Diode
Rapid Switching Emitter Controlled Diode

IDW15E65D2
Emitter Controlled Diode

Data sheet

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Emitter Controlled Diode

## Rapid Switching Emitter Controlled Diode

Features:

• Qualified according to JEDEC for target applications
• 650 V Emitter Controlled technology
• Fast recovery
• Soft switching
• Low reverse recovery charge
• Low forward voltage and stable over temperature
• 175 °C junction operating temperature
• Easy paralleling
• Pb-free lead plating; RoHS compliant
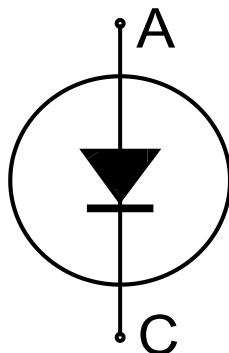
Applications:

• Boost diode in CCM PFC

Package pin definition:

• Pin 1 - not connected
• Pin 2 - cathode
• Pin 3 - anode

A

C

TO-247

1 2 3

PB Green

HAL Halogen-Free

RoHS

Key Performance and Package Parameters

Type	V_{rrm}	I_f	V_f, T_{vj}=25°C	T_{vjmax}	Marking	Package
IDW15E65D2	650V	15A	1.6V	175°C	E15ED2	PG-TO247-3

Table of Contents

Maximum Ratings

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	V_{RRM}	650	V
Diode forward current, limited by T_{vjmax} T_C = 25°C T_C = 100°C	I_F	30.0 15.0	A
Diode pulsed current, t_p limited by T_{vjmax}	I_{Fpuls}	45.0	A
Diode surge non repetitive forward current T_C = 25°C, t_p = 8.3ms, sine halfwave	I_{FSM}	100.0	A
Power dissipation T_C = 25°C	P_{tot}	85.7	W
Operating junction temperature	T_{vj}	-40...+175	°C
Storage temperature	T_{stg}	-55...+150	°C
Soldering temperature, wave soldering 1.6 mm (0.063 in.) from case for 10s		260	°C
Mounting torque, M3 screw Maximum of mounting processes: 3	M	0.6	Nm

Thermal Resistance

Parameter	Symbol	Conditions	Max. Value	Unit
Characteristic				
Diode thermal resistance,[1] junction - case	$R_{th(j-c)}$		1.75	K/W
Thermal resistance junction - ambient	$R_{th(j-a)}$		40	K/W

Electrical Characteristic, 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 = 15.0A T_{vj} = 25°C T_{vj} = 175°C	- -	1.60 1.65	2.20 -	V
Reverse leakage current	I_R	V_R = 650V T_{vj} = 25°C T_{vj} = 175°C	- -	- -	40.0 4000.0	µA

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

[1] Please be aware that in non standard load conditions, due to high Rth(j-c), Tvj close to Tvjmax can be reached.

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Switching Characteristic, Inductive Load

Parameter	Symbol	Conditions	Value			Unit
			min.	typ.	max.	

Diode Characteristic, at T_{vj} = 25°C

Parameter	Symbol	Conditions	min.	typ.	max.	Unit
Diode reverse recovery time	t_{rr}	T_{vj} = 25°C, V_R = 400V, I_F = 15.0A, di_F/dt = 1000A/µs, $L\sigma$ = 35nH, $C\sigma$ = 32pF, switch IPW60R045CP	-	30	-	ns
Diode reverse recovery charge	Q_{rr}		-	0.20	-	µC
Diode peak reverse recovery current	I_{rrm}		-	12.8	-	A
Diode peak rate of fall of reverse recovery current during t_b	di_{rr}/dt		-	-6500	-	A/µs
Diode reverse recovery time	t_{rr}	T_{vj} = 25°C, V_R = 400V, I_F = 15.0A, di_F/dt = 200A/µs, $L\sigma$ = 35nH, $C\sigma$ = 32pF, switch IPW60R045CP	-	47	-	ns
Diode reverse recovery charge	Q_{rr}		-	0.12	-	µC
Diode peak reverse recovery current	I_{rrm}		-	3.3	-	A
Diode peak rate of fall of reverse recovery current during t_b	di_{rr}/dt		-	-1500	-	A/µs

Switching Characteristic, Inductive Load

Parameter	Symbol	Conditions	Value			Unit
			min.	typ.	max.	

