Diode

Rapid Switching Emitter Controlled Diode

IDW40E65D1

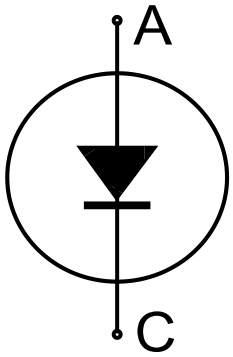
Emitter Controlled Diode Rapid 1 Series

Data sheet

Industrial Power Control

Rapid Switching Emitter Controlled Diode

Features:



- 650 V Emitter Controlled technology
- Temperature stable behaviour of key parameters
- Low forward voltage (V_F)
- Ultra fast recovery
- Low reverse recovery charge (Q_{rr})
- Low reverse recovery current (I_{rrm})
- Softness factor >1
- 175 °C junction operating temperature
- Pb-free lead plating; RoHS compliant

Applications:

- AC/DC converters
- Boost diode in PFC stages
- Free wheeling diodes in inverters and motor drives
- General purpose inverters
- Switch mode power supplies

Package pin definition:

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

Key Performance and Package Parameters

Type	V_{rrm}	I_f	V_f, T_{vj}=25°C	T_{vjmax}	Marking	Package
IDW40E65D1	650V	40A	1.35V	175°C	D40E65D1	PG-TO247-pin123

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Maximum ratings

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	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°C, t_p = 10.0ms, sine halfwave	I_{FSM}	320.0	A
Power dissipation T_C = 25°C	P_{tot}	179.0	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	$R_{th(j-c)}$		0.84	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 = 40.0A T_{vj} = 25°C T_{vj} = 125°C T_{vj} = 175°C	- - -	1.35 1.32 1.28	1.70 - -	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.

Switching Characteristic, Inductive Load

Parameter	Symbol	Conditions	Value			Unit
			min.	typ.	max.	
Diode Characteristic, at T_{vj} = 25°C						
Diode reverse recovery time	t_{rr}	T_{vj} = 25°C, V_R = 400V, I_F = 40.0A, di_F/dt = 1000A/µs	-	77	-	ns
Diode reverse recovery charge	Q_{rr}		-	0.87	-	µC
Diode peak reverse recovery current	I_{rrm}		-	17.5	-	A
Diode peak rate of fall of reverse recovery current during t_b	di_{rr}/dt		-	-1520	-	A/µs
Diode reverse recovery time	t_{rr}	T_{vj} = 25°C, V_R = 400V, I_F = 40.0A, di_F/dt = 200A/µs	-	129	-	ns
Diode reverse recovery charge	Q_{rr}		-	0.49	-	µC
Diode peak reverse recovery current	I_{rrm}		-	6.9	-	A
Diode peak rate of fall of reverse recovery current during t_b	di_{rr}/dt		-	-300	-	A/µs

Switching Characteristic, Inductive Load

Parameter	Symbol	Conditions	Value			Unit
			min.	typ.	max.	
Diode Characteristic, at T_{vj} = 175°C/125°C						
Diode reverse recovery time	t_{rr}	T_{vj} = 175°C, V_R = 400V, I_F = 40.0A, di_F/dt = 1000A/µs	-	110	-	ns
Diode reverse recovery charge	Q_{rr}		-	2.36	-	µC
Diode peak reverse recovery current	I_{rrm}		-	27.3	-	A
Diode peak rate of fall of reverse recovery current during t_b	di_{rr}/dt		-	-1320	-	A/µs
Diode reverse recovery time	t_{rr}	T_{vj} = 125°C, V_R = 400V, I_F = 40.0A, di_F/dt = 200A/µs	-	163	-	ns
Diode reverse recovery charge	Q_{rr}		-	1.04	-	µC
Diode peak reverse recovery current	I_{rrm}		-	10.4	-	A
Diode peak rate of fall of reverse recovery current during t_b	di_{rr}/dt		-	-600	-	A/µs

