

Rapid Switching Emitter Controlled Diode

Features:

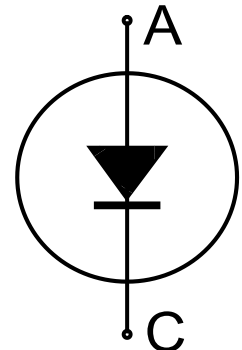
- Qualified according to JEDEC for target applications
- 650 V Emitter Controlled technology
- Fast recovery
- Soft switching
- Low reverse recovery charge
- Low forward voltage and stable over temperature
- 175 °C junction operating temperature
- Easy paralleling
- Pb-free lead plating; RoHS compliant

Applications:

- Boost diode in CCM PFC

Package pin definition:

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



Key Performance and Package Parameters

Type	V_{rrm}	I_f	$V_f, T_{vj}=25^{\circ}\text{C}$	T_{vjmax}	Marking	Package
IDW40E65D2	650V	40A	1.6V	175°C	E40ED2	PG-TO247-3

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Emitter Controlled Diode

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} $T_C = 25^\circ\text{C}$ $T_C = 100^\circ\text{C}$	I_F	80.0 40.0	A
Diode pulsed current, t_p limited by T_{vjmax}	I_{Fpuls}	120.0	A
Diode surge non repetitive forward current $T_C = 25^\circ\text{C}$, $t_p = 8.3\text{ms}$, sine halfwave	I_{FSM}	250.0	A
Power dissipation $T_C = 25^\circ\text{C}$	P_{tot}	180.0	W
Operating junction temperature	T_{vj}	-40...+175	$^\circ\text{C}$
Storage temperature	T_{stg}	-55...+150	$^\circ\text{C}$
Soldering temperature, wave soldering 1.6 mm (0.063 in.) from case for 10s		260	$^\circ\text{C}$
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	$R_{th(j-c)}$		0.84	K/W
Thermal resistance junction - ambient	$R_{th(j-a)}$		40	K/W

Electrical Characteristic, 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	$I_F = 40.0A$ $T_{vj} = 25^{\circ}C$ $T_{vj} = 175^{\circ}C$	- -	1.60 1.65	2.30 -	V
Reverse leakage current	I_R	$V_R = 650V$ $T_{vj} = 25^{\circ}C$ $T_{vj} = 175^{\circ}C$	- -	- -	40.0 4000.0	μA

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

¹⁾ Please be aware that in non standard load conditions, due to high $R_{th(j-c)}$, T_{vj} close to T_{vjmax} can be reached.

Switching Characteristic, 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}	$T_{vj} = 25^{\circ}\text{C},$ $V_R = 400\text{V},$ $I_F = 40.0\text{A},$ $di_F/dt = 1000\text{A}/\mu\text{s}$	-	36	-	ns
Diode reverse recovery charge	Q_{rr}		-	0.40	-	μC
Diode peak reverse recovery current	I_{rrm}		-	22.0	-	A
Diode peak rate of fall of reverse recovery current during t_b	di_{rr}/dt		-	-10000	-	$\text{A}/\mu\text{s}$
Diode reverse recovery time	t_{rr}	$T_{vj} = 25^{\circ}\text{C},$ $V_R = 400\text{V},$ $I_F = 40.0\text{A},$ $di_F/dt = 200\text{A}/\mu\text{s}$	-	75	-	ns
Diode reverse recovery charge	Q_{rr}		-	0.13	-	μC
Diode peak reverse recovery current	I_{rrm}		-	2.9	-	A
Diode peak rate of fall of reverse recovery current during t_b	di_{rr}/dt		-	-54	-	$\text{A}/\mu\text{s}$

Switching Characteristic, 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}	$T_{vj} = 175^{\circ}\text{C},$ $V_R = 400\text{V},$ $I_F = 40.0\text{A},$ $di_F/dt = 1000\text{A}/\mu\text{s}$	-	60	-	ns
Diode reverse recovery charge	Q_{rr}		-	1.14	-	μC
Diode peak reverse recovery current	I_{rrm}		-	32.0	-	A
Diode peak rate of fall of reverse recovery current during t_b	di_{rr}/dt		-	-8700	-	$\text{A}/\mu\text{s}$
Diode reverse recovery time	t_{rr}	$T_{vj} = 125^{\circ}\text{C},$ $V_R = 400\text{V},$ $I_F = 40.0\text{A},$ $di_F/dt = 200\text{A}/\mu\text{s}$	-	83	-	ns
Diode reverse recovery charge	Q_{rr}		-	0.32	-	μC
Diode peak reverse recovery current	I_{rrm}		-	5.6	-	A
Diode peak rate of fall of reverse recovery current during t_b	di_{rr}/dt		-	-51	-	$\text{A}/\mu\text{s}$

