

## Diode

Rapid Switching Emitter Controlled Diode

## IDW60C65D1

Emitter Controlled Diode Rapid 1 Common Cathode Series

Data sheet

Industrial Power Control

## Rapid Switching Emitter Controlled Diode

### Features:

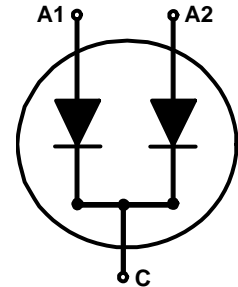
- Qualified according to JEDEC for target applications
- 650V Emitter Controlled technology
- Temperature stable behaviour of key parameters
- Low forward voltage ( $V_F$ )
- Ultra fast recovery
- Low reverse recovery charge ( $Q_{rr}$ )
- Low reverse recovery current ( $I_{rrm}$ )
- 175°C junction operating 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 - anode (A1)
- Pin 2 and backside - cathode (C)
- Pin 3 - anode (A2)



### Key Performance and Package Parameters

Type	$V_{rrm}$	$I_f$	$V_f, T_{vj}=25^\circ\text{C}$	$T_{vjmax}$	Marking	Package
IDW60C65D1	650V	2x 30A	1.35V	175°C	C60ED1	PG-TO247-3



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**Maximum Ratings (per leg)**

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, $T_{vj} \geq 25^{\circ}\text{C}$	$V_{RRM}$	650	V
Diode forward current, limited by $T_{vjmax}$ $T_C = 25^{\circ}\text{C}$ $T_C = 100^{\circ}\text{C}$	$I_F$	60.0 30.0	A
Diode pulsed current, $t_p$ limited by $T_{vjmax}$	$I_{Fpuls}$	90.0	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 $T_C = 25^{\circ}\text{C}$ Power dissipation $T_C = 100^{\circ}\text{C}$	$P_{tot}$	142.0 71.0	W
Operating junction temperature	$T_{vj}$	-40...+175	$^{\circ}\text{C}$
Storage temperature	$T_{stg}$	-55...+150	$^{\circ}\text{C}$
Soldering temperature, wave soldering 1.6mm (0.063in.) from case for 10s		260	$^{\circ}\text{C}$
Mounting torque, M3 screw Maximum of mounting processes: 3	$M$	0.6	Nm

**Thermal Resistances (per leg)**

Parameter	Symbol	Conditions	Max. Value	Unit
<b>Characteristic</b>				
Diode thermal resistance, <sup>1)</sup> junction - case	$R_{th(j-c)}$		1.06	K/W
Thermal resistance junction - ambient	$R_{th(j-a)}$		40	K/W

**Electrical Characteristics (per leg), 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	$V_F$	$I_F = 30.0\text{A}$ $T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 175^{\circ}\text{C}$	- - -	1.35 1.32 1.28	1.70 - -	V
Reverse leakage current <sup>2)</sup>	$I_R$	$V_R = 650\text{V}$ $T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 175^{\circ}\text{C}$	- -	- 1200.0	40.0 -	$\mu\text{A}$

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

Parameter	Symbol	Conditions	Value			Unit
			min.	typ.	max.	
<b>Dynamic Characteristic</b>						
Internal emitter inductance measured 5mm (0.197 in.) from case	$L_E$		-	13.0	-	nH

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

<sup>2)</sup> Reverse leakage current per leg specified for operating conditions with zero voltage applied to the other leg.

**Switching Characteristics (per leg), Inductive Load**

Parameter	Symbol	Conditions	Value			Unit
			min.	typ.	max.	
<b>Diode Characteristic, at <math>T_{vj} = 25^{\circ}\text{C}</math></b>						
Diode reverse recovery time	$t_{rr}$	$T_{vj} = 25^{\circ}\text{C}$ , $V_R = 400\text{V}$ , $I_F = 30.0\text{A}$ , $di_F/dt = 1000\text{A}/\mu\text{s}$ , $L\sigma = 30\text{nH}$ , $C\sigma = 40\text{pF}$ , switch IGW50N65H5.	-	66	-	ns
Diode reverse recovery charge	$Q_{rr}$		-	0.73	-	$\mu\text{C}$
Diode peak reverse recovery current	$I_{rrm}$		-	16.8	-	A
Diode peak rate of fall of reverse recovery current during $t_b$	$di_{rr}/dt$		-	-1370	-	$\text{A}/\mu\text{s}$
Diode reverse recovery time	$t_{rr}$	$T_{vj} = 25^{\circ}\text{C}$ , $V_R = 400\text{V}$ , $I_F = 30.0\text{A}$ , $di_F/dt = 200\text{A}/\mu\text{s}$ , $L\sigma = 30\text{nH}$ , $C\sigma = 40\text{pF}$ , switch IGW50N65H5.	-	115	-	ns
Diode reverse recovery charge	$Q_{rr}$		-	0.45	-	$\mu\text{C}$
Diode peak reverse recovery current	$I_{rrm}$		-	5.4	-	A
Diode peak rate of fall of reverse recovery current during $t_b$	$di_{rr}/dt$		-	-660	-	$\text{A}/\mu\text{s}$

