

Final datasheet

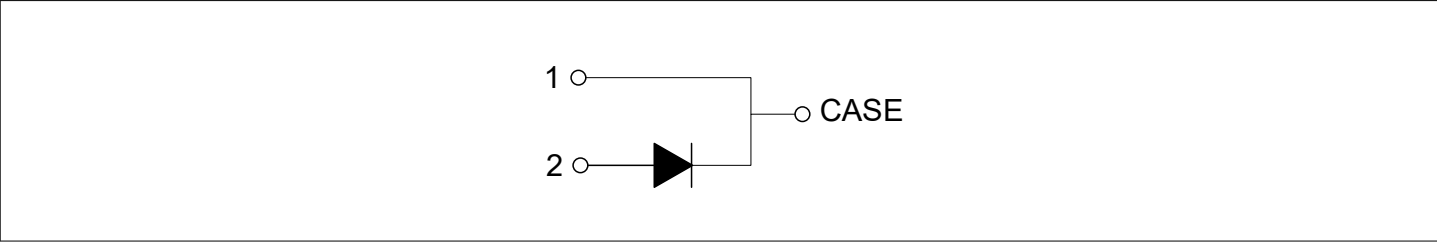
Soft and ultra-fast recovery 1200 V Emitter controlled 7 diode for both Industrial and Home Appliance applications

- Features
- $V_{RRM} = 1200\text{ V}$
 - $I_F = 40\text{ A}$
 - 1200 V emitter controlled technology
 - Maximum junction temperature $T_{vjmax} = 175^{\circ}\text{C}$
 - Low forward voltage (V_F)
 - Low reverse recovery charge
 - Ultrafast recovery times
 - Soft recovery characteristics
 - Pb-free lead plating; RoHS compliant
 - Humidity robust design

- Potential applications
- String inverter
 - EV-Charging
 - Heat pump

- Product validation
- Qualified for industrial applications according to the relevant tests of JEDEC47/20/22

- Description
- Pin definition:
- Pin 1 and backside - Cathode
 - Pin 2 - Anode



Type	Package	Marking
IDWD40E120D7	PG-TO247-2-STD-NA8.8	E40MD7



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1 Package

1 Package

Table 1 Characteristic values

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Internal emitter inductance measured 5 mm (0.197 in.) from case	L_E			13		nH
Storage temperature	T_{stg}		-55		150	°C
Soldering temperature	T_{sold}	wave soldering 1.6 mm (0.063 in.) from case for 10 s			260	°C
Mounting torque	M	M3 screw, Maximum of mounting processes: 3			0.6	Nm
Thermal resistance, junction-ambient	$R_{th(j-a)}$				40	K/W
Diode thermal resistance, junction-case	$R_{th(j-c)}$			0.6	0.78	K/W

2 Diode

Table 2 Maximum rated values

Parameter	Symbol	Note or test condition		Values	Unit
Repetitive peak reverse voltage	V_{RRM}	$T_{vj} \geq 25\text{ °C}$		1200	V
Diode forward current, limited by T_{vjmax}	I_F		$T_c = 25\text{ °C}$	67	A
			$T_c = 100\text{ °C}$	42	
Diode pulsed current, t_p limited by T_{vjmax}	I_{Fpulse}			160	A
Diode surge non repetitive forward current, sine halfwave	I_{FSM}	$t_p = 10\text{ ms}$	$T_c = 25\text{ °C}$	185	A
Diode surge repetitive forward current, sine halfwave ¹⁾	I_{FRM}	$t_p = 10\text{ ms}$	$T_c = 25\text{ °C}$	120	A
Power dissipation	P_{tot}		$T_c = 25\text{ °C}$	193	W
			$T_c = 100\text{ °C}$	97	

1) Not subject to production test. The test was performed with 20k pulses (half-wave rectified sine with 10 ms period).

