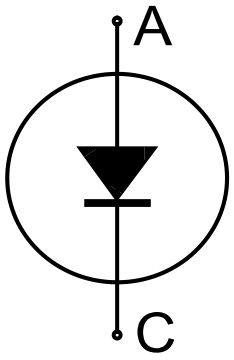
Emitter Controlled Diode Rapid 1 Advanced Isolation

Rapid switching emitter controlled diode in fully isolated package

Features:

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



Fully isolated package TO-247

Potential Applications:

- Air Conditioning PFC
- General Purpose Drives (GPD)

Package pin definition:

- Pin 1 - not connected
- Pin 2 - cathode
- Pin 3 - anode

Product Validation:

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

Pb

Green

Halogen-Free

RoHS

Key Performance and Package Parameters

Type	V_{rrm}	I_f	V_f, T_{vj}=25°C	T_{vjmax}	Marking	Package
IDFW40E65D1E	650V	40A	1.7V	175°C	D40E65D1E	PG-TO247-3-AI

Table of Contents

Emitter Controlled Diode Rapid 1 Advanced Isolation

Maximum Ratings

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, $T_{vj} \geq 25°C$	V_{RRM}	650	V
Diode forward current, limited by T_{vjmax} $T_h = 25°C$ $T_h = 65°C$	I_F	 42.0 35.0	A
Diode pulsed current, t_p limited by T_{vjmax}	I_{Fpuls}	120.0	A
Power dissipation $T_h = 25°C$ Power dissipation $T_h = 65°C$	P_{tot}	78.0 57.0	W
Operating junction temperature	T_{vj}	-40...+175	°C
Storage temperature	T_{stg}	-55...+150	°C
Soldering temperature, wave soldering 1.6mm (0.063in.) from case for 10s		260	°C
Mounting torque, M3 screw Maximum of mounting processes: 3	M	0.6	Nm
Isolation voltage RMS, f = 50/60Hz, t = 1min[1)]	V_{isol}	2500	V

Thermal Resistance

Parameter	Symbol	Conditions	Value			Unit
			min.	typ.	max.	
R_{th} Characteristics						
Diode thermal resistance,[2)] junction - heatsink	$R_{th(j-h)}$		-	1.75	1.92	K/W
Thermal resistance junction - ambient	$R_{th(j-a)}$		-	-	65	K/W

Electrical Characteristic, at T_{vj} = 25°C, unless otherwise specified

Parameter	Symbol	Conditions	Value			Unit
			min.	typ.	max.	
Static Characteristic						
Diode forward voltage	V_F	I_F = 40.0A T_{vj} = 25°C T_{vj} = 175°C	 - -	 1.70 1.75	 2.10 -	V
Reverse leakage current	I_R	V_R = 650V T_{vj} = 25°C T_{vj} = 175°C	 - -	 - 350	 40 -	µA

Electrical Characteristic, at T_{vj} = 25°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

[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 = 500N, T_a = 25°C

Switching Characteristic, Inductive Load

Parameter	Symbol	Conditions	Value			Unit
			min.	typ.	max.	

Diode Characteristic, at T_{vj} = 25°C

Diode reverse recovery time	t_{rr}	T_{vj} = 25°C, V_R = 400V, I_F = 40.0A, di_F/dt = 1000A/µs, $L\sigma$ = 75nH, $C\sigma$ = 30pF, Switch IKFW50N60DH3	-	76	-	ns
Diode reverse recovery charge	Q_{rr}		-	0.57	-	µC
Diode peak reverse recovery current	I_{rrm}		-	11.0	-	A
Diode peak rate of fall of reverse recovery current during t_b	di_{rr}/dt		-	-885	-	A/µs

Diode reverse recovery time	t_{rr}	T_{vj} = 25°C, V_R = 400V, I_F = 40.0A, di_F/dt = 300A/µs, $L\sigma$ = 75nH, $C\sigma$ = 30pF, Switch IKFW50N60DH3	-	232	-	ns
Diode reverse recovery charge	Q_{rr}		-	0.52	-	µC
Diode peak reverse recovery current	I_{rrm}		-	6.0	-	A
Diode peak rate of fall of reverse recovery current during t_b	di_{rr}/dt		-	-130	-	A/µs

Switching Characteristic, Inductive Load

Parameter	Symbol	Conditions	Value			Unit
			min.	typ.	max.	

