

**Final datasheet**

**The Soft 650 V Emitter Controlled Si Diode 7 offers improved reliability for both Industrial and Home Appliance applications**

**Features**

- $V_{RRM} = 650\text{ V}$
- $I_F = 50\text{ A}$
- Low and temperature stable forward voltage ( $V_F$ )
- Very soft and fast recovery
- Low reverse recovery current ( $I_{rrm}$ )
- Humidity robust design
- Cosmic ray ruggedness
- Maximum junction temperature  $T_{vjmax} = 175^\circ\text{C}$
- Qualified according to JEDEC for target applications
- Pb-free lead plating; RoHS compliant
- Complete product spectrum and PSpice Models: <http://www.infineon.com/ec7/>

**Potential applications**

- String and micro inverter
- Datacenter UPS
- Offline UPS/Residential UPS
- Online UPS/Industrial UPS
- Residential aircon
- Welding

**Product validation**

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

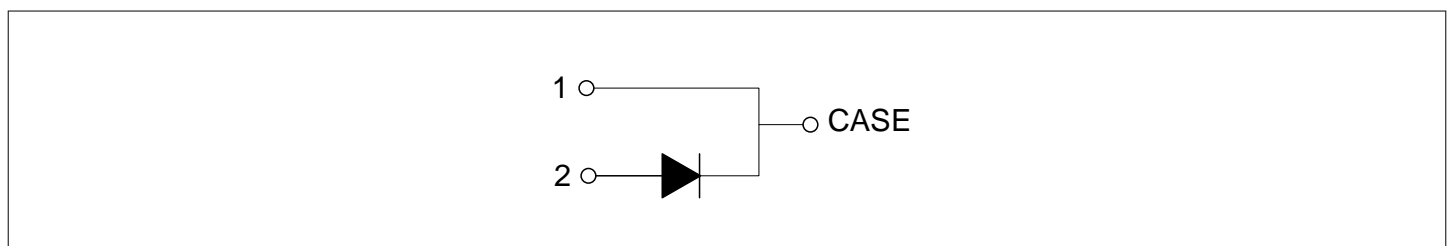
**Description**

Pin definition:

- Pin 1 and backside - Cathode
- Pin 2 - Anode



- Green
- Halogen-free
- Lead-free
- RoHS



Type	Package	Marking
IDWD50E65E7	PG-TO247-2-STD-NA8.8	E50EE7

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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	$R_{th(j-c)}$				0.8	K/W

## 2 Diode

Table 2 Maximum rated values

Parameter	Symbol	Note or test condition	Values	Unit	
Repetitive peak reverse voltage	$V_{RRM}$	$T_{vj} \geq 25\text{ °C}$	650	V	
Diode forward current, limited by $T_{vjmax}$	$I_F$		$T_c = 25\text{ °C}$	92	A
			$T_c = 100\text{ °C}$	59	
Diode pulsed current, $t_p$ limited by $T_{vjmax}$	$I_{Fpulse}$		200	A	
Diode surge non repetitive forward current, sine halfwave	$I_{FSM}$	$t_p = 10\text{ ms}$	$T_c = 25\text{ °C}$	228	A
Power dissipation	$P_{tot}$		$T_c = 25\text{ °C}$	188	W
			$T_c = 100\text{ °C}$	94	

Table 3 Characteristic values

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Diode forward voltage	$V_F$	$I_F = 50\text{ A}$	$T_{vj} = 25\text{ °C}$	1.65	2.1	V
			$T_{vj} = 125\text{ °C}$	1.6		
			$T_{vj} = 175\text{ °C}$	1.55		

(table continues...)

