

Final datasheet

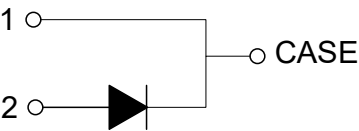
Soft and ultra-fast recovery 1200 V Emitter controlled 7 diode for both Industrial and Home Appliance applications

- Features
- $V_{RRM} = 1200\text{ V}$
 - $I_F = 140\text{ A}$
 - 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
IDWD140E120D7	PG-TO247-2-STD-NA8.8	E140MD7



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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	$R_{th(j-c)}$			0.21	0.27	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		$T_c = 25\text{ °C}$	207	A
			$T_c = 91\text{ °C}$	140	
Diode pulsed current, t_p limited by T_{vjmax}	I_{Fpulse}			560	A
Diode surge non repetitive forward current, sine halfwave	I_{FSM}	$t_p = 10\text{ ms}$	$T_c = 25\text{ °C}$	462	A
Diode surge repetitive forward current, sine halfwave ¹⁾	I_{FRM}	$t_p = 10\text{ ms}$	$T_c = 25\text{ °C}$	420	A
Power dissipation	P_{tot}		$T_c = 25\text{ °C}$	561	W
			$T_c = 100\text{ °C}$	280	

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	$I_F = 140\text{ A}$	$T_{vj} = 25\text{ °C}$		2.5	3	V
			$T_{vj} = 150\text{ °C}$		2.35		
			$T_{vj} = 175\text{ °C}$		2.3		
Reverse leakage current	I_R		$T_{vj} = 25\text{ °C}$			20	μA
			$T_{vj} = 175\text{ °C}$		2400		
Diode reverse recovery time	t_{rr}	$V_R = 800\text{ V}$	$T_{vj} = 25\text{ °C}$, $I_F = 140\text{ A}$, $-di_F/dt = 1000\text{ A}/\mu\text{s}$		225		ns
			$T_{vj} = 25\text{ °C}$, $I_F = 70\text{ A}$, $-di_F/dt = 1000\text{ A}/\mu\text{s}$		190		
			$T_{vj} = 175\text{ °C}$, $I_F = 140\text{ A}$, $-di_F/dt = 1000\text{ A}/\mu\text{s}$		245		
			$T_{vj} = 175\text{ °C}$, $I_F = 70\text{ A}$, $-di_F/dt = 1000\text{ A}/\mu\text{s}$		160		
Diode reverse recovery charge	Q_{rr}	$V_R = 800\text{ V}$	$T_{vj} = 25\text{ °C}$, $I_F = 140\text{ A}$, $-di_F/dt = 1000\text{ A}/\mu\text{s}$		3.1		μC
			$T_{vj} = 25\text{ °C}$, $I_F = 70\text{ A}$, $-di_F/dt = 1000\text{ A}/\mu\text{s}$		2.85		
			$T_{vj} = 175\text{ °C}$, $I_F = 140\text{ A}$, $-di_F/dt = 1000\text{ A}/\mu\text{s}$		7.55		
			$T_{vj} = 175\text{ °C}$, $I_F = 70\text{ A}$, $-di_F/dt = 1000\text{ A}/\mu\text{s}$		6.1		

