

## Diode

Fast Switching Emitter Controlled Diode

## IDW50E60

Emitter Controlled Diode series

Data sheet

Industrial Power Control

## Fast Switching Emitter Controlled Diode

### Features:

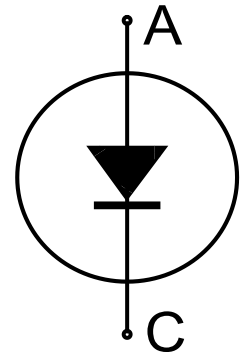
- Qualified according to JEDEC for target applications
- 600 V Emitter Controlled technology
- Fast recovery
- Soft switching
- Low reverse recovery charge
- Low forward voltage
- 175 °C junction operating temperature
- Easy paralleling
- Pb-free lead plating; RoHS compliant

### Applications:

- Switching diode for PFC applications with operating range up to 30kHz

### 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
IDW50E60	600V	50A	1.65V	175°C	D50E60	PG-TO247-3

**Table of Contents**

Description .....	2
Table of Contents .....	3
Maximum ratings .....	4
Thermal Resistance .....	4
Electrical Characteristics .....	4
Electrical Characteristics diagrams .....	6
Package Drawing .....	9
Testing Conditions .....	10
Revision History .....	11
Disclaimer .....	11

**Maximum ratings**

Parameter	Symbol	Value	Unit
Repetitive peak reverse voltage	$V_{RRM}$	600	V
Diode forward current, limited by $T_{vjmax}$ $T_C = 25^\circ\text{C}$ $T_C = 100^\circ\text{C}$	$I_F$	80.0 50.0	A
Diode pulsed current, $t_p$ limited by $T_{vjmax}$	$I_{Fpuls}$	150.0	A
Diode surge non repetitive forward current $T_C = 25^\circ\text{C}$ , $t_p = 10.0\text{ms}$ , sine halfwave	$I_{FSM}$	240.0	A
Power dissipation $T_C = 25^\circ\text{C}$	$P_{tot}$	187.0	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
<b>Characteristic</b>				
Diode thermal resistance, junction - case	$R_{th(j-c)}$		0.80	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.	
<b>Static Characteristic</b>						
Diode forward voltage	$V_F$	$I_F = 50.0\text{A}$ $T_{vj} = 25^\circ\text{C}$ $T_{vj} = 175^\circ\text{C}$	- -	1.65 1.60	2.00 -	V
Reverse leakage current	$I_R$	$V_R = 600\text{V}$ $T_{vj} = 25^\circ\text{C}$ $T_{vj} = 175^\circ\text{C}$	- -	- -	40.0 1650.0	$\mu\text{A}$

**Electrical Characteristic, at  $T_{vj} = 25^\circ\text{C}$ , unless otherwise specified**

Parameter	Symbol	Conditions	Value			Unit
			min.	typ.	max.	

**Dynamic Characteristic**
**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	$t_{rr}$	$T_{vj} = 25^{\circ}\text{C},$ $V_R = 400\text{V},$ $I_F = 50.0\text{A},$ $di_F/dt = 1200\text{A}/\mu\text{s}$	-	115	-	ns
Diode reverse recovery charge	$Q_{rr}$		-	1.50	-	$\mu\text{C}$
Diode peak reverse recovery current	$I_{rrm}$		-	30.0	-	A
Diode peak rate of fall of reverse recovery current during $t_b$	$di_{rr}/dt$		-	-470	-	$\text{A}/\mu\text{s}$

**Switching Characteristic, Inductive Load**

Parameter	Symbol	Conditions	Value			Unit
			min.	typ.	max.	