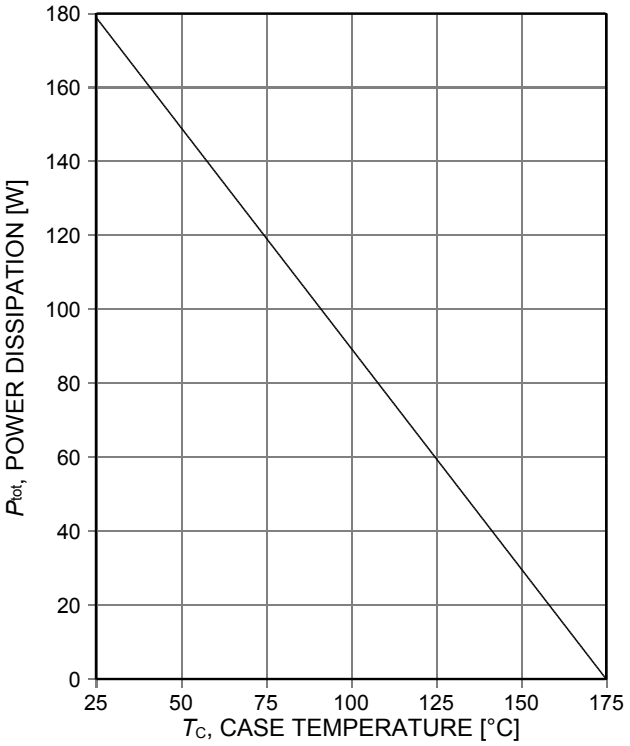

Figure 1. **Power dissipation as a function of case temperature**
(T_{vj}≤175°C)

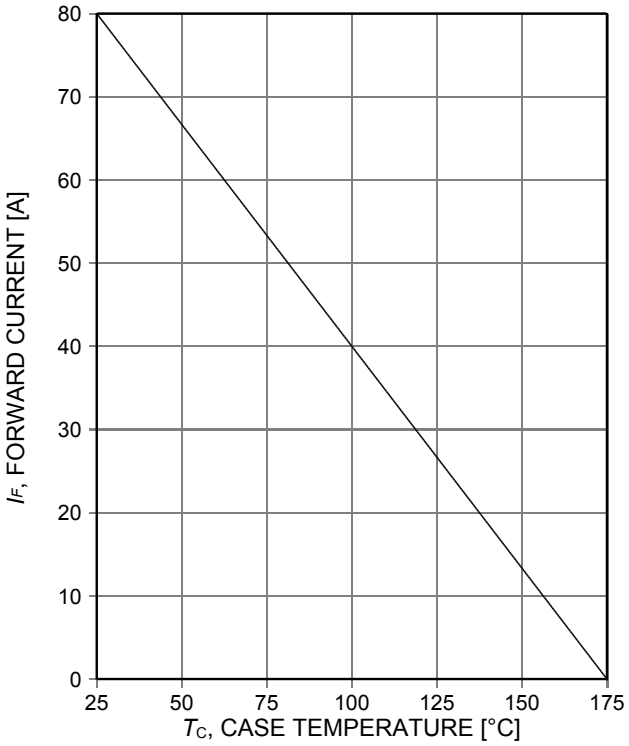

Figure 2. **Diode forward current as a function of case temperature**
(T_{vj}≤175°C)