Table 3 Characteristic values

Parameter	Symbol	Note or test condition		Values			Unit
				Min.	Typ.	Max.	
Diode forward voltage	V_F	$I_F = 40\text{ A}$	$T_{vj} = 25\text{ °C}$		2.5	3	V
			$T_{vj} = 150\text{ °C}$		2.35		
			$T_{vj} = 175\text{ °C}$		2.3		
Reverse leakage current	I_R	$V_R = 1200\text{ V}$	$T_{vj} = 25\text{ °C}$			20	μA
			$T_{vj} = 175\text{ °C}$		480		
Diode reverse recovery time	t_{rr}	$V_R = 800\text{ V}$	$T_{vj} = 25\text{ °C}$, $I_F = 40\text{ A}$, $-di_F/dt = 1000\text{ A}/\mu\text{s}$		155		ns
			$T_{vj} = 25\text{ °C}$, $I_F = 20\text{ A}$, $-di_F/dt = 1000\text{ A}/\mu\text{s}$		115		
			$T_{vj} = 175\text{ °C}$, $I_F = 40\text{ A}$, $-di_F/dt = 1000\text{ A}/\mu\text{s}$		175		
			$T_{vj} = 175\text{ °C}$, $I_F = 20\text{ A}$, $-di_F/dt = 1000\text{ A}/\mu\text{s}$		135		
Diode reverse recovery charge	Q_{rr}	$V_R = 800\text{ V}$	$T_{vj} = 25\text{ °C}$, $I_F = 40\text{ A}$, $-di_F/dt = 1000\text{ A}/\mu\text{s}$		1.15		μC
			$T_{vj} = 25\text{ °C}$, $I_F = 20\text{ A}$, $-di_F/dt = 1000\text{ A}/\mu\text{s}$		0.8		
			$T_{vj} = 175\text{ °C}$, $I_F = 40\text{ A}$, $-di_F/dt = 1000\text{ A}/\mu\text{s}$		2.4		
			$T_{vj} = 175\text{ °C}$, $I_F = 20\text{ A}$, $-di_F/dt = 1000\text{ A}/\mu\text{s}$		1.7		

(table continues...)

Table 3 (continued) Characteristic values

Parameter	Symbol	Note or test condition		Values			Unit
				Min.	Typ.	Max.	
Diode peak reverse recovery current	I_{rrm}	$V_R = 800\text{ V}$	$T_{vj} = 25\text{ °C},$ $I_F = 40\text{ A},$ $-di_F/dt = 1000\text{ A/}\mu\text{s}$		19		A
			$T_{vj} = 25\text{ °C},$ $I_F = 20\text{ A},$ $-di_F/dt = 1000\text{ A/}\mu\text{s}$		16		
			$T_{vj} = 175\text{ °C},$ $I_F = 40\text{ A},$ $-di_F/dt = 1000\text{ A/}\mu\text{s}$		28		
			$T_{vj} = 175\text{ °C},$ $I_F = 20\text{ A},$ $-di_F/dt = 1000\text{ A/}\mu\text{s}$		26		
Diode peak rate of fall of reverse recovery current	di_{rr}/dt	$V_R = 800\text{ V}$	$T_{vj} = 25\text{ °C},$ $I_F = 40\text{ A},$ $-di_F/dt = 1000\text{ A/}\mu\text{s}$		160		A/ μs
			$T_{vj} = 25\text{ °C},$ $I_F = 20\text{ A},$ $-di_F/dt = 1000\text{ A/}\mu\text{s}$		180		
			$T_{vj} = 175\text{ °C},$ $I_F = 40\text{ A},$ $-di_F/dt = 1000\text{ A/}\mu\text{s}$		190		
			$T_{vj} = 175\text{ °C},$ $I_F = 20\text{ A},$ $-di_F/dt = 1000\text{ A/}\mu\text{s}$		260		
Reverse recovery energy	E_{rec}	$V_R = 800\text{ V}$	$T_{vj} = 25\text{ °C},$ $I_F = 40\text{ A},$ $-di_F/dt = 1000\text{ A/}\mu\text{s}$		0.45		mJ
			$T_{vj} = 25\text{ °C},$ $I_F = 20\text{ A},$ $-di_F/dt = 1000\text{ A/}\mu\text{s}$		0.25		
			$T_{vj} = 175\text{ °C},$ $I_F = 40\text{ A},$ $-di_F/dt = 1000\text{ A/}\mu\text{s}$		0.85		
			$T_{vj} = 175\text{ °C},$ $I_F = 20\text{ A},$ $-di_F/dt = 1000\text{ A/}\mu\text{s}$		0.6		
Operating junction temperature	T_{vj}			-40		175	°C