Diode Characteristic, at T_{vj} = 175°C

Diode reverse recovery time	t_{rr}	T_{vj} = 175°C, V_R = 400V, I_F = 40.0A, di_F/dt = 1000A/µs, $L\sigma$ = 75nH, $C\sigma$ = 30pF, Switch IKFW50N60DH3	-	106	-	ns
Diode reverse recovery charge	Q_{rr}		-	1.51	-	µC
Diode peak reverse recovery current	I_{rrm}		-	20.0	-	A
Diode peak rate of fall of reverse recovery current during t_b	di_{rr}/dt		-	-760	-	A/µs

Diode reverse recovery time	t_{rr}	T_{vj} = 175°C, V_R = 400V, I_F = 40.0A, di_F/dt = 300A/µs, $L\sigma$ = 75nH, $C\sigma$ = 30pF, Switch IKFW50N60DH3	-	228	-	ns
Diode reverse recovery charge	Q_{rr}		-	1.33	-	µC
Diode peak reverse recovery current	I_{rrm}		-	9.8	-	A
Diode peak rate of fall of reverse recovery current during t_b	di_{rr}/dt		-	-160	-	A/µs

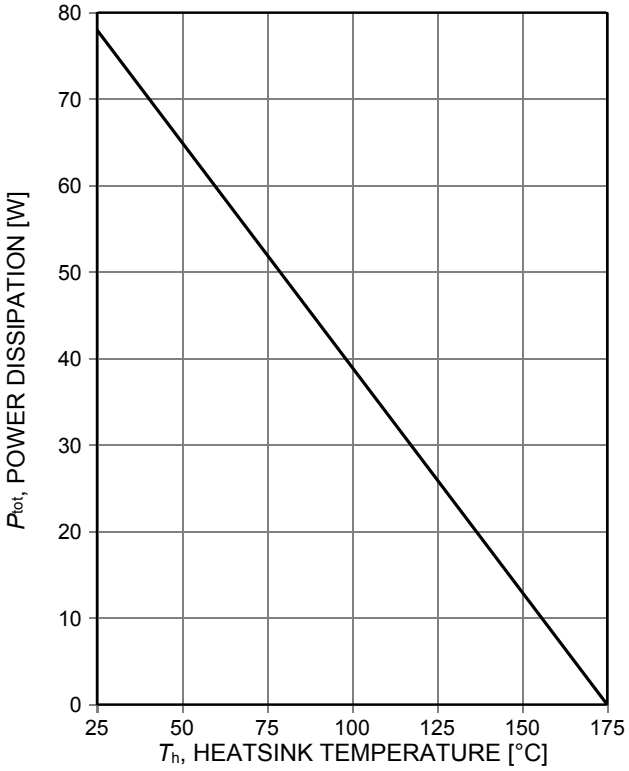


Figure 1. **Power dissipation as a function of heatsink temperature**
($T_j \leq 175°C$)