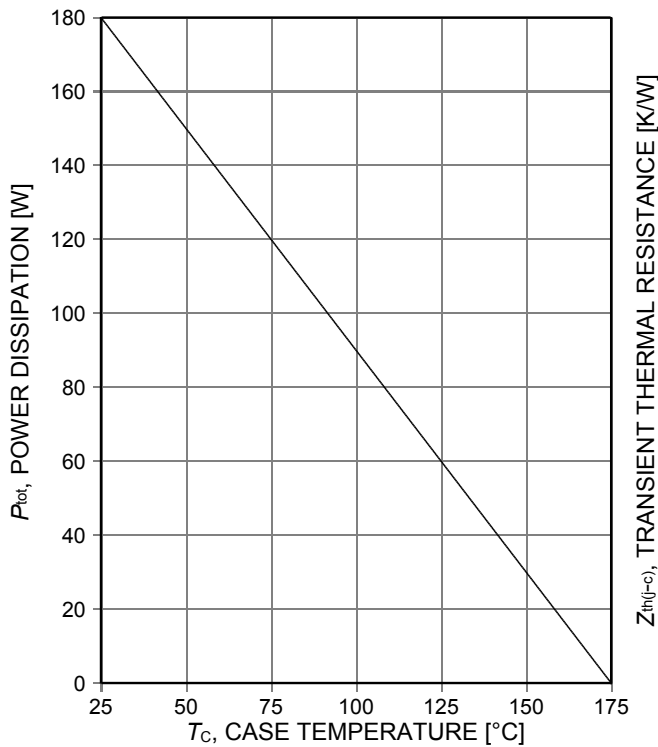


Figure 1. Power dissipation as a function of case temperature ($T_{vj} \leq 175^\circ\text{C}$)

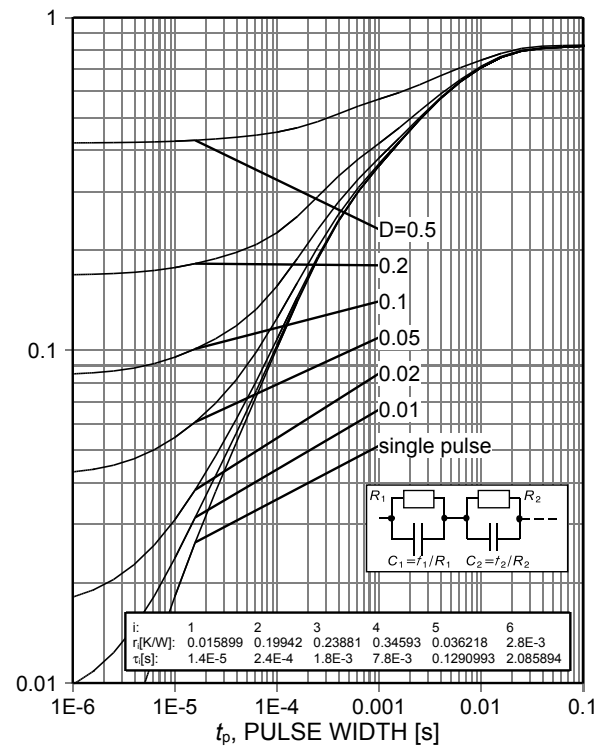


Figure 2. Diode transient thermal impedance as a function of pulse width ($D = t_p / T$)