**Switching Characteristics (per leg), Inductive Load**

Parameter	Symbol	Conditions	Value			Unit
			min.	typ.	max.	
<b>Diode Characteristic, at <math>T_{vj} = 175^{\circ}\text{C}/125^{\circ}\text{C}</math></b>						
Diode reverse recovery time	$t_{rr}$	$T_{vj} = 175^{\circ}\text{C}$ , $V_R = 400\text{V}$ , $I_F = 30.0\text{A}$ , $di_F/dt = 1000\text{A}/\mu\text{s}$ , $L\sigma = 30\text{nH}$ , $C\sigma = 40\text{pF}$ , switch IGW50N65H5.	-	105	-	ns
Diode reverse recovery charge	$Q_{rr}$		-	1.83	-	$\mu\text{C}$
Diode peak reverse recovery current	$I_{rrm}$		-	25.6	-	A
Diode peak rate of fall of reverse recovery current during $t_b$	$di_{rr}/dt$		-	-1000	-	$\text{A}/\mu\text{s}$
Diode reverse recovery time	$t_{rr}$	$T_{vj} = 125^{\circ}\text{C}$ , $V_R = 400\text{V}$ , $I_F = 30.0\text{A}$ , $di_F/dt = 200\text{A}/\mu\text{s}$ , $L\sigma = 30\text{nH}$ , $C\sigma = 40\text{pF}$ , switch IGW50N65H5.	-	154	-	ns
Diode reverse recovery charge	$Q_{rr}$		-	0.98	-	$\mu\text{C}$
Diode peak reverse recovery current	$I_{rrm}$		-	9.8	-	A
Diode peak rate of fall of reverse recovery current during $t_b$	$di_{rr}/dt$		-	-490	-	$\text{A}/\mu\text{s}$

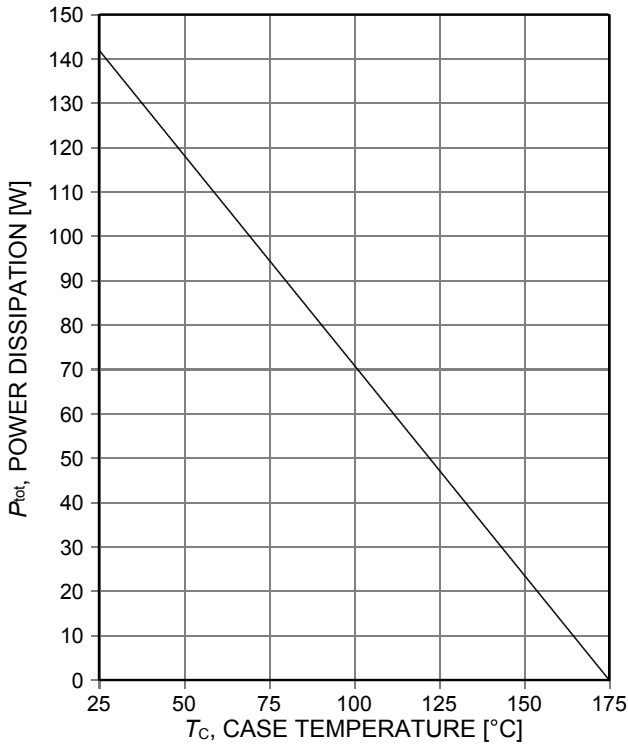


Figure 1. Power dissipation per leg as a function of case temperature ( $T_{vj} \leq 175^\circ\text{C}$ )