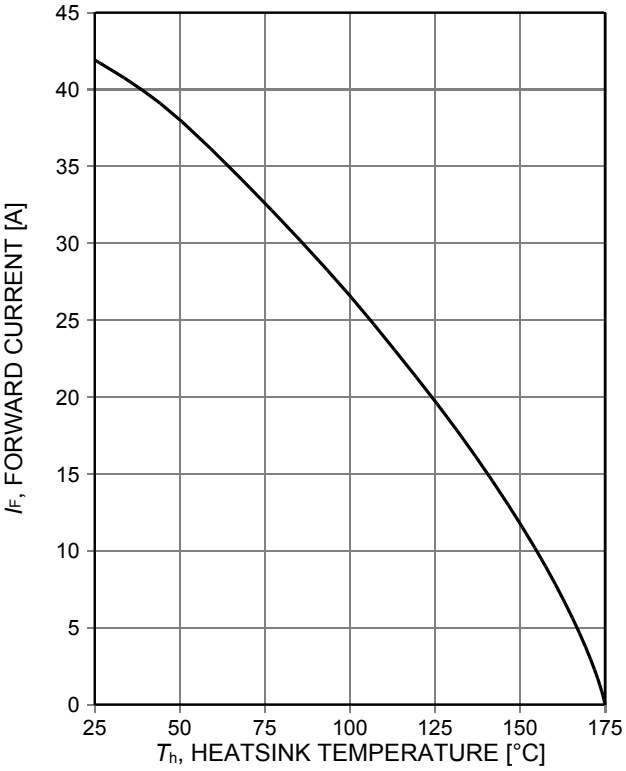


Figure 2. **Diode forward current as a function of heatsink temperature**

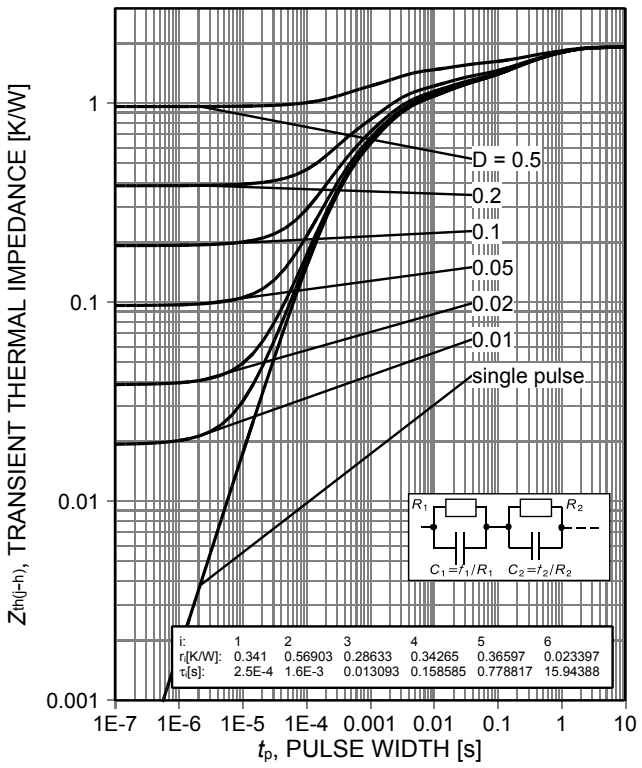


Figure 3. **Diode transient thermal impedance as a function of pulse width**
($D=t_p/T$)

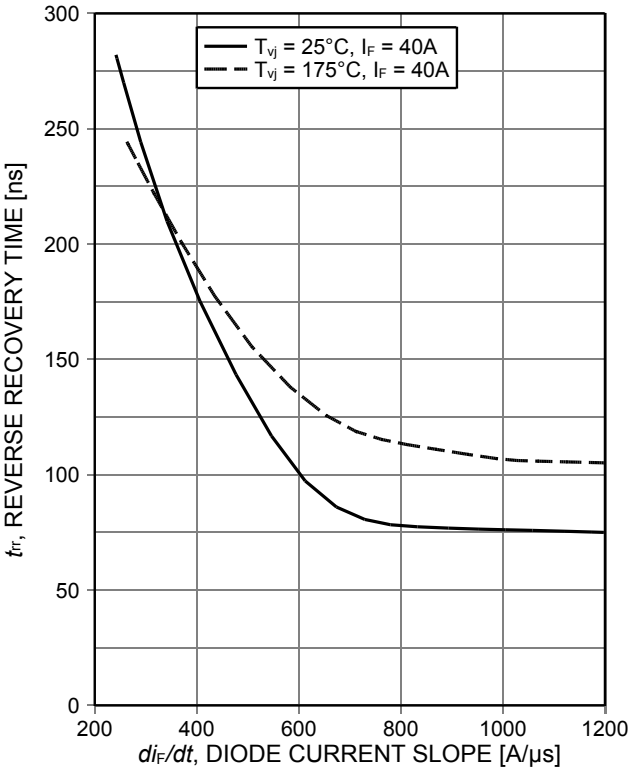


Figure 4. **Typical reverse recovery time as a function of diode current slope**
(V_R=400V)