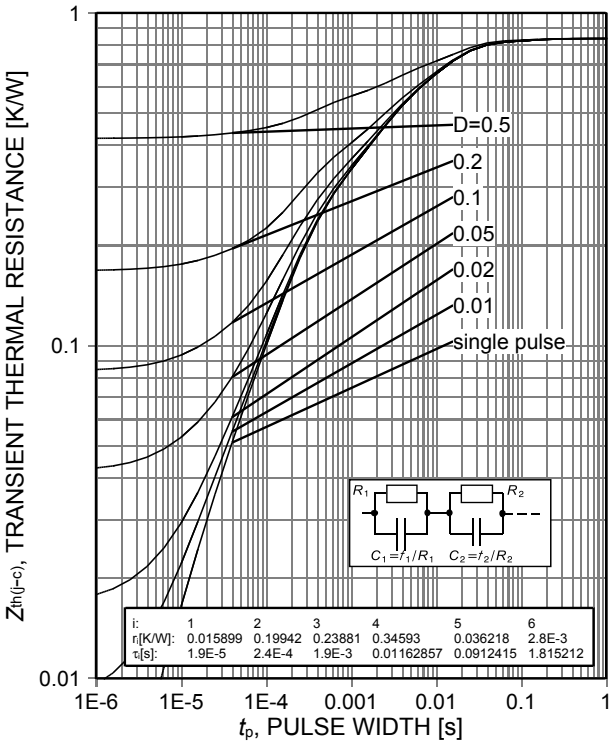

Figure 3. **Diode transient thermal impedance as a function of pulse width**
(D=t_p/T)

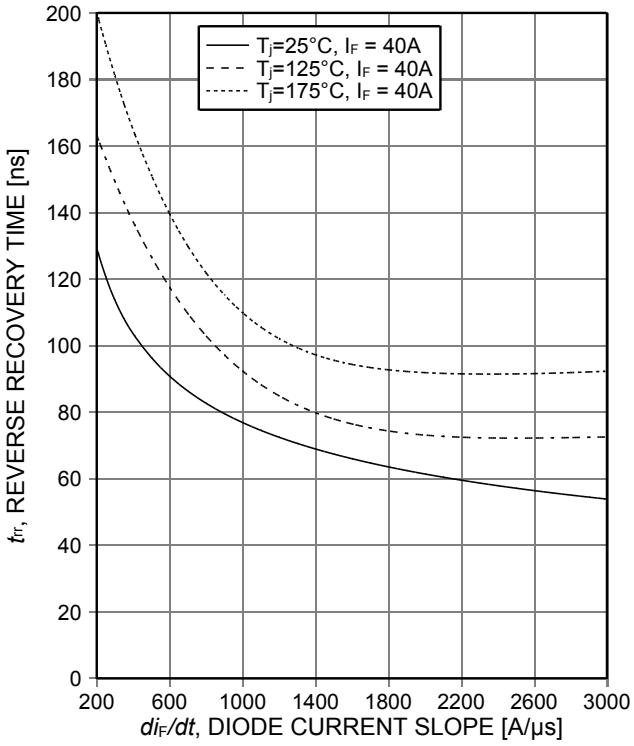

Figure 4. **Typical reverse recovery time as a function of diode current slope**
(V_R=400V)

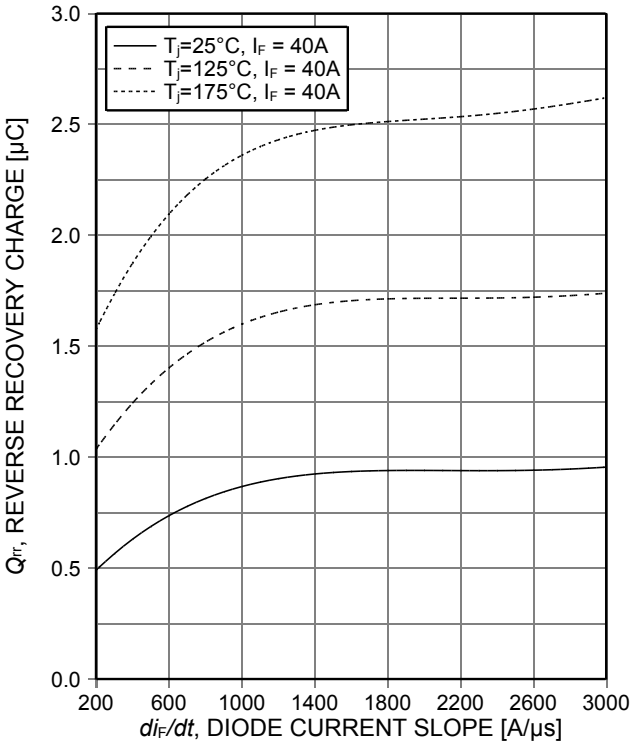

Figure 5. **Typical reverse recovery charge as a function of diode current slope**
(V_R=400V)