Table 3 (continued) Characteristic values

Parameter	Symbol	Note or test condition		Values			Unit
				Min.	Typ.	Max.	
Reverse leakage current	$I_R$	$V_R = 650 \text{ V}$	$T_{vj} = 25 \text{ }^\circ\text{C}$			20	$\mu\text{A}$
			$T_{vj} = 175 \text{ }^\circ\text{C}$		428		
Diode reverse recovery time	$t_{rr}$	$V_R = 400 \text{ V}$	$T_{vj} = 25 \text{ }^\circ\text{C}$ , $I_F = 50 \text{ A}$ , $-di_F/dt = 1000 \text{ A}/\mu\text{s}$		94		ns
			$T_{vj} = 25 \text{ }^\circ\text{C}$ , $I_F = 25 \text{ A}$ , $-di_F/dt = 1000 \text{ A}/\mu\text{s}$		74.3		
			$T_{vj} = 175 \text{ }^\circ\text{C}$ , $I_F = 50 \text{ A}$ , $-di_F/dt = 1000 \text{ A}/\mu\text{s}$		148		
			$T_{vj} = 175 \text{ }^\circ\text{C}$ , $I_F = 25 \text{ A}$ , $-di_F/dt = 1000 \text{ A}/\mu\text{s}$		114		
Diode reverse recovery charge	$Q_{rr}$	$V_R = 400 \text{ V}$	$T_{vj} = 25 \text{ }^\circ\text{C}$ , $I_F = 50 \text{ A}$ , $-di_F/dt = 1000 \text{ A}/\mu\text{s}$		0.95		$\mu\text{C}$
			$T_{vj} = 25 \text{ }^\circ\text{C}$ , $I_F = 25 \text{ A}$ , $-di_F/dt = 1000 \text{ A}/\mu\text{s}$		0.71		
			$T_{vj} = 175 \text{ }^\circ\text{C}$ , $I_F = 50 \text{ A}$ , $-di_F/dt = 1000 \text{ A}/\mu\text{s}$		2.81		
			$T_{vj} = 175 \text{ }^\circ\text{C}$ , $I_F = 25 \text{ A}$ , $-di_F/dt = 1000 \text{ A}/\mu\text{s}$		2.04		
Diode peak reverse recovery current	$I_{rrm}$	$V_R = 400 \text{ V}$	$T_{vj} = 25 \text{ }^\circ\text{C}$ , $I_F = 50 \text{ A}$ , $-di_F/dt = 1000 \text{ A}/\mu\text{s}$		17.3		A
			$T_{vj} = 25 \text{ }^\circ\text{C}$ , $I_F = 25 \text{ A}$ , $-di_F/dt = 1000 \text{ A}/\mu\text{s}$		15.7		
			$T_{vj} = 175 \text{ }^\circ\text{C}$ , $I_F = 50 \text{ A}$ , $-di_F/dt = 1000 \text{ A}/\mu\text{s}$		29.6		
			$T_{vj} = 175 \text{ }^\circ\text{C}$ , $I_F = 25 \text{ A}$ , $-di_F/dt = 1000 \text{ A}/\mu\text{s}$		26.9		

(table continues...)

Table 3 (continued) Characteristic values

Parameter	Symbol	Note or test condition		Values			Unit
				Min.	Typ.	Max.	
Diode peak rate of fall of reverse recovery current	$di_{rr}/dt$	$V_R = 400 \text{ V}$	$T_{vj} = 25 \text{ }^\circ\text{C},$ $I_F = 50 \text{ A},$ $-di_F/dt = 1000 \text{ A}/\mu\text{s}$		777		A/ $\mu\text{s}$
					946		
					526		
					752		
Reverse recovery energy	$E_{rec}$	$V_R = 400 \text{ V}$	$T_{vj} = 25 \text{ }^\circ\text{C},$ $I_F = 50 \text{ A},$ $-di_F/dt = 1000 \text{ A}/\mu\text{s}$		0.16		mJ
					0.11		
					0.56		
					0.4		
Operating junction temperature	$T_{vj}$			-40		175	$^\circ\text{C}$

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.