Note: *For optimum lifetime and reliability, Infineon recommends operating conditions that do not exceed 80% of the maximum ratings stated in this datasheet.*

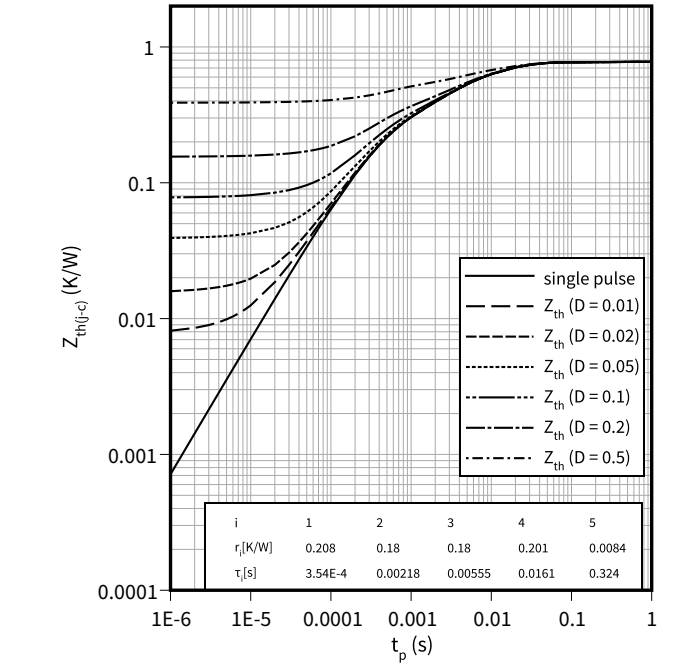
Electrical Characteristic at $T_{vj} = 25^{\circ}\text{C}$, unless otherwise specified.

Dynamic test circuit, parasitic inductance $L_{\sigma} = 27 \text{ nH}$, parasitic capacitor $C_{\sigma} = 12 \text{ pF}$ from Fig. E, IKZA40N120CH7 was used as IGBT.

3 Characteristics diagrams

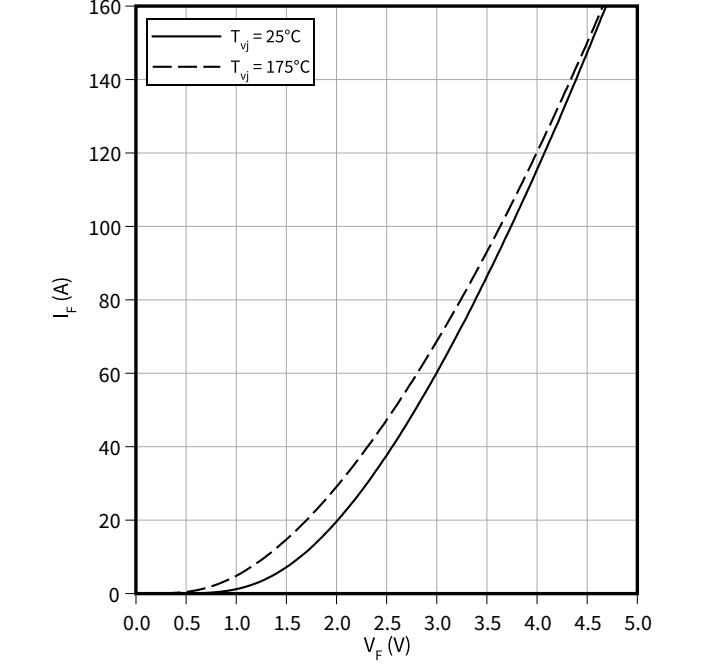
Diode transient thermal impedance as a function of pulse width