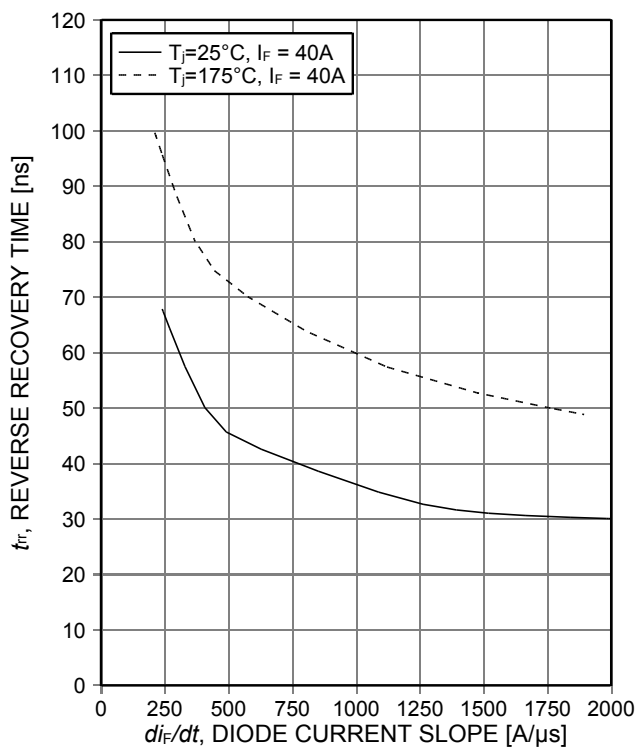


Figure 3. Typical reverse recovery time as a function of diode current slope ($V_R = 400\text{V}$)

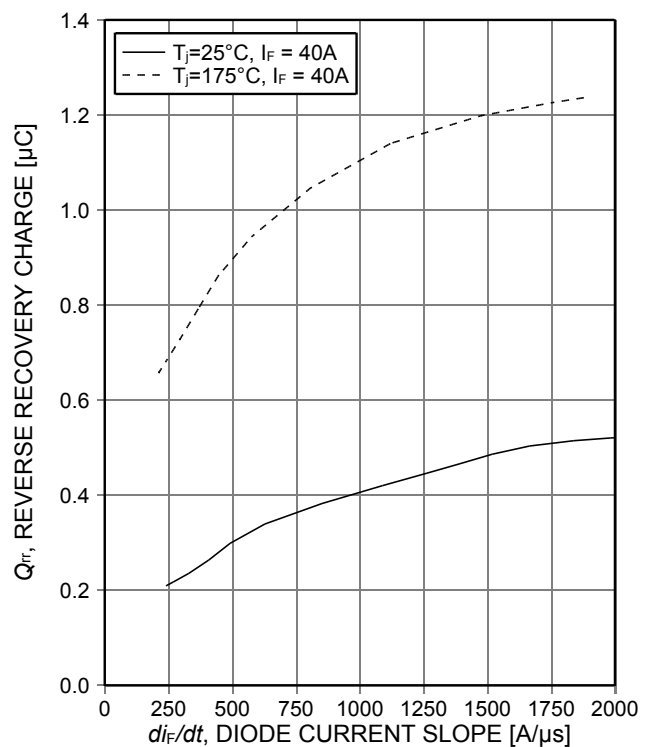


Figure 4. Typical reverse recovery charge as a function of diode current slope ($V_R = 400\text{V}$)

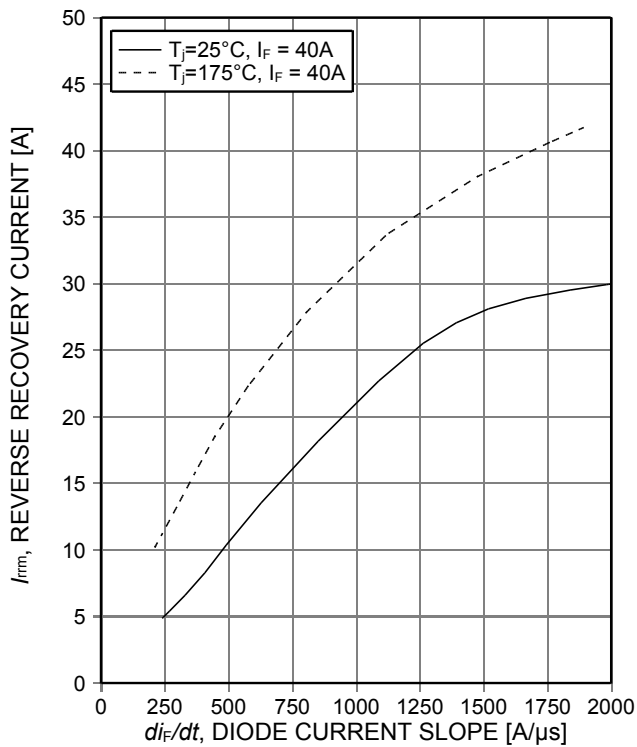


Figure 5. Typical peak reverse recovery current as a function of diode current slope ($V_R=400V$)