(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}	$V_R = 800 \text{ V}$	$T_{vj} = 25 \text{ }^{\circ}\text{C}$, $I_F = 140 \text{ A}$, $-di_F/dt = 1000 \text{ A}/\mu\text{s}$		27		A
			$T_{vj} = 25 \text{ }^{\circ}\text{C}$, $I_F = 70 \text{ A}$, $-di_F/dt = 1000 \text{ A}/\mu\text{s}$		26		
			$T_{vj} = 175 \text{ }^{\circ}\text{C}$, $I_F = 140 \text{ A}$, $-di_F/dt = 1000 \text{ A}/\mu\text{s}$		50		
			$T_{vj} = 175 \text{ }^{\circ}\text{C}$, $I_F = 70 \text{ A}$, $-di_F/dt = 1000 \text{ A}/\mu\text{s}$		47		
Diode peak rate of fall of reverse recovery current	di_{rr}/dt	$V_R = 800 \text{ V}$	$T_{vj} = 25 \text{ }^{\circ}\text{C}$, $I_F = 140 \text{ A}$, $-di_F/dt = 1000 \text{ A}/\mu\text{s}$		115		A/ μs
			$T_{vj} = 25 \text{ }^{\circ}\text{C}$, $I_F = 70 \text{ A}$, $-di_F/dt = 1000 \text{ A}/\mu\text{s}$		140		
			$T_{vj} = 175 \text{ }^{\circ}\text{C}$, $I_F = 140 \text{ A}$, $-di_F/dt = 1000 \text{ A}/\mu\text{s}$		210		
			$T_{vj} = 175 \text{ }^{\circ}\text{C}$, $I_F = 70 \text{ A}$, $-di_F/dt = 1000 \text{ A}/\mu\text{s}$		260		
Reverse recovery energy	E_{rec}	$V_R = 800 \text{ V}$	$T_{vj} = 25 \text{ }^{\circ}\text{C}$, $I_F = 140 \text{ A}$, $-di_F/dt = 1000 \text{ A}/\mu\text{s}$		0.85		mJ
			$T_{vj} = 25 \text{ }^{\circ}\text{C}$, $I_F = 70 \text{ A}$, $-di_F/dt = 1000 \text{ A}/\mu\text{s}$		0.7		
			$T_{vj} = 175 \text{ }^{\circ}\text{C}$, $I_F = 140 \text{ A}$, $-di_F/dt = 1000 \text{ A}/\mu\text{s}$		2.15		
			$T_{vj} = 175 \text{ }^{\circ}\text{C}$, $I_F = 70 \text{ A}$, $-di_F/dt = 1000 \text{ A}/\mu\text{s}$		1.75		
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.

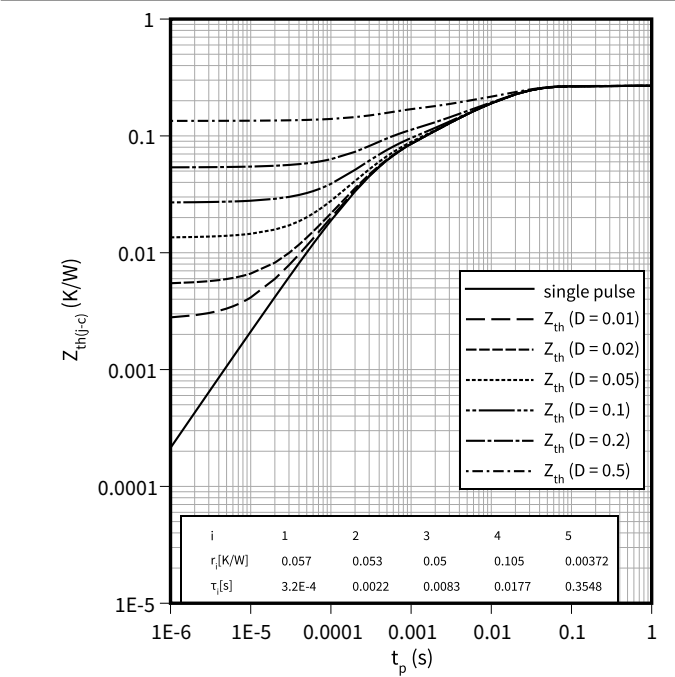
Dynamic test circuit, parasitic inductance $L_{\sigma} = 27 \text{ nH}$, parasitic capacitor $C_{\sigma} = 12 \text{ pF}$ from Fig. E, IKY140N120CH7 was used as IGBT.