$Z_{th(j-c)} = f(t_p)$
 $D = t_p/T$



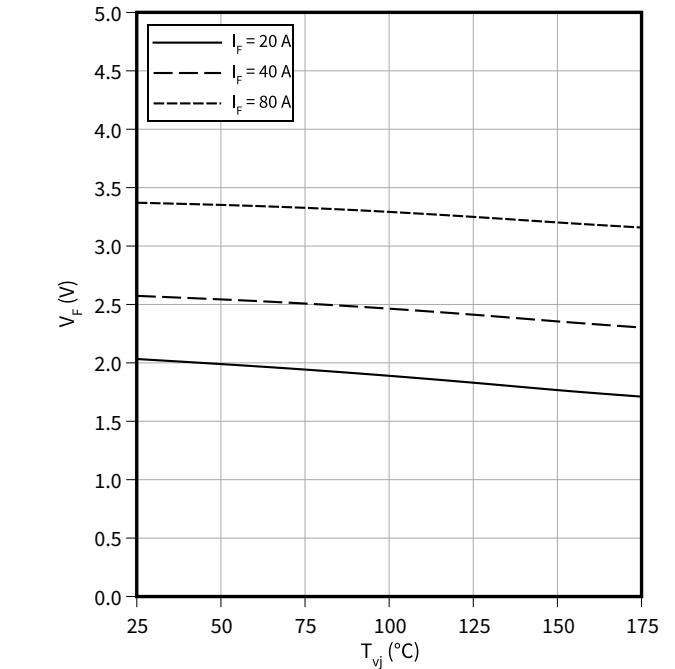
Typical diode forward current as a function of forward voltage

$I_F = f(V_F)$



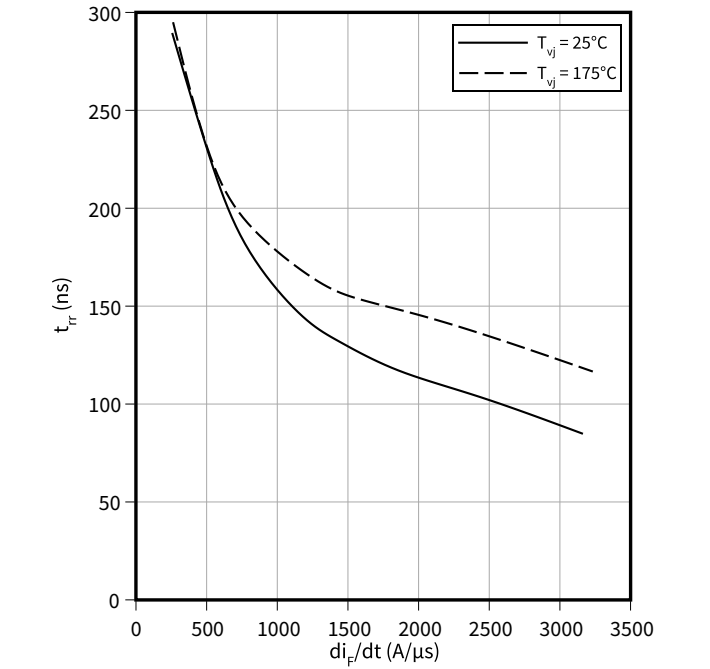
Typical diode forward voltage as a function of junction temperature