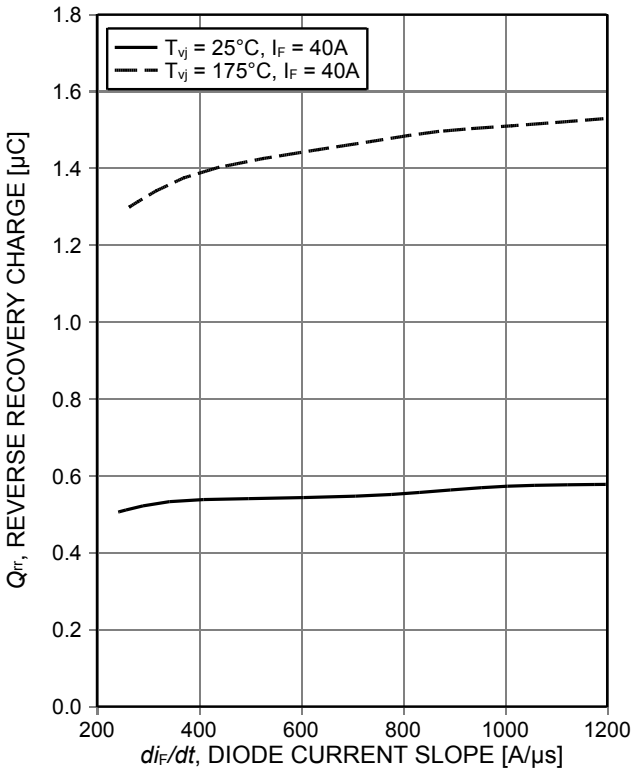


Figure 5. **Typical reverse recovery charge as a function of diode current slope**
(V_R=400V)

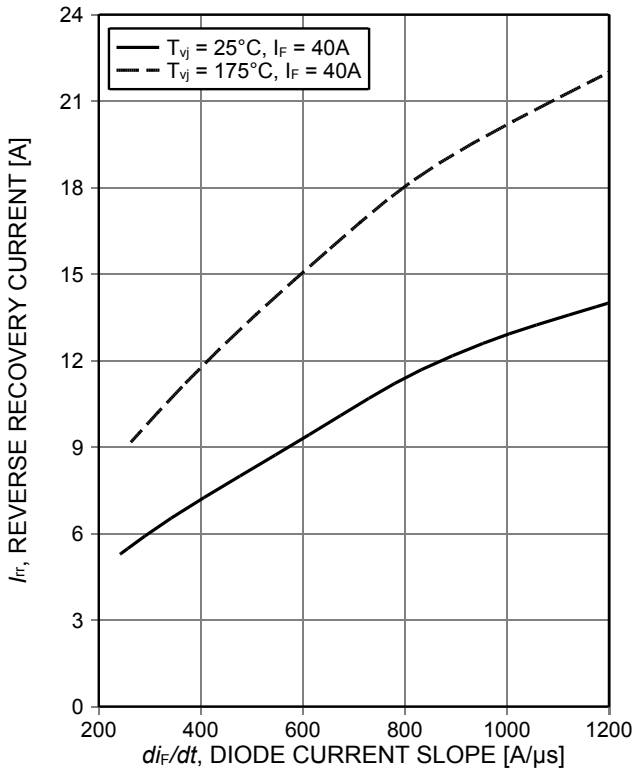


Figure 6. **Typical reverse recovery current as a function of diode current slope**
(V_R=400V)

