynamic Characteristic</b>  |        |            |       |      |      |      |
| Internal emitter inductance<br>measured 5mm (0.197 in.) from<br>case | $L_E$  |            | -     | 13.0 | -    | nH   |

<sup>1)</sup> Please be aware that in nonstandard load conditions, due to high  $R_{th(j-c)}$ ,  $T_{vj}$  close to  $T_{vjmax}$  can be reached.

<sup>2)</sup> Reverse leakage current per leg specified for operating conditions with zero voltage applied to the other leg.

**Switching Characteristics (per leg), Inductive Load**

| Parameter  | Symbol       | Conditions  | Value |        |      | Unit                   |
|--|--------------|---|-------|--------|------|------------------------|
|  |              |   | min.  | typ.   | max. |                        |
| <b>Diode Characteristic, at <math>T_{vj} = 25^{\circ}\text{C}</math></b> |              |   |       |        |      |                        |
| Diode reverse recovery time  | $t_{rr}$     | $T_{vj} = 25^{\circ}\text{C}$ ,<br>$V_R = 400\text{V}$ ,<br>$I_F = 40.0\text{A}$ ,<br>$di_F/dt = 1000\text{A}/\mu\text{s}$ ,<br>$L\sigma = 30\text{nH}$ ,<br>$C\sigma = 40\text{pF}$ ,<br>switch IPW60R045CP. | -     | 36     | -    | ns                     |
| Diode reverse recovery charge  | $Q_{rr}$     |   | -     | 0.40   | -    | $\mu\text{C}$          |
| Diode peak reverse recovery current                                      | $I_{rrm}$    |   | -     | 22.0   | -    | A                      |
| Diode peak rate of fall of reverse recovery current during $t_b$         | $di_{rr}/dt$ |   | -     | -10000 | -    | $\text{A}/\mu\text{s}$ |
| Diode reverse recovery time  | $t_{rr}$     | $T_{vj} = 25^{\circ}\text{C}$ ,<br>$V_R = 400\text{V}$ ,<br>$I_F = 40.0\text{A}$ ,<br>$di_F/dt = 200\text{A}/\mu\text{s}$ ,<br>$L\sigma = 30\text{nH}$ ,<br>$C\sigma = 40\text{pF}$ ,<br>switch IPW60R045CP.  | -     | 68     | -    | ns                     |
| Diode reverse recovery charge  | $Q_{rr}$     |   | -     | 0.18   | -    | $\mu\text{C}$          |
| Diode peak reverse recovery current                                      | $I_{rrm}$    |   | -     | 3.6    | -    | A                      |
| Diode peak rate of fall of reverse recovery current during $t_b$         | $di_{rr}/dt$ |   | -     | -660   | -    | $\text{A}/\mu\text{s}$ |

**Switching Characteristics (per leg), Inductive Load**

| Parameter   | Symbol       | Conditions   | Value |       |      | Unit                   |
|---|--------------|--|-------|-------|------|------------------------|
|   |              |  | min.  | typ.  | max. |                        |
| <b>Diode Characteristic, at <math>T_{vj} = 175^{\circ}\text{C}/125^{\circ}\text{C}</math></b> |              |  |       |       |      |                        |
| Diode reverse recovery time   | $t_{rr}$     | $T_{vj} = 175^{\circ}\text{C}$ ,<br>$V_R = 400\text{V}$ ,<br>$I_F = 40.0\text{A}$ ,<br>$di_F/dt = 1000\text{A}/\mu\text{s}$ ,<br>$L\sigma = 30\text{nH}$ ,<br>$C\sigma = 40\text{pF}$ ,<br>switch IPW60R045CP. | -     | 60    | -    | ns                     |
| Diode reverse recovery charge   | $Q_{rr}$     |  | -     | 1.11  | -    | $\mu\text{C}$          |
| Diode peak reverse recovery current   | $I_{rrm}$    |  | -     | 32.0  | -    | A                      |
| Diode peak rate of fall of reverse recovery current during $t_b$                              | $di_{rr}/dt$ |  | -     | -8700 | -    | $\text{A}/\mu\text{s}$ |
| Diode reverse recovery time   | $t_{rr}$     | $T_{vj} = 125^{\circ}\text{C}$ ,<br>$V_R = 400\text{V}$ ,<br>$I_F = 40.0\text{A}$ ,<br>$di_F/dt = 200\text{A}/\mu\text{s}$ ,<br>$L\sigma = 30\text{nH}$ ,<br>$C\sigma = 40\text{pF}$ ,<br>switch IPW60R045CP.  | -     | 82    | -    | ns                     |
| Diode reverse recovery charge   | $Q_{rr}$     |  | -     | 0.44  | -    | $\mu\text{C}$          |
| Diode peak reverse recovery current   | $I_{rrm}$    |  | -     | 7.0   | -    | A                      |
| Diode peak rate of fall of reverse recovery current during $t_b$                              | $di_{rr}/dt$ |  | -     | -1350 | -    | $\text{A}/\mu\text{s}$ |