Diode Characteristic, at T_{vj} = 175°C/125°C

| Parameter	Symbol	Conditions	min.	typ.	max.	Unit
Diode reverse recovery time	t_{rr}	T_{vj} = 175°C, V_R = 400V, I_F = 15.0A, di_F/dt = 1000A/µs, $L\sigma$ = 35nH, $C\sigma$ = 32pF, switch IPW60R045CP	-	30	-	ns
Diode reverse recovery charge	Q_{rr}		-	0.37	-	µC
Diode peak reverse recovery current	I_{rrm}		-	16.9	-	A
Diode peak rate of fall of reverse recovery current during t_b	di_{rr}/dt		-	-6800	-	A/µs
Diode reverse recovery time	t_{rr}	T_{vj} = 125°C, V_R = 400V, I_F = 15.0A, di_F/dt = 200A/µs, $L\sigma$ = 35nH, $C\sigma$ = 32pF, switch IPW60R045CP	-	51	-	ns
Diode reverse recovery charge	Q_{rr}		-	0.21	-	µC
Diode peak reverse recovery current	I_{rrm}		-	5.0	-	A
Diode peak rate of fall of reverse recovery current during t_b	di_{rr}/dt		-	-1900	-	A/µs

Emitter Controlled Diode
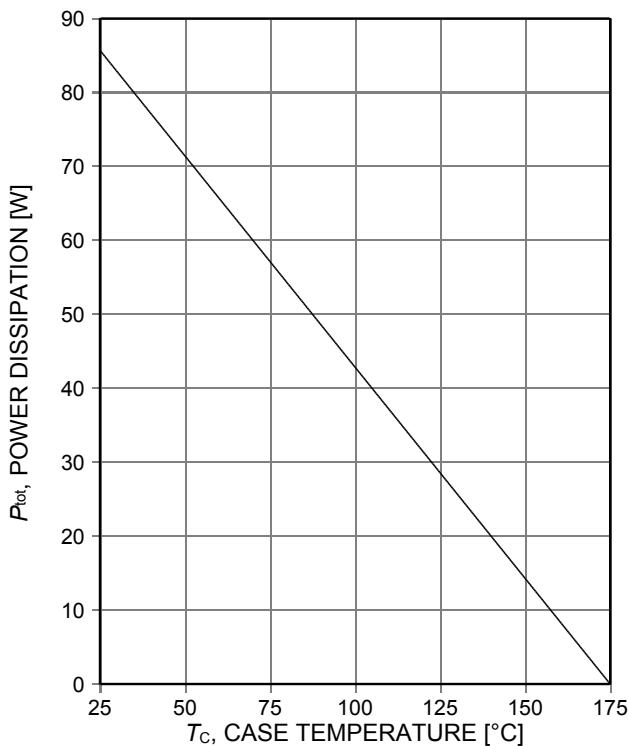
Figure 1. **Power dissipation as a function of case temperature**
($T_{vj} \leq 175°C$)
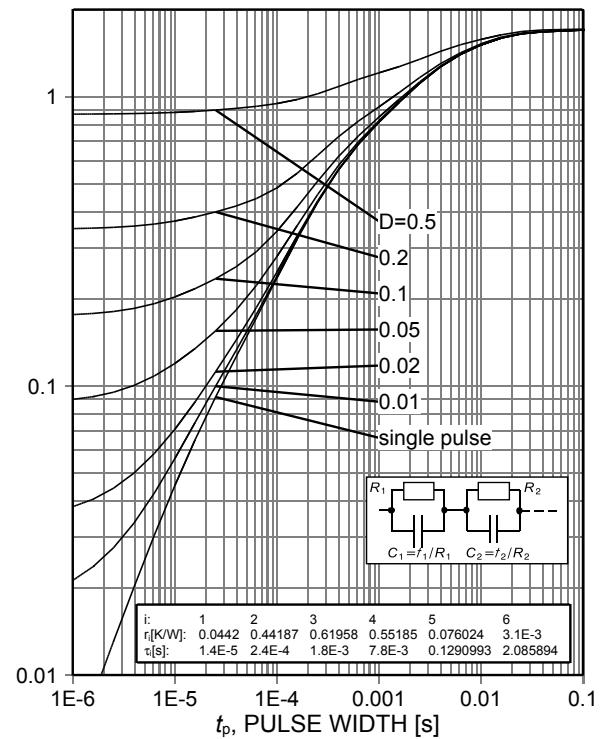
Figure 2. **Diode transient thermal impedance as a function of pulse width**
($D = t_p/T$)

