

## Diode

Rapid Switching Emitter Controlled Diode

## IDW80C65D1

Emitter Controlled Diode Rapid 1 Common Cathode Series

Data sheet

Industrial Power Control

## Rapid Switching Emitter Controlled Diode

### Features:

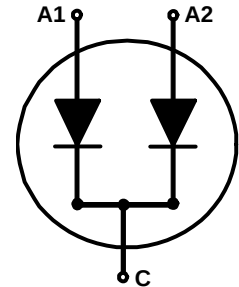
- Qualified according to JEDEC for target applications
- 650V Emitter Controlled technology
- Temperature stable behaviour of key parameters
- Low forward voltage ( $V_F$ )
- Ultra fast recovery
- Low reverse recovery charge ( $Q_{rr}$ )
- Low reverse recovery current ( $I_{rrm}$ )
- 175°C junction operating 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 (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    |
|------------|-----------|--------|--------------------------------|-------------|---------|------------|
| IDW80C65D1 | 650V      | 2x 40A | 1.35V                          | 175°C       | C80ED1  | 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 .....                     | 9  |
| Testing Conditions .....                  | 10 |
| Revision History .....                    | 11 |
| Disclaimer .....                          | 11 |

### 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>$T_C = 25^{\circ}\text{C}$ , $t_p = 10.0\text{ms}$ , sine halfwave | $I_{FSM}$   | 320.0         | A                  |
| Power dissipation $T_C = 25^{\circ}\text{C}$<br>Power dissipation $T_C = 100^{\circ}\text{C}$                    | $P_{tot}$   | 179.0<br>89.0 | 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.           |      |
| Static Characteristic                 |        |                                                                                               |             |                      |                |      |
| Diode forward voltage                 | $V_F$  | $I_F = 40.0A$<br>$T_{vj} = 25^{\circ}C$<br>$T_{vj} = 125^{\circ}C$<br>$T_{vj} = 175^{\circ}C$ | -<br>-<br>- | 1.35<br>1.32<br>1.28 | 1.70<br>-<br>- | V    |
| Reverse leakage current <sup>2)</sup> | $I_R$  | $V_R = 650V$<br>$T_{vj} = 25^{\circ}C$<br>$T_{vj} = 175^{\circ}C$                             | -<br>-      | -<br>1600.0          | 40.0<br>-      | μA   |

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

| Parameter                                                            | Symbol         | Conditions | Value |      |      | Unit |
|----------------------------------------------------------------------|----------------|------------|-------|------|------|------|
|                                                                      |                |            | min.  | typ. | max. |      |
| Dynamic Characteristic                                               |                |            |       |      |      |      |
| Internal emitter inductance<br>measured 5mm (0.197 in.) from<br>case | L <sub>E</sub> |            | -     | 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. |                  |
| Diode Characteristic, at $T_{vj} = 25^{\circ}\text{C}$           |              |                                                                                                                                                                                                              |       |       |      |                  |
| 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 IGZ75N65H5. | -     | 77    | -    | ns               |
| Diode reverse recovery charge                                    | $Q_{rr}$     |                                                                                                                                                                                                              | -     | 0.87  | -    | $\mu\text{C}$    |
| Diode peak reverse recovery current                              | $I_{rrm}$    |                                                                                                                                                                                                              | -     | 17.5  | -    | A                |
| Diode peak rate of fall of reverse recovery current during $t_b$ | $di_{rr}/dt$ |                                                                                                                                                                                                              | -     | -1520 | -    | 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 IGZ75N65H5.  | -     | 129   | -    | ns               |
| Diode reverse recovery charge                                    | $Q_{rr}$     |                                                                                                                                                                                                              | -     | 0.49  | -    | $\mu\text{C}$    |
| Diode peak reverse recovery current                              | $I_{rrm}$    |                                                                                                                                                                                                              | -     | 6.9   | -    | A                |
| Diode peak rate of fall of reverse recovery current during $t_b$ | $di_{rr}/dt$ |                                                                                                                                                                                                              | -     | -300  | -    | A/ $\mu\text{s}$ |

