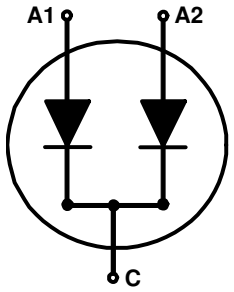
Emitter Controlled Diode Rapid 1 Advanced Isolation

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



Fully isolated package TO-247

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

Pb-free Green Halogen-Free RoHS

Key Performance and Package Parameters

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

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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, $T_{vj} \geq 25°C$	V_{RRM}	650	V
Diode forward current, limited by T_{vjmax} $T_h = 25°C$ $T_h = 65°C$	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 $T_h = 25°C$, $t_p = 10.0ms$, sine halfwave	I_{FSM}	 320.0	A
Power dissipation $T_h = 25°C$ Power dissipation $T_h = 65°C$	P_{tot}	112.0 82.0	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 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°C, unless otherwise specified

Parameter	Symbol	Conditions	Value			Unit
			min.	typ.	max.	
Static Characteristic						
Diode forward voltage	V_F	$I_F = 40.0A$ $T_{vj} = 25°C$ $T_{vj} = 175°C$	 - -	 1.45 1.39	 1.70 -	V
Reverse leakage current[3)]	I_R	$V_R = 650V$ $T_{vj} = 25°C$ $T_{vj} = 175°C$	 - -	 - 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 = 500N, $T_a = 25°C$
[3)] Reverse leakage current per leg specified for operating conditions with zero voltage applied to the other leg.

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

Switching Characteristics (per leg), 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 = 820A/µs, $L\sigma$ = 30nH, $C\sigma$ = 40pF, 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	-	A/µs

Switching Characteristics (per leg), Inductive Load

Parameter	Symbol	Conditions	Value			Unit
			min.	typ.	max.	
Diode Characteristic, at T_{vj} = 150°C						
Diode reverse recovery time	t_{rr}	T_{vj} = 150°C, V_R = 400V, I_F = 40.0A, di_F/dt = 820A/µs, $L\sigma$ = 30nH, $C\sigma$ = 40pF, 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	-	A/µs

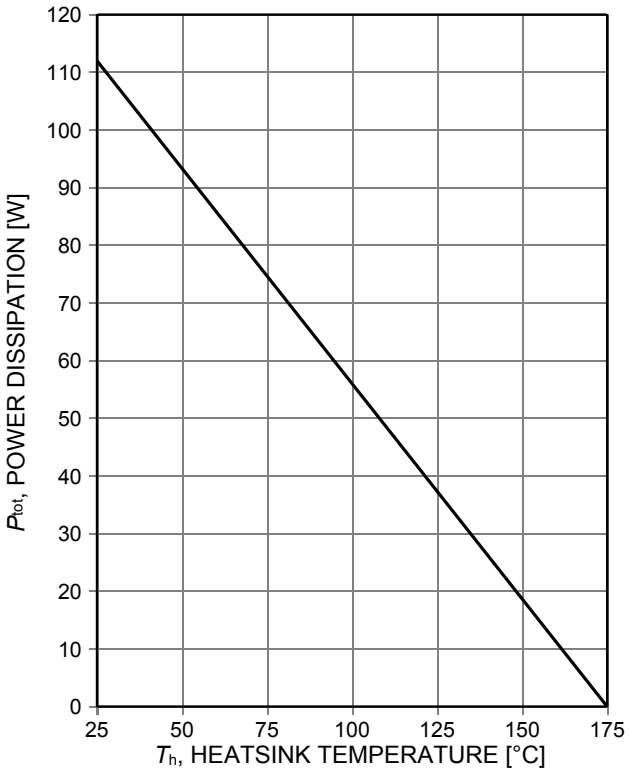


Figure 1. **Power dissipation per leg as a function of heatsink temperature**
(T_{vj}≤175°C)

