

## Diode

Rapid Switching Emitter Controlled Diode

## IDP20C65D2

Emitter Controlled Diode Rapid 2 Common Cathode Series

Data sheet

Industrial Power Control

## Rapid Switching Emitter Controlled Diode

### Features:

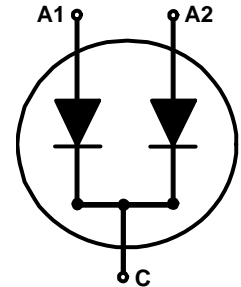
- Qualified according to JEDEC for target applications
- 650 V Emitter Controlled technology
- Fast recovery
- Soft switching
- Low reverse recovery charge
- Low forward voltage and stable over temperature
- 175 °C junction operating temperature
- Easy paralleling
- Pb-free lead plating; RoHS compliant

### 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
IDP20C65D2	650V	2x 10A	1.6V	175°C	C20ED2	PG-TO220-3



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**Maximum Ratings (electrical parameters per diode)**

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 $T_{vjmax}$ $T_C = 25^{\circ}\text{C}$ $T_C = 100^{\circ}\text{C}$	$I_F$	20.0 10.0	A
Diode pulsed current, $t_p$ limited by $T_{vjmax}$	$I_{Fpuls}$	30.0	A
Diode surge non repetitive forward current $T_C = 25^{\circ}\text{C}$ , $t_p = 8.3\text{ms}$ , sine halfwave	$I_{FSM}$	60.0	A
Power dissipation $T_C = 25^{\circ}\text{C}$	$P_{tot}$	68.0	W
Operating junction temperature	$T_{vj}$	-40...+175	$^{\circ}\text{C}$
Storage temperature	$T_{stg}$	-55...+150	$^{\circ}\text{C}$
Soldering temperature, wave soldering 1.6 mm (0.063 in.) from case for 10s		260	$^{\circ}\text{C}$
Mounting torque, M3 screw Maximum of mounting processes: 3	$M$	0.6	Nm

**Thermal Resistances (per diode)**

Parameter	Symbol	Conditions	Max. Value	Unit
<b>Characteristic</b>				
Diode thermal resistance, <sup>1)</sup> junction - case	$R_{th(j-c)}$		2.20	K/W
Thermal resistance junction - ambient	$R_{th(j-a)}$		62	K/W

**Electrical Characteristics (per diode), 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	$V_F$	$I_F = 10.0\text{A}$ $T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 175^{\circ}\text{C}$	- -	1.60 1.65	2.20 -	V
Reverse leakage current <sup>2)</sup>	$I_R$	$V_R = 650\text{V}$ $T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 175^{\circ}\text{C}$	- -	4.0 250.0	40.0 -	$\mu\text{A}$

**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 measured 5mm (0.197 in.) from case	$L_E$		-	7.0	-	nH

<sup>1)</sup> Please be aware that in non standard 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 diode specified for operating conditions with zero voltage applied to the other diode.

**Switching Characteristics (per diode), 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	$t_{rr}$	$T_{vj} = 25^{\circ}\text{C}$ , $V_R = 400\text{V}$ , $I_F = 10.0\text{A}$ , $di_F/dt = 1000\text{A}/\mu\text{s}$ , $L\sigma = 30\text{nH}$ , $C\sigma = 40\text{pF}$ , switch IKW50N65H5	-	28	-	ns
Diode reverse recovery charge	$Q_{rr}$		-	0.16	-	$\mu\text{C}$
Diode peak reverse recovery current	$I_{rrm}$		-	8.6	-	A
Diode peak rate of fall of reverse recovery current during $t_b$	$di_{rr}/dt$		-	-740	-	$\text{A}/\mu\text{s}$
Diode reverse recovery time	$t_{rr}$	$T_{vj} = 25^{\circ}\text{C}$ , $V_R = 400\text{V}$ , $I_F = 10.0\text{A}$ , $di_F/dt = 350\text{A}/\mu\text{s}$ , $L\sigma = 30\text{nH}$ , $C\sigma = 40\text{pF}$ , switch IKW50N65H5	-	50	-	ns
Diode reverse recovery charge	$Q_{rr}$		-	0.13	-	$\mu\text{C}$
Diode peak reverse recovery current	$I_{rrm}$		-	4.3	-	A
Diode peak rate of fall of reverse recovery current during $t_b$	$di_{rr}/dt$		-	-130	-	$\text{A}/\mu\text{s}$