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

| Parameter                                                                   | Symbol       | Conditions                                                                                                                                                                                                    | Value |       |      | Unit                   |
|-----------------------------------------------------------------------------|--------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|-------|------|------------------------|
|                                                                             |              |                                                                                                                                                                                                               | min.  | typ.  | max. |                        |
| Diode Characteristic, at $T_{vj} = 175^{\circ}\text{C}/125^{\circ}\text{C}$ |              |                                                                                                                                                                                                               |       |       |      |                        |
| 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 IGZ75N65H5. | -     | 110   | -    | ns                     |
| Diode reverse recovery charge                                               | $Q_{rr}$     |                                                                                                                                                                                                               | -     | 2.36  | -    | $\mu\text{C}$          |
| Diode peak reverse recovery current                                         | $I_{rrm}$    |                                                                                                                                                                                                               | -     | 27.3  | -    | A                      |
| Diode peak rate of fall of reverse recovery current during $t_b$            | $di_{rr}/dt$ |                                                                                                                                                                                                               | -     | -1320 | -    | $\text{A}/\mu\text{s}$ |
|                                                                             |              |                                                                                                                                                                                                               |       |       |      |                        |
| 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 IGZ75N65H5.  | -     | 163   | -    | ns                     |
| Diode reverse recovery charge                                               | $Q_{rr}$     |                                                                                                                                                                                                               | -     | 1.04  | -    | $\mu\text{C}$          |
| Diode peak reverse recovery current                                         | $I_{rrm}$    |                                                                                                                                                                                                               | -     | 10.4  | -    | A                      |
| Diode peak rate of fall of reverse recovery current during $t_b$            | $di_{rr}/dt$ |                                                                                                                                                                                                               | -     | -600  | -    | $\text{A}/\mu\text{s}$ |

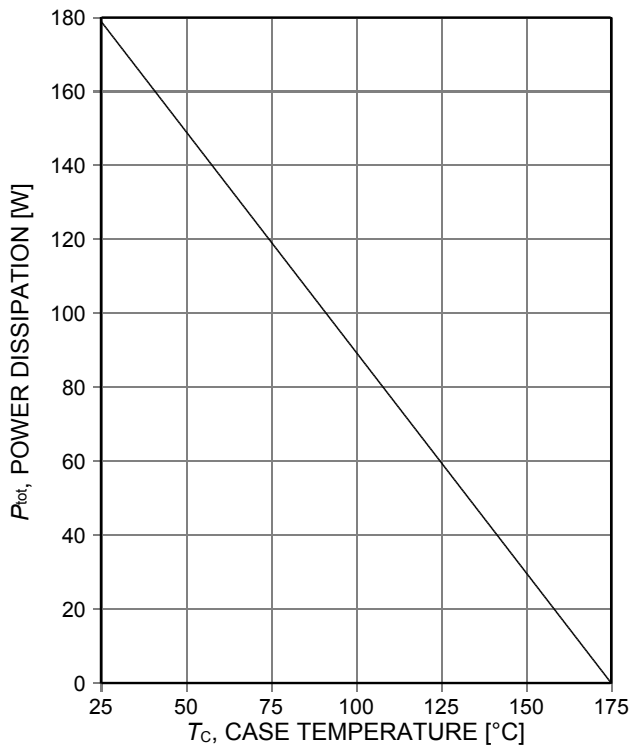


Figure 1. Power dissipation per leg as a function of case temperature ( $T_{vj} \leq 175^\circ\text{C}$ )