| i:	1	2	3	4	5	6
r_i[K/W]:	0.0442	0.44187	0.61958	0.55185	0.076024	3.1E-3
τ_i[s]:	1.4E-5	2.4E-4	1.8E-3	7.8E-3	0.1290993	2.085894
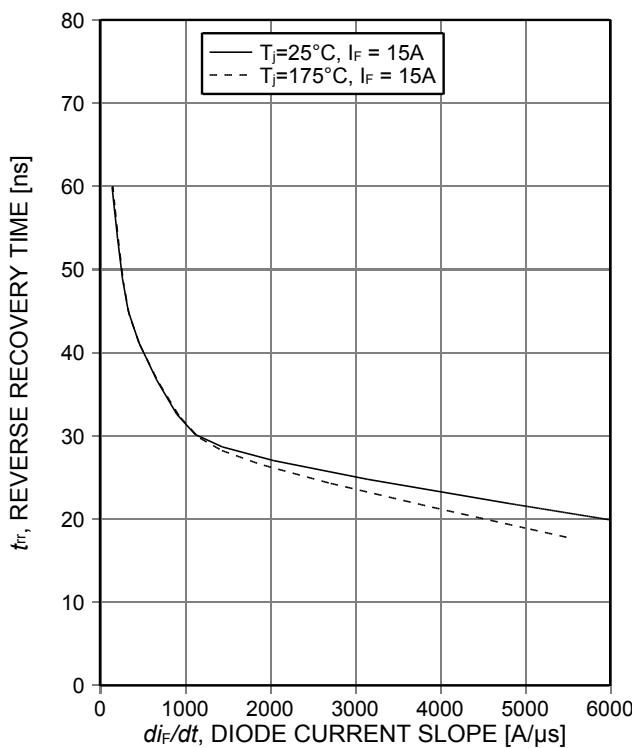
Figure 3. **Typical reverse recovery time as a function of diode current slope**
($V_R = 400V$)
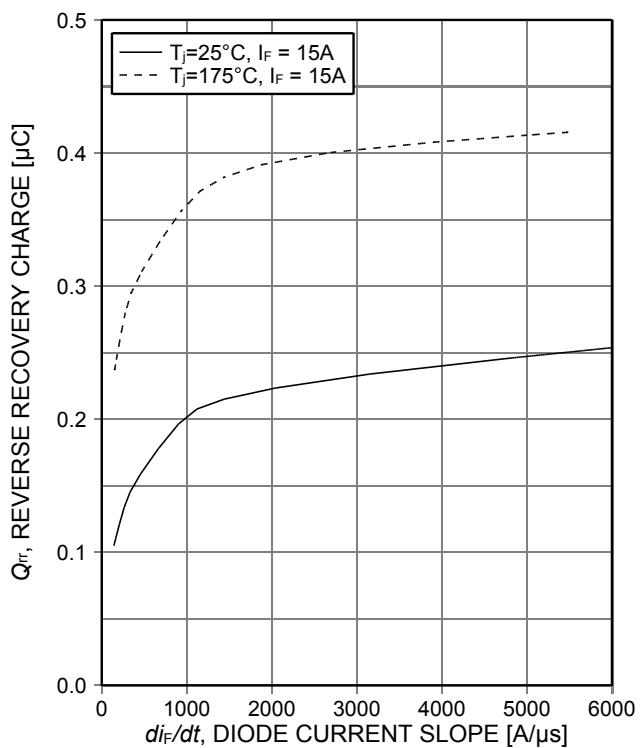
Figure 4. **Typical reverse recovery charge as a function of diode current slope**
($V_R = 400V$)