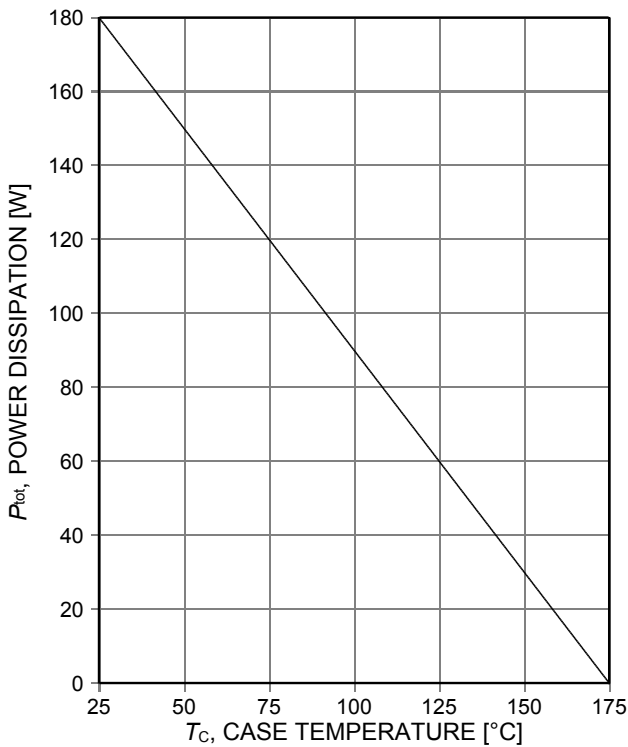


Figure 1. Power dissipation per leg as a function of case temperature ( $T_{vj} \leq 175^\circ\text{C}$ )

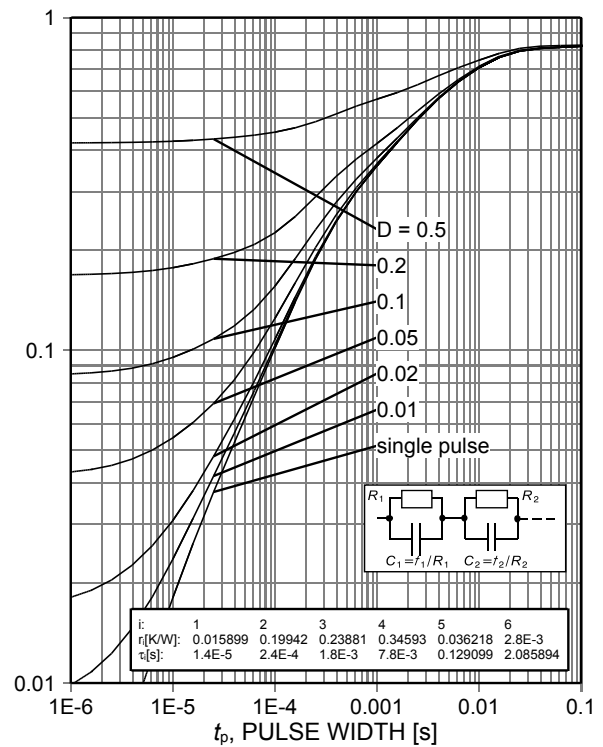


Figure 2. Diode transient thermal impedance per leg as a function of pulse width ( $D = t_p/T$ )

