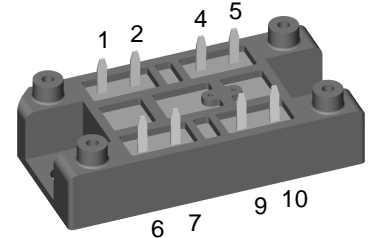
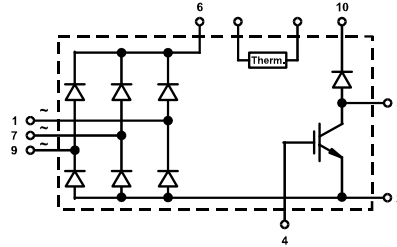


# Three Phase Rectifier Bridge with IGBT and Fast Recovery Diode for Braking System

**V<sub>RRM</sub> = 1200-1600 V**  
**I<sub>dAVM</sub> = 70 A**

V <sub>RRM</sub> V	Type
1200	VUB 60-12 NO1
1600	VUB 60-16 NO1



Symbol	Test Conditions	Maximum Ratings	
<b>V<sub>RRM</sub></b> <b>I<sub>dAV</sub></b> <b>I<sub>dAVM</sub></b>	T <sub>H</sub> = 110°C, sinusoidal 120° limited by leads	1200 / 1600	V
		59	A
		70	A
<b>I<sub>FSM</sub></b>	T <sub>VJ</sub> = 45°C, t = 10 ms, V <sub>R</sub> = 0 V T <sub>VJ</sub> = 150°C, t = 10 ms, V <sub>R</sub> = 0 V	530	A
		475	A
<b>I<sup>2</sup>t</b>	T <sub>VJ</sub> = 45°C, t = 10 ms, V <sub>R</sub> = 0 V T <sub>VJ</sub> = 150°C, t = 10 ms, V <sub>R</sub> = 0 V	1400	A
		1130	A
<b>P<sub>tot</sub></b>	T <sub>H</sub> = 80°C per diode	49	W
<b>V<sub>CES</sub></b> <b>V<sub>GE</sub></b>	T <sub>VJ</sub> = 25°C to 150°C Continuous	1200	V
		± 20	V
<b>I<sub>C25</sub></b> <b>I<sub>C70</sub></b> <b>I<sub>C80</sub></b>	T <sub>H</sub> = 25°C, DC T <sub>H</sub> = 70°C, DC T <sub>H</sub> = 80°C, DC	31	A
		23	A
		21	A
<b>I<sub>CM</sub></b>	t <sub>p</sub> = Pulse width limited by T <sub>VJM</sub>	62	A
<b>P<sub>tot</sub></b>	T <sub>H</sub> = 80°C	70	W
<b>V<sub>RRM</sub></b> <b>I<sub>FAV</sub></b> <b>I<sub>FRMS</sub></b> <b>I<sub>FRM</sub></b>	T <sub>H</sub> = 80°C, rectangular d = 0.5 T <sub>H</sub> = 80°C, rectangular d = 0.5 T <sub>H</sub> = 80°C, t <sub>p</sub> = 10 μs, f = 5 kHz	1200	V
		8	A
		12	A
		90	A
<b>I<sub>FSM</sub></b>	T <sub>VJ</sub> = 45°C, t = 10 ms T <sub>VJ</sub> = 150°C, t = 10 ms	75	A
		60	A
<b>P<sub>tot</sub></b>	T <sub>H</sub> = 80°C	22	W
<b>T<sub>VJ</sub></b> <b>T<sub>VJM</sub></b> <b>T<sub>stg</sub></b>		-40...+150	°C
		150	°C
		-40...+125	°C
<b>V<sub>ISOL</sub></b>	50/60 Hz t = 1 min I <sub>ISOL</sub> ≤ 1 mA t = 1 s	3000	V~
		3600	V~
<b>M<sub>d</sub></b>	Mounting torque (M5) (10-32 unf)	2-2.5 18-22	Nm lb.in.
<b>Weight</b>	typ.	35	g

