

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:

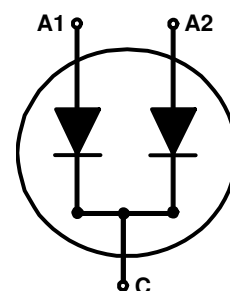
- Air Conditioning
- GPD (General Purpose Drives)
- Industrial SMPS

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
IDFW60C65D1	650V	2x 30A	1.45V	175°C	C60ED1	PG-TO247-3-AI



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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	56.0 43.0	A
Diode pulsed current, t_p limited by T_{vjmax}	I_{Fpuls}	90.0	A
Diode surge non repetitive forward current $T_h = 25^{\circ}\text{C}$, $t_p = 10.0\text{ms}$, sine halfwave	I_{FSM}	240.0	A
Power dissipation $T_h = 25^{\circ}\text{C}$ Power dissipation $T_h = 65^{\circ}\text{C}$	P_{tot}	100.0 73.0	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)}		-	1.37	1.50	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	$I_F = 30.0A$ $T_{vj} = 25^{\circ}C$ $T_{vj} = 125^{\circ}C$ $T_{vj} = 175^{\circ}C$	- - -	1.45 1.42 1.40	1.75 - -	V
Reverse leakage current ⁽³⁾	I_R	$V_R = 650V$ $T_{vj} = 25^{\circ}C$ $T_{vj} = 175^{\circ}C$	- -	- 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.

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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}	$T_{vj} = 25^{\circ}\text{C}$, $V_R = 400\text{V}$, $I_F = 30.0\text{A}$, $di_F/dt = 1000\text{A}/\mu\text{s}$, $L\sigma = 30\text{nH}$, $C\sigma = 40\text{pF}$, switch IGW50N65H5.	-	65	-	ns
Diode reverse recovery charge	Q_{rr}		-	0.76	-	μC
Diode peak reverse recovery current	I_{rrm}		-	17.6	-	A
Diode peak rate of fall of reverse recovery current during t_b	di_{rr}/dt		-	-1360	-	$\text{A}/\mu\text{s}$

Diode reverse recovery time	t_{rr}	$T_{vj} = 25^{\circ}\text{C}$, $V_R = 400\text{V}$, $I_F = 30.0\text{A}$, $di_F/dt = 200\text{A}/\mu\text{s}$, $L\sigma = 30\text{nH}$, $C\sigma = 40\text{pF}$, switch IGW50N65H5.	-	112	-	ns
Diode reverse recovery charge	Q_{rr}		-	0.47	-	μC
Diode peak reverse recovery current	I_{rrm}		-	4.5	-	A
Diode peak rate of fall of reverse recovery current during t_b	di_{rr}/dt		-	-655	-	$\text{A}/\mu\text{s}$

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}	$T_{vj} = 175^{\circ}\text{C}$, $V_R = 400\text{V}$, $I_F = 30.0\text{A}$, $di_F/dt = 1000\text{A}/\mu\text{s}$, $L\sigma = 30\text{nH}$, $C\sigma = 40\text{pF}$, switch IGW50N65H5.	-	102	-	ns
Diode reverse recovery charge	Q_{rr}		-	1.80	-	μC
Diode peak reverse recovery current	I_{rrm}		-	25.9	-	A
Diode peak rate of fall of reverse recovery current during t_b	di_{rr}/dt		-	-995	-	$\text{A}/\mu\text{s}$

Diode reverse recovery time	t_{rr}	$T_{vj} = 125^{\circ}\text{C}$, $V_R = 400\text{V}$, $I_F = 30.0\text{A}$, $di_F/dt = 200\text{A}/\mu\text{s}$, $L\sigma = 30\text{nH}$, $C\sigma = 40\text{pF}$, switch IGW50N65H5.	-	148	-	ns
Diode reverse recovery charge	Q_{rr}		-	0.98	-	μC
Diode peak reverse recovery current	I_{rrm}		-	8.5	-	A
Diode peak rate of fall of reverse recovery current during t_b	di_{rr}/dt		-	-485	-	$\text{A}/\mu\text{s}$

