

Emitter Controlled Diode Rapid 1 Advanced Isolation

Rapid Switching Emitter Controlled Diode in fully isolated package

Features:

- 650V Emitter Controlled technology
- Temperature stable behaviour of key parameters
- Low forward voltage (V_F)
- Low reverse recovery charge (Q_{rr})
- Low reverse recovery current (I_{rrm})
- Maximum junction temperature 175°C
- 2500 VRMS electrical isolation, 50/60 Hz, $t = 1$ min
- 100 % tested isolated mounting surface
- Pb-free lead plating
- RoHS compliant

Potential Applications:

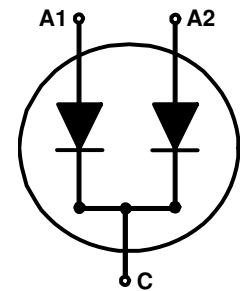
- Air Conditioning
- GPD (General Purpose Drives)
- Industrial SMPS

Package pin definition:

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

Product Validation:

Qualified for industrial applications according to the relevant tests of JEDEC 47/20/22



Fully isolated package TO-247



Key Performance and Package Parameters

Type	V_{rrm}	I_f	$V_f, T_{vj}=25^\circ\text{C}$	T_{vjmax}	Marking	Package
IDFW80C65D1	650V	2x 40A	1.45V	175°C	C80ED1	PG-TO247-3-AI

Emitter Controlled Diode Rapid 1 Advanced Isolation

Table of Contents

Description	1
Table of Contents	2
Maximum Ratings (per leg)	3
Thermal Resistances (per leg)	3
Electrical Characteristics	3
Electrical Characteristics Diagrams	5
Package Drawing	8
Testing Conditions	9
Revision History	10
Disclaimer	11

Emitter Controlled Diode Rapid 1 Advanced Isolation

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} $T_h = 25^{\circ}\text{C}$ $T_h = 65^{\circ}\text{C}$	I_F	74.0 59.0	A
Diode pulsed current, t_p limited by T_{vjmax}	I_{Fpuls}	160.0	A
Diode surge non repetitive forward current $T_h = 25^{\circ}\text{C}$, $t_p = 10.0\text{ms}$, sine halfwave	I_{FSM}	320.0	A
Power dissipation $T_h = 25^{\circ}\text{C}$ Power dissipation $T_h = 65^{\circ}\text{C}$	P_{tot}	112.0 82.0	W
Operating junction temperature	T_{vj}	-40...+175	$^{\circ}\text{C}$
Storage temperature	T_{stg}	-55...+150	$^{\circ}\text{C}$
Soldering temperature, wave soldering 1.6mm (0.063in.) from case for 10s		260	$^{\circ}\text{C}$
Mounting torque, M3 screw Maximum of mounting processes: 3	M	0.6	Nm
Isolation voltage RMS, $f = 50/60\text{Hz}$, $t = 1\text{min}^{1)}$	V_{isol}	2500	V

Thermal Resistances (per leg)

Parameter	Symbol	Conditions	Value			Unit
			min.	typ.	max.	
R_{th} Characteristics						
Diode thermal resistance, ²⁾ junction - heatsink	$R_{th(j-h)}$		-	1.14	1.34	K/W
Thermal resistance junction - ambient	$R_{th(j-a)}$		-	-	65	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	$I_F = 40.0\text{A}$ $T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 175^{\circ}\text{C}$	- -	1.45 1.39	1.70 -	V
Reverse leakage current ³⁾	I_R	$V_R = 650\text{V}$ $T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 175^{\circ}\text{C}$	- -	- 1200	40 -	μA

¹⁾ For a proper handling and assembly of the advanced isolation device in the application refer to the note at the package drawing.

²⁾ At force on body $F = 500\text{N}$, $T_a = 25^{\circ}\text{C}$

³⁾ Reverse leakage current per leg specified for operating conditions with zero voltage applied to the other leg.