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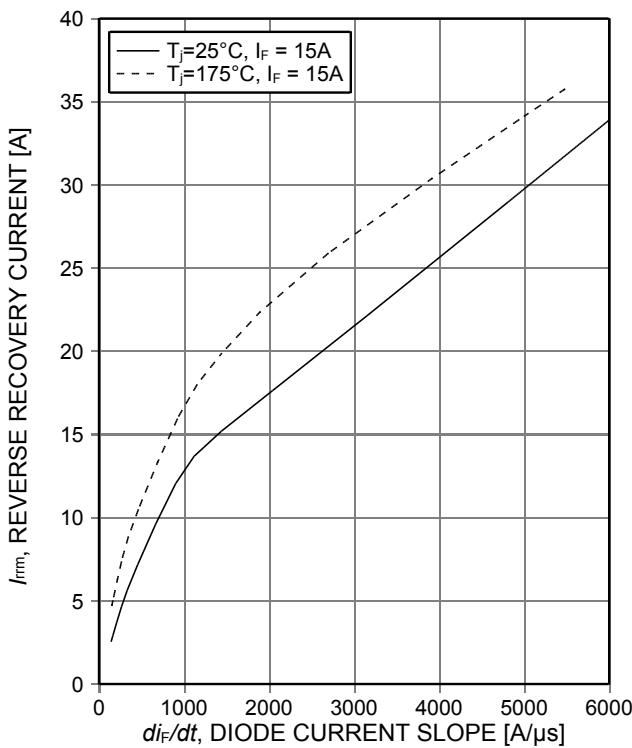
Figure 5. **Typical peak reverse recovery current as a function of diode current slope**
(V_R=400V)
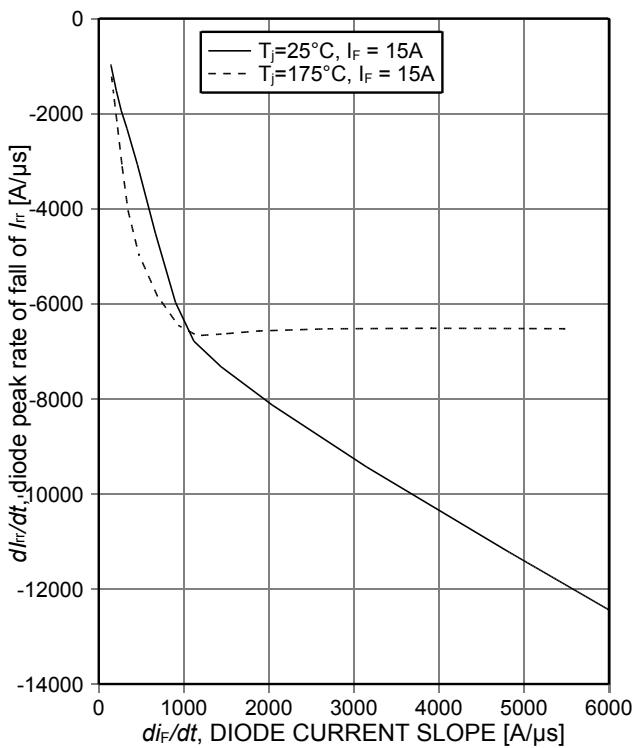
Figure 6. **Typical diode peak rate of fall of reverse recovery