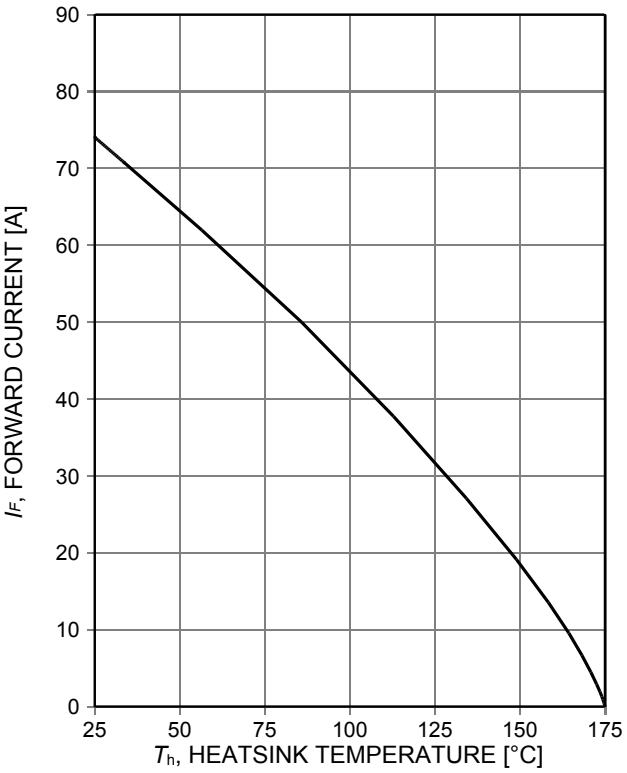


Figure 2. **Diode forward current per leg as a function of heatsink temperature**
(T_{vj}≤175°C)

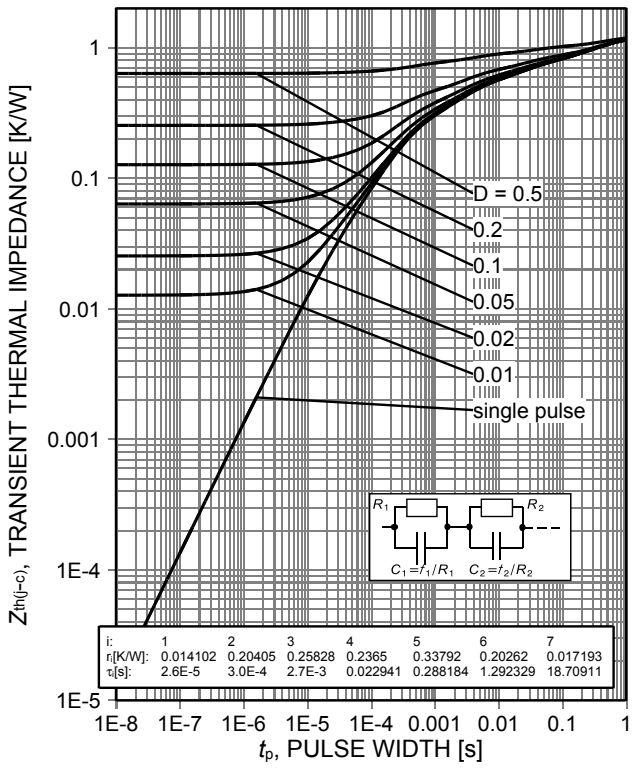


Figure 3. **Diode transient thermal impedance per leg as a function of pulse width**
(D=t_p/T)

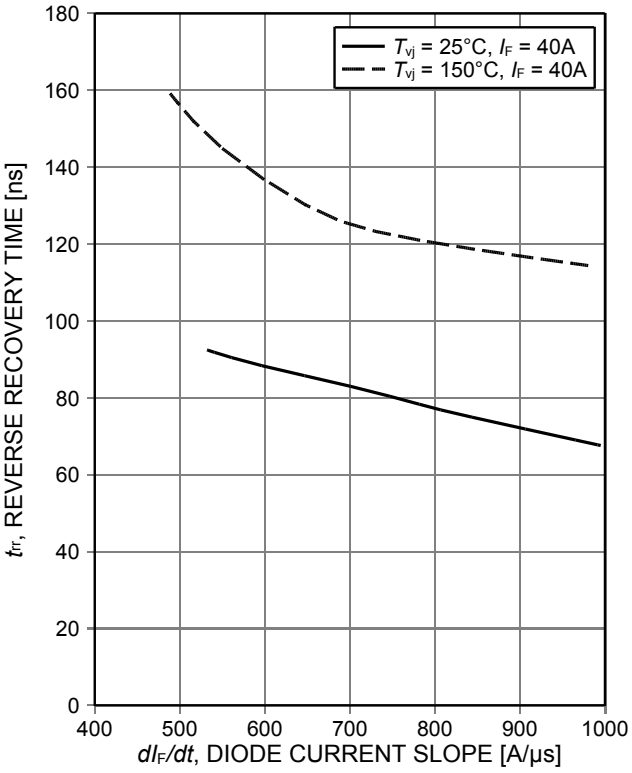


Figure 4. **Typical reverse recovery time per leg as a function of diode current slope**
(V_R=400V)