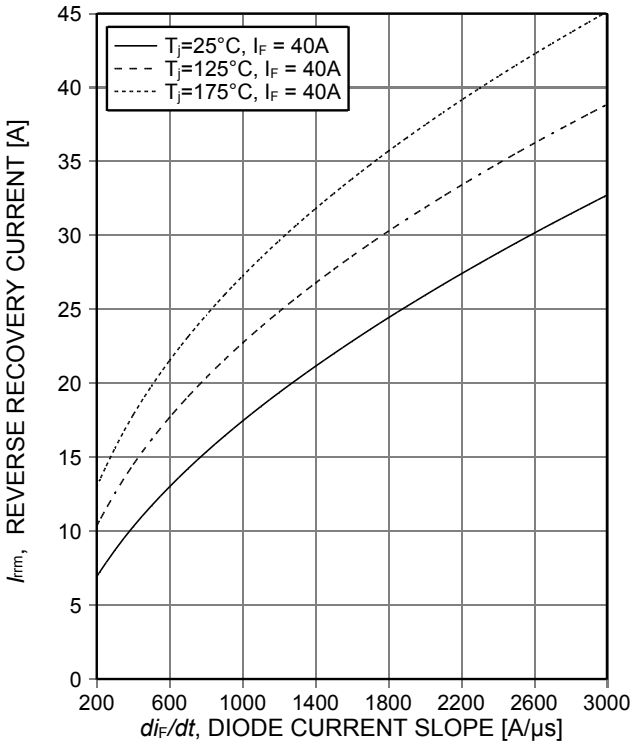

Figure 6. **Typical peak reverse recovery current as a function of diode current slope**
(V_R=400V)

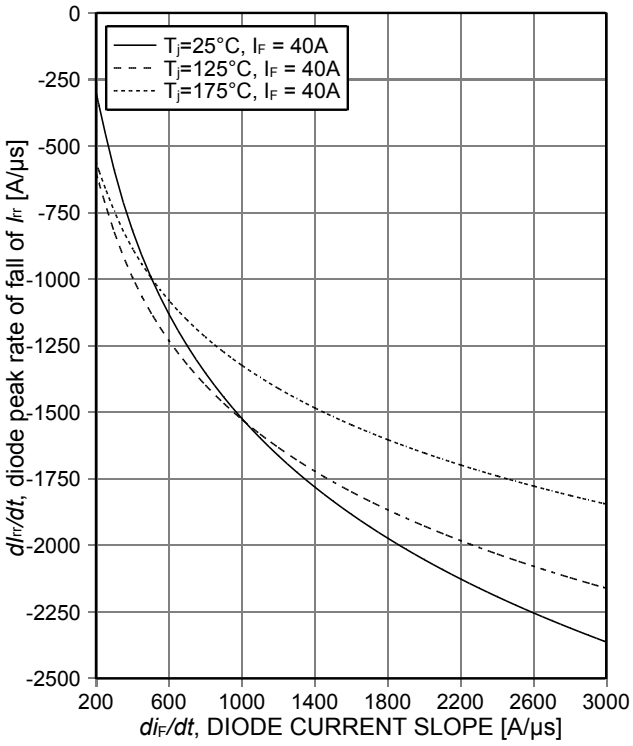

Figure 7. **Typical diode peak rate of fall of reverse recovery current as a function of diode current slope**
(V_R=400V)