$V_F = f(T_{vj})$



Typical reverse recovery time as a function of diode current slope

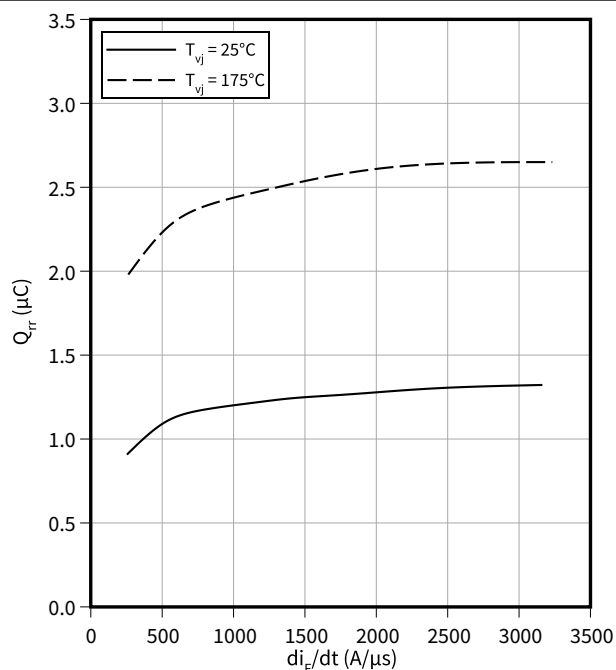
$t_{rr} = f(di_F/dt)$
 $V_R = 800\text{ V}, I_F = 40\text{ A}$



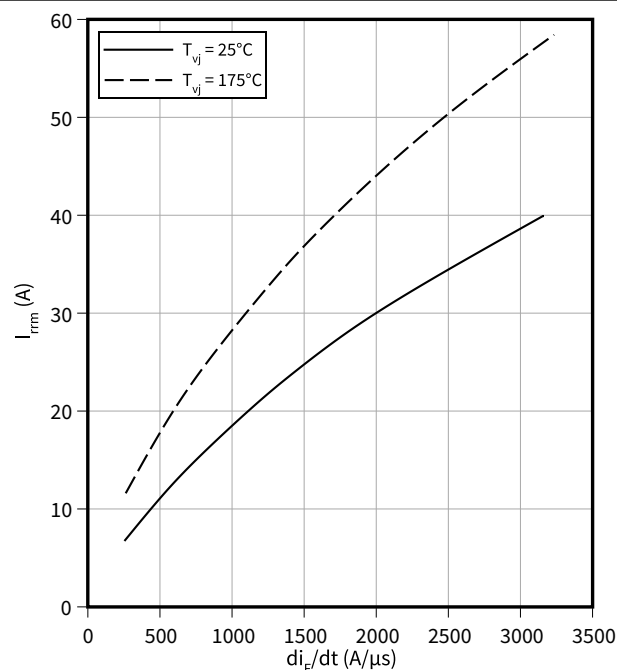
3 Characteristics diagrams

Typical reverse recovery charge as a function of diode current slope

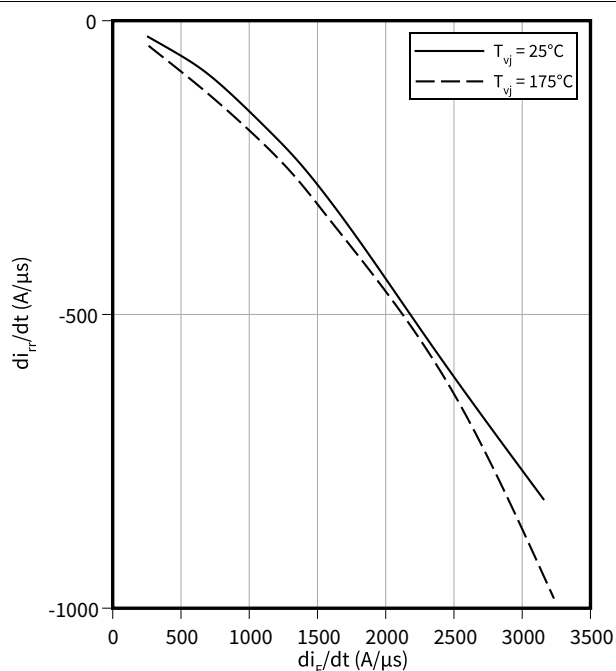
$$Q_{rr} = f(di_F/dt)$$

 $V_R = 800 \text{ V}, I_F = 40 \text{ A}$
**Typical reverse recovery current as a function of diode current slope**