**Diode Characteristic, at  $T_{vj} = 175^{\circ}\text{C}$** 

Diode reverse recovery time	$t_{rr}$	$T_{vj} = 175^{\circ}\text{C},$ $V_R = 400\text{V},$ $I_F = 50.0\text{A},$ $di_F/dt = 1200\text{A}/\mu\text{s}$	-	192	-	ns
Diode reverse recovery charge	$Q_{rr}$		-	4.10	-	$\mu\text{C}$
Diode peak reverse recovery current	$I_{rrm}$		-	52.0	-	A
Diode peak rate of fall of reverse recovery current during $t_b$	$di_{rr}/dt$		-	-650	-	$\text{A}/\mu\text{s}$

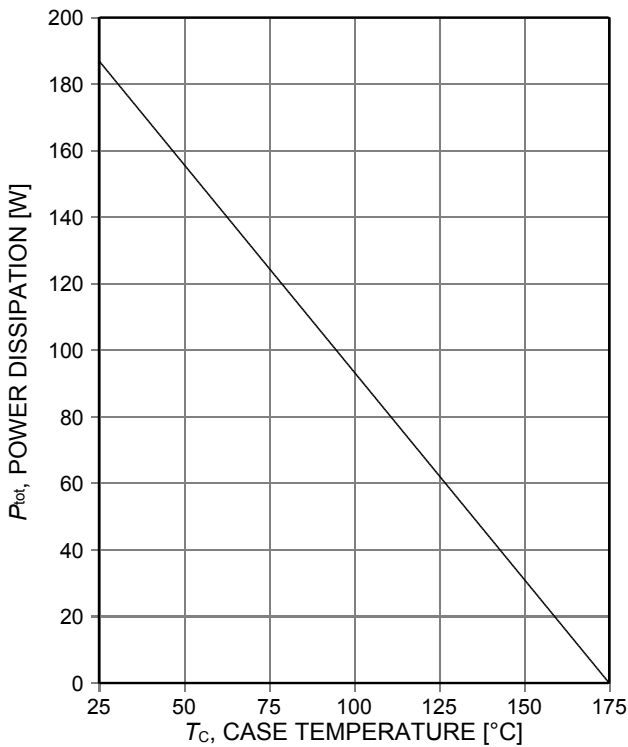


Figure 1. Power dissipation as a function of case temperature ( $T_J \leq 175^\circ\text{C}$ )

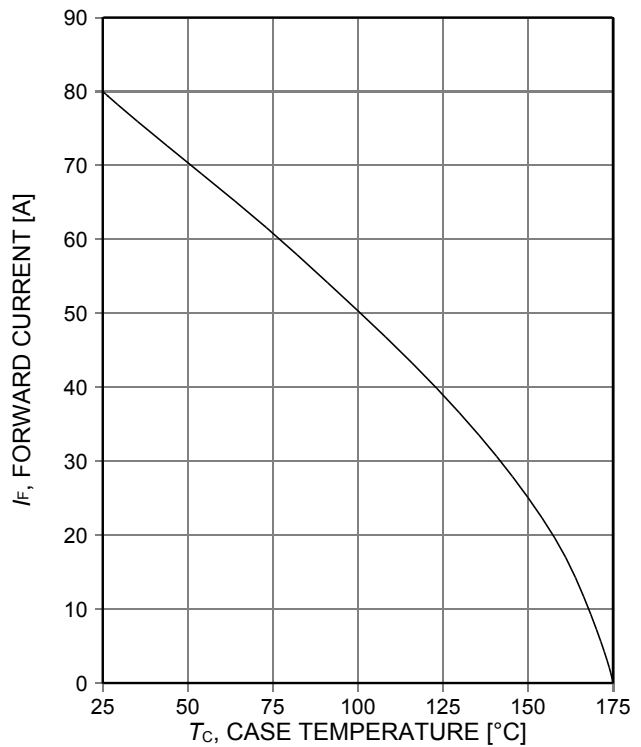


Figure 2. Diode forward current as a function of case temperature ( $T_J \leq 175^\circ\text{C}$ )