 Emitter Controlled Diode Rapid 1 Advanced Isolation

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 measured 5mm (0.197 in.) from case	L_E		-	13.0	-	nH

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}	$T_{vj} = 25^{\circ}\text{C}$, $V_R = 400\text{V}$, $I_F = 40.0\text{A}$, $di_F/dt = 820\text{A}/\mu\text{s}$, $L\sigma = 30\text{nH}$, $C\sigma = 40\text{pF}$, switch IKW40N65ES5.	-	73	-	ns
Diode reverse recovery charge	Q_{rr}		-	1.10	-	μC
Diode peak reverse recovery current	I_{rrm}		-	23.5	-	A
Diode peak rate of fall of reverse recovery current during t_b	di_{rr}/dt		-	-1500	-	$\text{A}/\mu\text{s}$

Switching Characteristics (per leg), Inductive Load

Parameter	Symbol	Conditions	Value			Unit
			min.	typ.	max.	
Diode Characteristic, at $T_{vj} = 150^{\circ}\text{C}$						
Diode reverse recovery time	t_{rr}	$T_{vj} = 150^{\circ}\text{C}$, $V_R = 400\text{V}$, $I_F = 40.0\text{A}$, $di_F/dt = 820\text{A}/\mu\text{s}$, $L\sigma = 30\text{nH}$, $C\sigma = 40\text{pF}$, switch IKW40N65ES5.	-	120	-	ns
Diode reverse recovery charge	Q_{rr}		-	2.62	-	μC
Diode peak reverse recovery current	I_{rrm}		-	36.0	-	A
Diode peak rate of fall of reverse recovery current during t_b	di_{rr}/dt		-	-1250	-	$\text{A}/\mu\text{s}$

Emitter Controlled Diode Rapid 1 Advanced Isolation

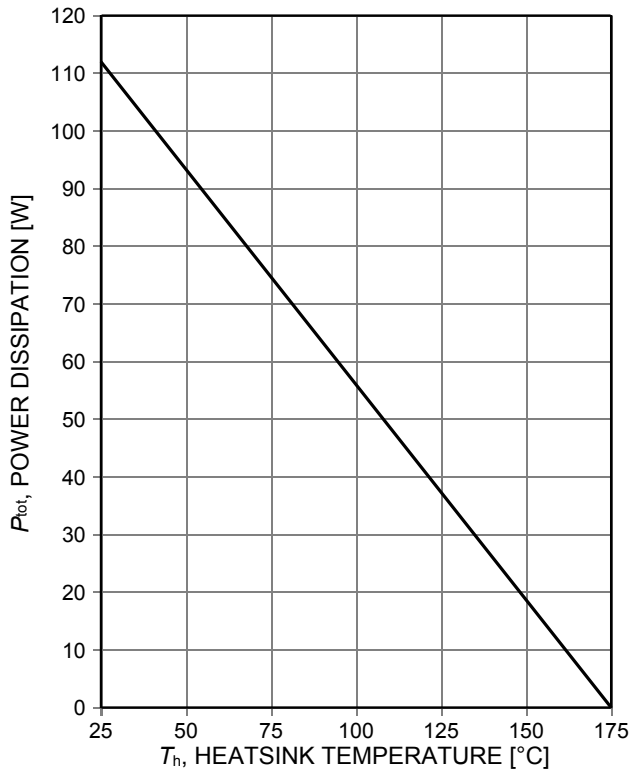


Figure 1. Power dissipation per leg as a function of heatsink temperature ($T_{vj} \leq 175^\circ\text{C}$)