**Switching Characteristics (per diode), 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	$t_{rr}$	$T_{vj} = 175^{\circ}\text{C}$ , $V_R = 400\text{V}$ , $I_F = 10.0\text{A}$ , $di_F/dt = 1000\text{A}/\mu\text{s}$ , $L\sigma = 30\text{nH}$ , $C\sigma = 40\text{pF}$ , switch IKW50N65H5	-	35	-	ns
Diode reverse recovery charge	$Q_{rr}$		-	0.23	-	$\mu\text{C}$
Diode peak reverse recovery current	$I_{rrm}$		-	11.3	-	A
Diode peak rate of fall of reverse recovery current during $t_b$	$di_{rr}/dt$		-	-730	-	$\text{A}/\mu\text{s}$
Diode reverse recovery time	$t_{rr}$	$T_{vj} = 125^{\circ}\text{C}$ , $V_R = 400\text{V}$ , $I_F = 10.0\text{A}$ , $di_F/dt = 350\text{A}/\mu\text{s}$ , $L\sigma = 30\text{nH}$ , $C\sigma = 40\text{pF}$ , switch IKW50N65H5	-	54	-	ns
Diode reverse recovery charge	$Q_{rr}$		-	0.18	-	$\mu\text{C}$
Diode peak reverse recovery current	$I_{rrm}$		-	5.0	-	A
Diode peak rate of fall of reverse recovery current during $t_b$	$di_{rr}/dt$		-	-190	-	$\text{A}/\mu\text{s}$

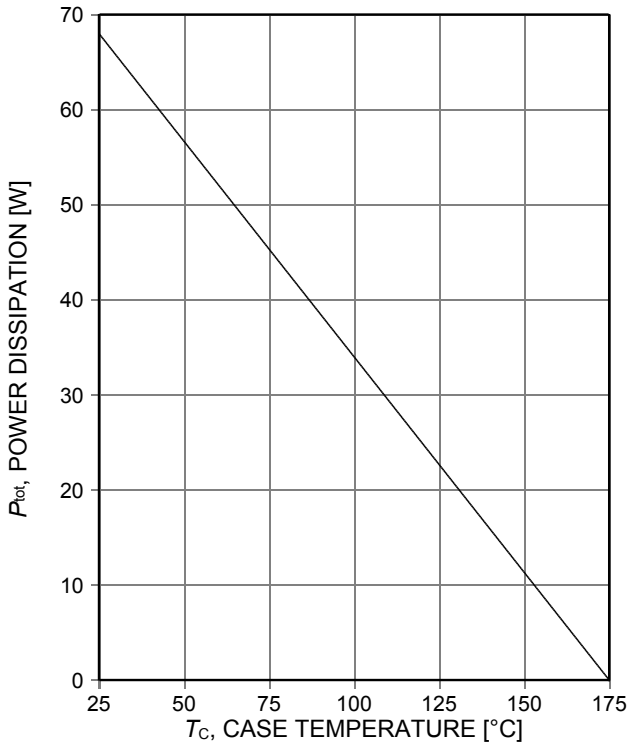


Figure 1. Power dissipation per diode as a function of case temperature ( $T_{vj} \leq 175^\circ\text{C}$ )