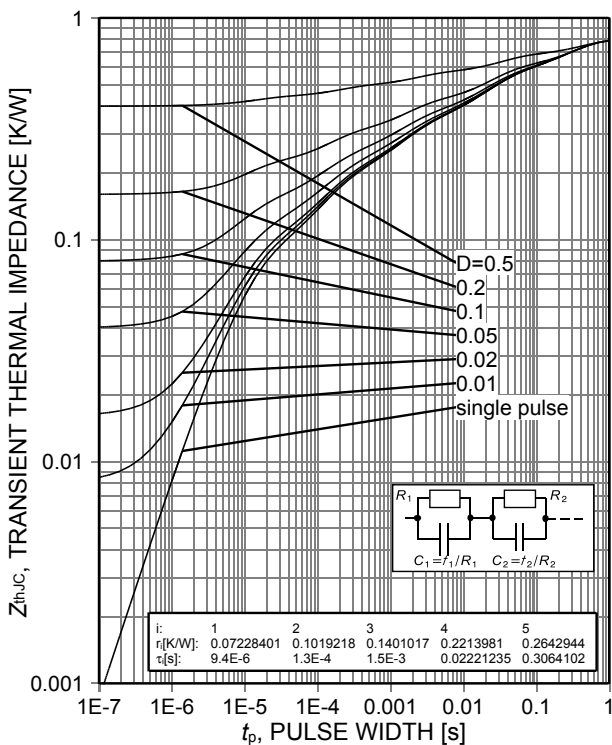


Figure 3. Diode transient thermal impedance as a function of pulse width ( $D = t_p/T$ )

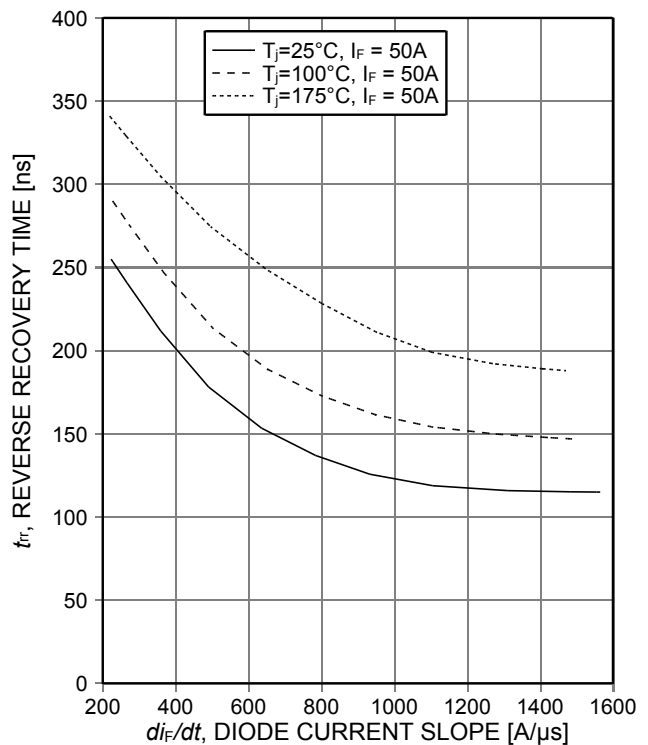


Figure 4. Typical reverse recovery time as a function of diode current slope ( $V_R=400\text{V}$ ,  $I_F=50\text{A}$ , Dynamic test circuit in Figure E)