### Features

- Soldering connections for PCB mounting
- Isolation voltage 3600 V~
- Ultrafast freewheel diode
- Convenient package outline
- UL registered E 72873
- Thermistor

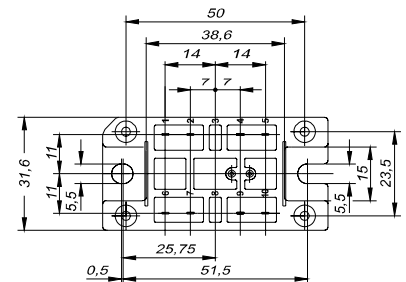
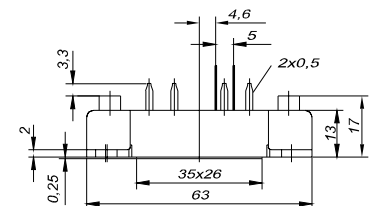
### Applications

- Drive Inverters with brake system

### Advantages

- 2 functions in one package
- No external isolation
- Easy to mount with two screws
- Suitable for wave soldering
- High temperature and power cycling capability

### Dimensions in mm (1 mm = 0.0394")



Data according to IEC 60747  
IXYS reserves the right to change limits, test conditions and dimensions.

Symbol	Test Conditions	Characteristic Values ( $T_{VJ} = 25^{\circ}\text{C}$ , unless otherwise specified)		
		min.	typ.	max.
<b>Rectifier Diodes</b>	$I_R$	$V_R = V_{RRM}^1$ $T_{VJ} = 25^{\circ}\text{C}$ $V_R = V_{RRM}^1$ $T_{VJ} = 150^{\circ}\text{C}$		0.1 mA 3 mA
	$V_F$	$I_F = 25 \text{ A}$ , $T_{VJ} = 25^{\circ}\text{C}$		1.3 V
	$V_{T0}$	For power-loss calculations only		0.85 V
	$r_T$	$T_{VJ} = 150^{\circ}\text{C}$		8.5 m $\Omega$
	$R_{thJH}$	per diode		1.42 K/W
<b>IGBT</b>	$V_{BR(CES)}$	$V_{GS} = 0 \text{ V}$ , $I_C = 3 \text{ mA}$	1200	V
	$V_{GE(th)}$	$I_C = 10 \text{ mA}$	5	7.5 V
	$I_{GES}$	$V_{GE} = \pm 20 \text{ V}$		500 nA
	$I_{CES}$	$T_{VJ} = 25^{\circ}\text{C}$ , $V_{CE} = 800 \text{ V}$ $T_{VJ} = 125^{\circ}\text{C}$ , $V_{CE} = 800 \text{ V}$		250 $\mu\text{A}$ 1 mA
	$V_{CEsat}$	$V_{GE} = 15 \text{ V}$ , $I_C = 25 \text{ A}$		3.5 V
	$t_{SC}$ (SCSOA)	$V_{GE} = 15 \text{ V}$ , $V_{CE} = 600 \text{ V}$ , $T_{VJ} = 125^{\circ}\text{C}$ , $R_G = 4.7 \Omega$ , non repetitive		10 $\mu\text{s}$
	RBSOA	$V_{GE} = 15 \text{ V}$ , $V_{CE} = 800 \text{ V}$ , $T_{VJ} = 125^{\circ}\text{C}$ , $R_G = 4.7 \Omega$ , Clamped Inductive load, $L = 100 \mu\text{H}$		50 A
	$C_{ies}$	$V_{CE} = 25 \text{ V}$ , $f = 1 \text{ MHz}$ , $V_{GE} = 0 \text{ V}$	2.85	nF
	$t_{d(on)}$	$V_{CE} = 600 \text{ V}$ , $I_C = 25 \text{ A}$ $V_{GE} = 15 \text{ V}$ , $R_G = 4.7 \Omega$ Inductive load; $L = 100 \mu\text{H}$ $T_{VJ} = 125^{\circ}\text{C}$	100	ns
	$t_{d(off)}$		220	ns
$t_{fi}$	1600		ns	
$E_{on}$	3.5		mJ	
$E_{off}$	12		mJ	
$R_{thJH}$			1 K/W	
<b>Fast Recovery Diode</b>	$I_R$	$V_R = V_{RRM}^1$ , $T_{VJ} = 25^{\circ}\text{C}$ $V_R = 800 \text{ V}$ , $T_{VJ} = 150^{\circ}\text{C}$		0.2 mA 6 mA
	$V_F$	$I_F = 12 \text{ A}$ , $T_{VJ} = 25^{\circ}\text{C}$		2.7 V
	$V_{T0}$	For power-loss calculations only		1.65 V
	$r_T$	$T_{VJ} = 150^{\circ}\text{C}$		46 m $\Omega$
	$I_{RM}$	$I_F = 25 \text{ A}$ , $-di_F/dt = 100 \text{ A}/\mu\text{s}$ $V_R = 100 \text{ V}$	6.5	7 A
$t_{rr}$	$I_F = 1 \text{ A}$ , $-di_F/dt = 100 \text{ A}/\mu\text{s}$ $V_R = 30 \text{ V}$	50	70 ns	
$R_{thJH}$			3.12 K/W	
$R_{25}$	<b>NTC</b> Siemens Typ S 891/2,2k/+9		2.2 k $\Omega$	
$d_s$	<b>Module</b> Creep distance on surface		12.7 mm	
$d_A$	Strike distance in air		9.4 mm	
$a$	Maximum allowable acceleration		50 m/s <sup>2</sup>	