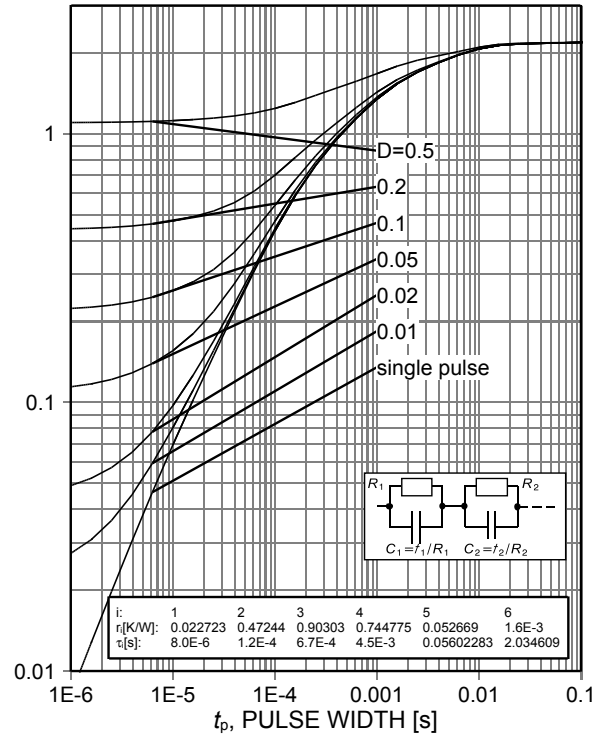


Figure 2. Diode transient thermal impedance per diode as a function of pulse width ( $D = t_p/T$ )

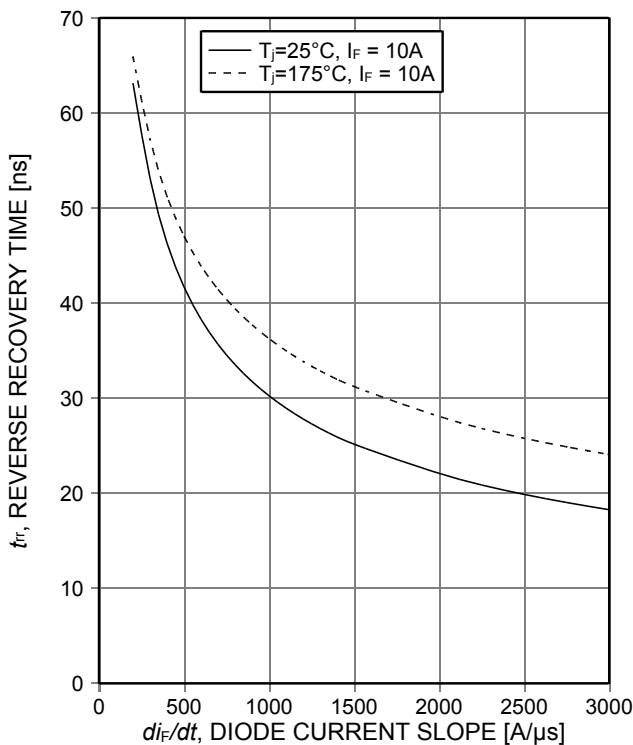


Figure 3. Typical reverse recovery time as a function of diode current slope ( $V_R = 400\text{V}$ )