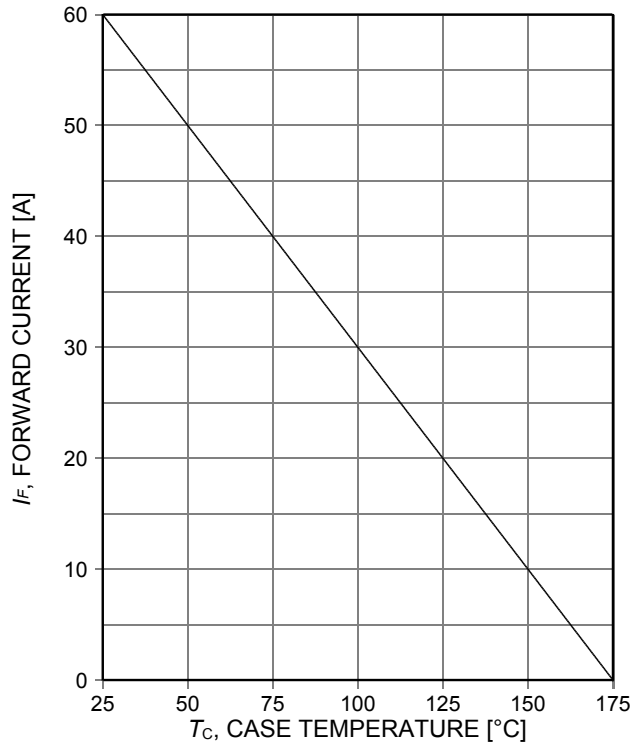


Figure 2. Diode forward current per leg as a function of case temperature ( $T_{vj} \leq 175^\circ\text{C}$ )

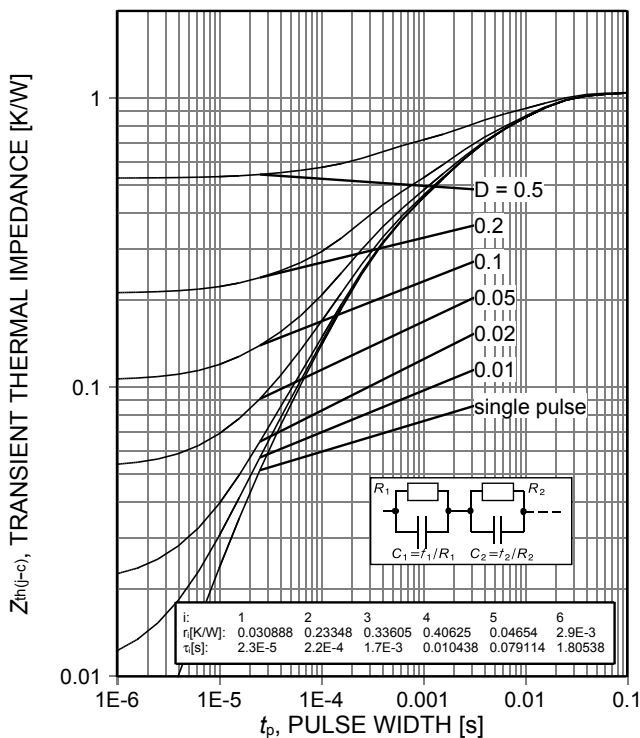


Figure 3. Diode transient thermal impedance per leg as a function of pulse width ( $D = t_p/T$ )