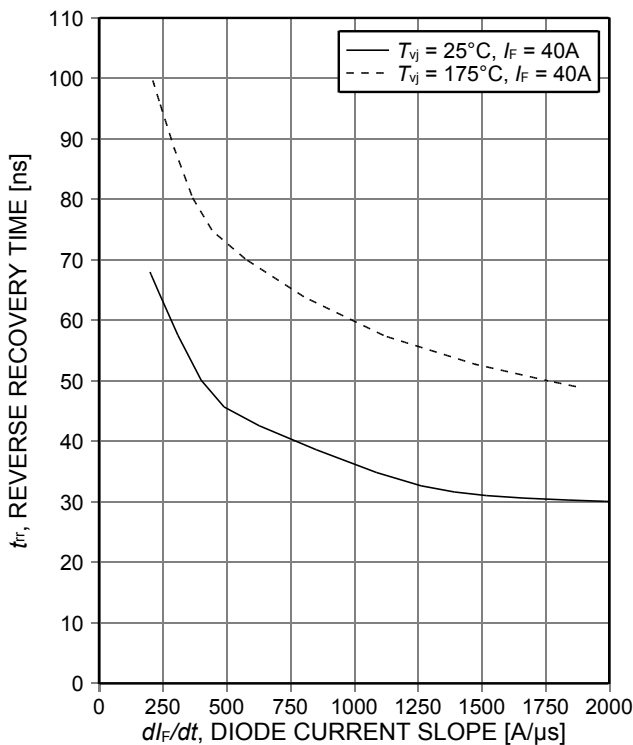


Figure 3. Typical reverse recovery time per leg as a function of diode current slope ( $V_R = 400\text{V}$ )

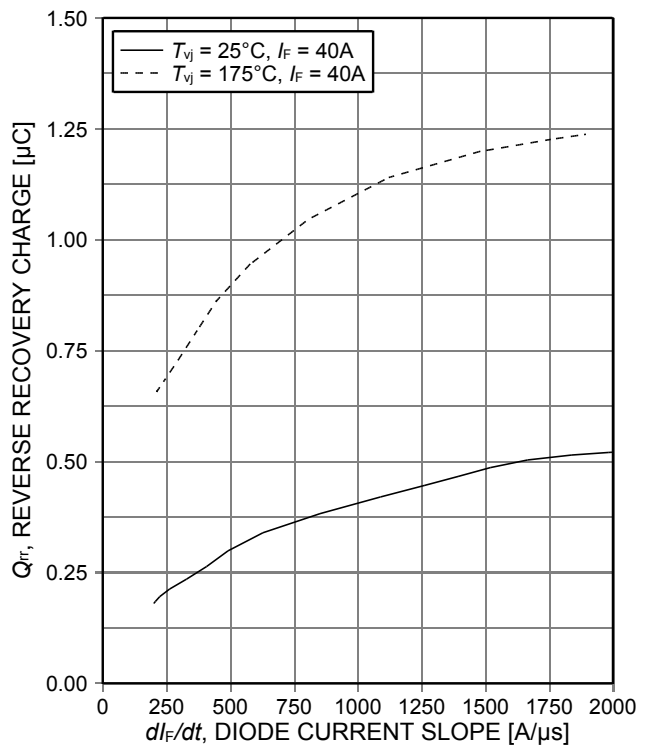


Figure 4. Typical reverse recovery charge per leg as a function of diode current slope ( $V_R = 400\text{V}$ )