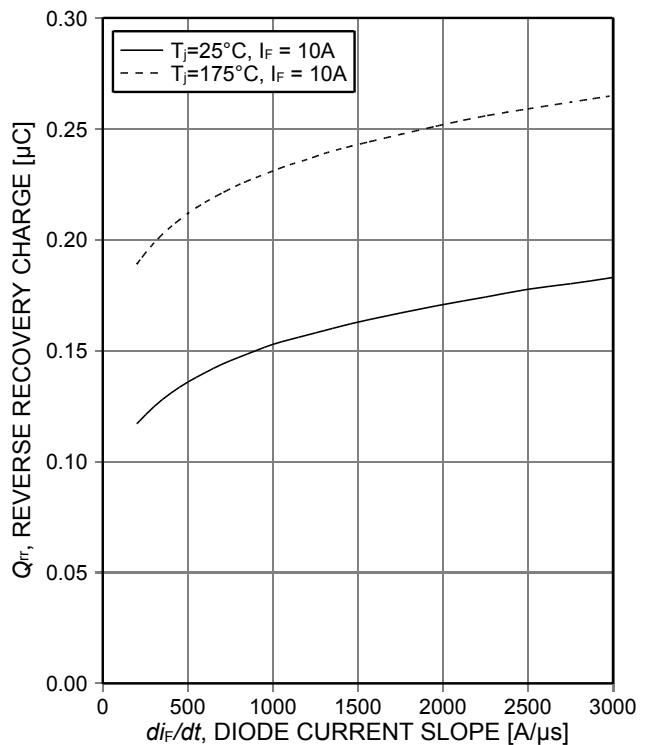


Figure 4. Typical reverse recovery charge per diode as a function of diode current slope ( $V_R = 400\text{V}$ )

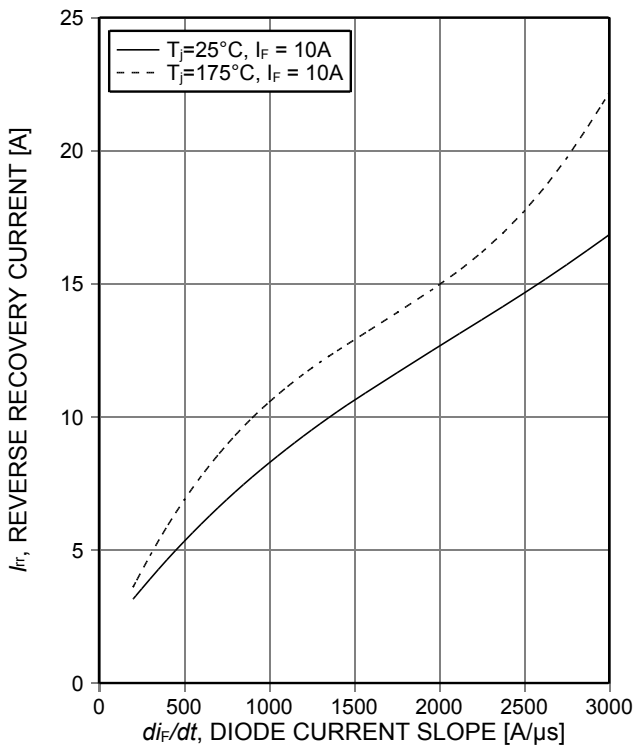


Figure 5. Typical reverse recovery current per diode as a function of diode current slope ( $V_R=400V$ )

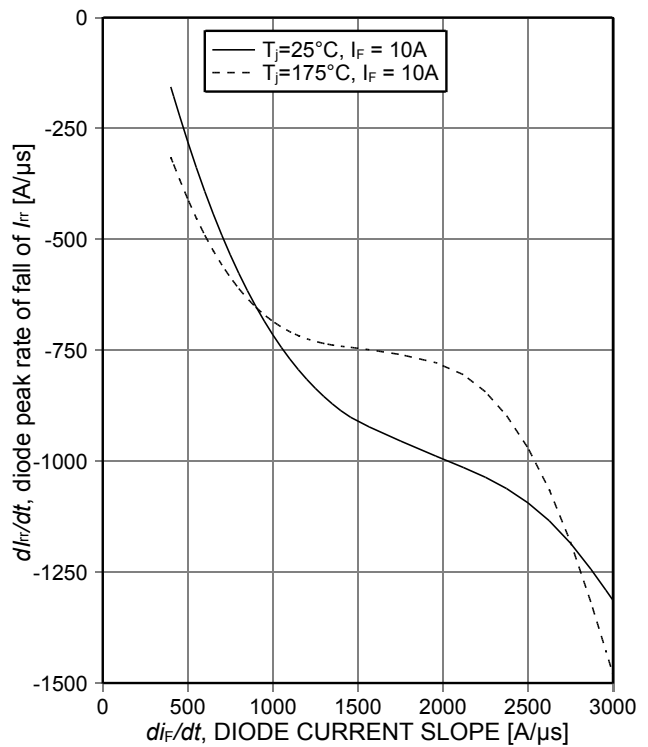


Figure 6. Typical diode peak rate of fall of rev. rec. current per diode as a function of diode current slope ( $V_R=400V$ )