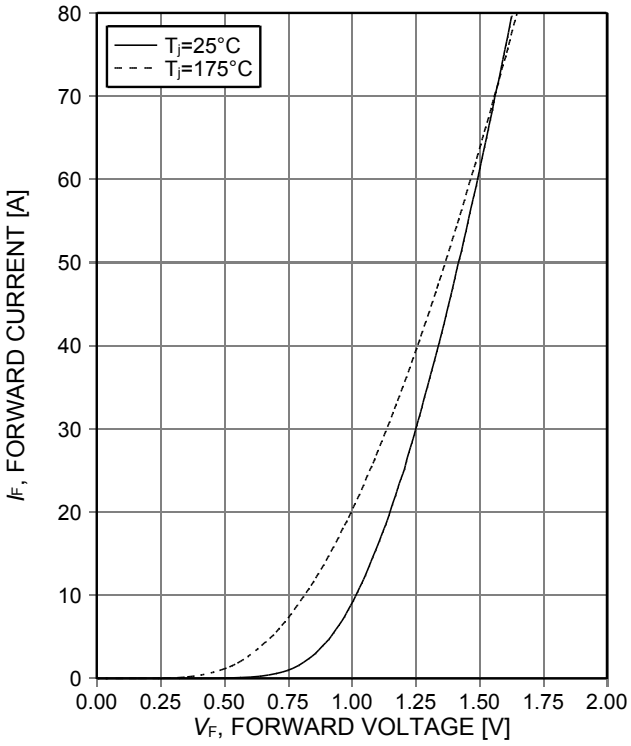

Figure 8. **Typical diode forward current as a function of forward voltage**

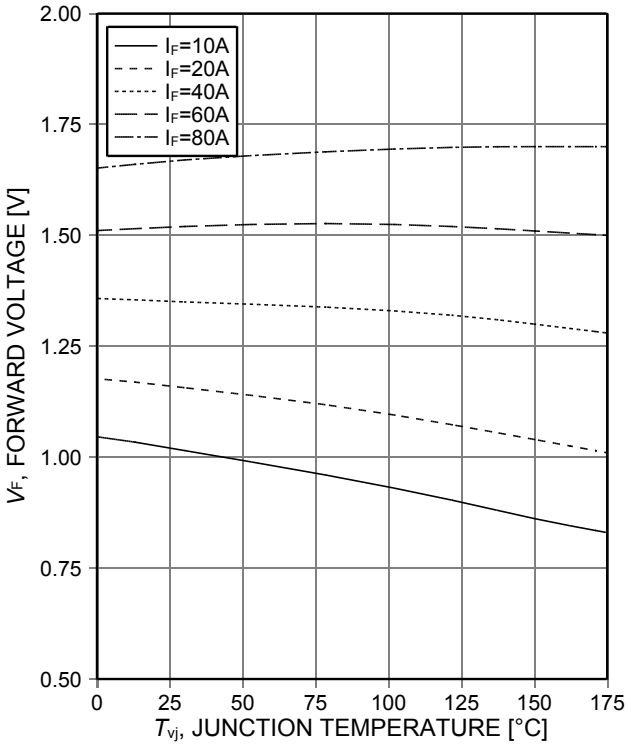

Figure 9. **Typical diode forward voltage as a function of junction temperature**