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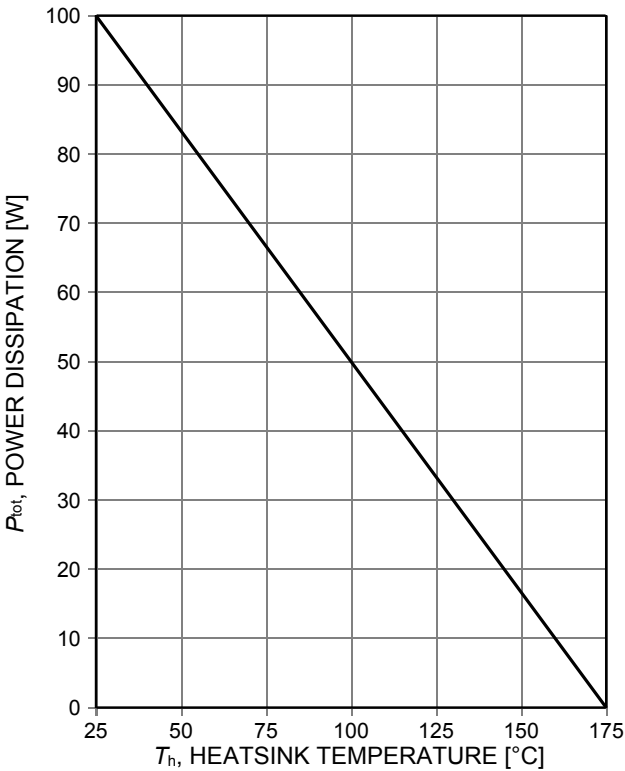


Figure 1. Power dissipation per leg as a function of heatsink temperature ($T_{vj} \leq 175^\circ\text{C}$)

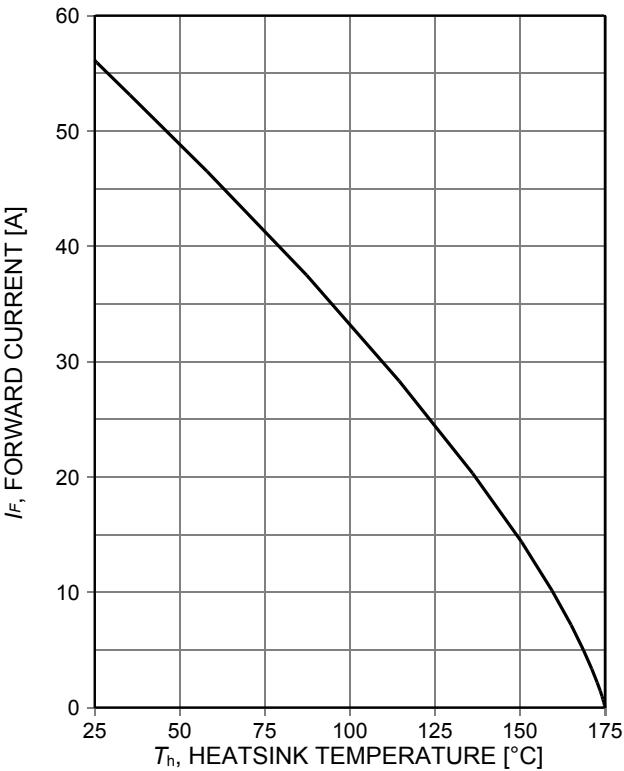


Figure 2. Diode forward current per leg as a function of heatsink temperature ($T_{vj} \leq 175^\circ\text{C}$)