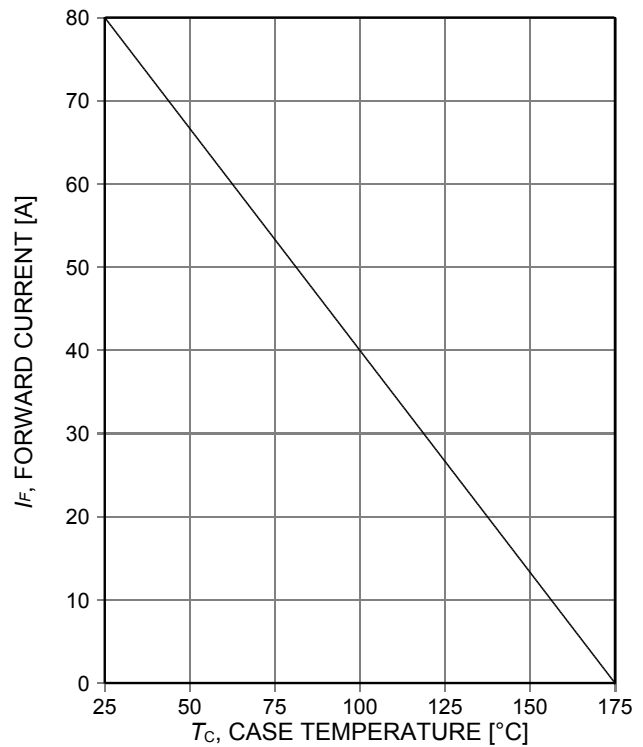


Figure 2. Diode forward current per leg as a function of case temperature ( $T_{vj} \leq 175^\circ\text{C}$ )

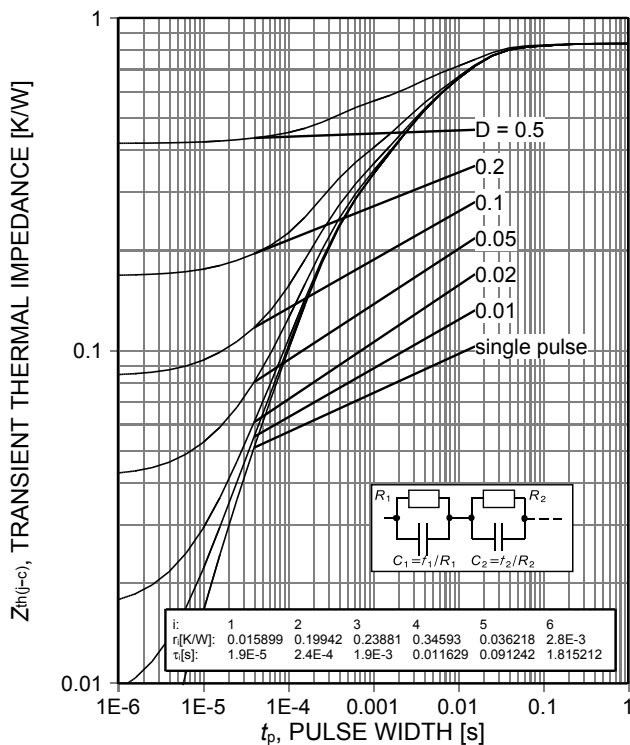


Figure 3. Diode transient thermal impedance per leg as a function of pulse width ( $D = t_p/T$ )