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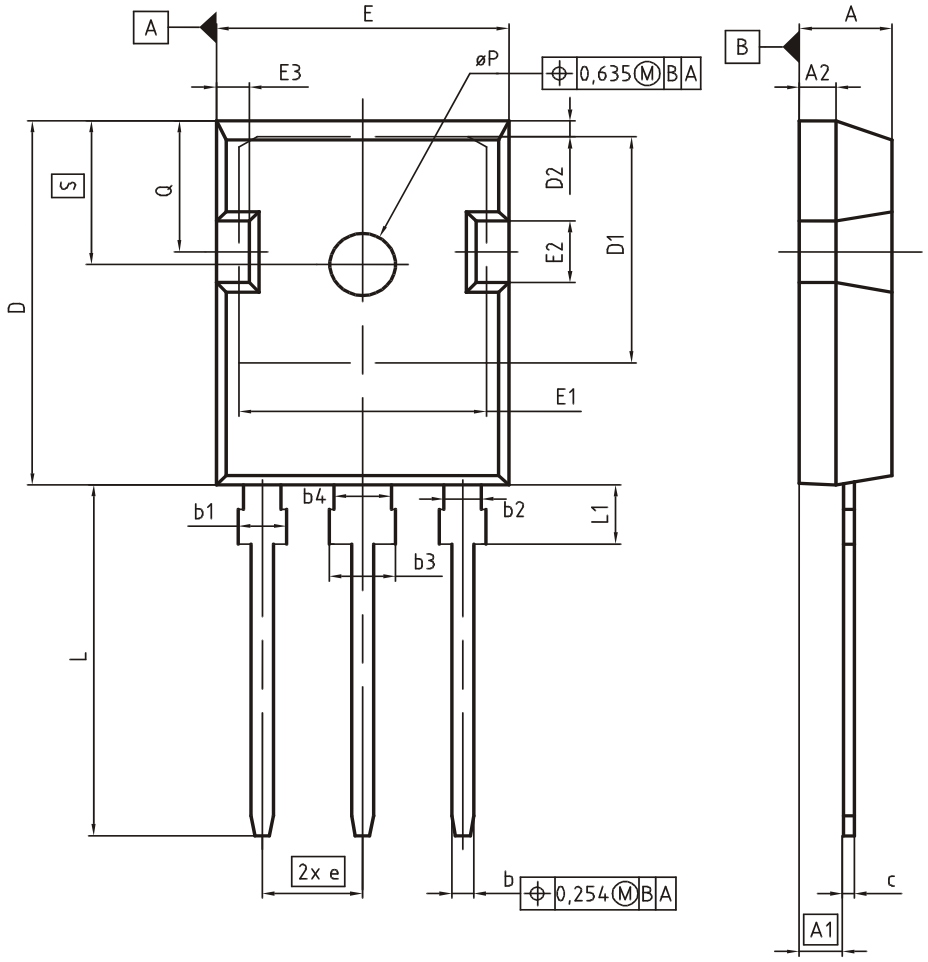

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	4.83	5.21	0.190	0.205
A1	2.27	2.54	0.089	0.100
A2	1.85	2.16	0.073	0.085
b	1.07	1.33	0.042	0.052
b1	1.90	2.41	0.075	0.095
b2	1.90	2.16	0.075	0.085
b3	2.87	3.38	0.113	0.133
b4	2.87	3.13	0.113	0.123
c	0.55	0.68	0.022	0.027
D	20.80	21.10	0.819	0.831
D1	16.25	17.65	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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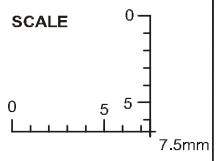
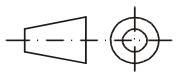
SCALE