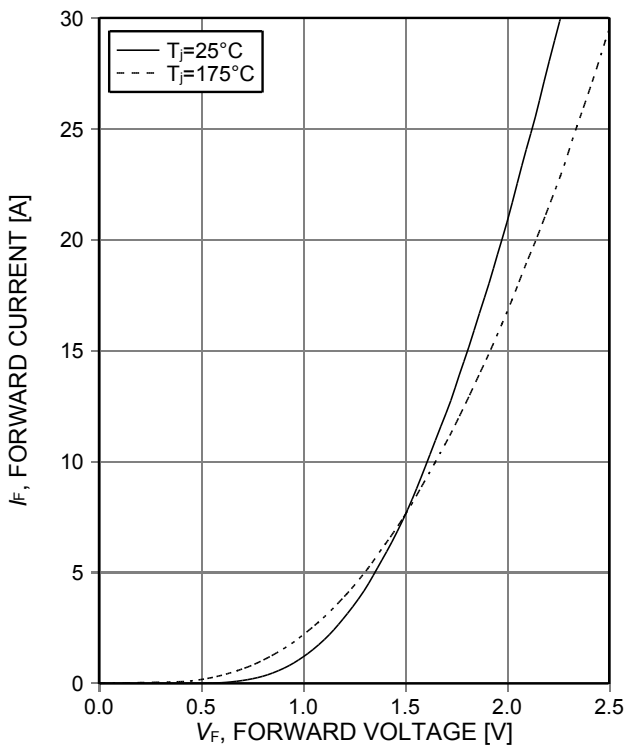


Figure 7. Typical diode forward current per diode as a function of forward voltage