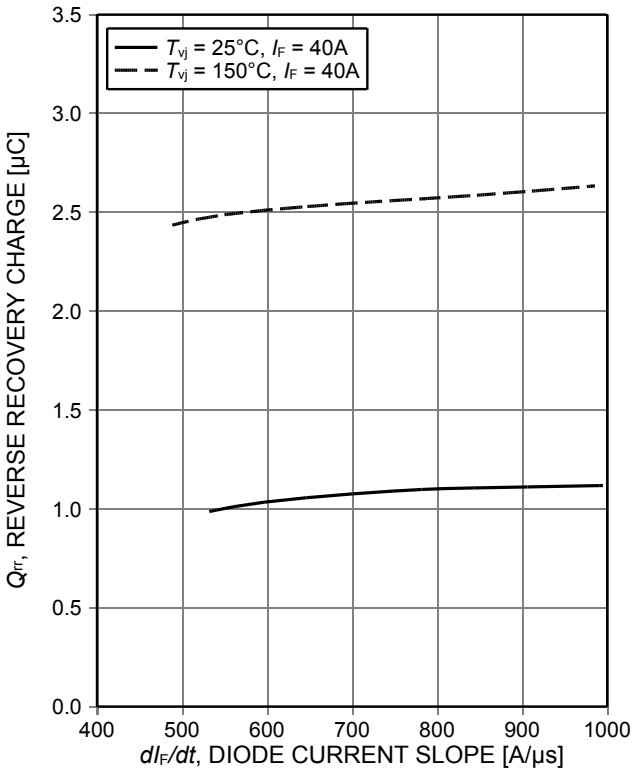


Figure 5. **Typical reverse recovery charge per leg as a function of diode current slope**
(V_R=400V)

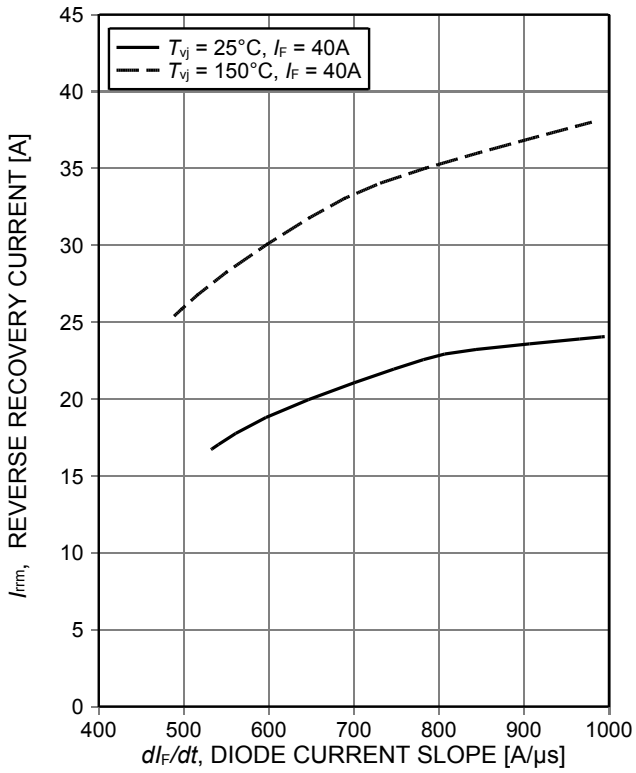


Figure 6. **Typical peak reverse recovery current per leg as a function of diode current slope**
(V_R=400V)