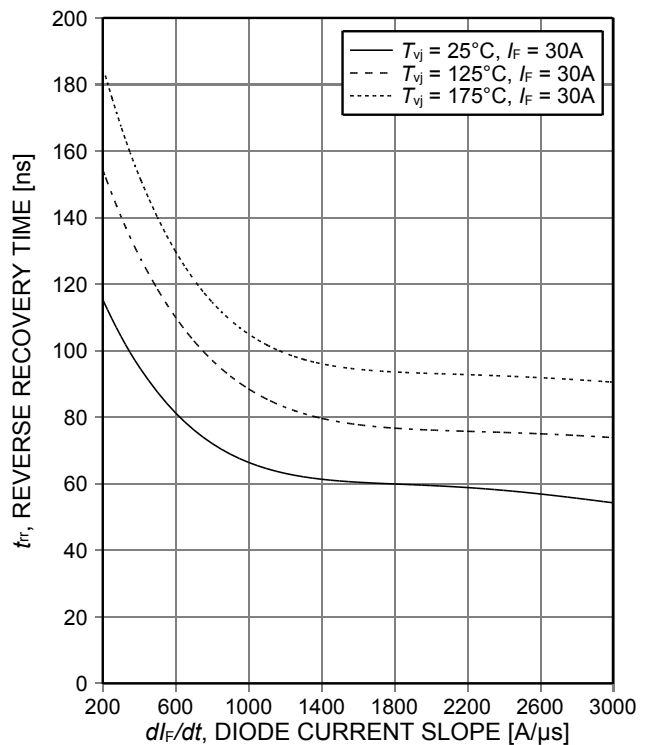


Figure 4. Typical reverse recovery time per leg as a function of diode current slope ( $V_R = 400\text{V}$ )

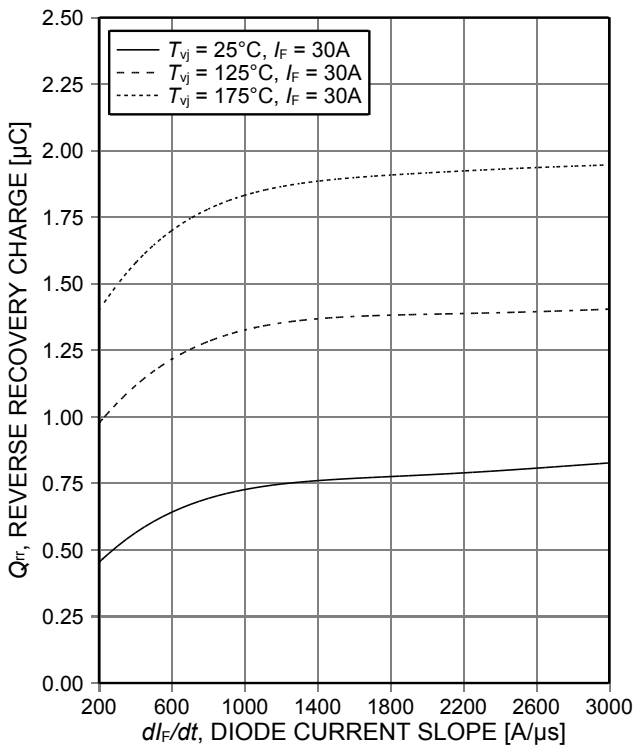


Figure 5. Typical reverse recovery charge per leg as a function of diode current slope ( $V_R=400V$ )

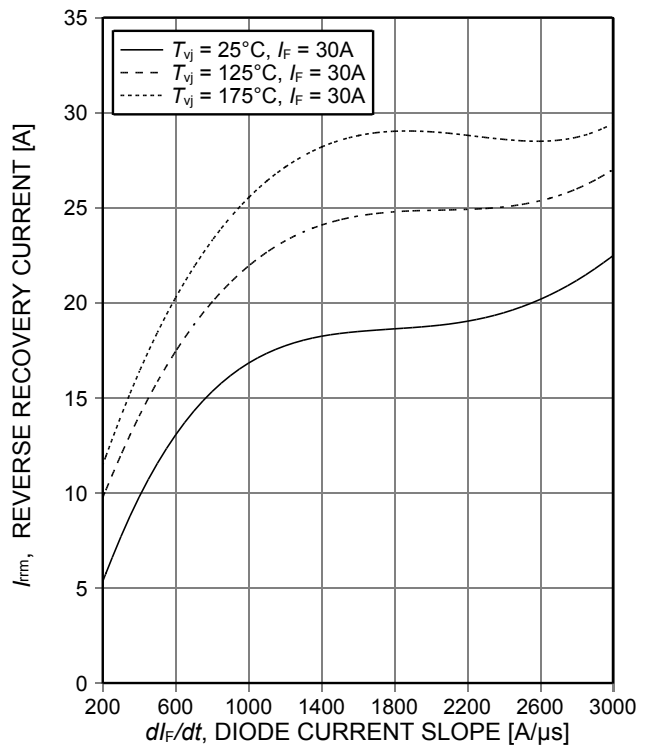


Figure 6. Typical peak reverse recovery current per leg as a function of diode current slope ( $V_R=400V$ )