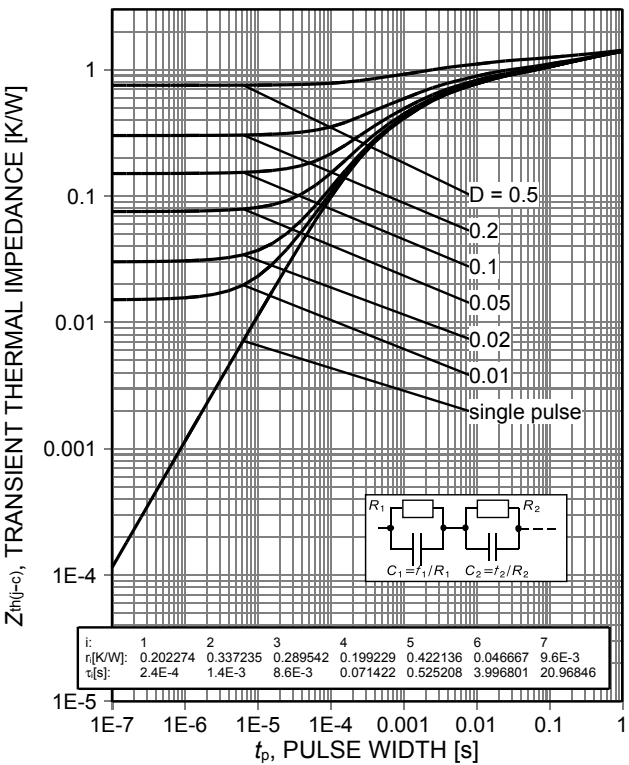


Figure 3. Diode transient thermal impedance per leg as a function of pulse width ($D = t_p/T$)

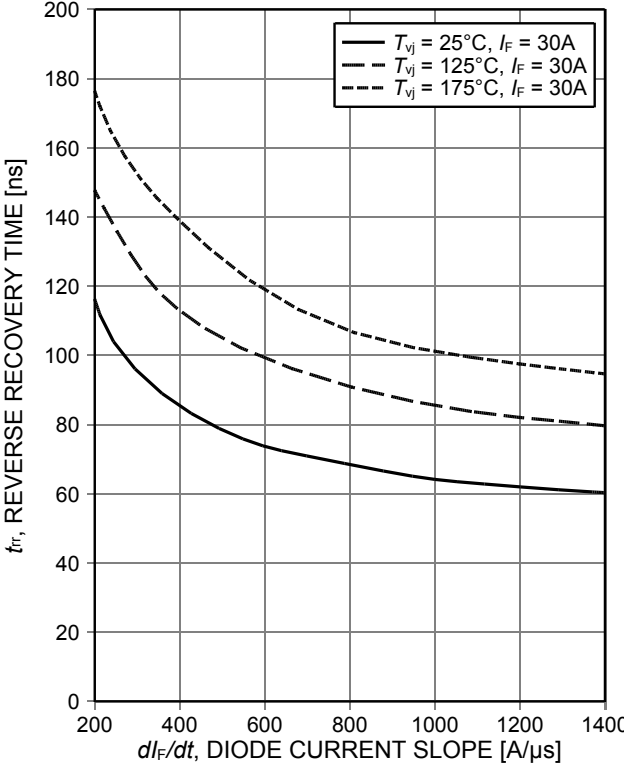


Figure 4. Typical reverse recovery time per leg as a function of diode current slope ($V_R = 400\text{V}$)

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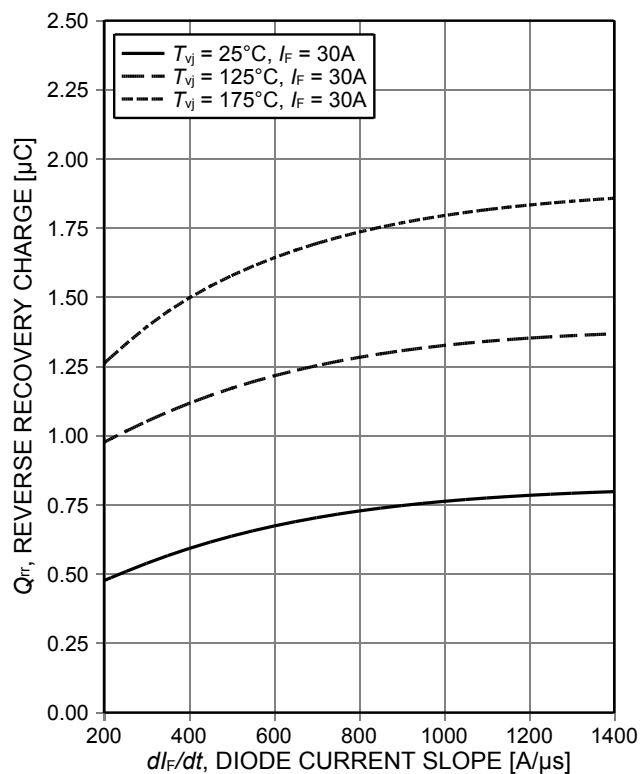