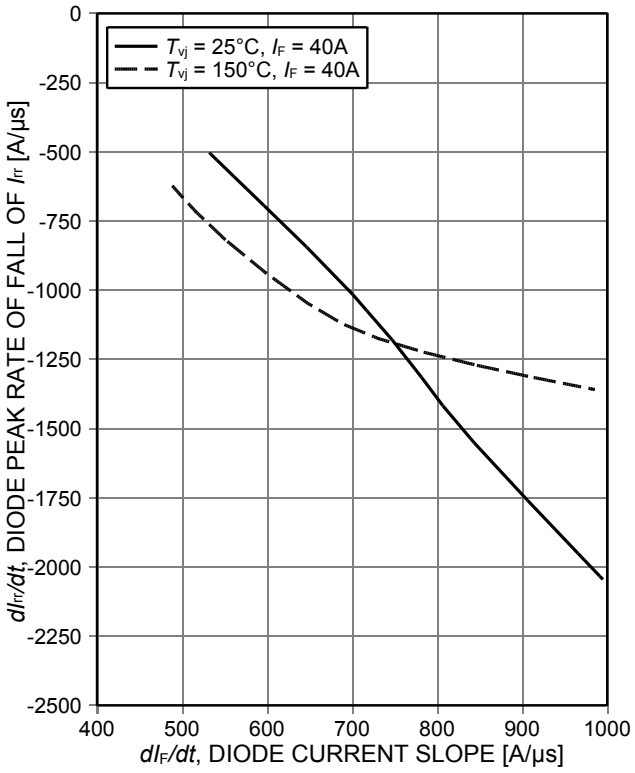


Figure 7. **Typical diode peak rate of fall of rev. rec. current per leg as a function of diode current slope**
(V_R=400V)

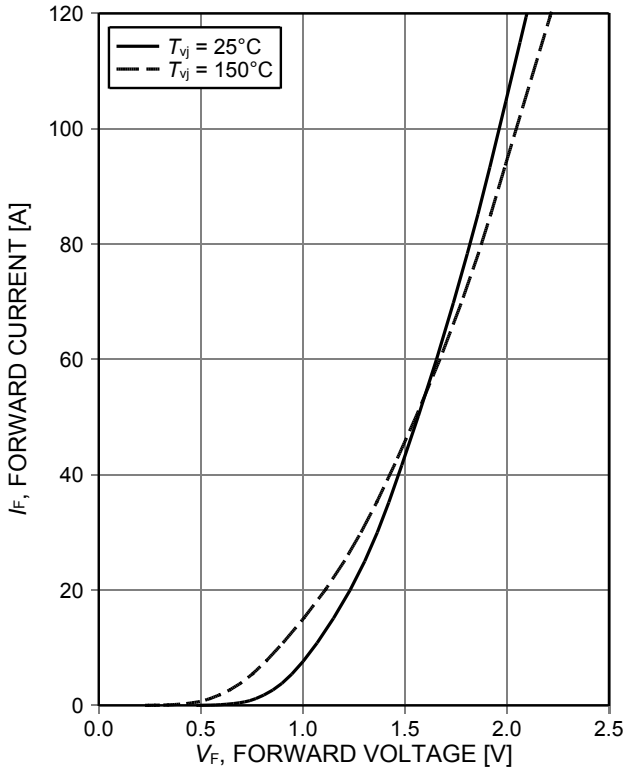


Figure 8. **Typical diode forward current per leg as a function of forward voltage**