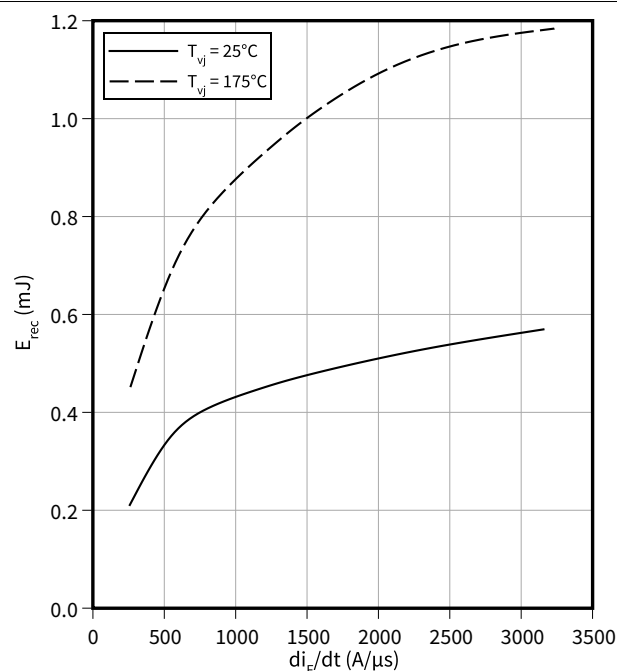
$$I_{rrm} = f(di_F/dt)$$

 $V_R = 800 \text{ V}, I_F = 40 \text{ A}$
**Typical diode peak rate of fall of reverse recovery current as a function of diode current slope**

$$di_{rr}/dt = f(di_F/dt)$$

 $V_R = 800 \text{ V}, I_F = 40 \text{ A}$
**Typical reverse energy losses as a function of diode current slope**