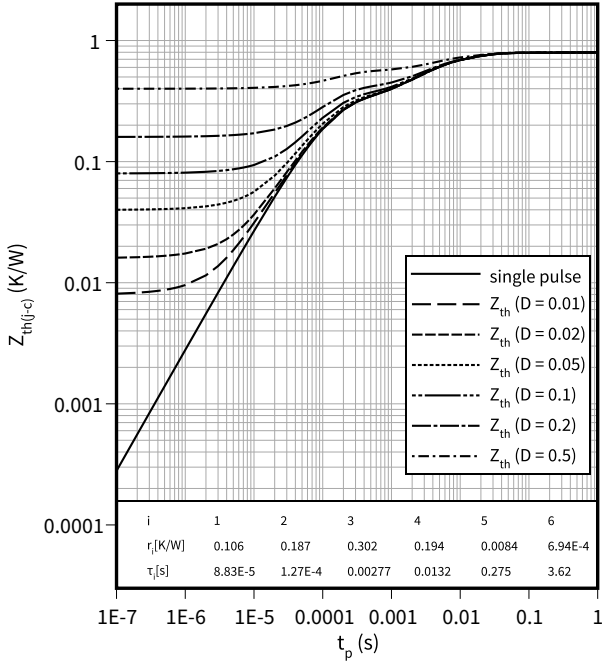
Dynamic test circuit, parasitic inductance  $L_\sigma = 30 \text{ nH}$ , parasitic capacitor  $C_\sigma = 18 \text{ pF}$  from Fig. E.

### 3 Characteristics diagrams

#### Diode transient thermal impedance as a function of pulse width

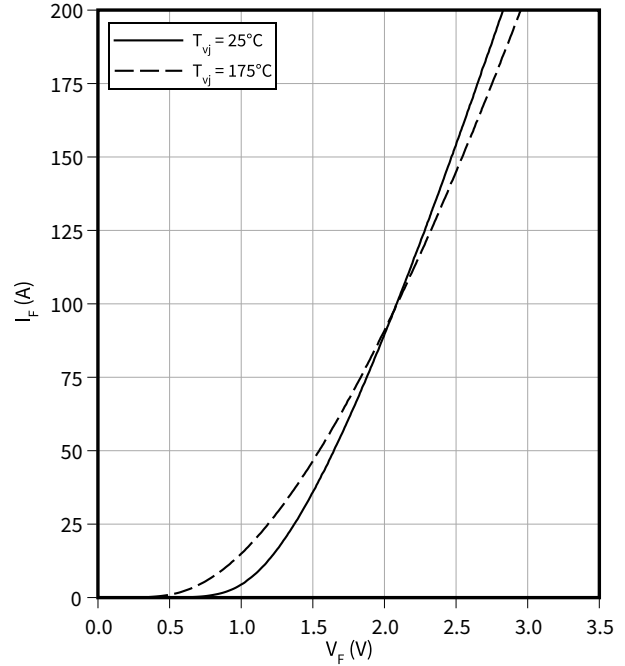
$$Z_{th(j-c)} = f(t_p)$$

$$D = t_p/T$$



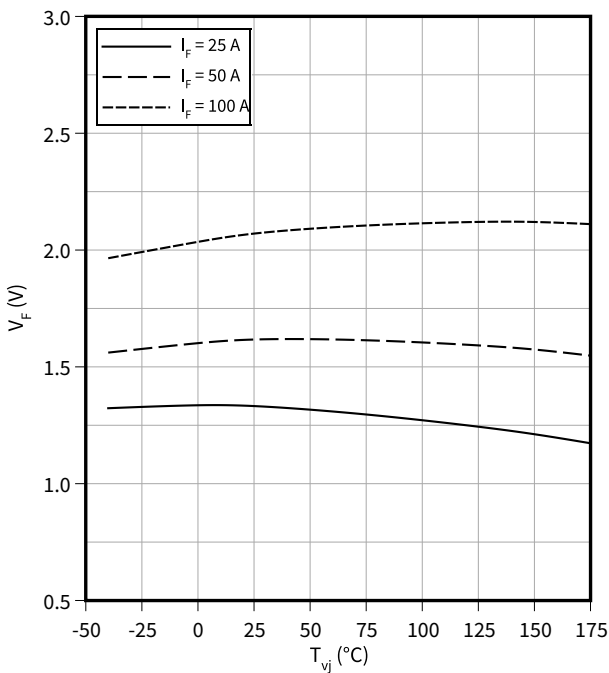
#### Typical diode forward current as a function of forward voltage