Figure 5. Typical reverse recovery charge per leg as a function of diode current slope ($V_R=400V$)

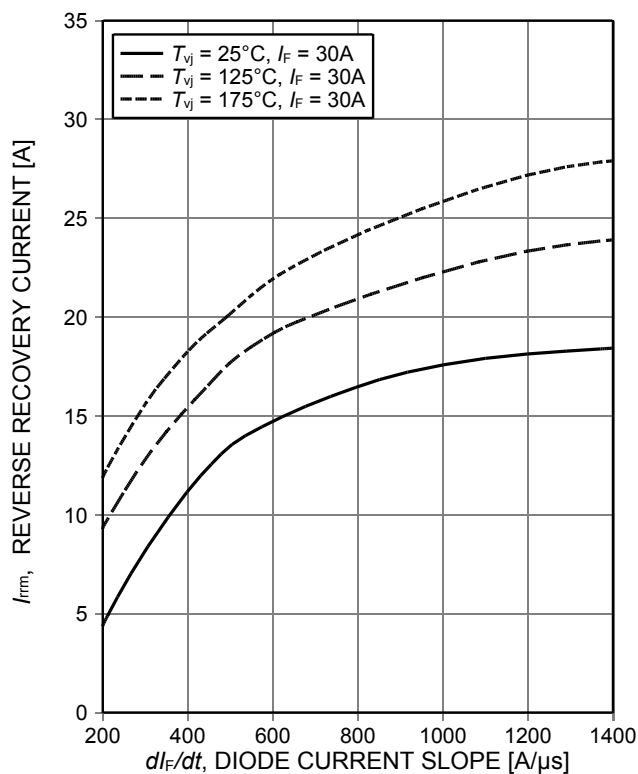


Figure 6. Typical peak reverse recovery current per leg as a function of diode current slope ($V_R=400V$)

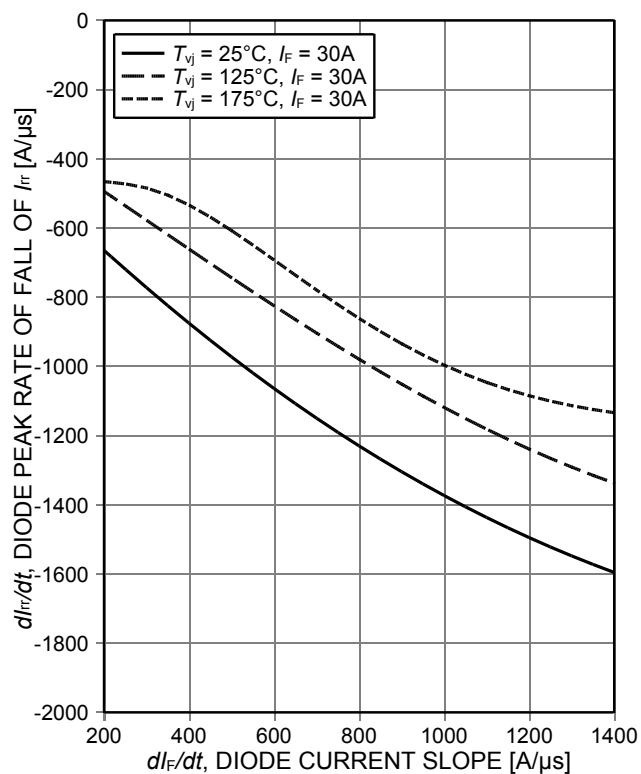


Figure 7. Typical diode peak rate of fall of rev. rec. current per leg as a function of diode current slope ($V_R=400V$)