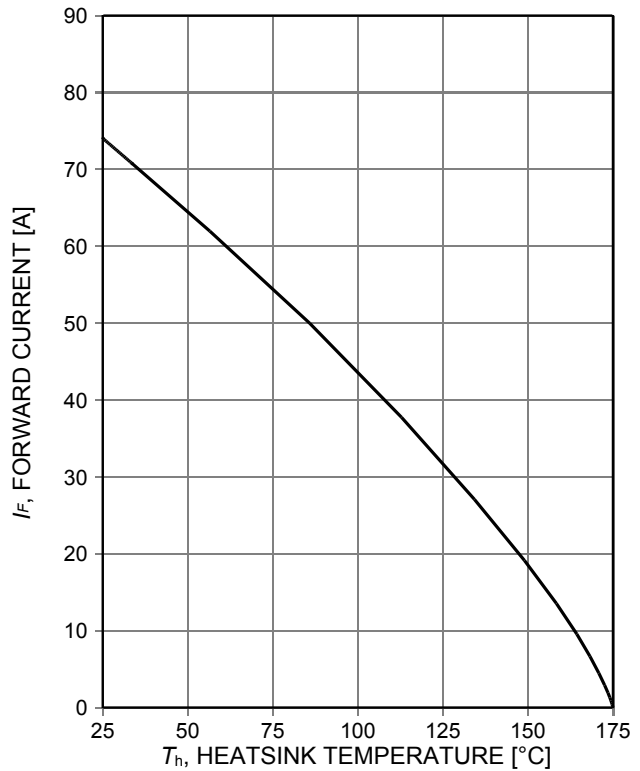


Figure 2. Diode forward current per leg as a function of heatsink temperature ($T_{vj} \leq 175^\circ\text{C}$)

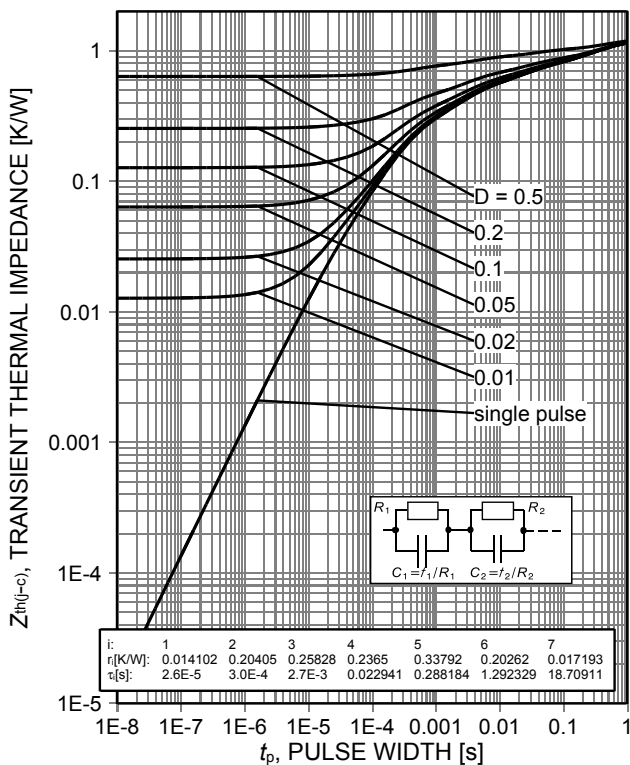


Figure 3. Diode transient thermal impedance per leg as a function of pulse width ($D = t_p/T$)