3

Characteristics diagrams

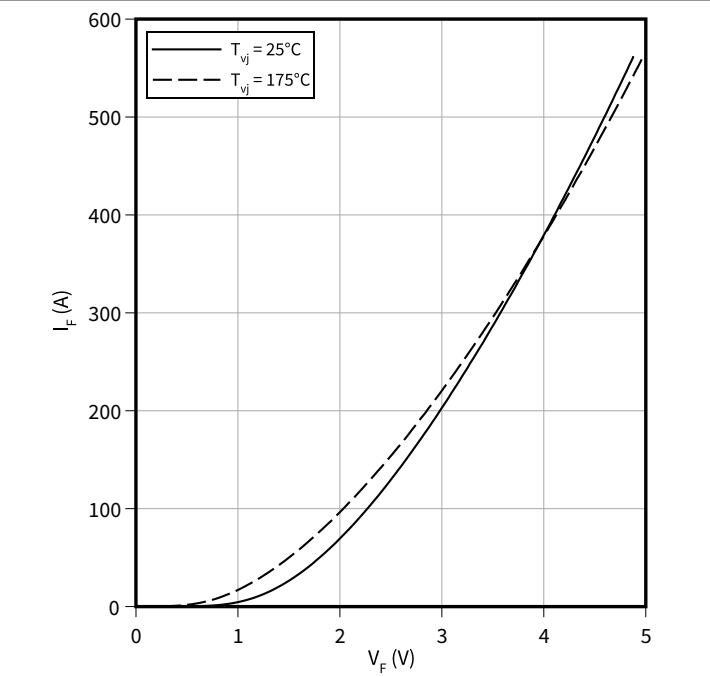
Diode transient thermal impedance as a function of pulse width

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



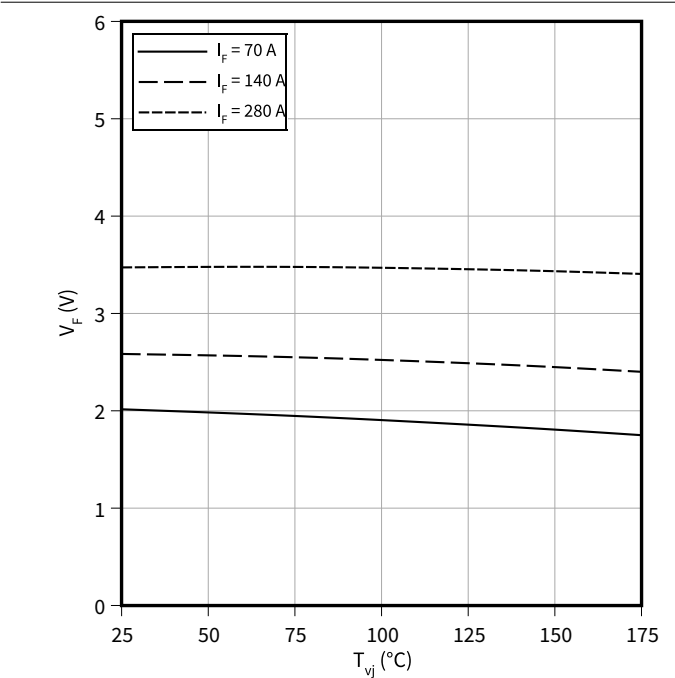
Typical diode forward current as a function of forward voltage

$$I_F = f(V_F)$$



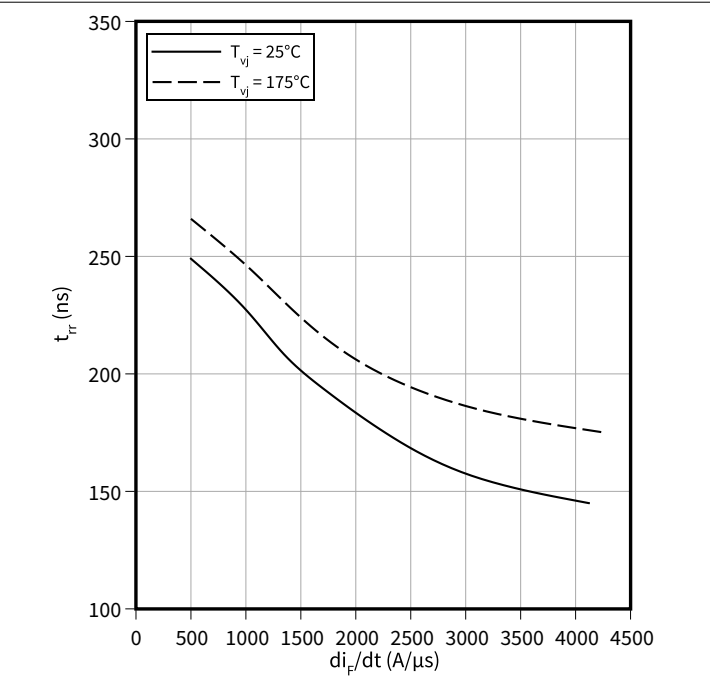
Typical diode forward voltage as a function of junction temperature