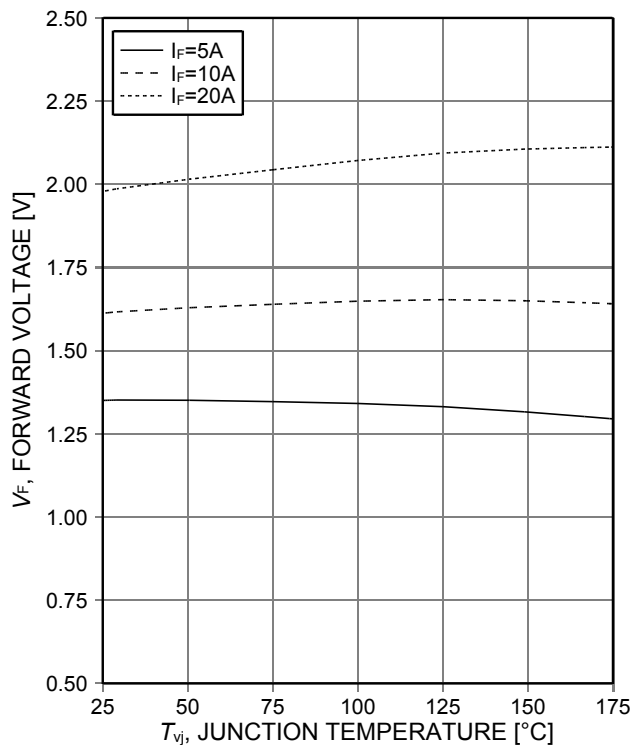
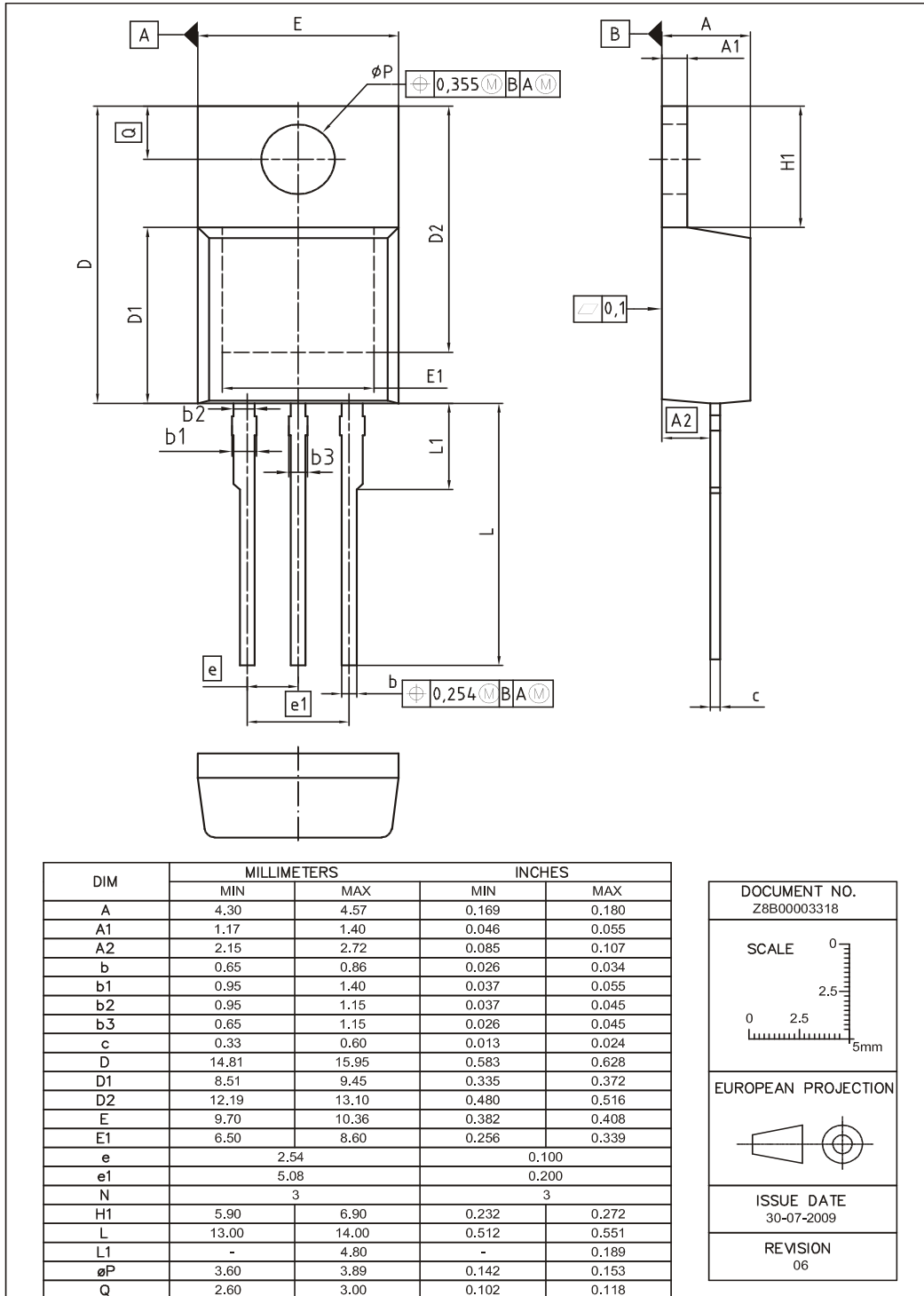