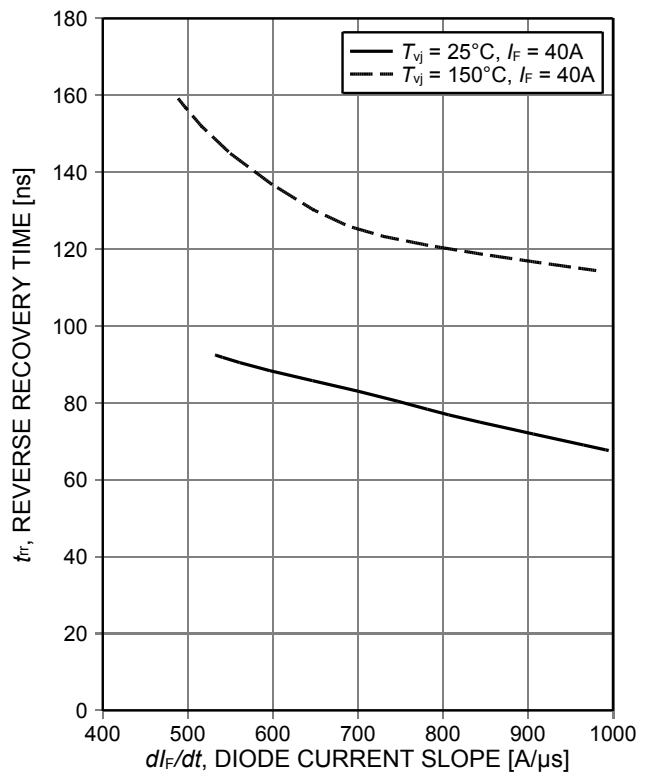


Figure 4. Typical reverse recovery time per leg as a function of diode current slope ($V_R = 400\text{V}$)

Emitter Controlled Diode Rapid 1 Advanced Isolation

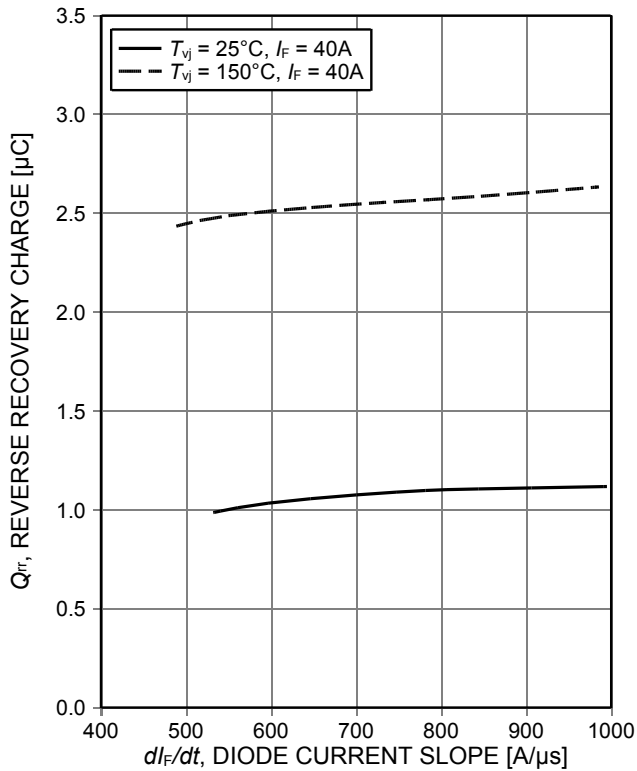


Figure 5. Typical reverse recovery charge per leg as a function of diode current slope (VR=400V)