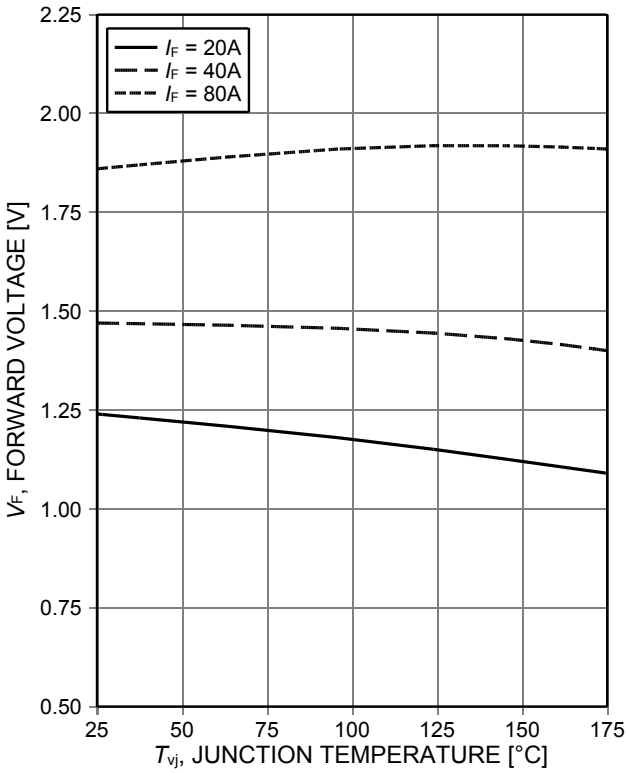
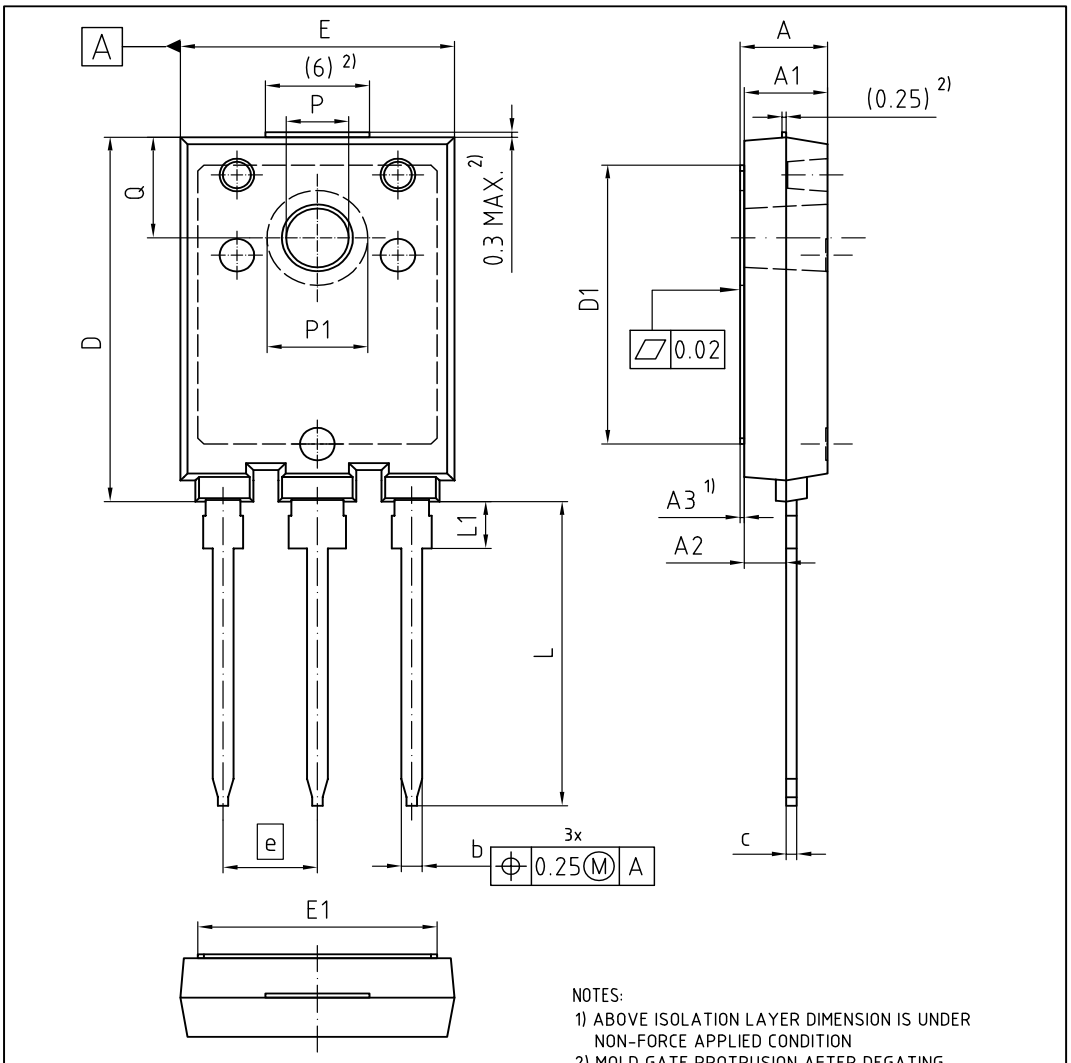


Figure 9. **Typical diode forward voltage per leg as a function of junction temperature**