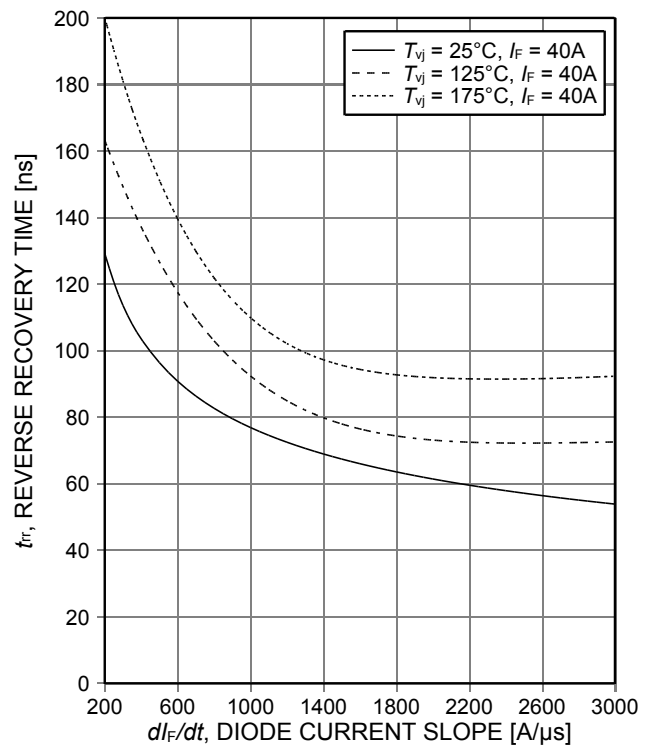


Figure 4. Typical reverse recovery time per leg as a function of diode current slope ( $V_R = 400\text{V}$ )

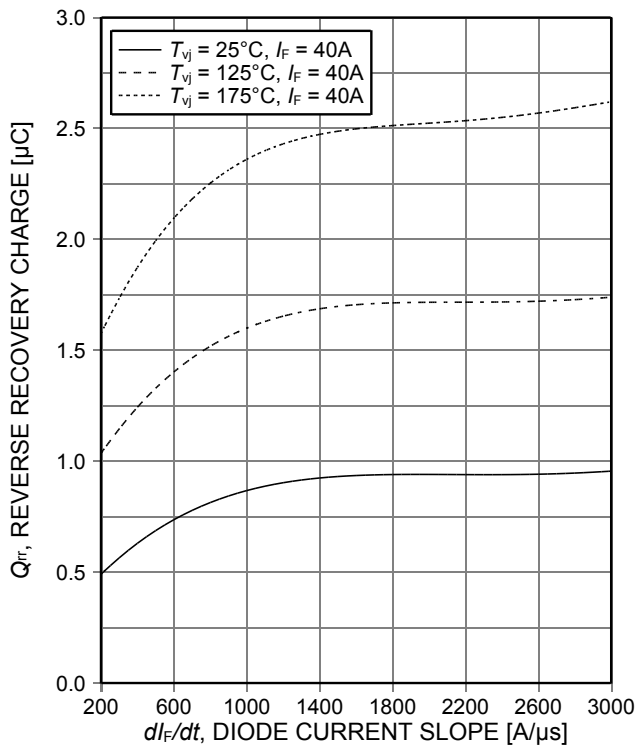


Figure 5. Typical reverse recovery charge per leg as a function of diode current slope ( $V_R=400V$ )

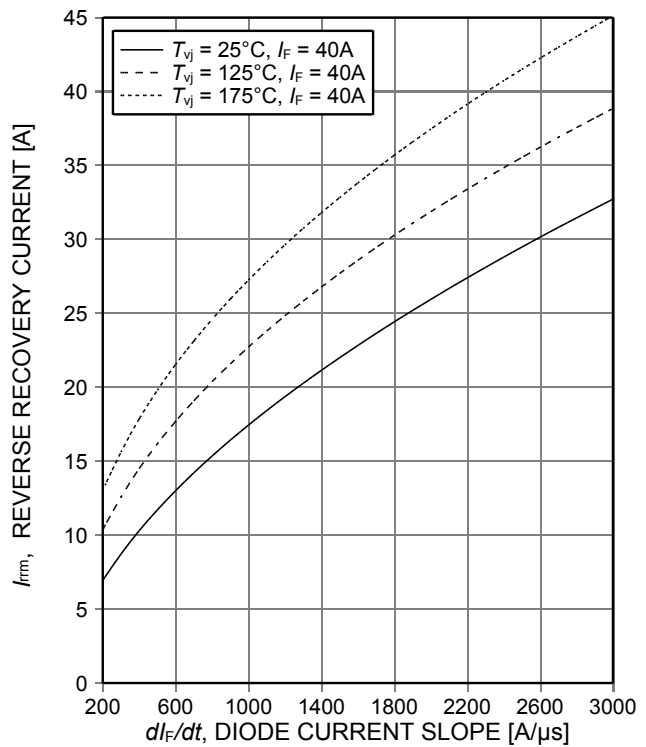


Figure 6. Typical peak reverse recovery current per leg as a function of diode current slope ( $V_R=400V$ )