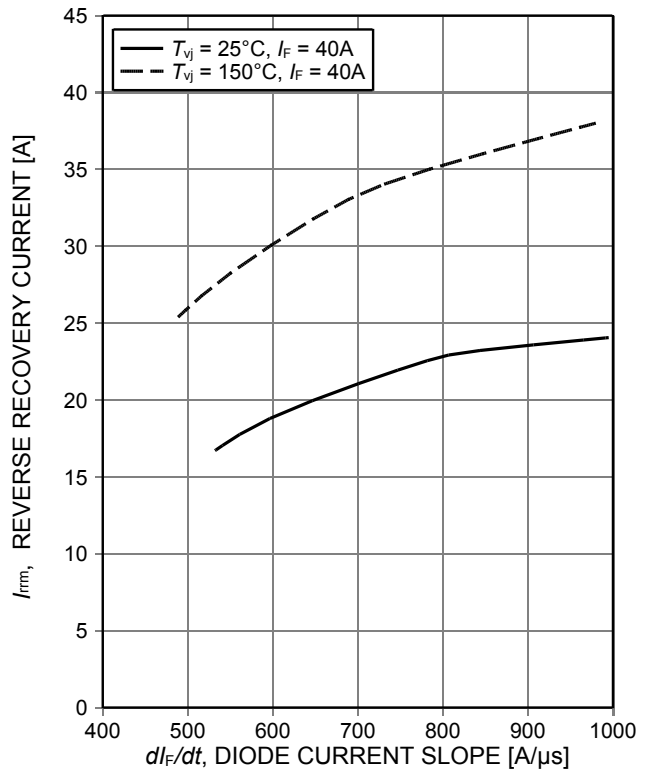


Figure 6. Typical peak reverse recovery current per leg as a function of diode current slope (VR=400V)

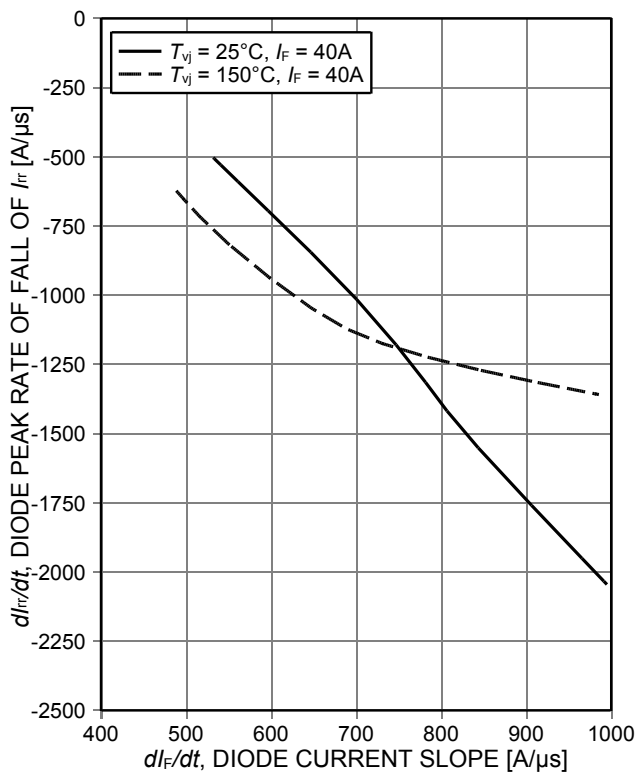


Figure 7. Typical diode peak rate of fall of rev. rec. current per leg as a function of diode current slope (VR=400V)