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



Typical reverse recovery time as a function of diode current slope

$$t_{rr} = f(di_F/dt)$$
$$V_R = 800 \text{ V}, I_F = 140 \text{ A}$$

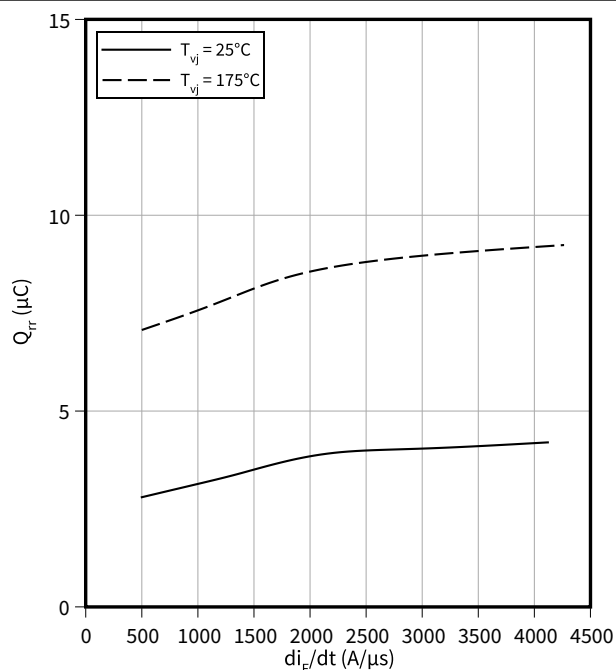


3 Characteristics diagrams

Typical reverse recovery charge as a function of diode current slope

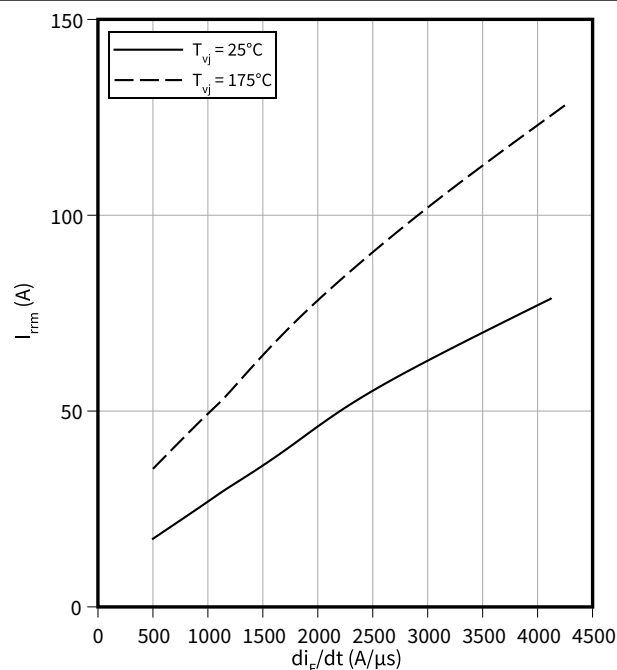
$$Q_{rr} = f(di_F/dt)$$

$$V_R = 800 \text{ V}, I_F = 140 \text{ A}$$

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

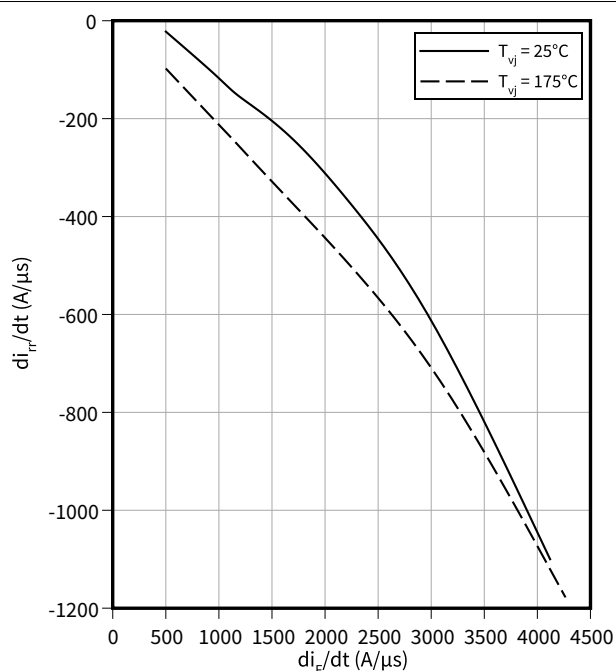