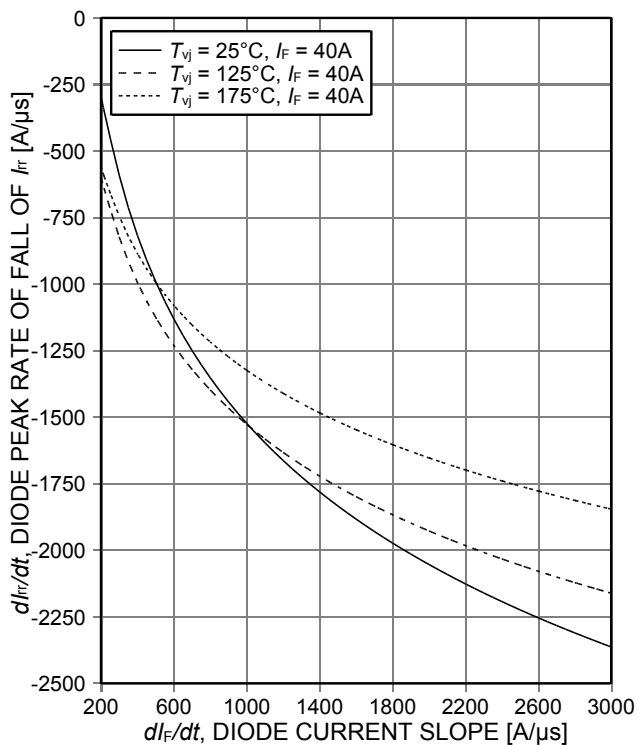


Figure 7. Typical diode peak rate of fall of rev. rec. current per leg as a function of diode current slope ( $V_R=400V$ )