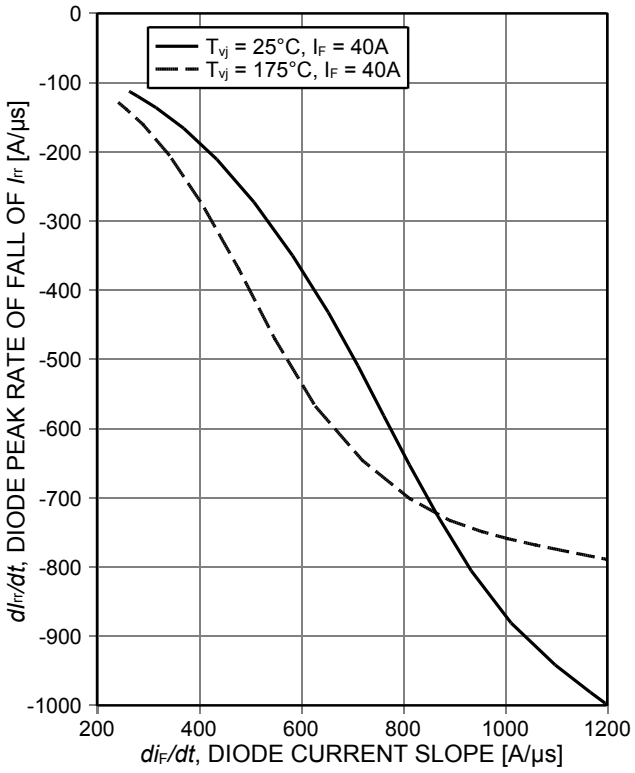


Figure 7. **Typical peak reverse recovery current as a function of diode current slope**
(V_R=400V)