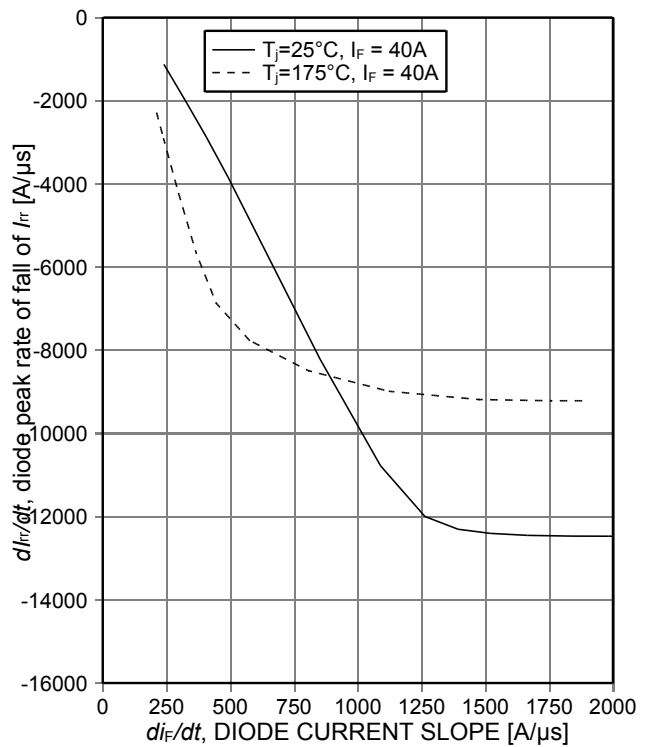


Figure 6. Typical diode peak rate of fall of reverse recovery current as a function of diode current slope ($V_R=400V$)