PG-TO247-3-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

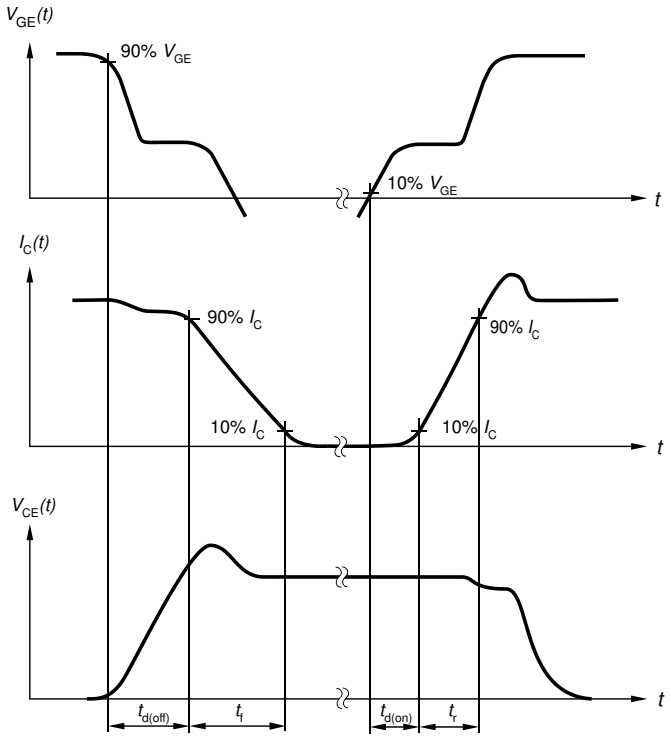


Figure A. **Definition of switching times**

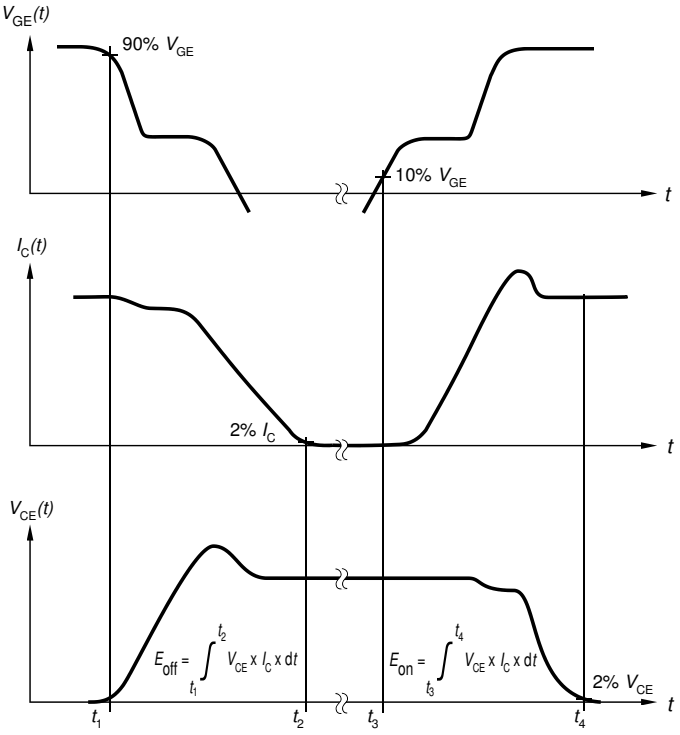


Figure B. **Definition of switching losses**

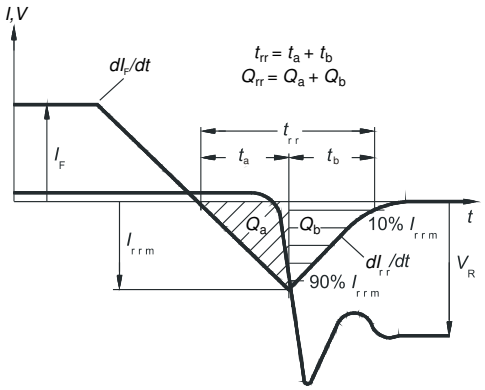


Figure C. **Definition of diode switching characteristics**

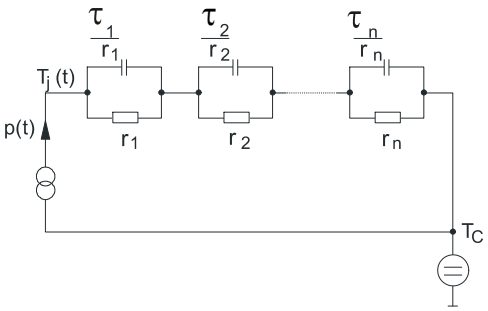


Figure D. **Thermal equivalent circuit**

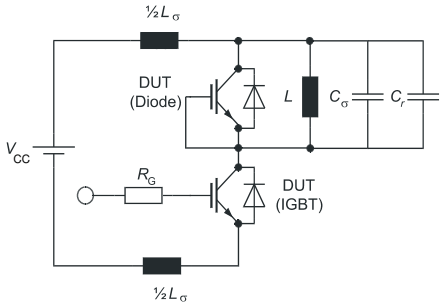


Figure E. **Dynamic test circuit**
Parasitic inductance L_σ,
parasitic capacitor C_σ,
relief capacitor C_r,
(only for ZVT switching)

Revision History

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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