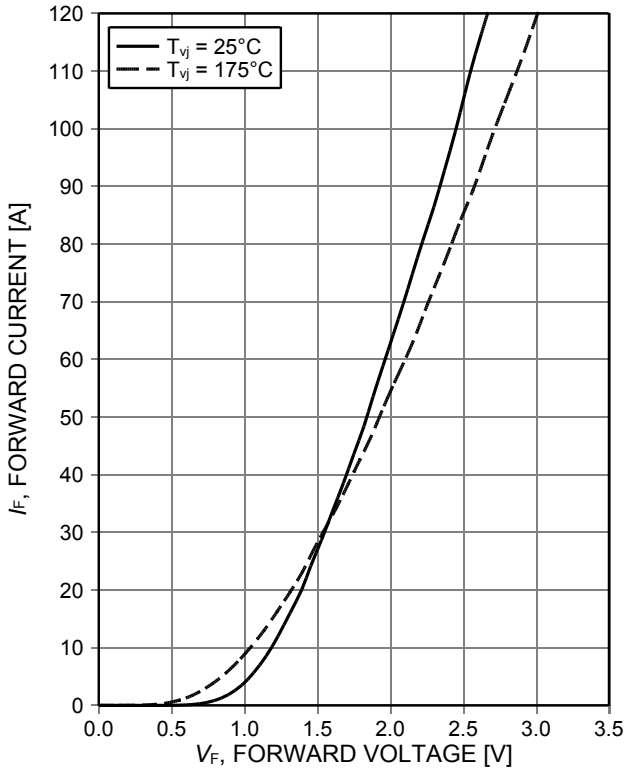


Figure 8. **Typical diode forward current as a function of forward voltage**

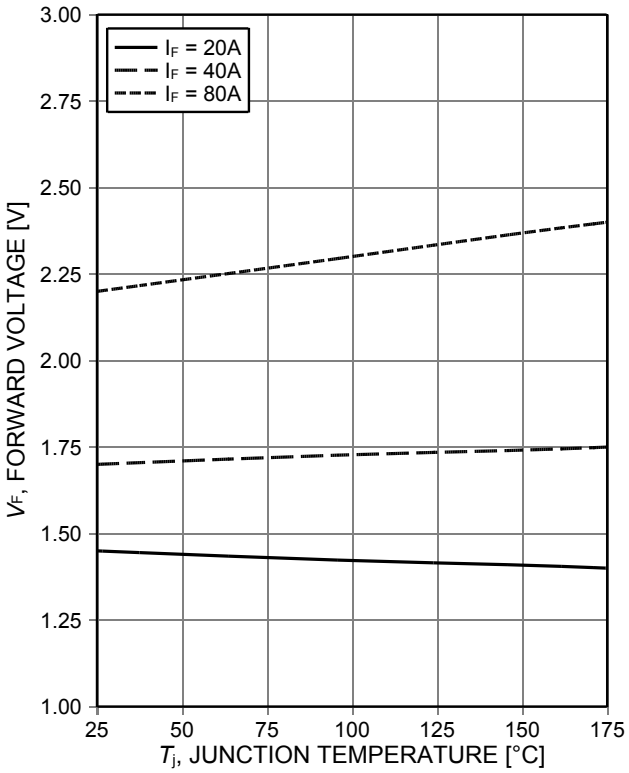
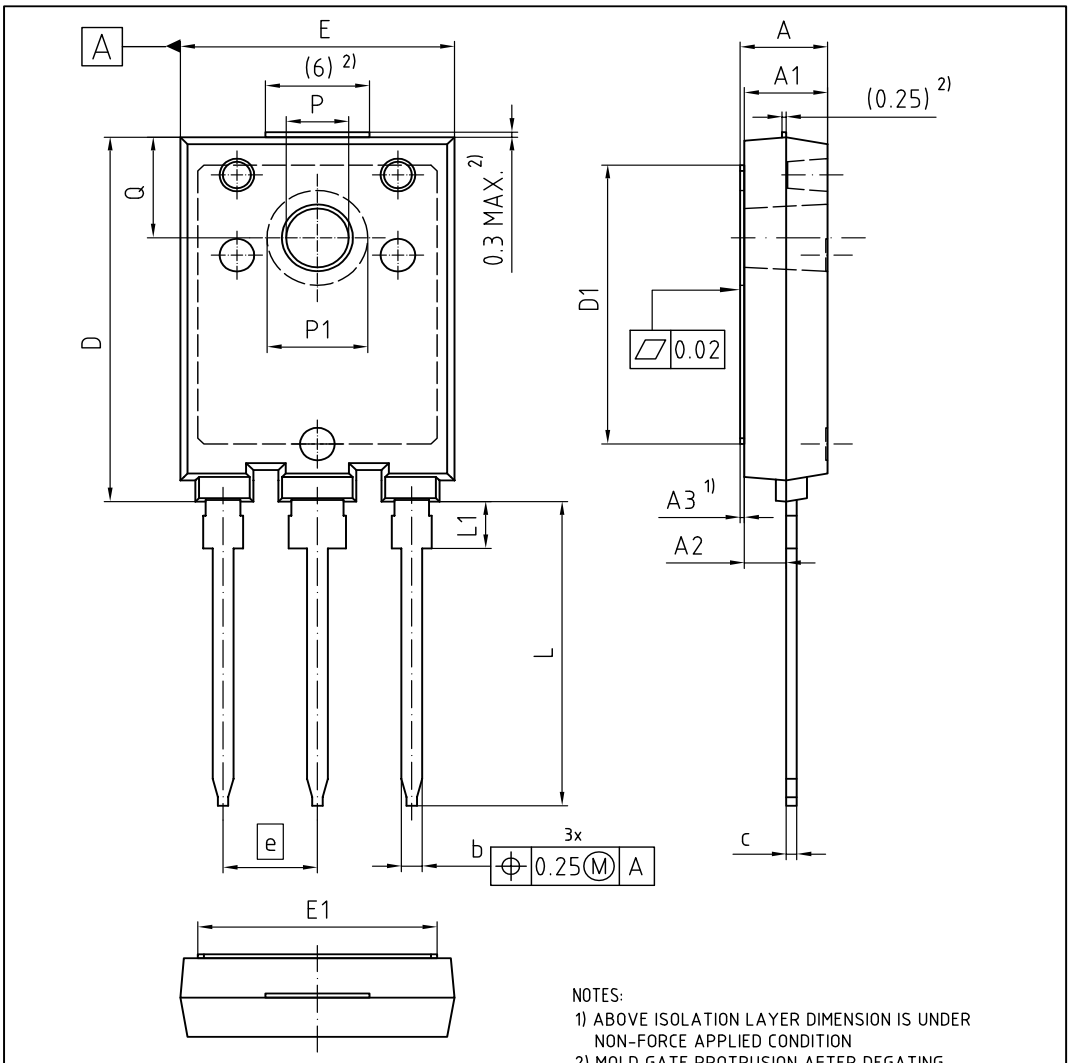