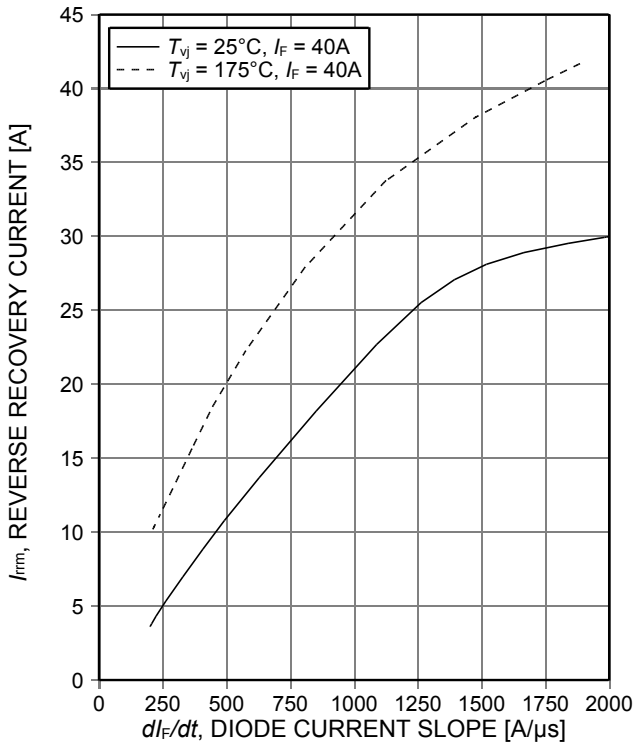


Figure 5. Typical peak reverse recovery current per leg as a function of diode current slope ( $V_R=400V$ )

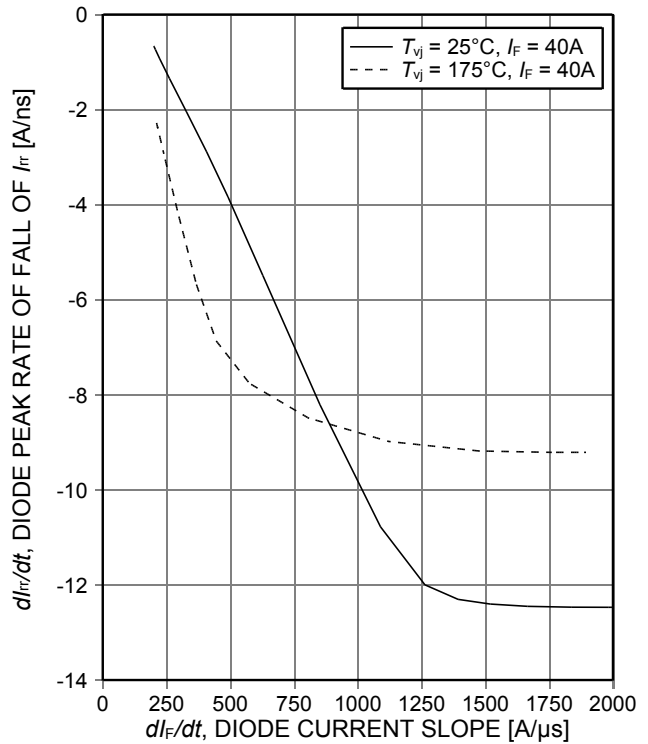


Figure 6. Typical diode peak rate of fall of rev. rec. current per leg as a function of diode current slope ( $V_R=400V$ )