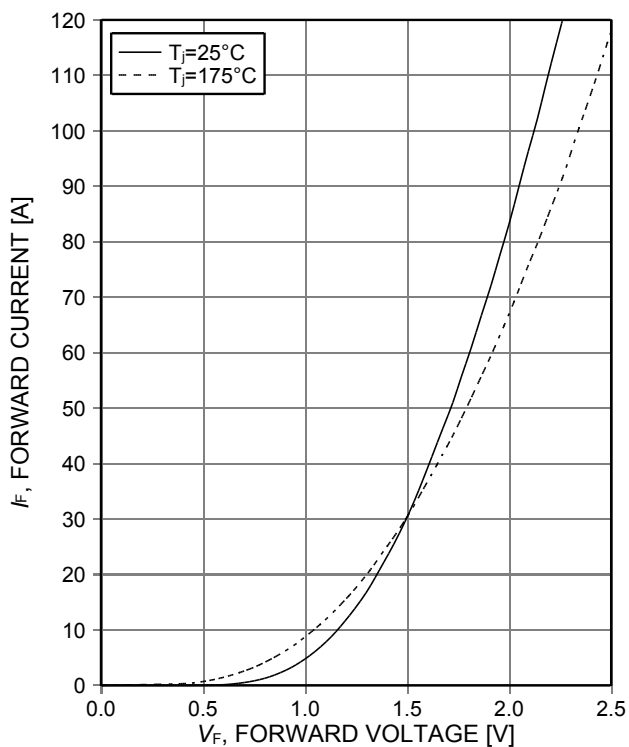


Figure 7. Typical diode forward current as a function of forward voltage

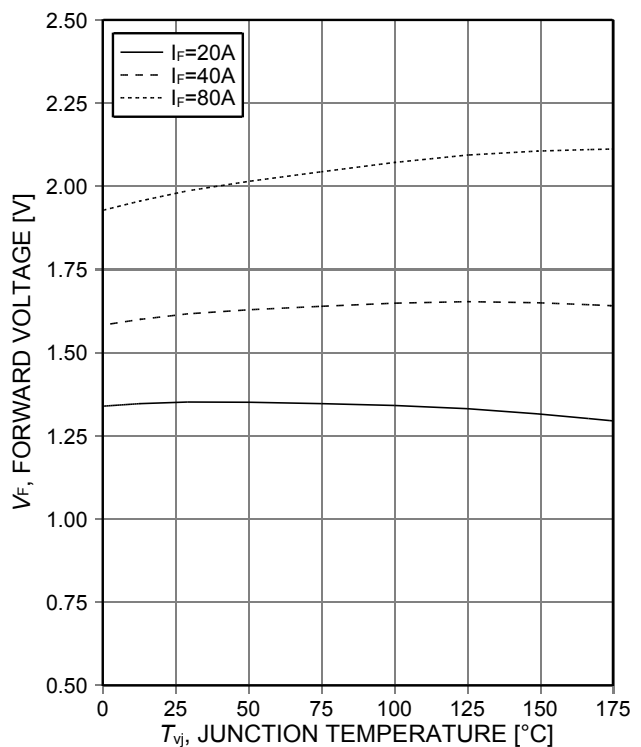
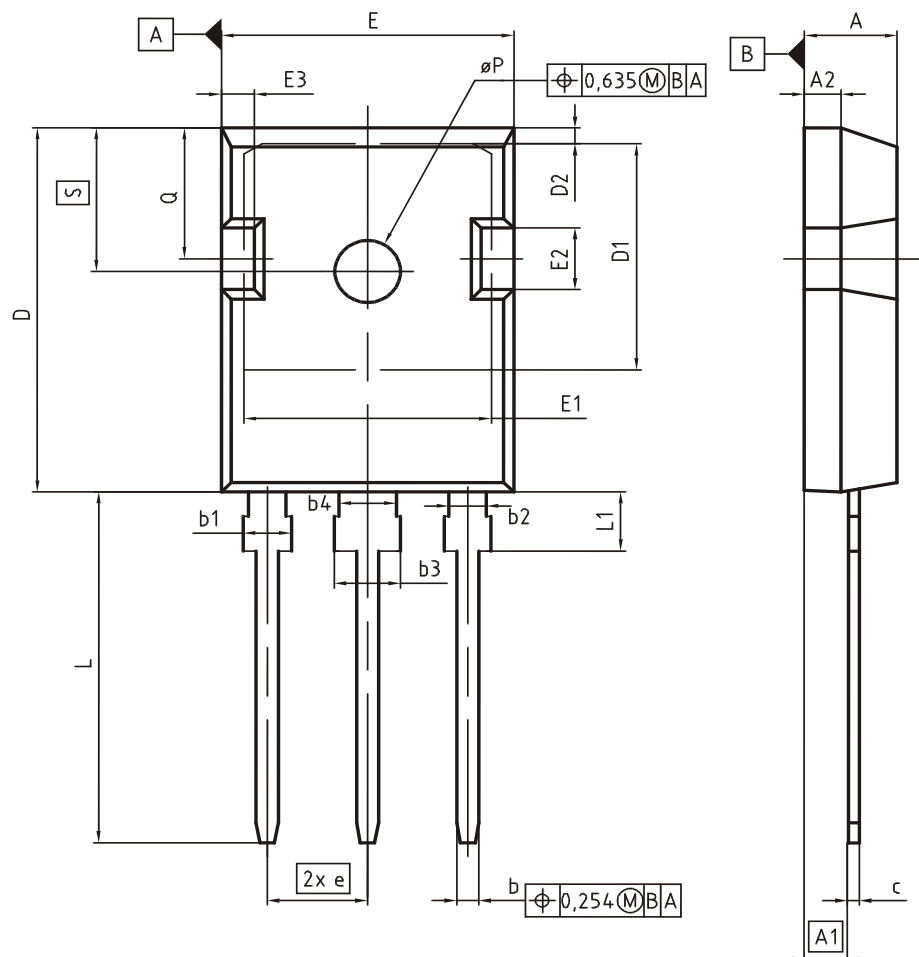
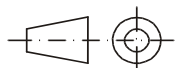