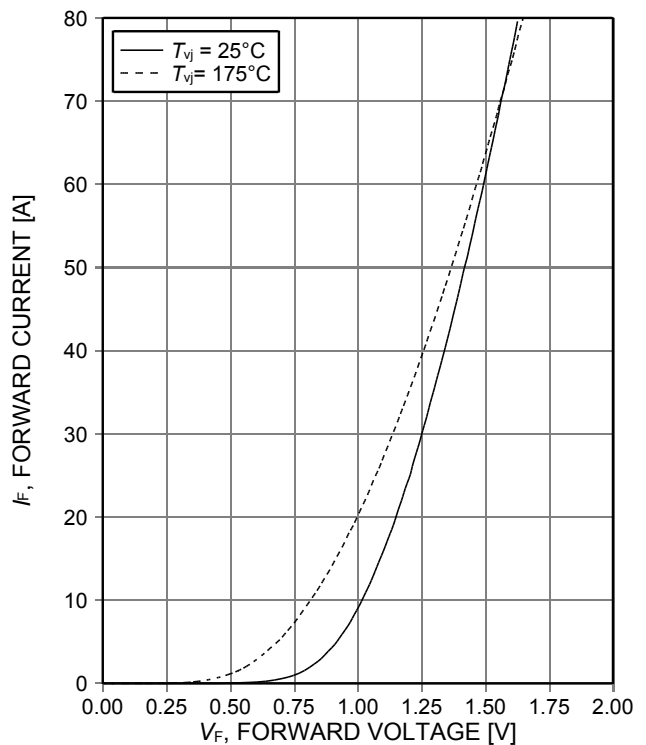


Figure 8. Typical diode forward current per leg as a function of forward voltage

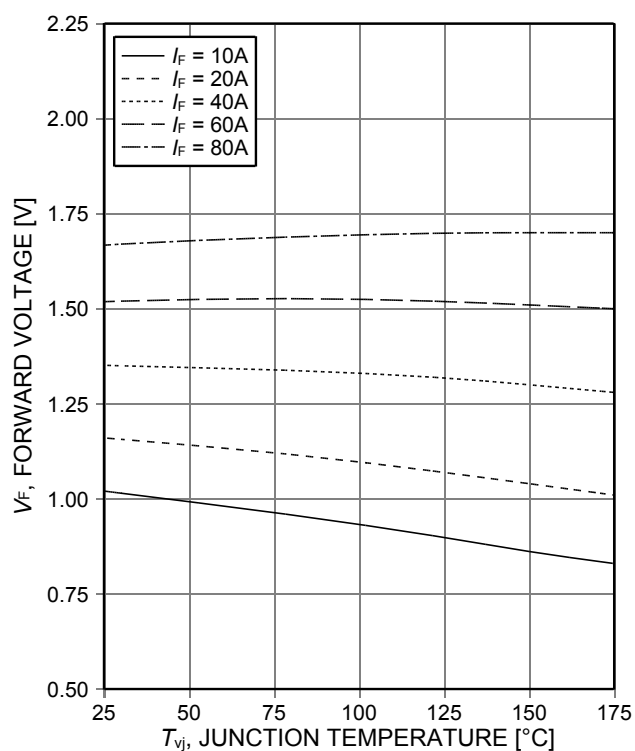
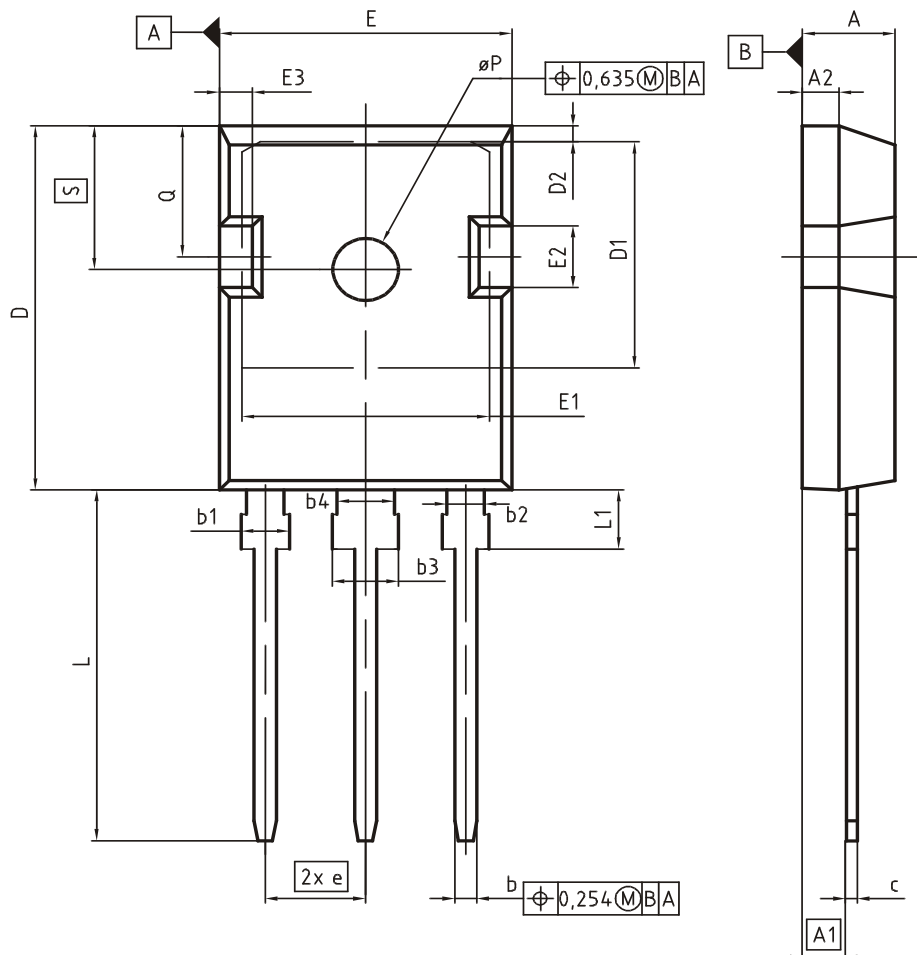