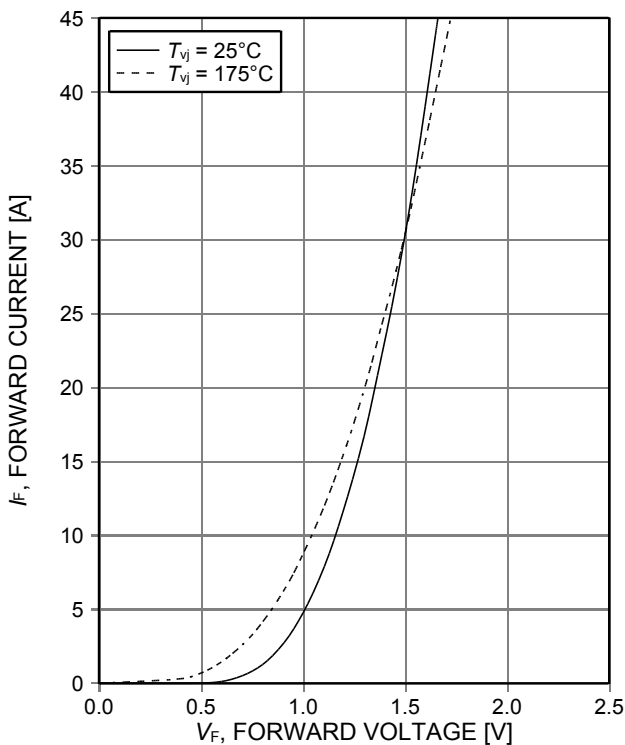


Figure 7. Typical diode forward current per leg as a function of forward voltage

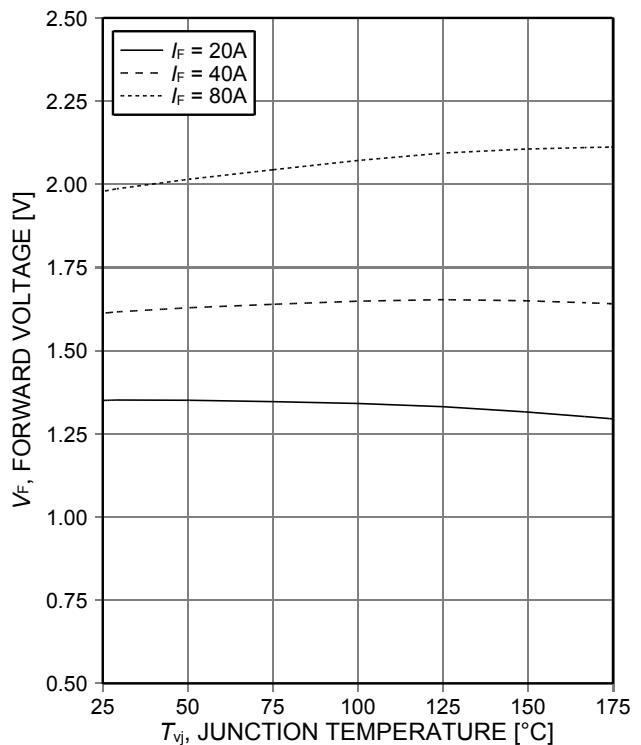
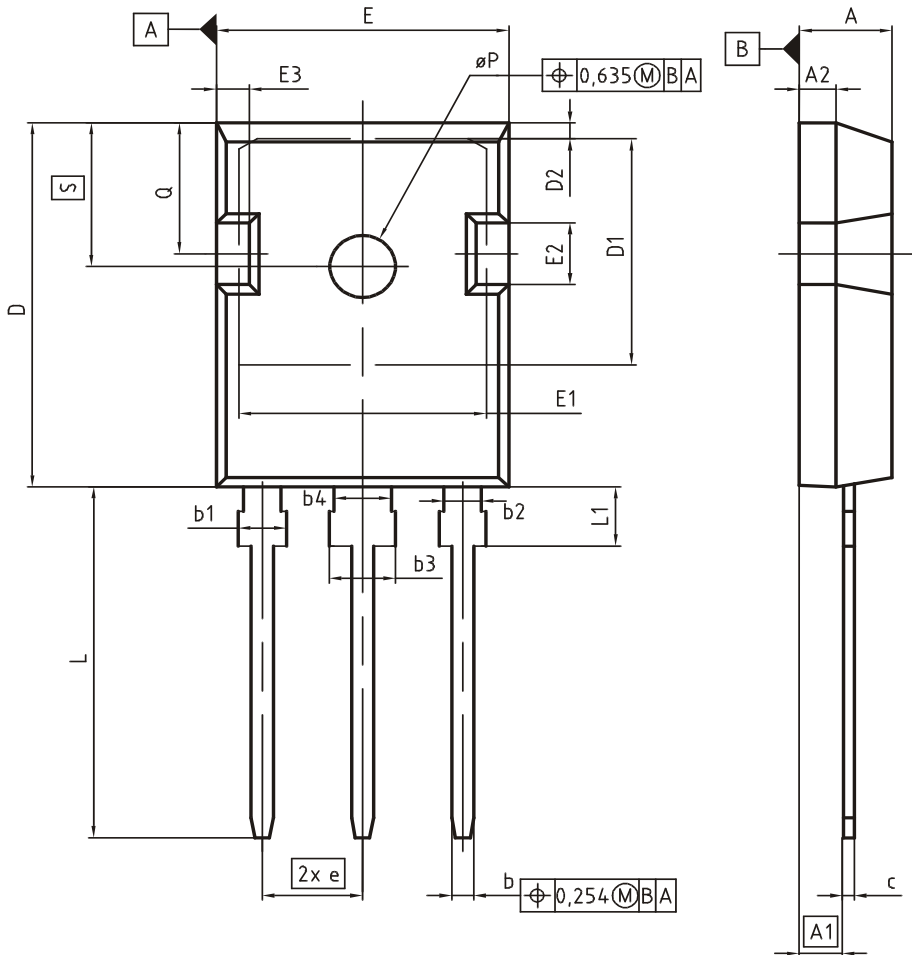