Figure 8. Typical diode forward voltage as a function of junction temperature

PG-TO247-3



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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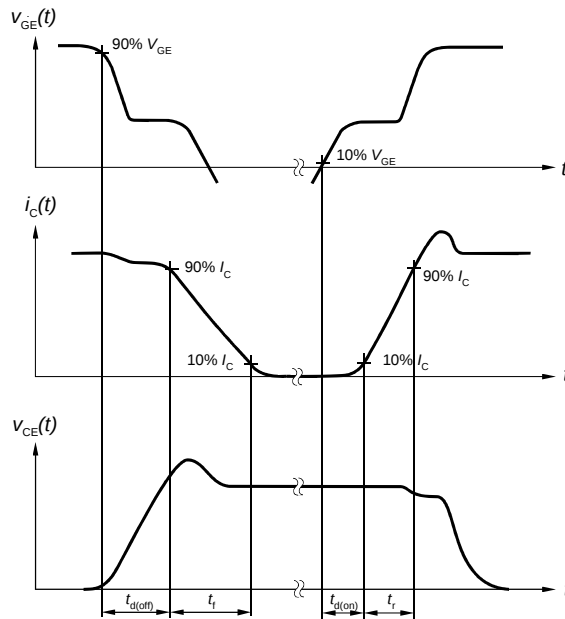


Figure A. Definition of switching times

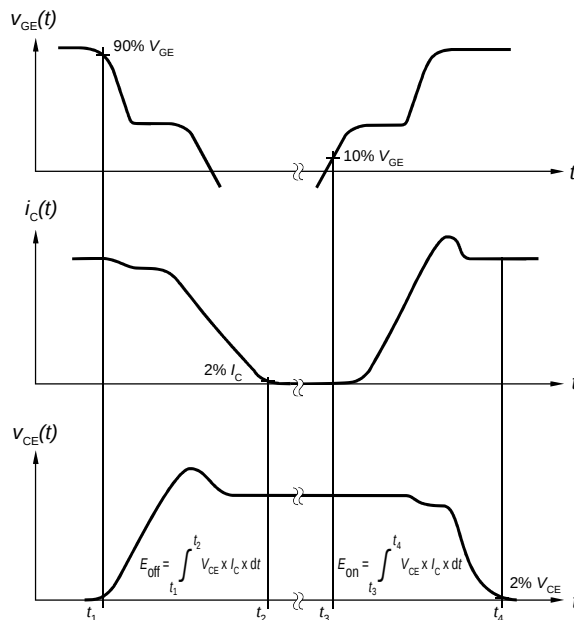


Figure B. Definition of switching losses

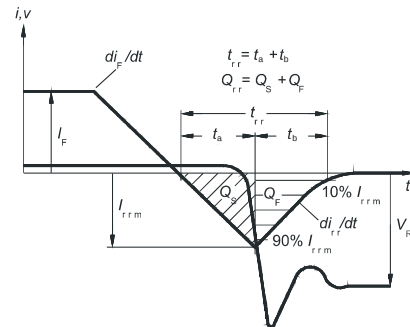


Figure C. Definition of diodes switching characteristics

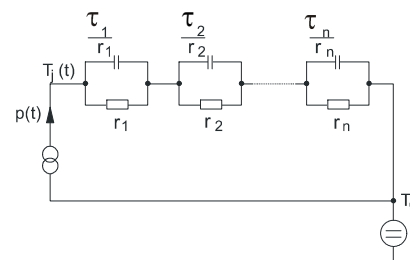
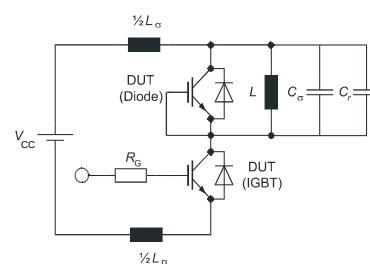


Figure D. Thermal equivalent circuit


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

Revision History

IDW40E65D2

Revision: 2013-12-16, Rev. 2.1

Previous Revision

Revision	Date	Subjects (major changes since last revision)
1.1	2013-03-14	Preliminary data sheet
1.2	2013-05-22	I _{FSM}
2.1	2013-12-16	Final DS / New Marking Pattern
2.2	2013-12-16	Value VFmax limit according BE test

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