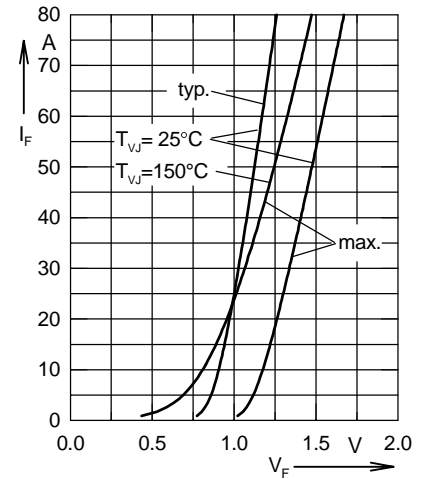


Fig. 1 Forward current versus voltage drop per rectifier diode

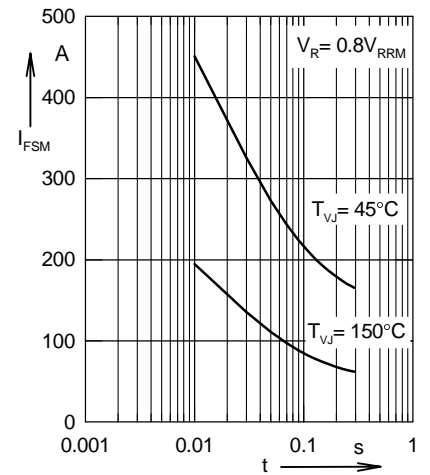


Fig. 2 Surge overload current per rectifier diode

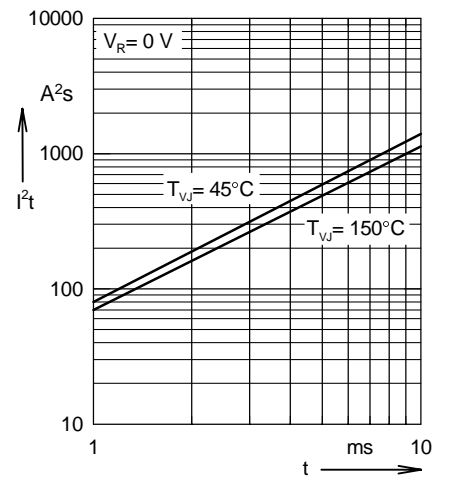


Fig. 3  $I^2t$  versus time per rectifier diode

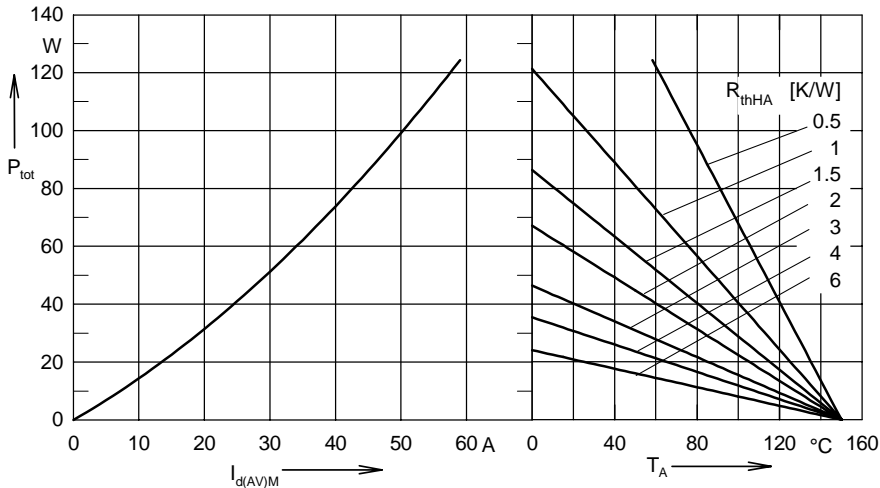