Figure 8. Typical diode forward voltage per leg as a function of junction temperature

PG-TO247-3



| DIM      | MILLIMETERS |       | INCHES      |       |
|----------|-------------|-------|-------------|-------|
|          | MIN         | MAX   | MIN         | MAX   |
| 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        | 1.33  | 0.042       | 0.052 |
| b1       | 1.90        | 2.41  | 0.075       | 0.095 |
| b2       | 1.90        | 2.16  | 0.075       | 0.085 |
| b3       | 2.87        | 3.38  | 0.113       | 0.133 |
| b4       | 2.87        | 3.13  | 0.113       | 0.123 |
| c        | 0.55        | 0.68  | 0.022       | 0.027 |
| D        | 20.80       | 21.10 | 0.819       | 0.831 |
| D1       | 16.25       | 17.65 | 0.640       | 0.695 |
| D2       | 0.95        | 1.35  | 0.037       | 0.053 |
| E        | 15.70       | 16.13 | 0.618       | 0.635 |
| E1       | 13.10       | 14.15 | 0.516       | 0.557 |
| E2       | 3.68        | 5.10  | 0.145       | 0.201 |
| E3       | 1.00        | 2.60  | 0.039       | 0.102 |
| e        | 5.44 (BSC)  |       | 0.214 (BSC) |       |
| N        | 3           |       | 3           |       |
| L        | 19.80       | 20.32 | 0.780       | 0.800 |
| L1       | 4.10        | 4.47  | 0.161       | 0.176 |
| $\phi P$ | 3.50        | 3.70  | 0.138       | 0.146 |
| Q        | 5.49        | 6.00  | 0.216       | 0.236 |
| S        | 6.04        | 6.30  | 0.238       | 0.248 |