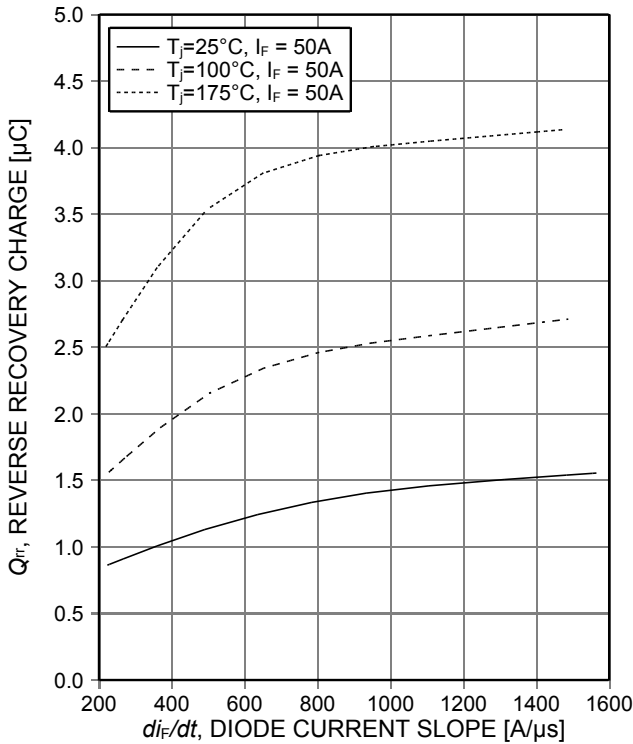


Figure 5. **Typical reverse recovery charge as a function of diode current slope**  
( $V_R=400V$ ,  $I_F=50A$ , Dynamic test circuit in Figure E)

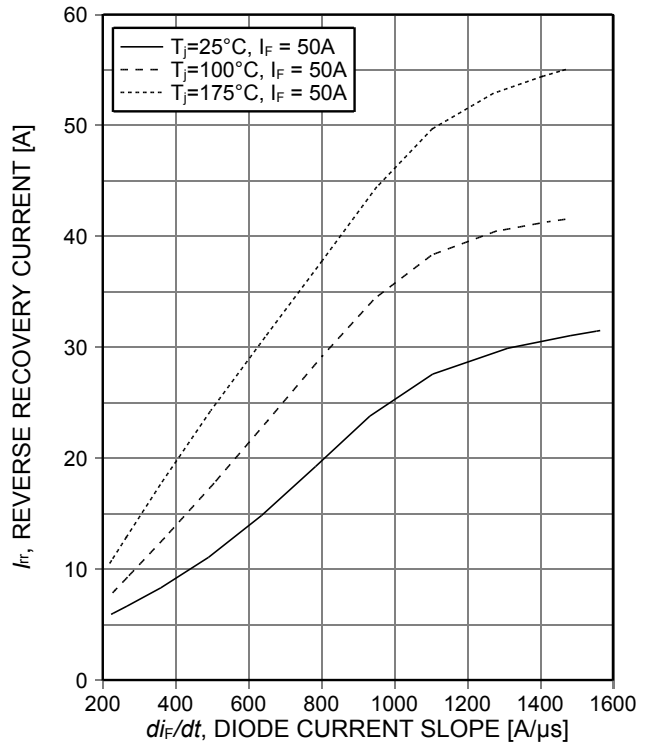


Figure 6. **Typical reverse recovery current as a function of diode current slope**  
( $V_R=400V$ ,  $I_F=50A$ , Dynamic test circuit in Figure E)

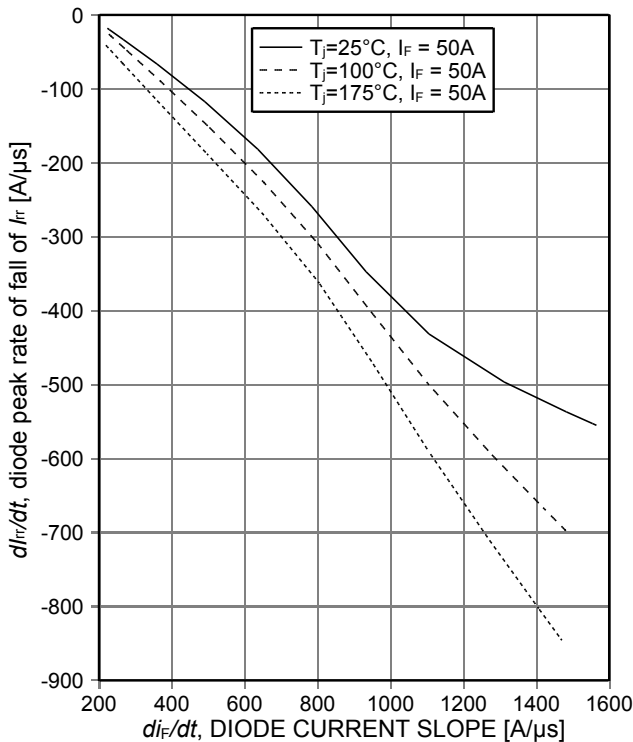


Figure 7. **Typical diode peak rate of fall of reverse recovery current as a function of diode current slope**  
( $V_R=400V$ ,  $I_F=50A$ , Dynamic test circuit in Figure E)