Figure 9. **Typical diode forward voltage as a function of junction temperature**

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



NOTES:
1) ABOVE ISOLATION LAYER DIMENSION IS UNDER NON-FORCE APPLIED CONDITION
2) MOLD GATE PROTRUSION AFTER DEGATING
ALL METAL SURFACES TIN PLATED EXCEPT AREA OF CUT

DIMENSIONS	MILLIMETERS	
	MIN.	MAX.
A	-	5.18
A1	4.70	4.90
A2	2.23	2.59
A3	0.20	0.28
b	1.10	1.30
c	0.50	0.70
D	22.20	22.40
D1	16.96	17.16
E	15.70	15.90
E1	13.68	13.88
e	5.44	
L	18.31	18.91
L1	2.76	2.96
øP	3.50	3.70
øP1	5.70	5.90
Q	5.96	6.36

DOCUMENT NO.	Z8B00186434
REVISION	02
SCALE 3:1	0 1 2 3 4 5 6 7 8mm
EUROPEAN PROJECTION	
ISSUE DATE	05.06.2018

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.

Testing Conditions

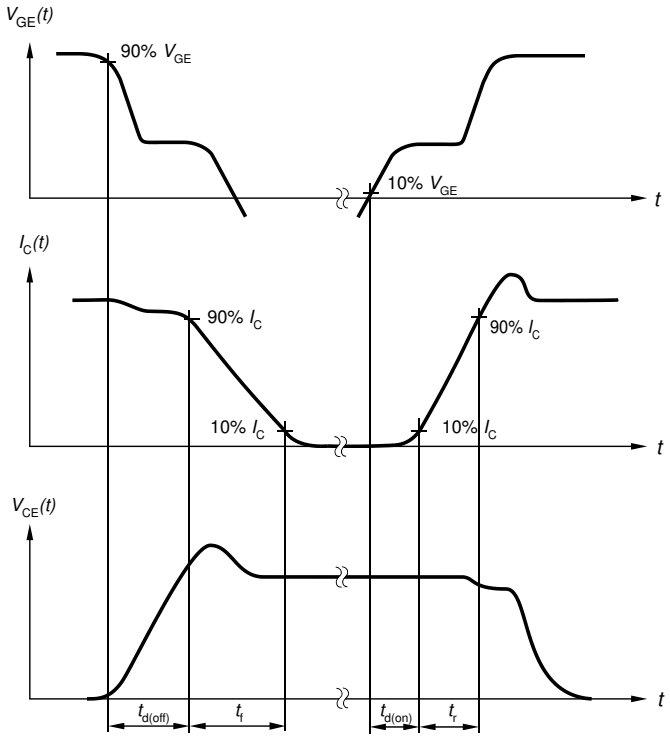


Figure A. **Definition of switching times**

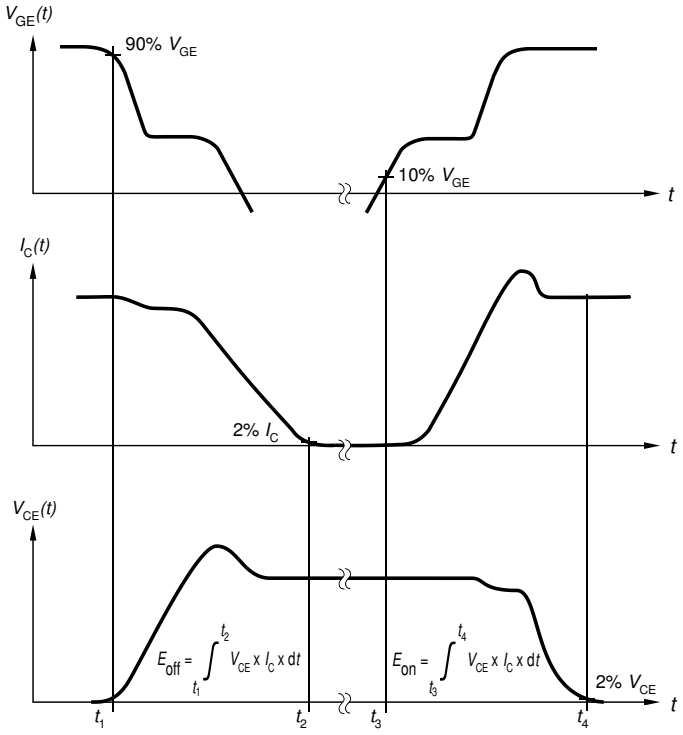


Figure B. **Definition of switching losses**

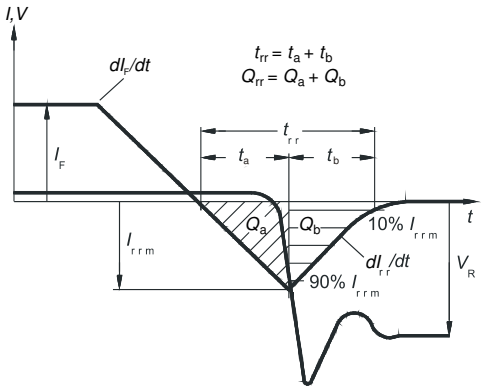


Figure C. **Definition of diode switching characteristics**

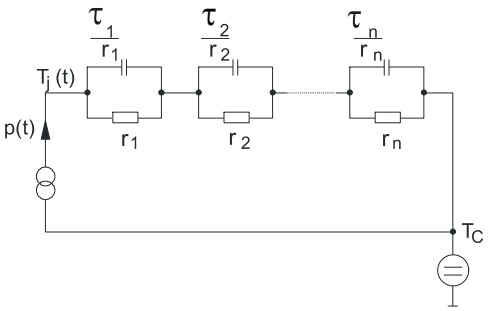


Figure D. **Thermal equivalent circuit**

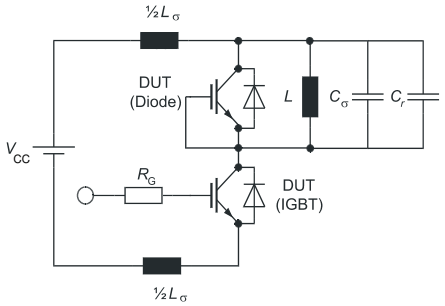


Figure E. **Dynamic test circuit**
Parasitic inductance L_σ,
parasitic capacitor C_σ,
relief capacitor C_r,
(only for ZVT switching)

Revision History

IDFW40E65D1E

Revision: 2017-10-27, Rev. 2.2

Previous Revision

Revision	Date	Subjects (major changes since last revision)
2.1	2017-09-21	Final data sheet
2.2	2017-10-27	Update condition Fig.2

Trademarks

All referenced product or service names and trademarks are the property of their respective owners.

Published by
Infineon Technologies AG
81726 München, Germany

Important Notice
The information given in this document shall in no event be regarded as a guarantee of conditions or characteristics ("Beschaffenheitsgarantie"). With respect to any examples, hints or any typical values stated herein and/or any information regarding the application of the product, 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.

In addition, any information given in this document is subject to customer's compliance with its obligations stated in this document and any applicable legal requirements, norms and standards concerning customer's products and any use of the product of Infineon Technologies in customer's applications.

The data contained in this document is exclusively intended for technically trained staff. It is the responsibility of customer's technical departments to evaluate the suitability of the product for the intended application and the completeness of the product information given in this document with respect to such application.

For further information on the product, technology, delivery terms and conditions and prices please contact your nearest Infineon Technologies office (www.infineon.com).

Please note that this product is not qualified according to the AEC Q100 or AEC Q101 documents of the Automotive Electronics Council.

Warnings
Due to technical requirements products may contain dangerous substances. For information on the types in question please contact your nearest Infineon Technologies office.

Except as otherwise explicitly approved by Infineon Technologies in a written document signed by authorized representatives of Infineon Technologies, Infineon Technologies' products may not be used in any applications where a failure of the product or any consequences of the use thereof can reasonably be expected to result in personal injury.