$$I_F = f(V_F)$$



#### Typical diode forward voltage as a function of junction temperature

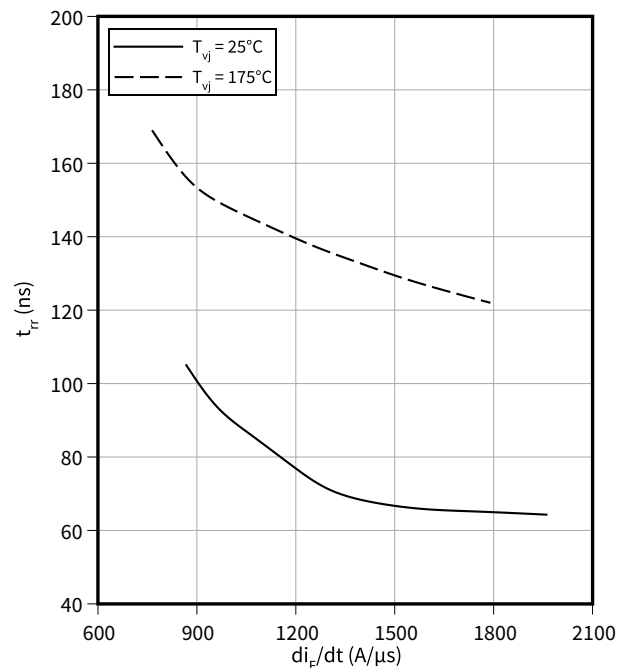
$$V_F = f(T_{vj})$$



#### Typical reverse recovery time as a function of diode current slope

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

$$V_R = 400 \text{ V}, I_F = 50 \text{ A}$$

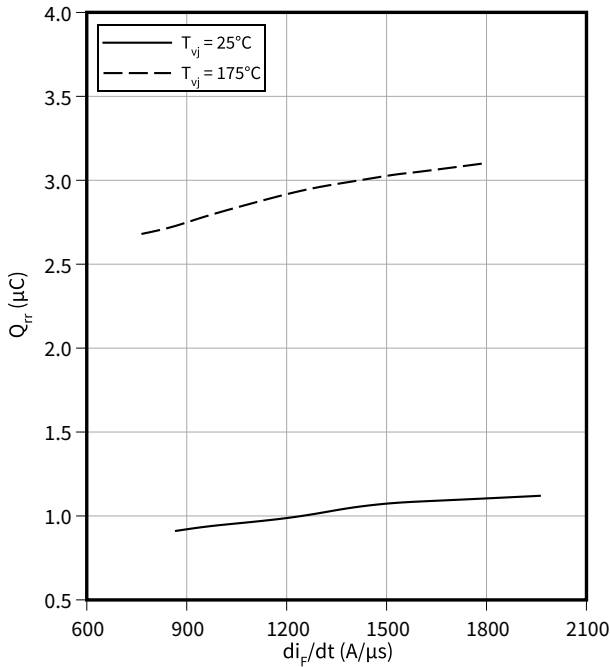


3 Characteristics diagrams

**Typical reverse recovery charge as a function of diode current slope**

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

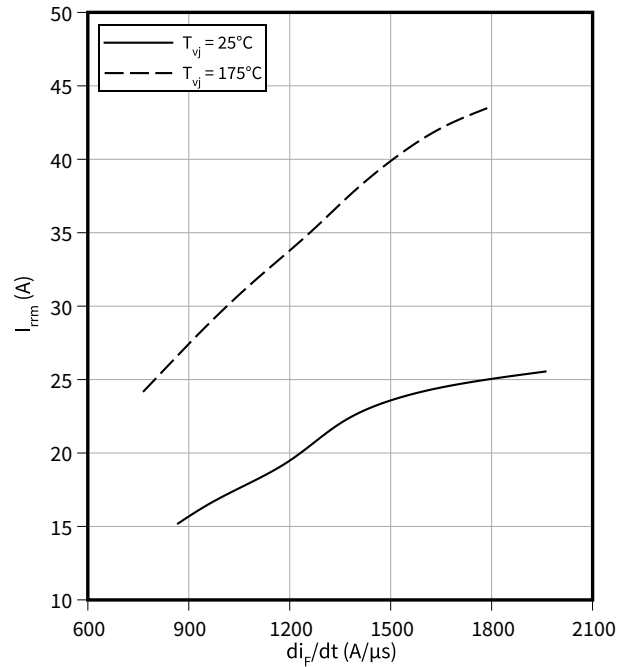