$$I_{rrm} = f(di_F/dt)$$

$$V_R = 800 \text{ V}, I_F = 140 \text{ A}$$

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

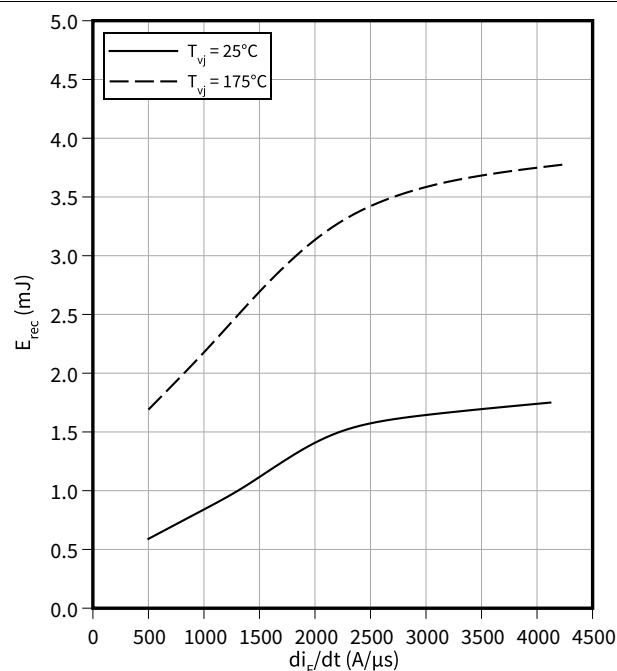
$$di_{rr}/dt = f(di_F/dt)$$

$$V_R = 800 \text{ V}, I_F = 140 \text{ A}$$

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

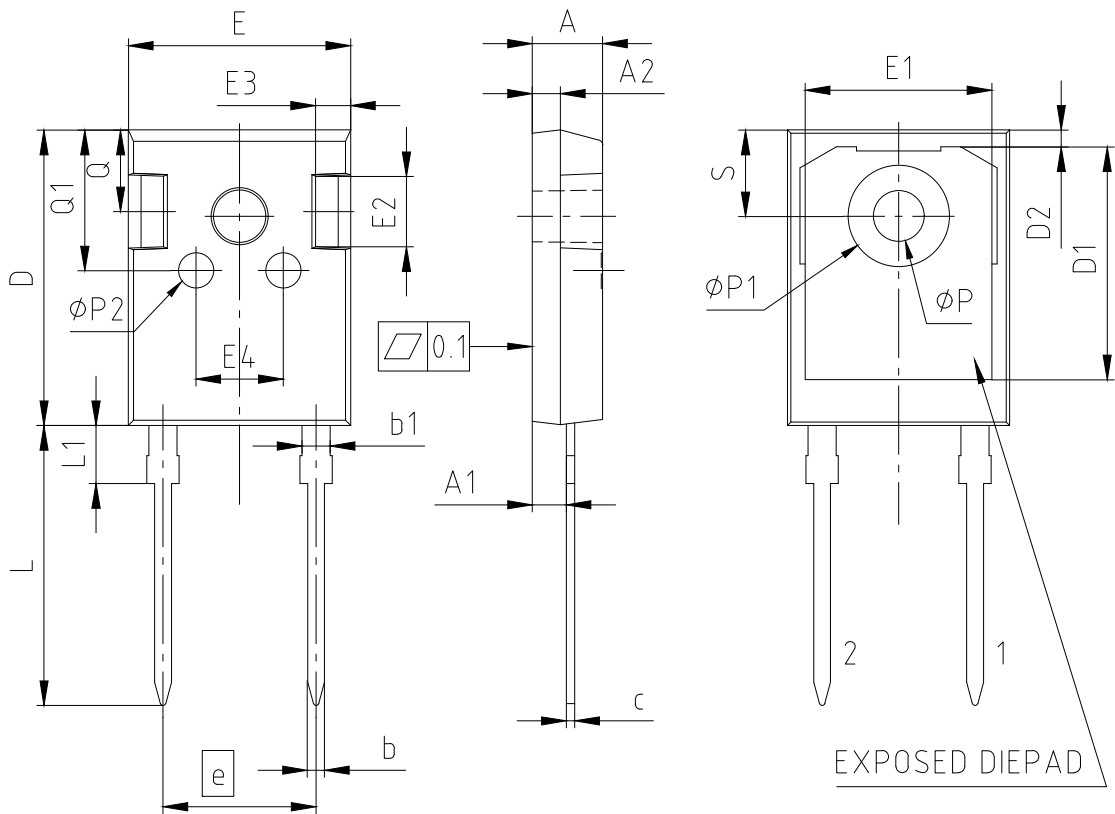
$$E_{rec} = f(di_F/dt)$$

$$V_R = 800 \text{ V}, I_F = 140 \text{ A}$$



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	ϕP	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