current as a function of diode current slope**
(V_R=400V)
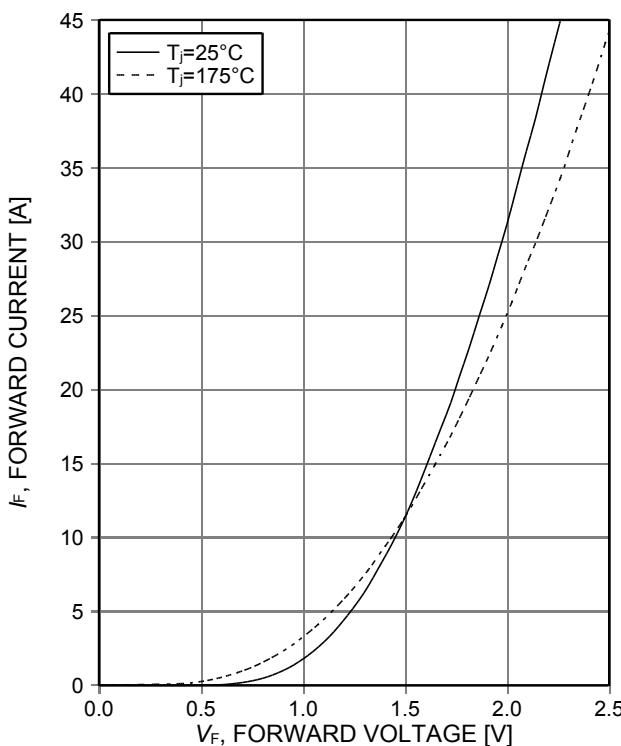
Figure 7. **Typical diode forward current as a function of forward voltage**
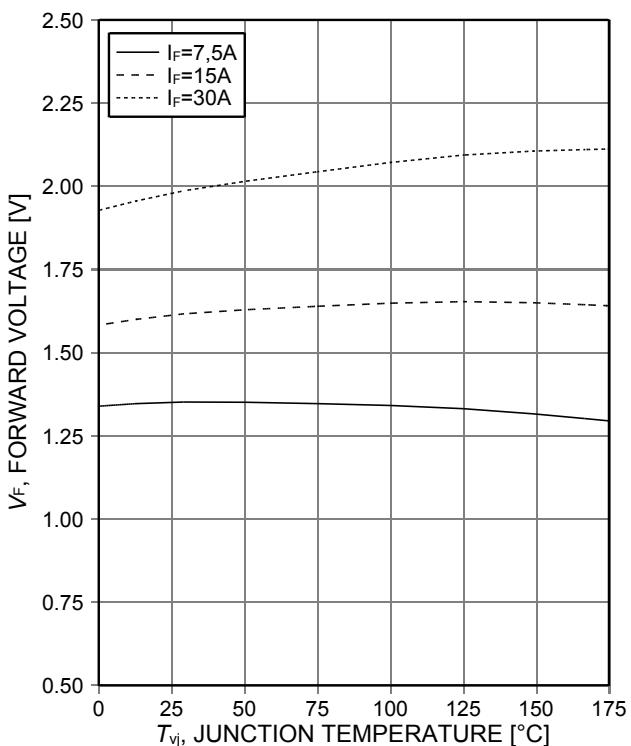
Figure 8. **Typical diode forward voltage as a function of junction temperature**