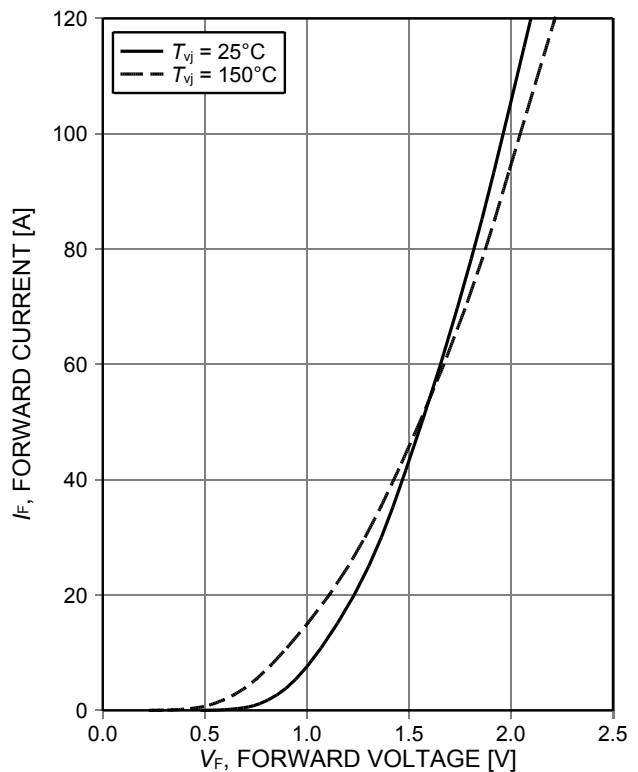


Figure 8. Typical diode forward current per leg as a function of forward voltage