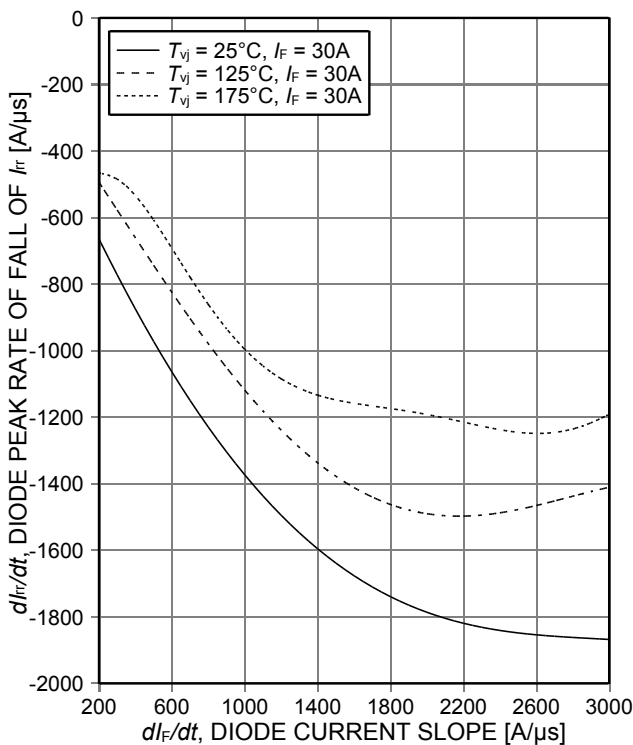


Figure 7. Typical diode peak rate of fall of rev. rec. current per leg as a function of diode current slope ( $V_R=400V$ )