Figure 9. Typical diode forward voltage per leg as a function of junction temperature

## 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 |
| ØP  | 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 |

|                                                                                                                     |
|---------------------------------------------------------------------------------------------------------------------|
| <b>DOCUMENT NO.</b><br>Z8B00003327                                                                                  |
| <b>SCALE</b><br>0 5 7.5mm                                                                                           |
| <b>EUROPEAN PROJECTION</b><br> |
| <b>ISSUE DATE</b><br>09-07-2010                                                                                     |
| <b>REVISION</b><br>05                                                                                               |

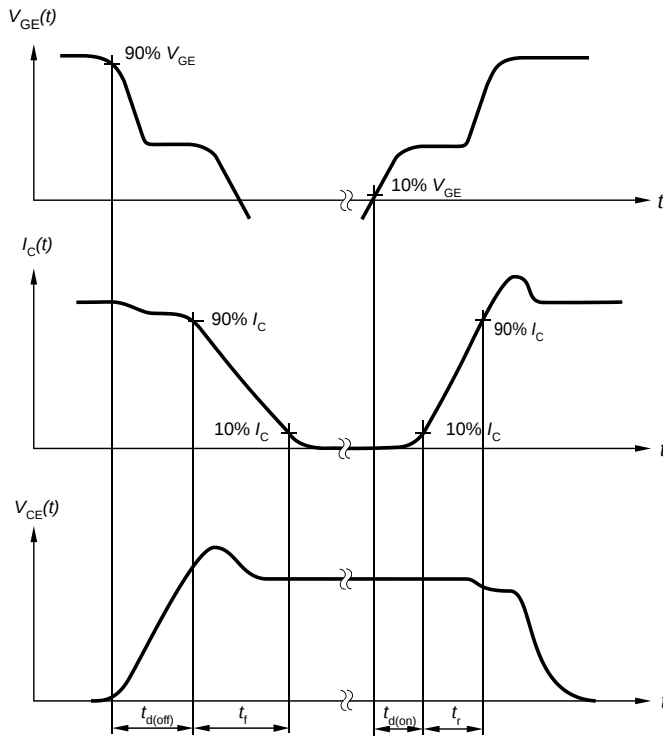


Figure A. Definition of switching times

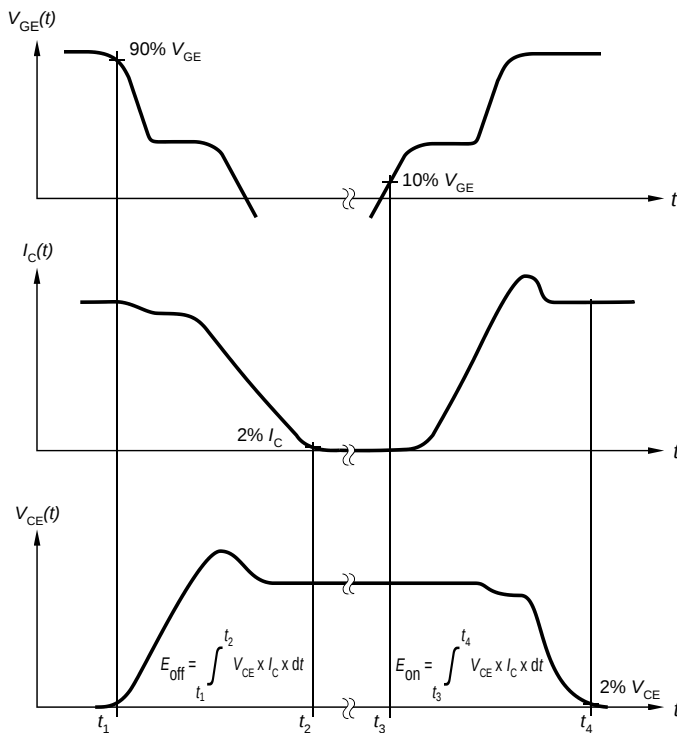


Figure B. Definition of switching losses

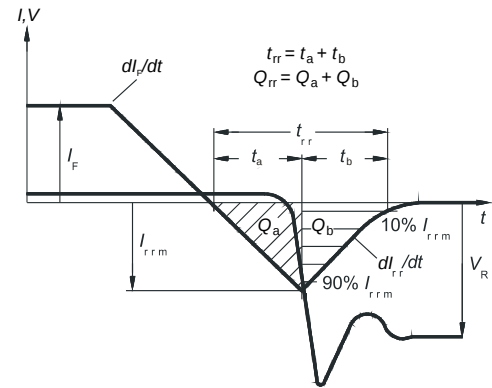


Figure C. Definition of diode switching characteristics

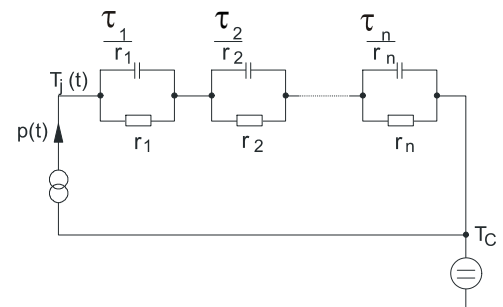
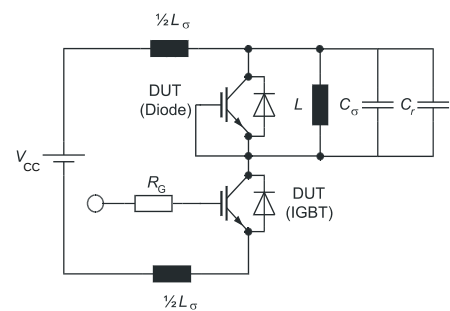


Figure D. Thermal equivalent circuit


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

## Revision History

IDW80C65D1

Revision: 2014-12-10, Rev. 2.1

## Previous Revision

| Revision | Date       | Subjects (major changes since last revision) |
|----------|------------|----------------------------------------------|