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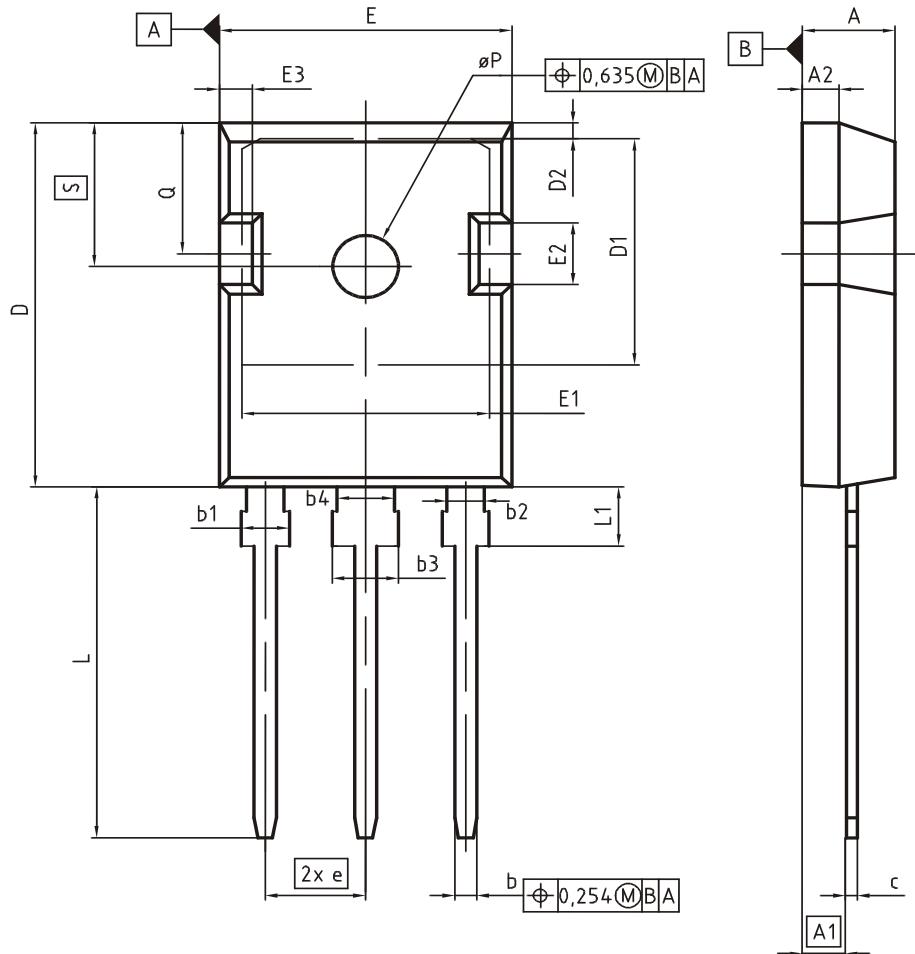
DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	4.83	5.21	0.190	0.205
A1	2.27	2.54	0.089	0.100
A2	1.85	2.16	0.073	0.085
b	1.07	1.33	0.042	0.052
b1	1.90	2.41	0.075	0.095
b2	1.90	2.16	0.075	0.085
b3	2.87	3.38	0.113	0.133
b4	2.87	3.13	0.113	0.123
c	0.55	0.68	0.022	0.027
D	20.80	21.10	0.819	0.831
D1	16.25	17.65	0.640	0.695
D2	0.95	1.35	0.037	0.053
E	15.70	16.13	0.618	0.635
E1	13.10	14.15	0.516	0.557
E2	3.68	5.10	0.145	0.201
E3	1.00	2.60	0.039	0.102
e	5.44 (BSC)		0.214 (BSC)	
N	3		3	
L	19.80	20.32	0.780	0.800
L1	4.10	4.47	0.161	0.176
øP	3.50	3.70	0.138	0.146
Q	5.49	6.00	0.216	0.236
S	6.04	6.30	0.238	0.248