DOCUMENT NO.  
Z8B00003327

SCALE

EUROPEAN PROJECTION

ISSUE DATE  
09-07-2010

REVISION  
05



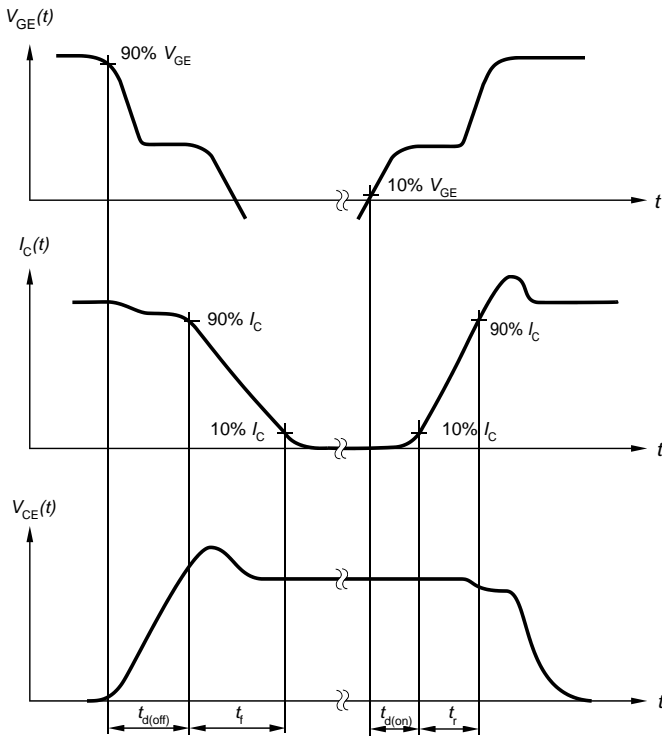


Figure A. Definition of switching times

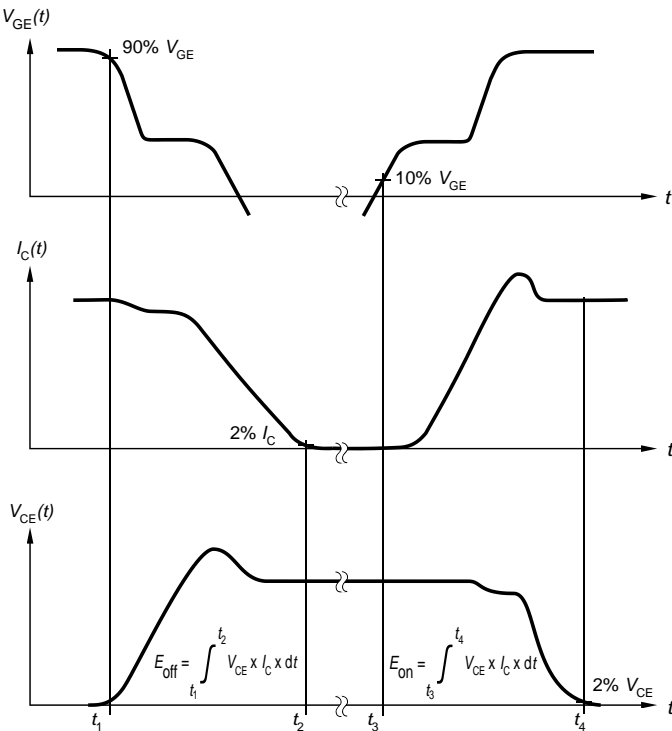


Figure B. Definition of switching losses

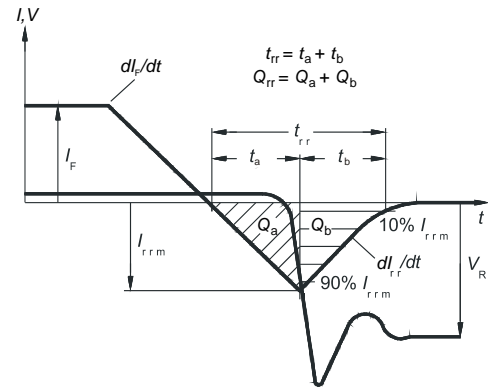


Figure C. Definition of diode switching characteristics

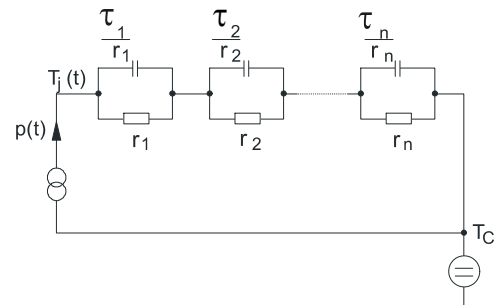


Figure D. Thermal equivalent circuit

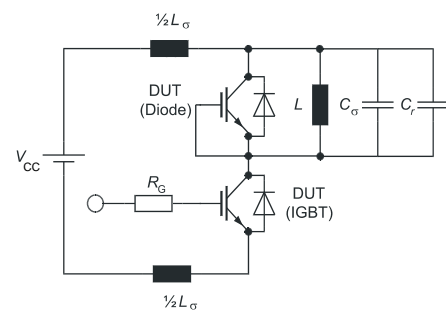


Figure E. Dynamic test circuit  
Parasitic inductance  $L_{\sigma}$ ,  
parasitic capacitor  $C_{\sigma}$ ,  
relief capacitor  $C_r$ ,  
(only for ZVT switching)