$V_R = 400\text{ V}, I_F = 50\text{ A}$



**Typical reverse recovery current as a function of diode current slope**

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

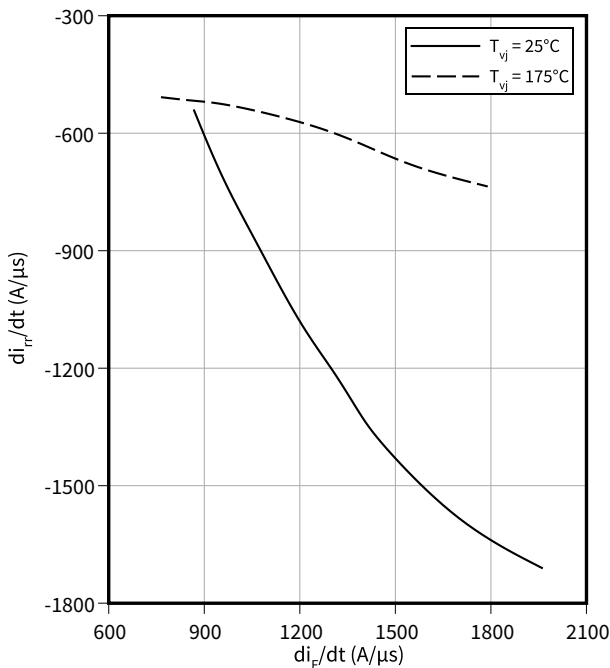
$V_R = 400\text{ V}, I_F = 50\text{ A}$



**Typical diode peak rate of fall of reverse recovery current as a function of diode current slope**

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

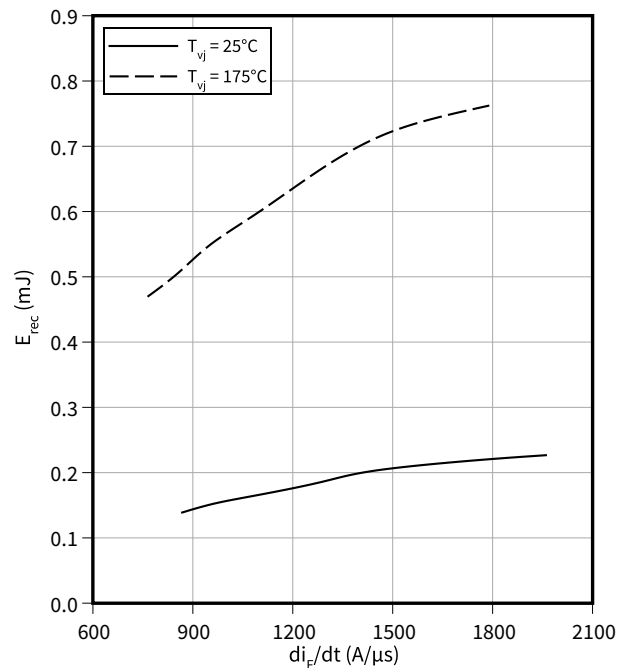
$V_R = 400\text{ V}, I_F = 50\text{ A}$



**Typical reverse energy losses as a function of diode current slope**

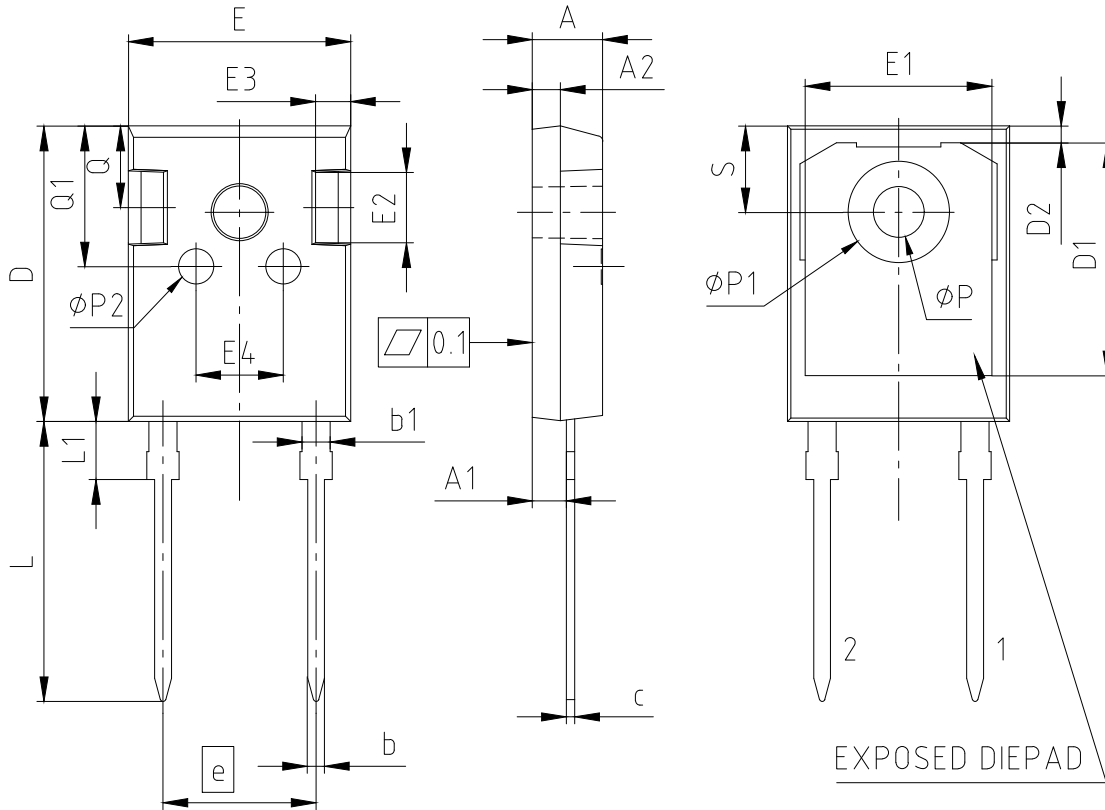
$$E_{rec} = f(di_F/dt)$$

$V_R = 400\text{ V}, I_F = 50\text{ A}$



4 Package outlines

PG-TO247-2-STD-NA8.8



PACKAGE - GROUP NUMBER:		PG-TO247-2-U01			
DIMENSIONS	MILLIMETERS				
	MIN.	MAX.			
A	4.90	5.10	L	19.80	20.10
A1	2.31	2.51	L1	---	4.30
A2	1.90	2.10	phi P	3.50	3.70
b	1.16	1.26	phi P1	7.00	7.40
b1	1.96	2.06	phi P2	2.40	2.60
c	0.59	0.66	Q	5.60	6.00
D	20.90	21.10	Q1	9.80	10.20
D1	16.25	16.85	S	6.05	6.25
D2	1.05	1.35			
E	15.70	15.90			
E1	13.10	13.50			
E2	4.90	5.10			
E3	2.40	2.60			
E4	6.00	6.40			
e	10.88				
N	2				

ALL DIMENSIONS DO NOT INCLUDE MOLD FLASH OR PROTRUSIONS.