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SCALE

EUROPEAN PROJECTION

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05

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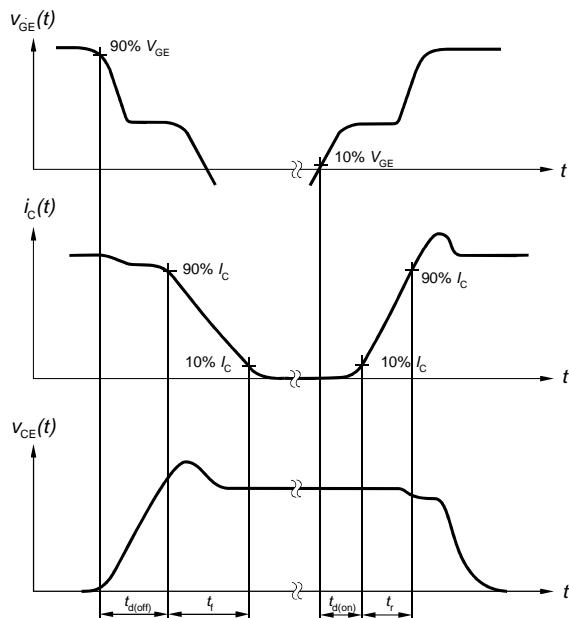
Figure A. Definition of switching times
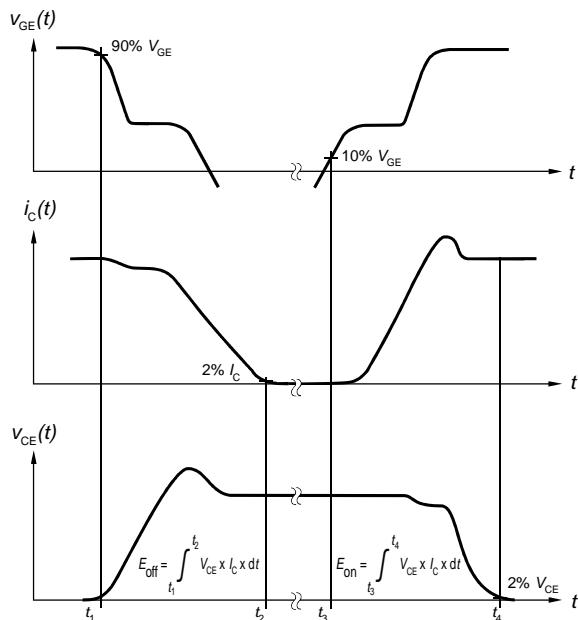
Figure B. Definition of switching losses

$$E_{off} = \int_{t_1}^{t_2} V_{CE} \times I_C \times dt$$

$$E_{on} = \int_{t_3}^{t_4} V_{CE} \times I_C \times dt$$
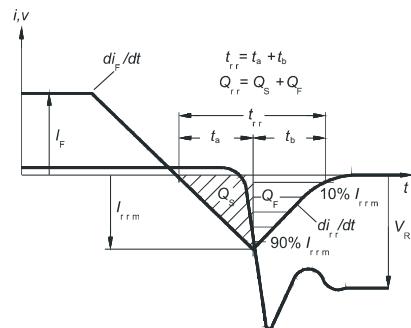
Figure C. Definition of diodes switching characteristics

$$t_{rr} = t_a + t_b$$
$$Q_{rr} = Q_S + Q_F$$
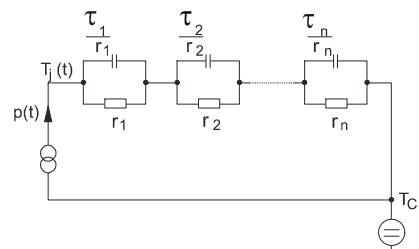
Figure D. Thermal equivalent circuit
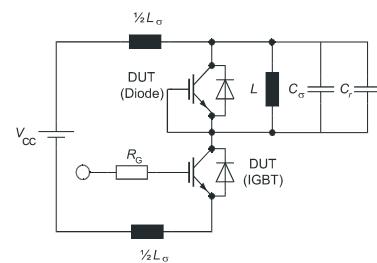
Figure E. Dynamic test circuit
Parasitic inductance L_σ,
Parasitic capacitor C_σ,
Relief capacitor C_r
(only for ZVT switching)