Emitter Controlled Diode Rapid 1 Advanced Isolation

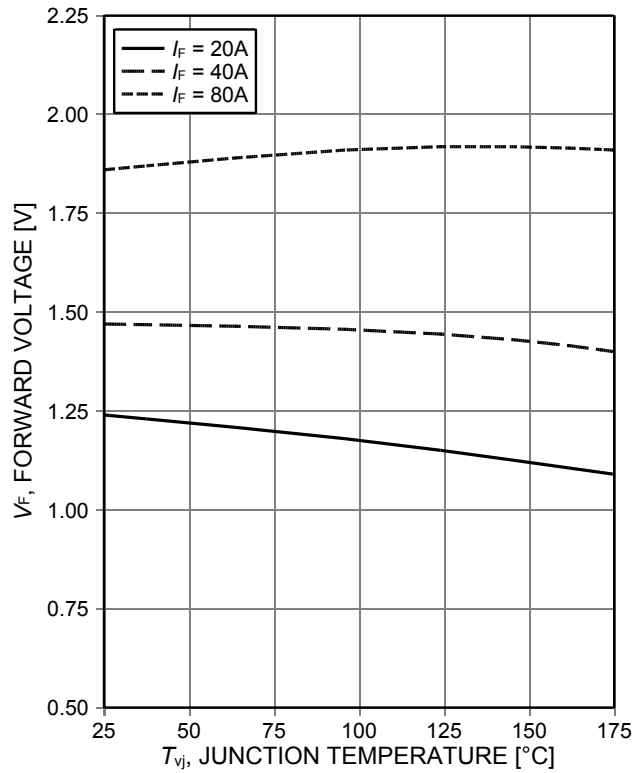
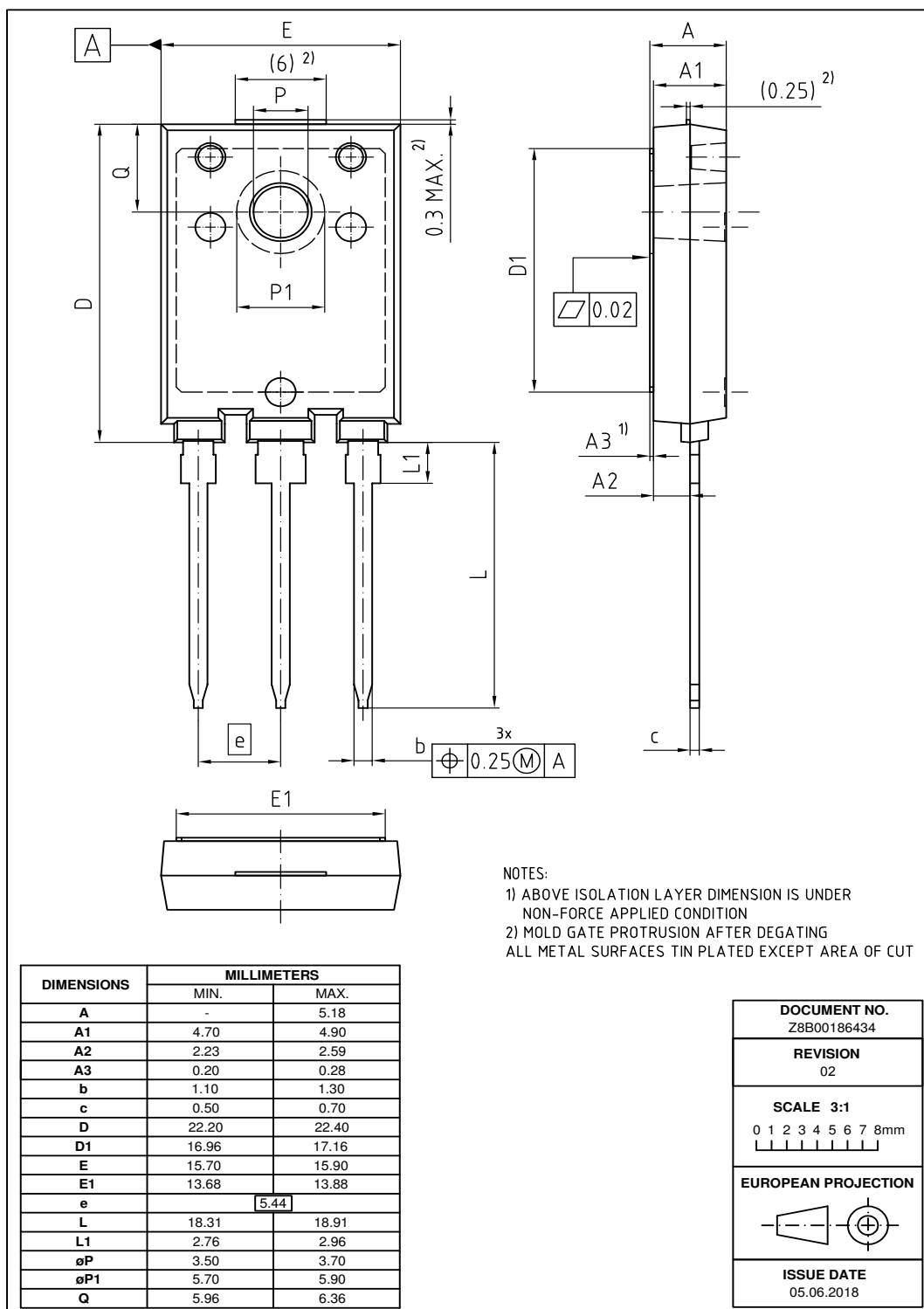