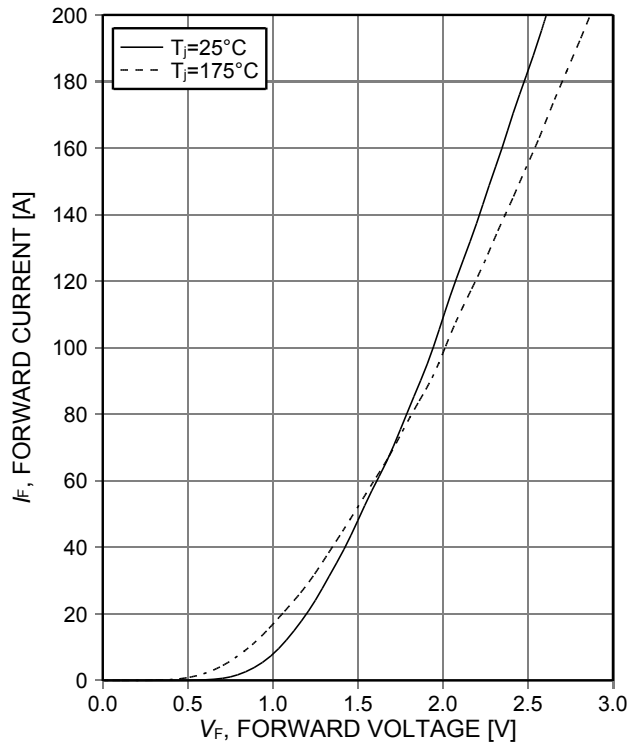


Figure 8. **Typical diode forward current as a function of forward voltage**

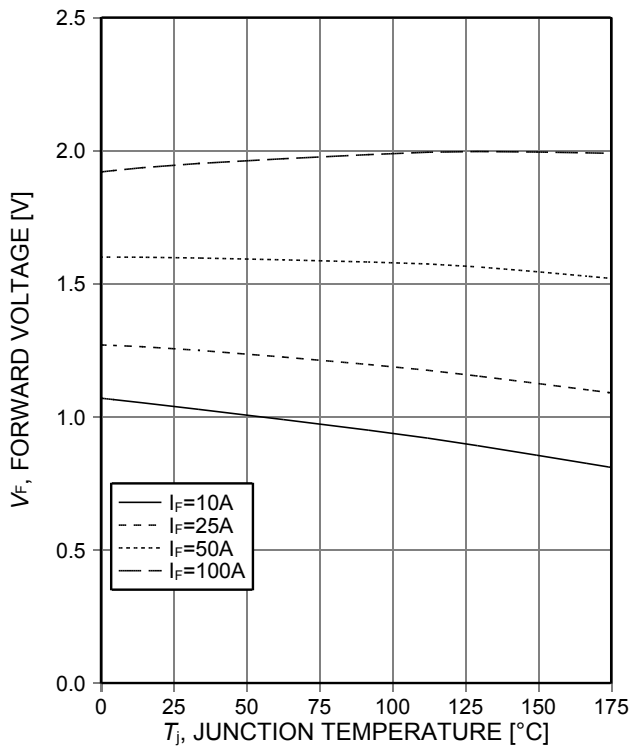
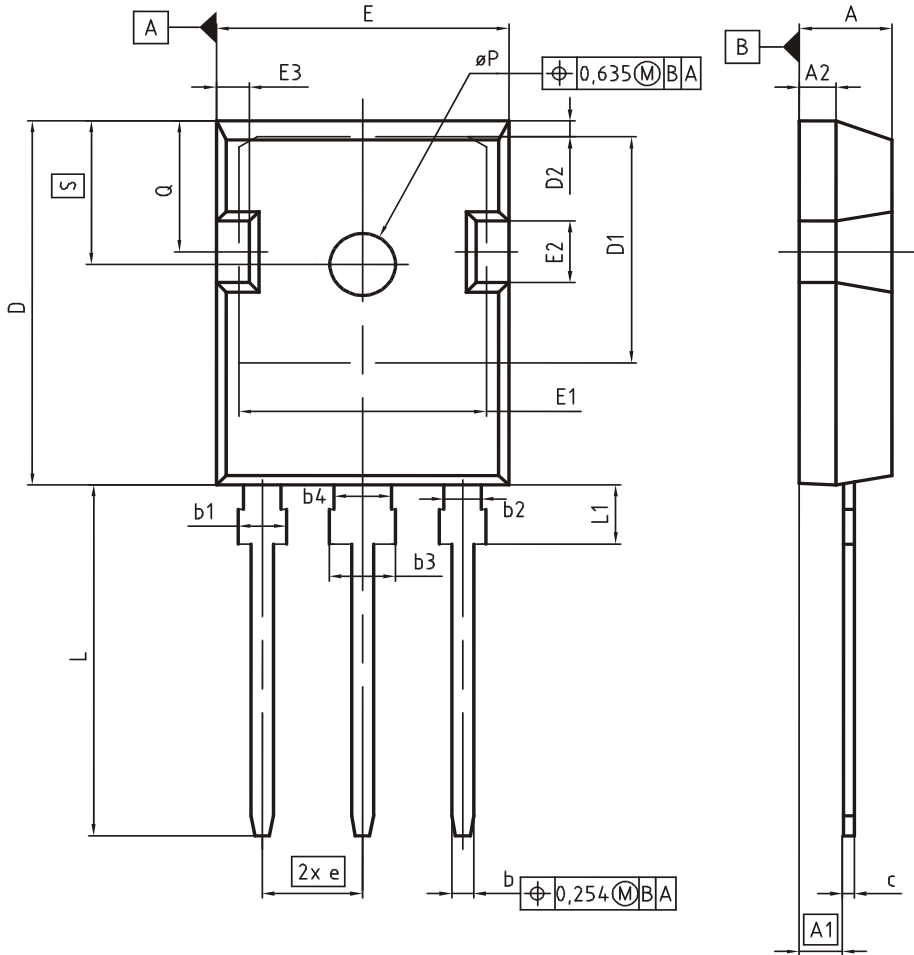