## Revision History

---

IDW80C65D2

Revision: 2014-12-09, Rev. 2.1

## Previous Revision

| Revision | Date       | Subjects (major changes since last revision) |
|----------|------------|--|
| 1.1      | 2014-12-02 | Preliminary data sheet                       |
| 2.1      | 2014-12-09 | Final data sheet                             |

## We Listen to Your Comments

Any information within this document that you feel is wrong, unclear or missing at all?

Your feedback will help us to continuously improve the quality of this document.

Please send your proposal (including a reference to this document) to: [erratum@infineon.com](mailto:erratum@infineon.com)

## Published by

Infineon Technologies AG

81726 Munich, Germany

81726 München, Germany

© 2014 Infineon Technologies AG

All Rights Reserved.

## Legal Disclaimer

The information given in this document shall in no event be regarded as a guarantee of conditions or characteristics.

With respect to any examples or hints given herein, any typical values stated herein and/or any information regarding the application of the device, Infineon Technologies hereby disclaims any and all warranties and liabilities of any kind, including without limitation, warranties of non-infringement of intellectual property rights of any third party.

## Information

For further information on technology, delivery terms and conditions and prices, please contact the nearest Infineon Technologies Office ([www.infineon.com](http://www.infineon.com)).

## Warnings

Due to technical requirements, components may contain dangerous substances. For information on the types in question, please contact the nearest Infineon Technologies Office.

The Infineon Technologies component described in this Data Sheet may be used in life-support devices or systems and/or automotive, aviation and aerospace applications or systems only with the express written approval of Infineon Technologies, if a failure of such components can reasonably be expected to cause the failure of that life-support, automotive, aviation and aerospace device or system or to affect the safety or effectiveness of that device or system. Life support devices or systems are intended to be implanted in the human body or to support and/or maintain and sustain and/or protect human life. If they fail, it is reasonable to assume that the health of the user or other persons may be endangered.



## Стандарт Электрон Связь

Мы молодая и активно развивающаяся компания в области поставок электронных компонентов. Мы поставляем электронные компоненты отечественного и импортного производства напрямую от производителей и с крупнейших складов мира.

Благодаря сотрудничеству с мировыми поставщиками мы осуществляем комплексные и плановые поставки широчайшего спектра электронных компонентов.

Собственная эффективная логистика и склад в обеспечивает надежную поставку продукции в точно указанные сроки по всей России.

Мы осуществляем техническую поддержку нашим клиентам и предпродажную проверку качества продукции. На все поставляемые продукты мы предоставляем гарантию .

Осуществляем поставки продукции под контролем ВП МО РФ на предприятия военно-промышленного комплекса России , а также работаем в рамках 275 ФЗ с открытием отдельных счетов в уполномоченном банке. Система менеджмента качества компании соответствует требованиям ГОСТ ISO 9001.

Минимальные сроки поставки, гибкие цены, неограниченный ассортимент и индивидуальный подход к клиентам являются основой для выстраивания долгосрочного и эффективного сотрудничества с предприятиями радиоэлектронной промышленности, предприятиями ВПК и научно-исследовательскими институтами России.

С нами вы становитесь еще успешнее!

### Наши контакты:

**Телефон:** +7 812 627 14 35

**Электронная почта:** [sales@st-electron.ru](mailto:sales@st-electron.ru)

**Адрес:** 198099, Санкт-Петербург,  
Промышленная ул, дом № 19, литера Н,  
помещение 100-Н Офис 331