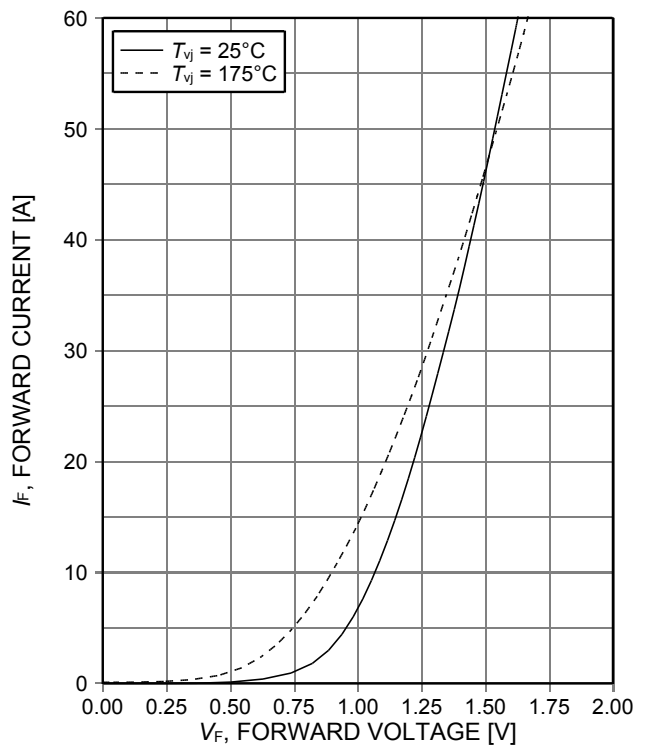


Figure 8. Typical diode forward current per leg as a function of forward voltage

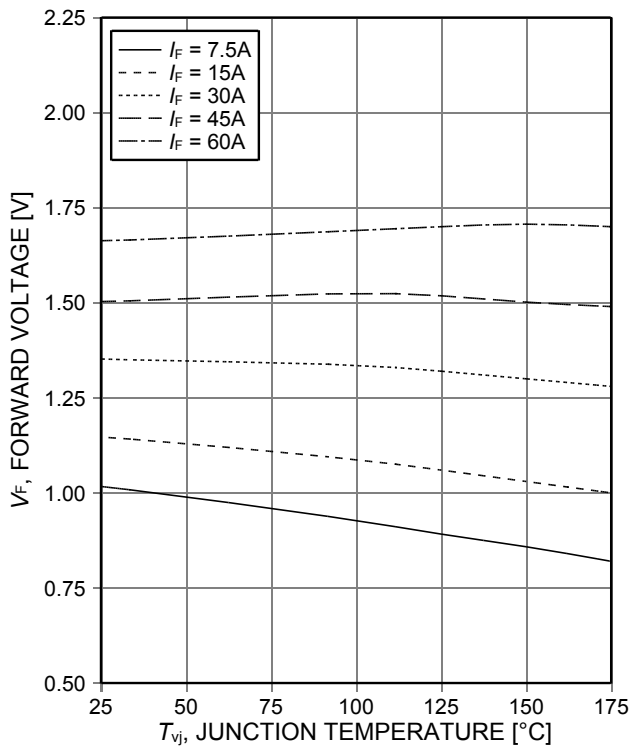
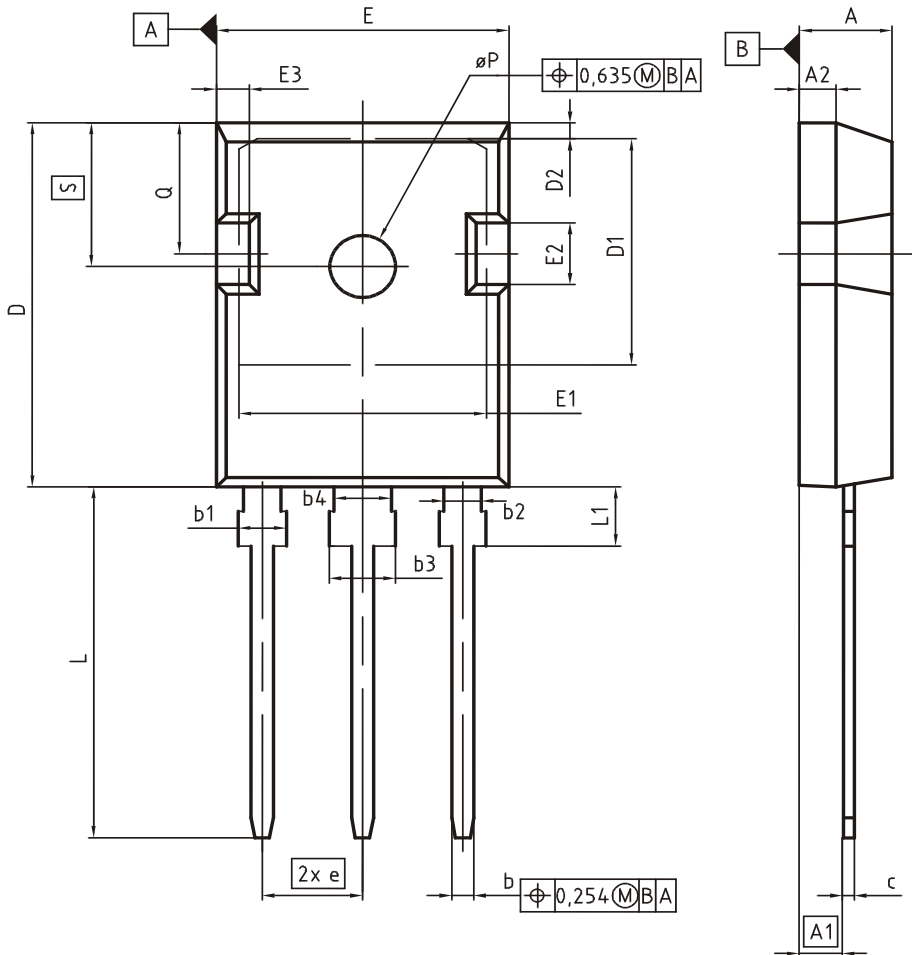


Figure 9. Typical diode forward voltage per leg as a function of junction temperature



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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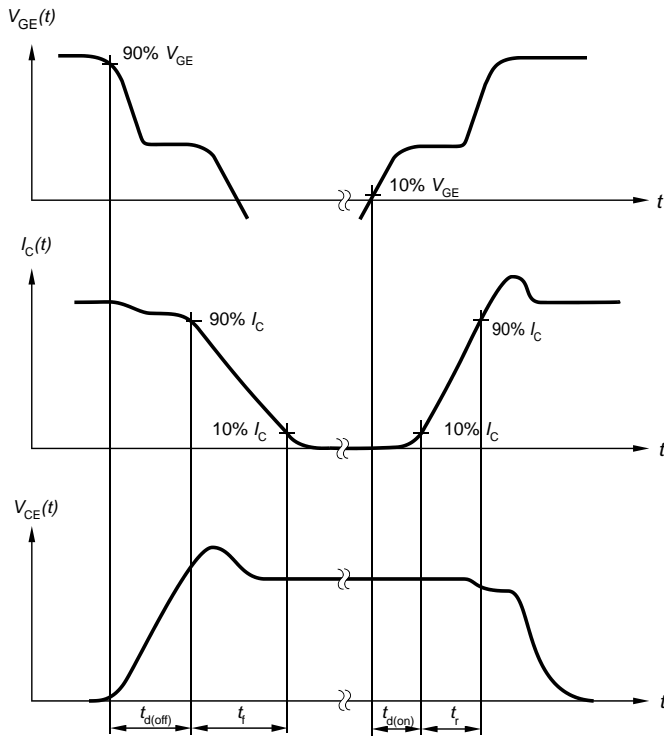