Figure 9. Typical diode forward voltage as a function of junction temperature



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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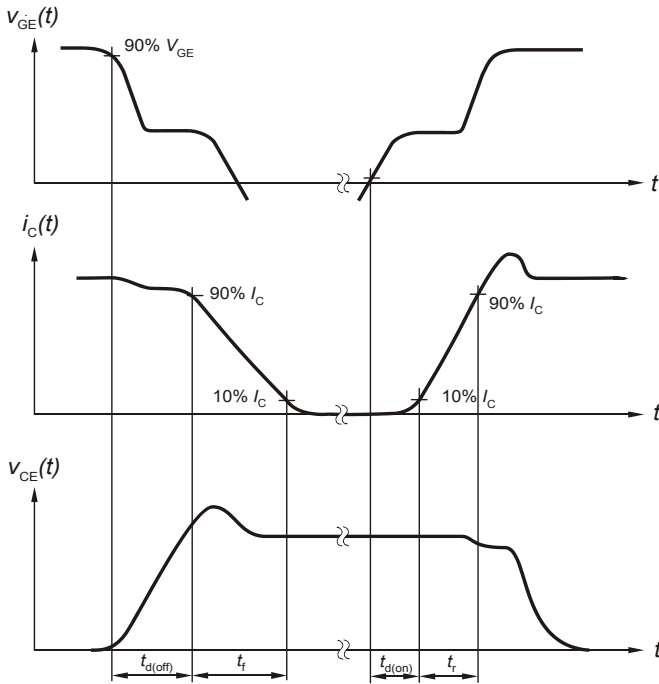