Fig. 4 Power dissipation versus direct output current and ambient temperature (Rectifier bridge)

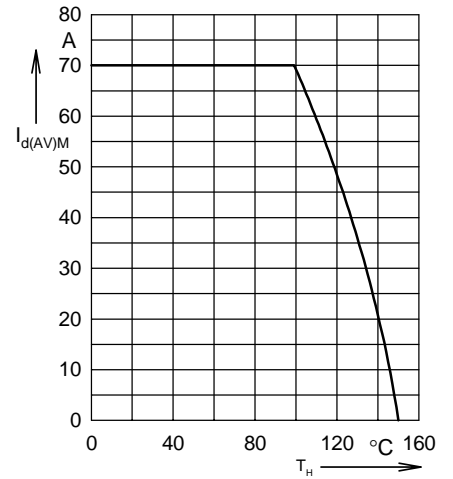


Fig. 5 Maximum forward current versus heatsink temperature (Rectifier bridge)

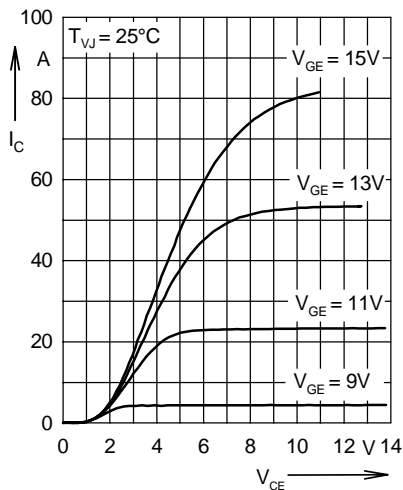


Fig. 6 Output characteristics for braking (IGBT)

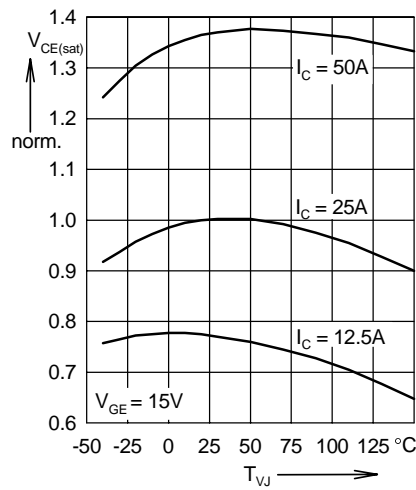


Fig. 7 Saturation voltage versus junction temperature normalized (IGBT)