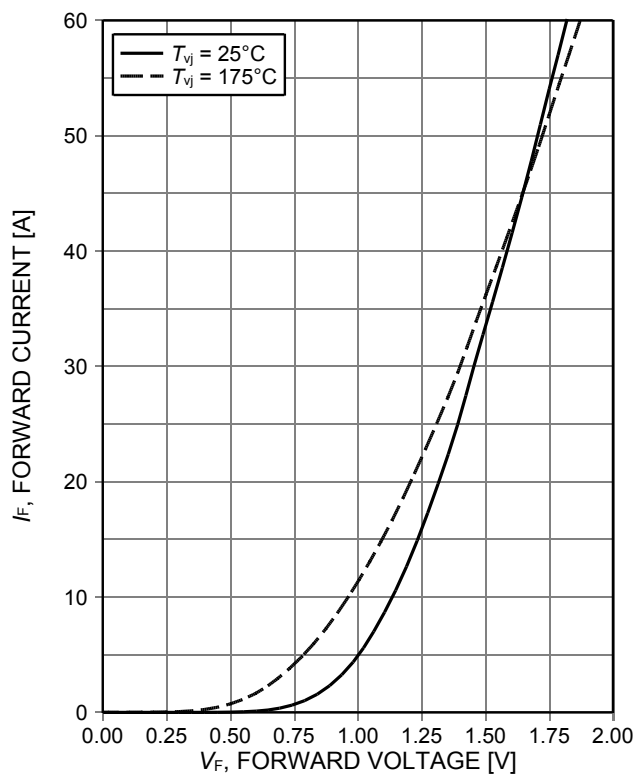


Figure 8. Typical diode forward current per leg as a function of forward voltage