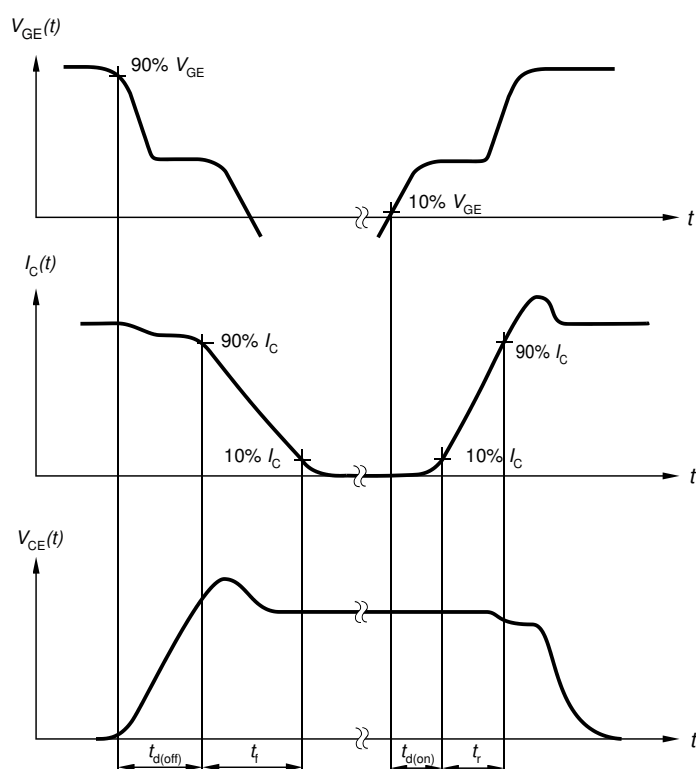


Figure A. Definition of switching times

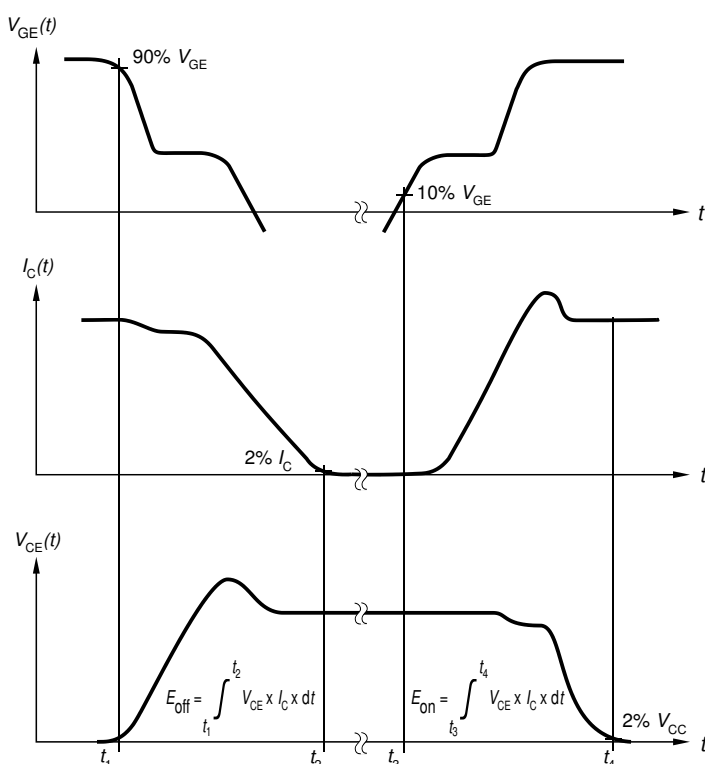


Figure B. Definition of switching losses

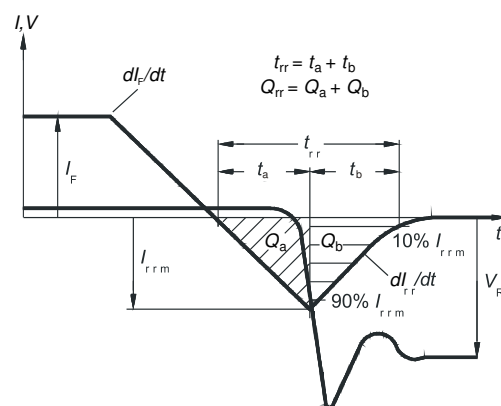


Figure C. Definition of diode switching characteristics

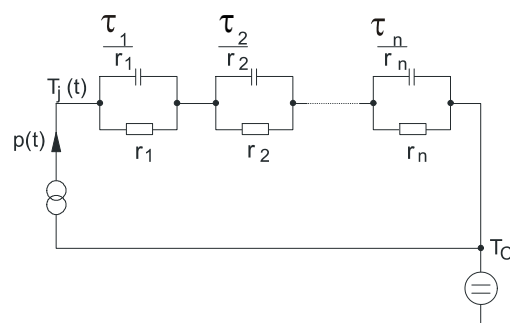


Figure D. Thermal equivalent circuit

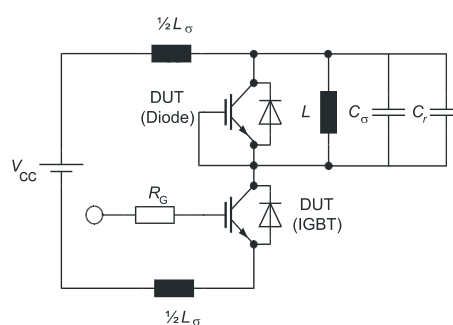


Figure E. **Dynamic test circuit**
Parasitic inductance L_{σ} ,
parasitic capacitor C_{σ} ,
relief capacitor C_r ,
(only for ZVT switching)

Revision history

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

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