Figure A. Definition of switching times

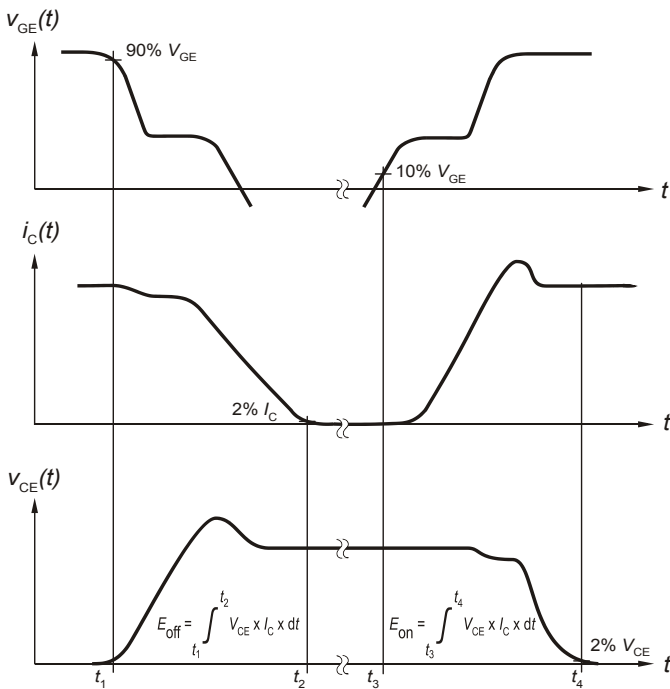


Figure B. Definition of switching losses

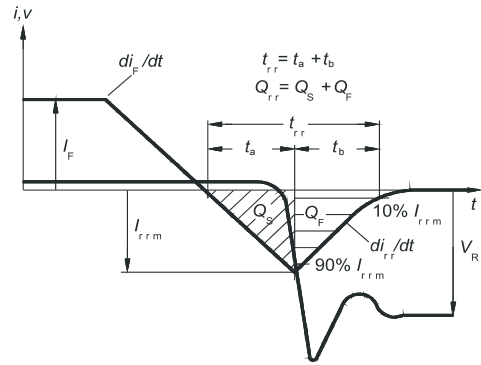


Figure C. Definition of diodes switching characteristics

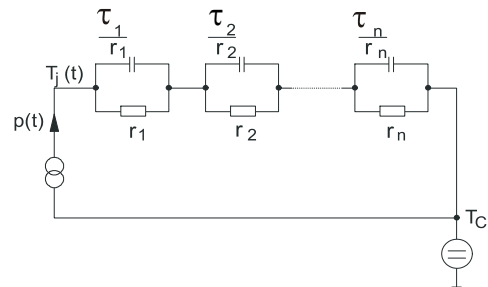


Figure D. Thermal equivalent circuit

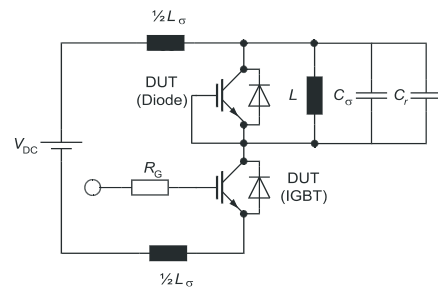


Figure E. Dynamic test circuit  
Parasitic inductance  $L_\sigma$ ,  
Parasitic capacitor  $C_\sigma$ ,  
Relief capacitor  $C_r$   
(only for ZVT switching)

**Revision History**

IDW50E60

**Revision: 2014-02-24, Rev. 2.2**

Previous Revision

Revision	Date	Subjects (major changes since last revision)
1.1	2011-12-07	Preliminary data sheet
1.2	2012-02-23	Prelim data sheet switch MOS C6 50A
2.1	2013-12-09	New value IRmax limit at 175°C
2.2	2014-02-24	New value IRmax limit at 175°C

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