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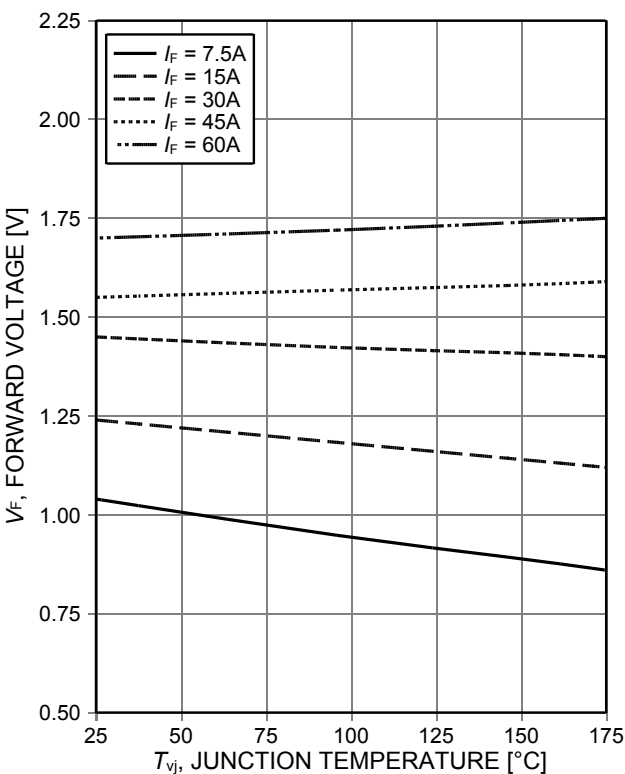
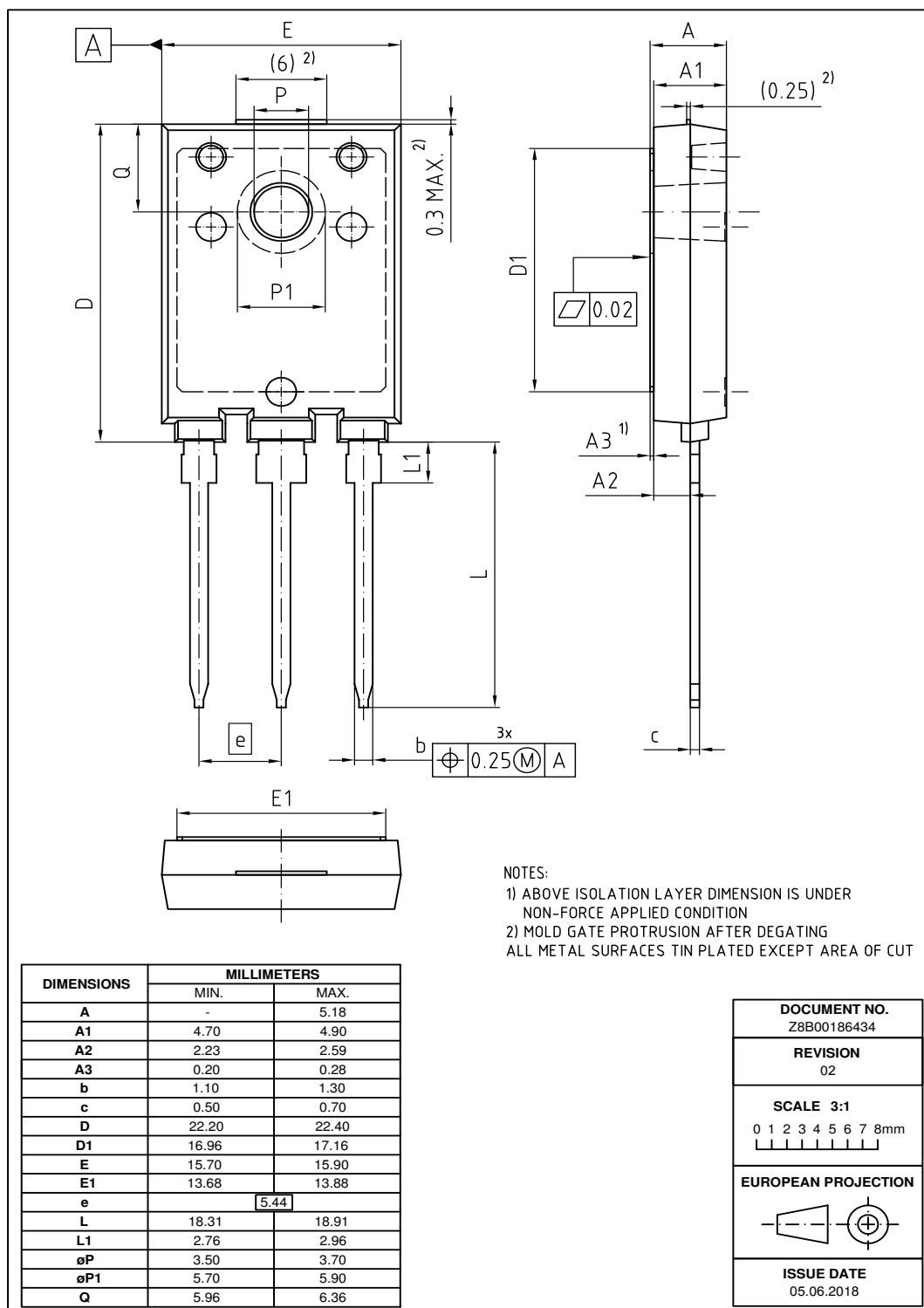