Figure 8. Typical diode forward voltage as a function of junction temperature

PG-TO220-3





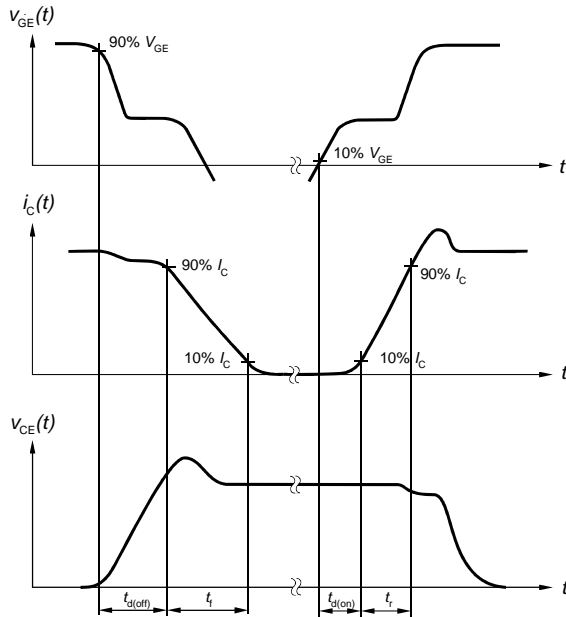


Figure A. Definition of switching times

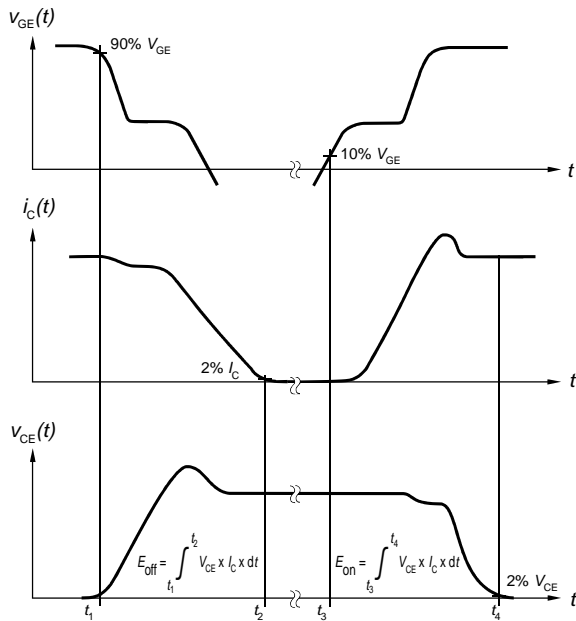


Figure B. Definition of switching losses

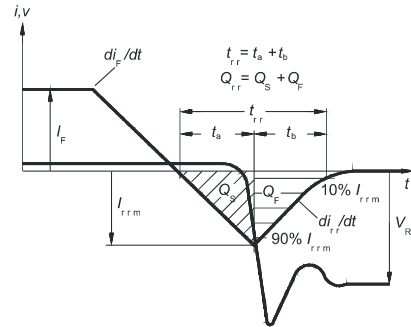


Figure C. Definition of diodes switching characteristics

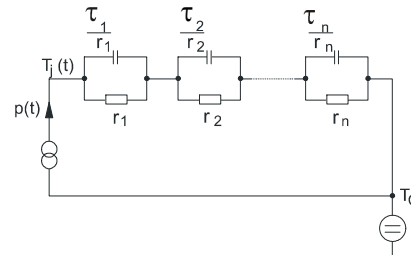


Figure D. Thermal equivalent circuit

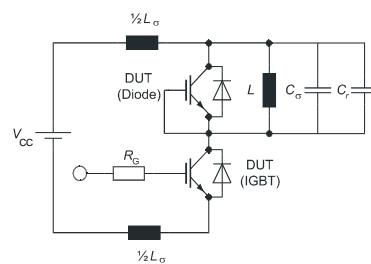


Figure E. Dynamic test circuit  
Parasitic inductance  $L_\sigma$ ,  
Parasitic capacitor  $C_\sigma$ ,  
Relief capacitor  $C_r$   
(only for ZVT switching)

## Revision History

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IDP20C65D2

Revision: 2014-09-18, Rev. 2.1

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Previous Revision

Revision	Date	Subjects (major changes since last revision)
2.1	2014-09-18	Final data sheet

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## Published by

Infineon Technologies AG

81726 Munich, Germany

81726 München, Germany

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