EUROPEAN PROJECTION



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09-07-2010

REVISION
05

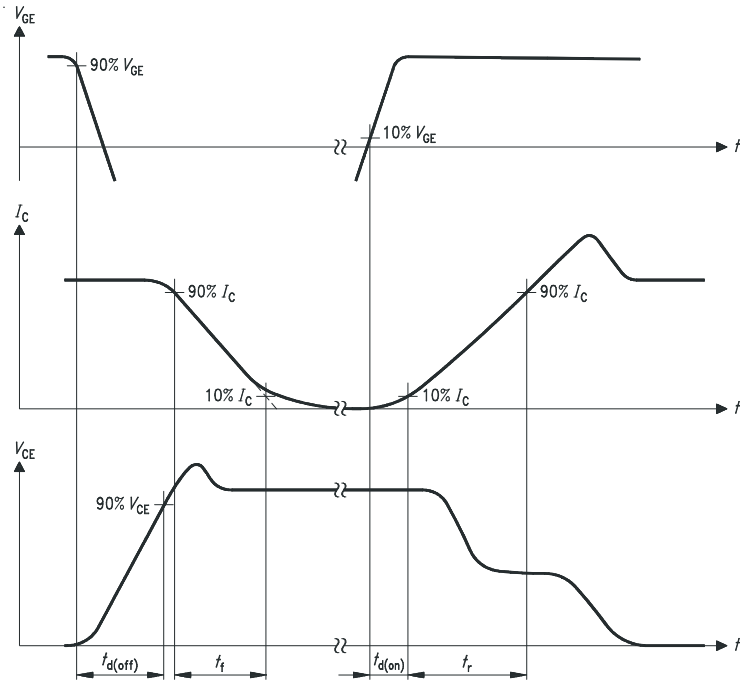

Figure A. Definition of switching times

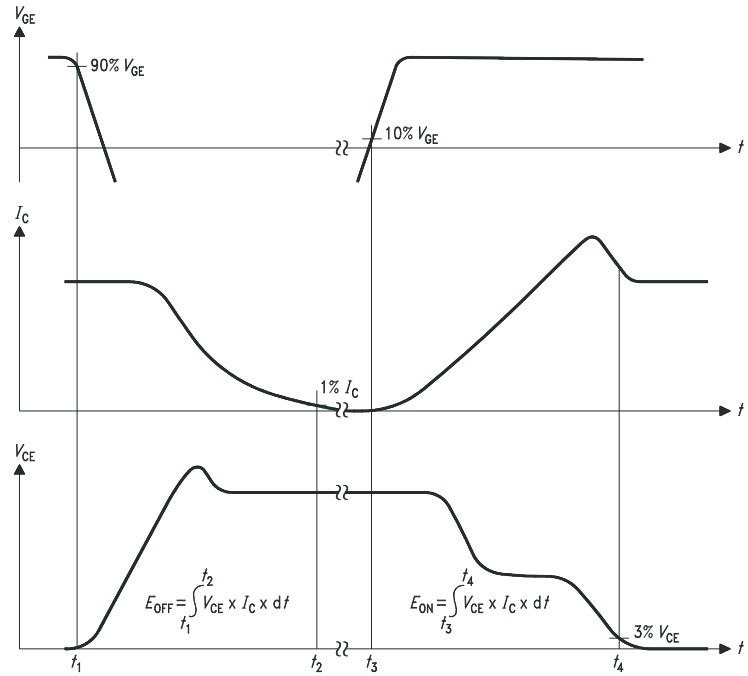

Figure B. Definition of switching losses

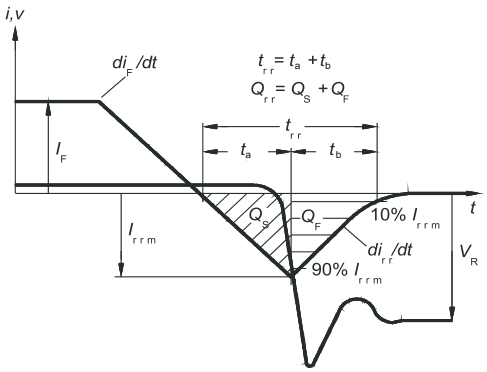

Figure C. Definition of diodes switching characteristics

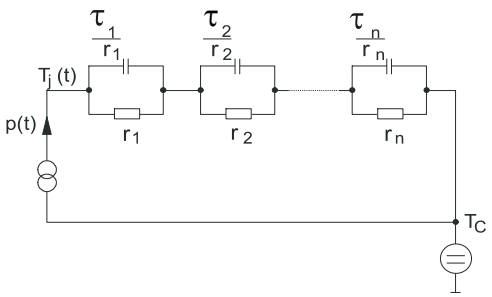

Figure D. Thermal equivalent circuit

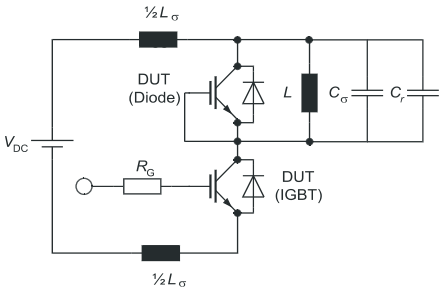

Figure E. Dynamic test circuit
Parasitic inductance L_σ,
Parasitic capacitor C_σ,
Relief capacitor C_r
(only for ZVT switching)

Revision History

IDW40E65D1

Revision: 2013-03-13, Rev. 1.1

Previous Revision

Revision	Date	Subjects (major changes since last revision)
1.1	2013-03-13	Preliminary data sheet

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