Figure 1



5 Testing conditions

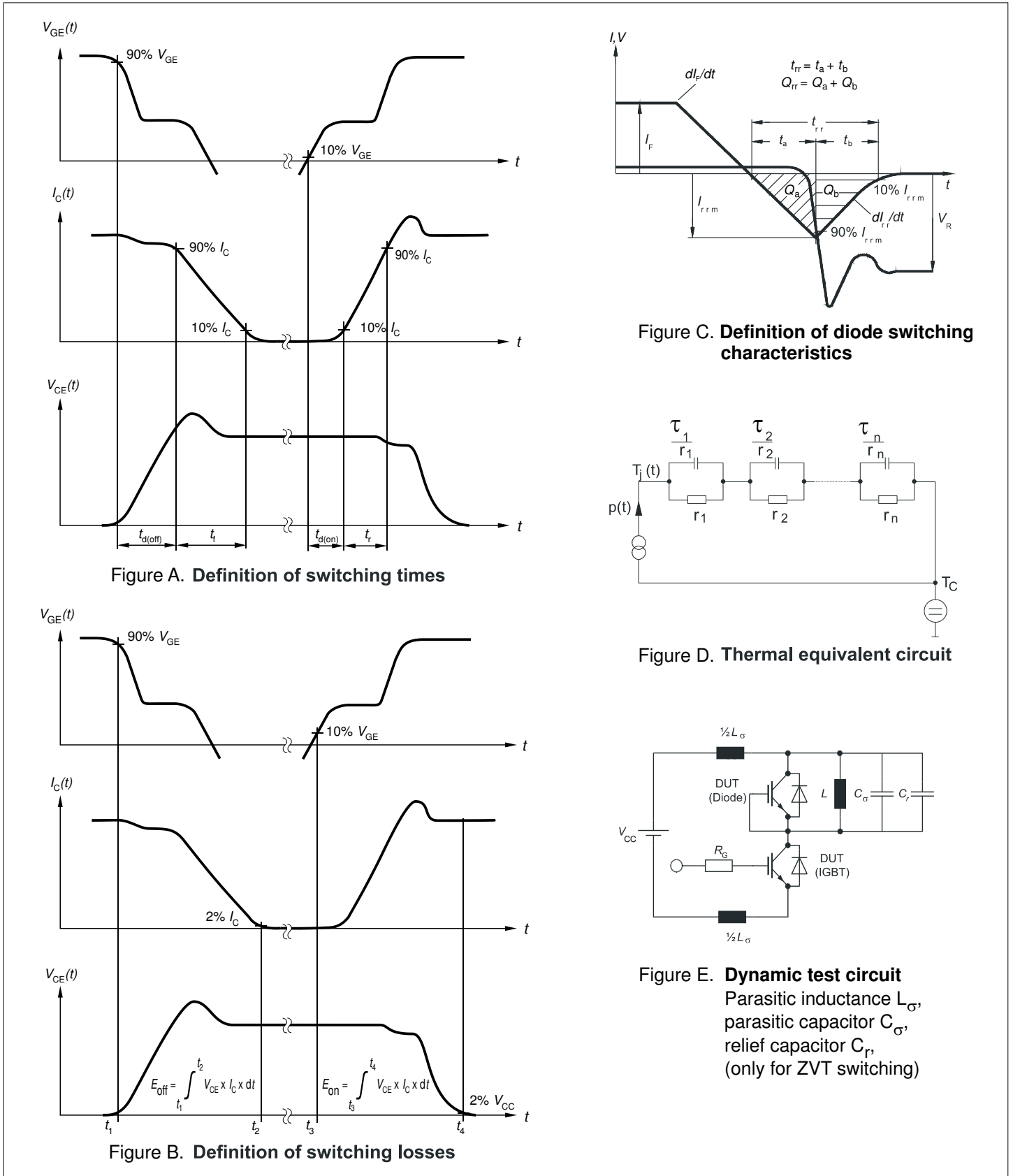


Figure A. Definition of switching times

Figure C. Definition of diode switching characteristics

Figure D. Thermal equivalent circuit

Figure E. Dynamic test circuit  
Parasitic inductance  $L_\sigma$ , parasitic capacitor  $C_\sigma$ , relief capacitor  $C_r$ , (only for ZVT switching)

Figure 2

**Revision history**

<b>Document revision</b>	<b>Date of release</b>	<b>Description of changes</b>
0.10	2023-04-26	Preliminary datasheet
1.00	2023-05-02	Final datasheet
1.10	2023-11-09	Update of diode forward current $I_F$ Update of graph on page 6

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