Figure A. Definition of switching times

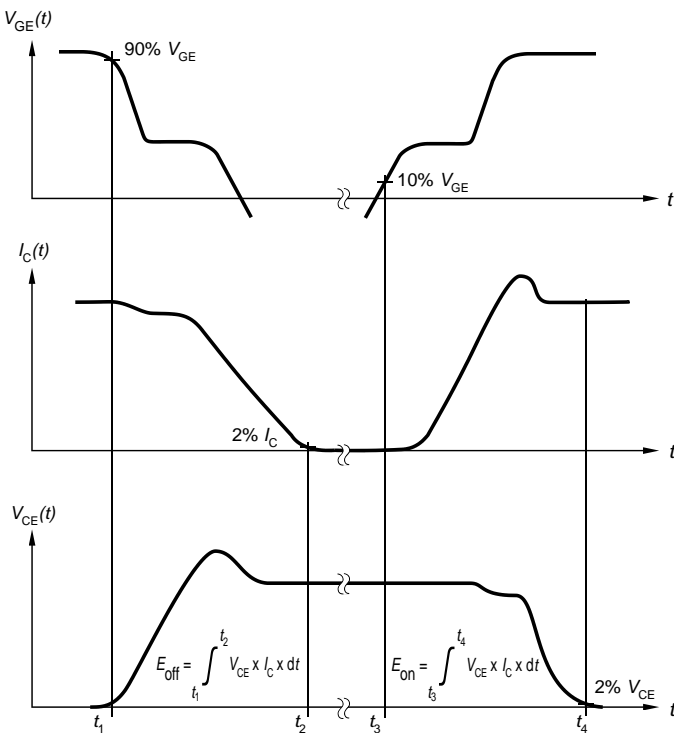


Figure B. Definition of switching losses

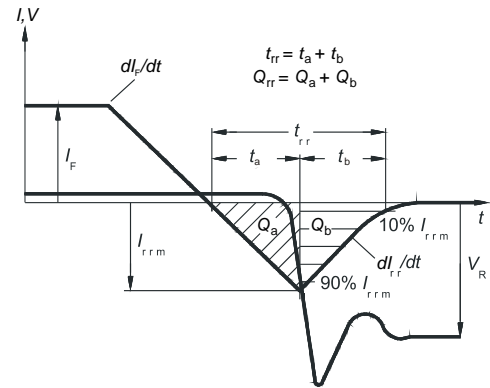


Figure C. Definition of diode switching characteristics

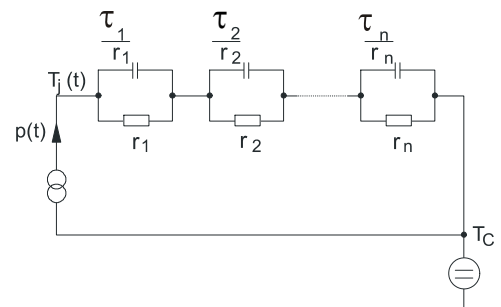


Figure D. Thermal equivalent circuit

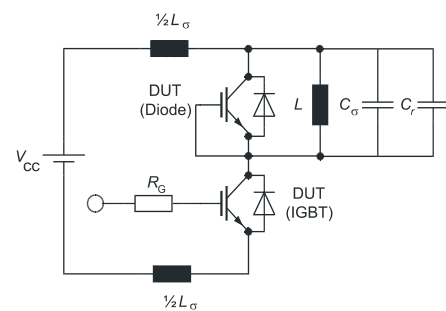


Figure E. Dynamic test circuit  
Parasitic inductance  $L_{\sigma}$ ,  
parasitic capacitor  $C_{\sigma}$ ,  
relief capacitor  $C_r$ ,  
(only for ZVT switching)