Figure 9. Typical diode forward voltage per leg as a function of junction temperature

PG-TO247-3-AI (PG-HSIP247-3)



Note: For a proper handling and assembly of the advanced isolation device in the application the isolation layer must not be exposed to potential penetration via sharp implements or mechanical impacts/shocks, which exceed levels indicated in International Standard (IEC60068-2-6 and IEC60068-2-27). The advanced isolation device is intended only to be used assembled on an appropriate heatsink with recommended flatness of <20µm per 100mm and roughness of <10µm.

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Testing Conditions

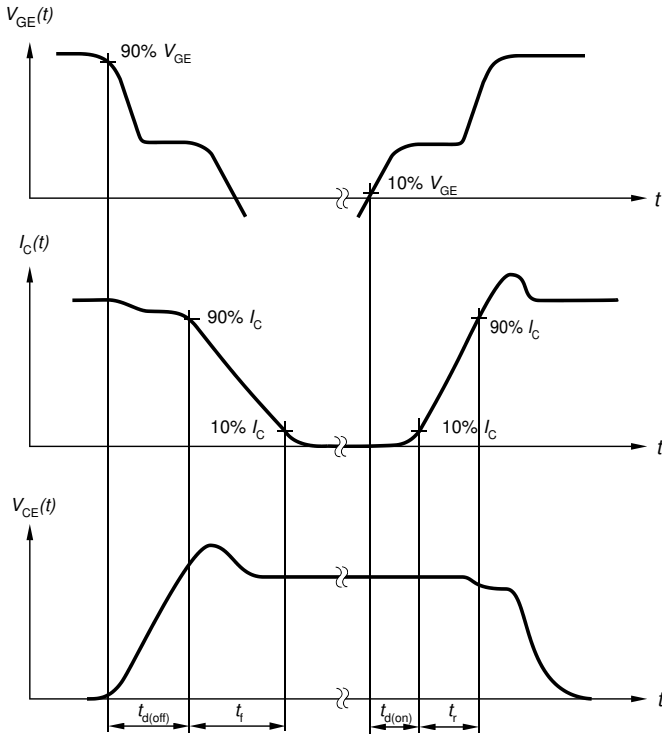


Figure A. Definition of switching times

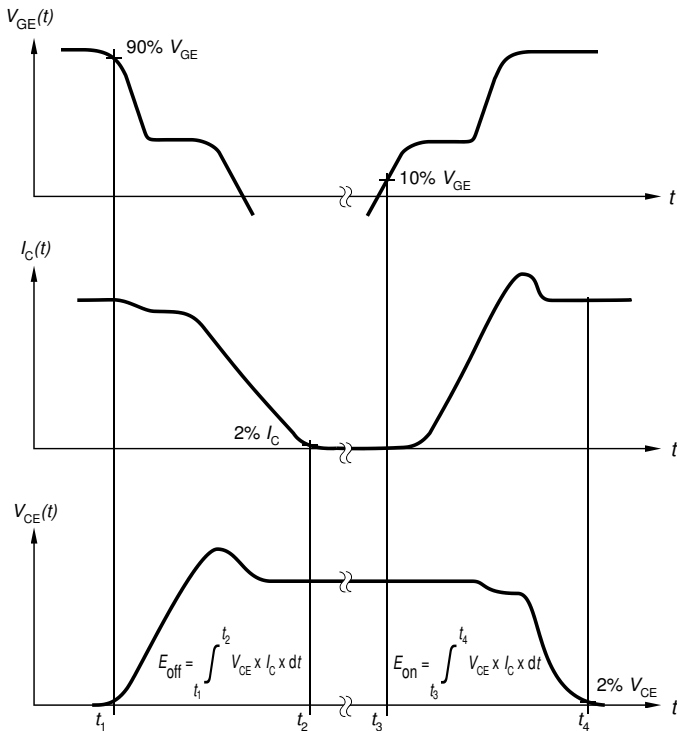


Figure B. Definition of switching losses

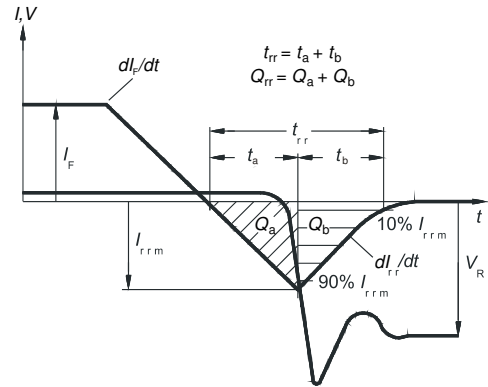


Figure C. Definition of diode switching characteristics

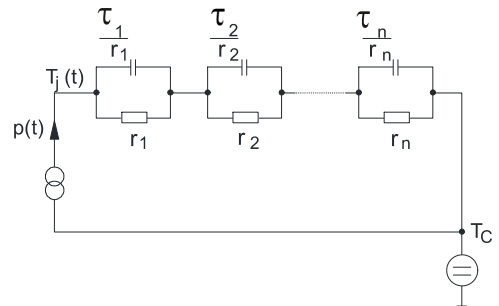


Figure D. Thermal equivalent circuit

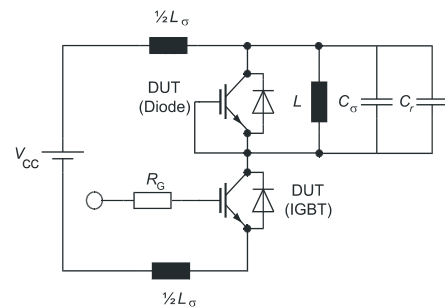


Figure E. Dynamic test circuit
Parasitic inductance L_{σ} ,
parasitic capacitor C_{σ} ,
relief capacitor C_r ,
(only for ZVT switching)

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Revision History

IDFW80C65D1

Revision: 2020-09-25, Rev. 2.2

Previous Revision

Revision	Date	Subjects (major changes since last revision)
2.1	2020-07-09	Final data sheet
2.2	2020-09-25	New marking description

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