| 1.1      | 2014-12-02 | Preliminary data sheet                       |
| 2.1      | 2014-12-10 | 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.

## Данный компонент на территории Российской Федерации

**Вы можете приобрести в компании MosChip.**

Для оперативного оформления запроса Вам необходимо перейти по данной ссылке:

<http://moschip.ru/get-element>

Вы можете разместить у нас заказ для любого Вашего проекта, будь то серийное производство или разработка единичного прибора.

В нашем ассортименте представлены ведущие мировые производители активных и пассивных электронных компонентов.

Нашей специализацией является поставка электронной компонентной базы двойного назначения, продукции таких производителей как XILINX, Intel (ex.ALTERA), Vicor, Microchip, Texas Instruments, Analog Devices, Mini-Circuits, Amphenol, Glenair.

Сотрудничество с глобальными дистрибьюторами электронных компонентов, предоставляет возможность заказывать и получать с международных складов практически любой перечень компонентов в оптимальные для Вас сроки.

На всех этапах разработки и производства наши партнеры могут получить квалифицированную поддержку опытных инженеров.

Система менеджмента качества компании отвечает требованиям в соответствии с ГОСТ Р ИСО 9001, ГОСТ РВ 0015-002 и ЭС РД 009

### Офис по работе с юридическими лицами:

105318, г.Москва, ул.Щербаковская д.3, офис 1107, 1118, ДЦ «Щербаковский»

Телефон: +7 495 668-12-70 (многоканальный)

Факс: +7 495 668-12-70 (доб.304)

E-mail: [info@moschip.ru](mailto:info@moschip.ru)

Skype отдела продаж:

moschip.ru

moschip.ru\_4

moschip.ru\_6

moschip.ru\_9