$$E_{rec} = f(di_F/dt)$$

 $V_R = 800 \text{ V}, I_F = 40 \text{ A}$


4 Package outlines

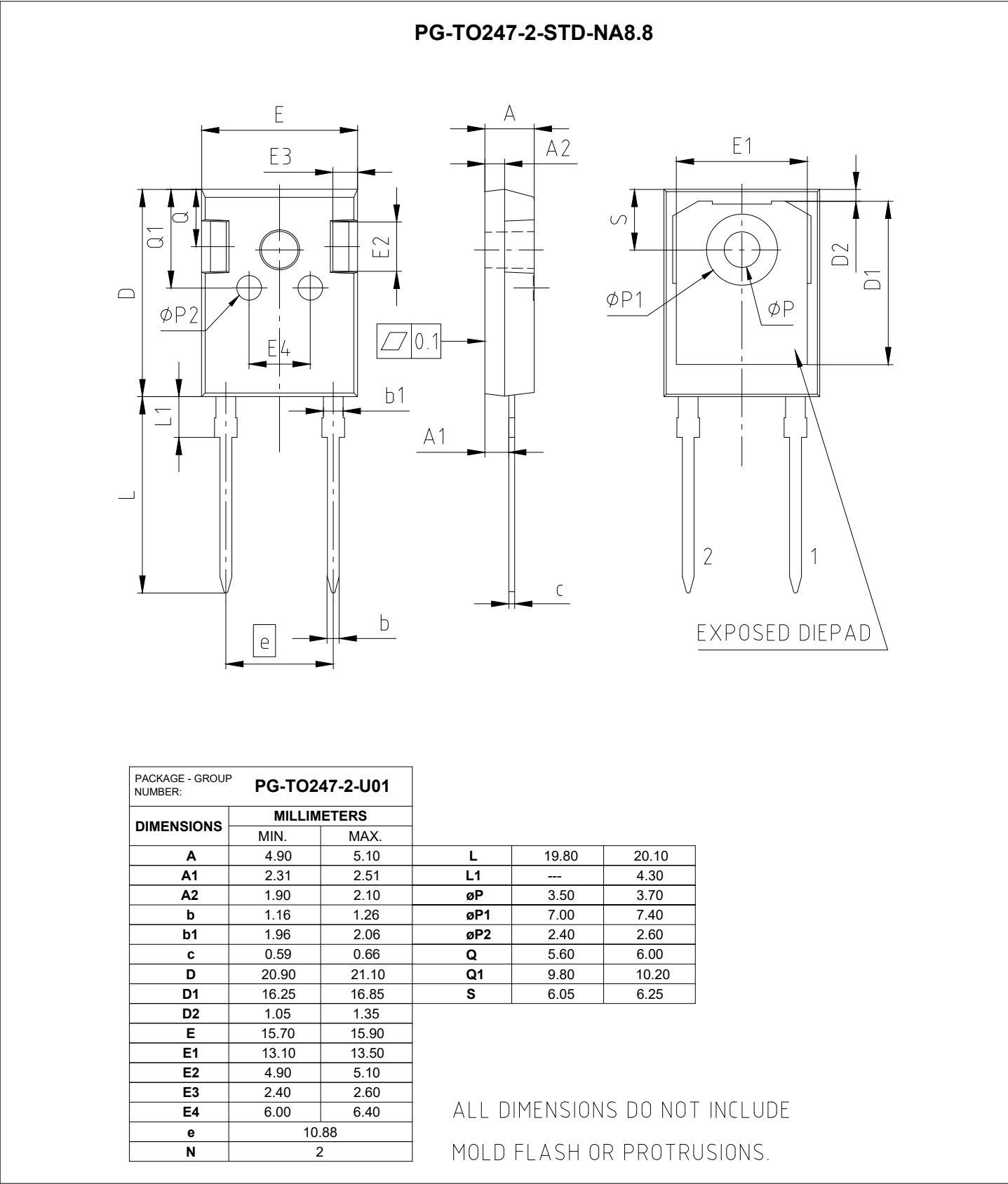


Figure 1

5 Testing conditions

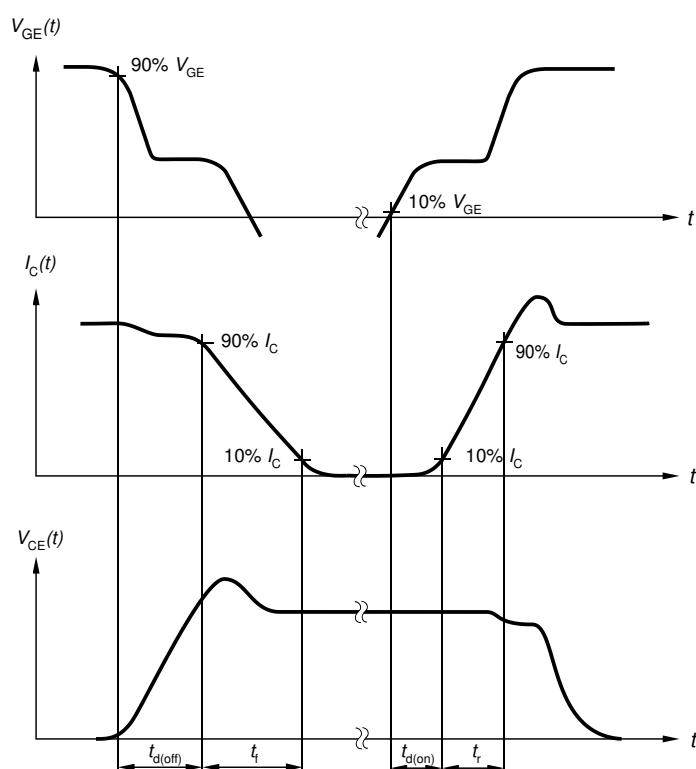


Figure A. Definition of switching times

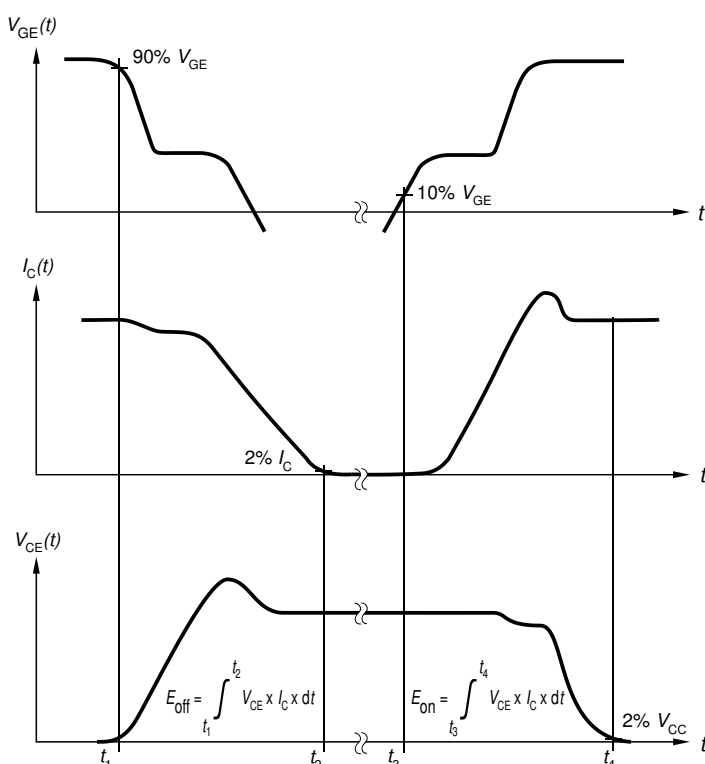


Figure B. Definition of switching losses

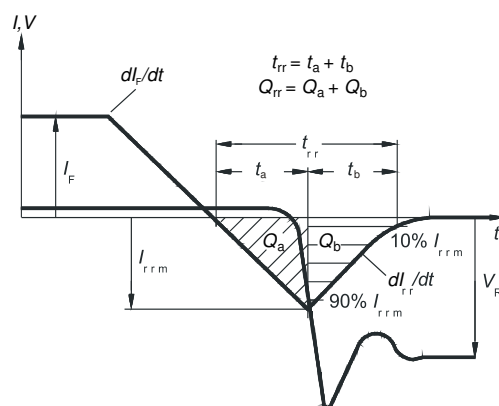


Figure C. Definition of diode switching characteristics

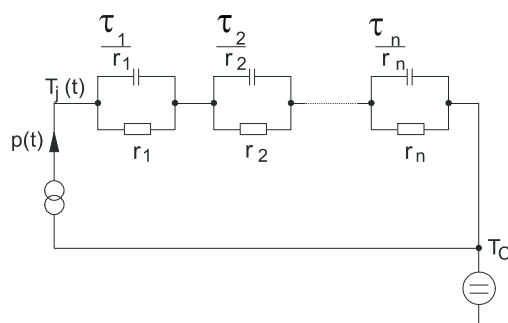


Figure D. Thermal equivalent circuit

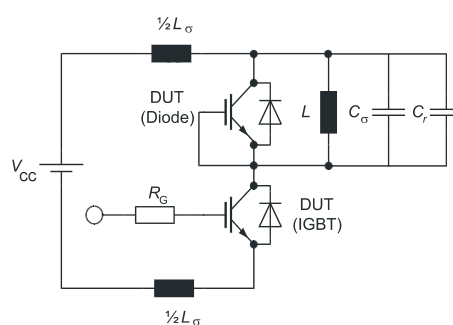


Figure E. **Dynamic test circuit**
Parasitic inductance L_σ ,
parasitic capacitor C_σ ,
relief capacitor C_r ,
(only for ZVT switching)

Revision history

Document revision	Date of release	Description of changes
1.00	2023-12-15	Final datasheet

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Edition 2023-12-15

Published by

Infineon Technologies AG
81726 Munich, Germany

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Document reference
IFX-ABI958-001

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