Figure 9. Typical diode forward voltage per leg as a function of junction temperature

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

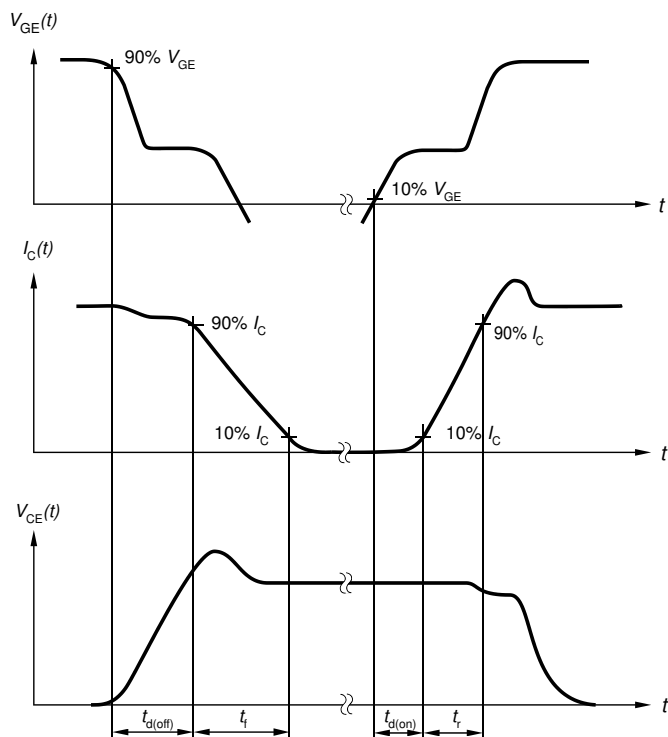


Figure A. Definition of switching times

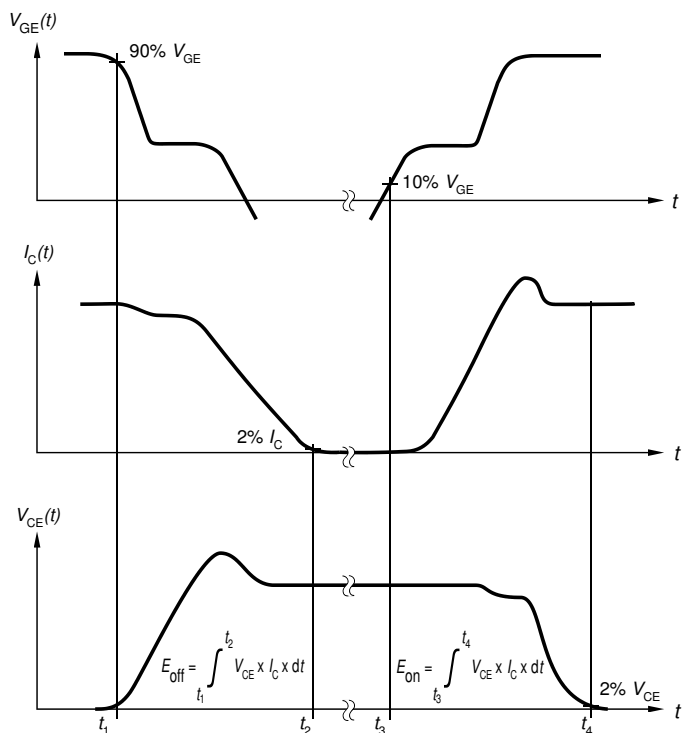


Figure B. Definition of switching losses

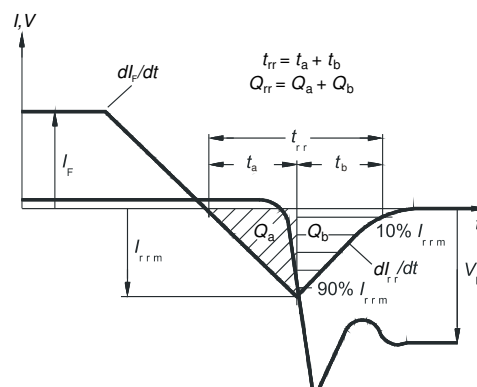


Figure C. Definition of diode switching characteristics

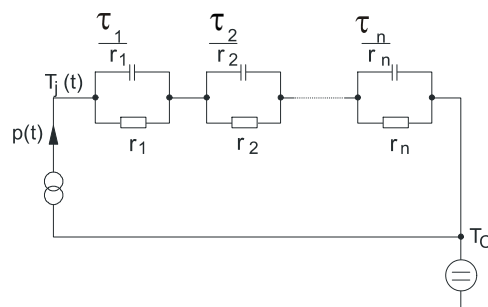


Figure D. Thermal equivalent circuit

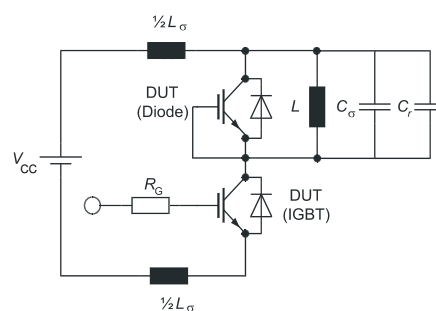


Figure E. **Dynamic test circuit**
Parasitic inductance L_σ ,
parasitic capacitor C_σ ,
relief capacitor C_r ,
(only for ZVT switching)

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Revision History

IDFW60C65D1

Revision: 2019-05-20, Rev. 2.2

Previous Revision

Revision	Date	Subjects (major changes since last revision)
2.1	2018-06-20	Final data sheet
2.2	2019-05-20	New marking description

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