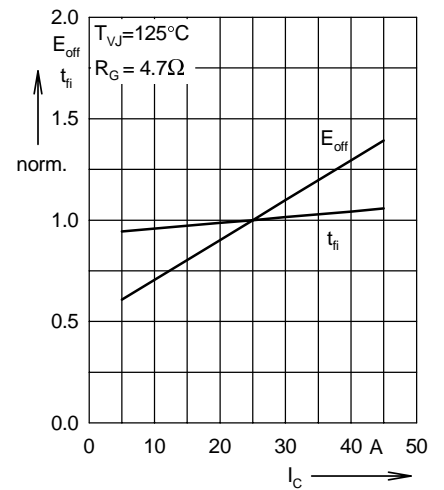


Fig. 8 Turn-off energy per pulse and fall time versus collector current, normalized (IGBT)

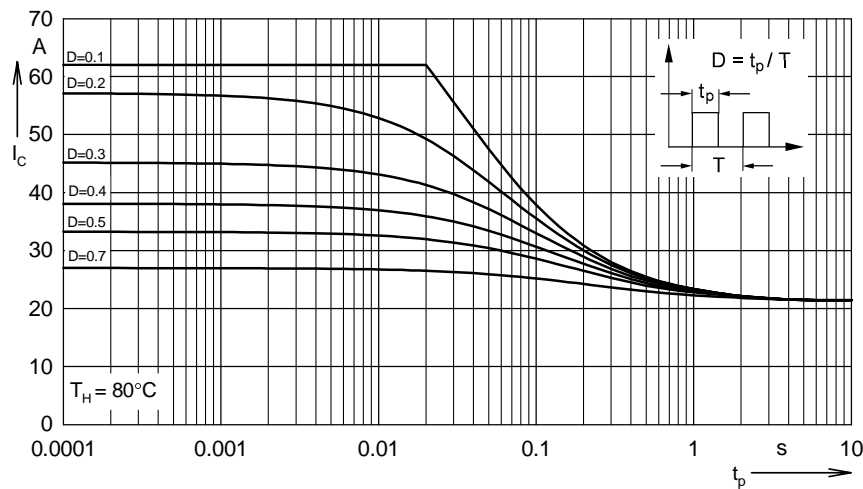


Fig. 9 Collector current versus pulse width and duty cycle (IGBT)

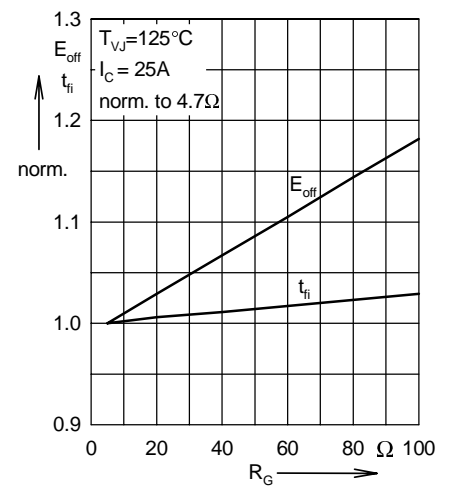


Fig. 10 Turn-off energy per pulse and fall time versus  $R_G$  (IGBT)

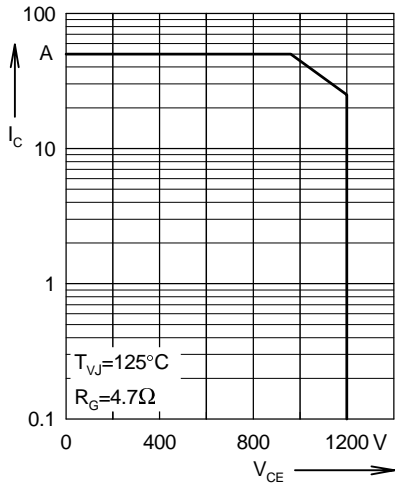


Fig. 11 Reverse biased safe operation area (IGBT)

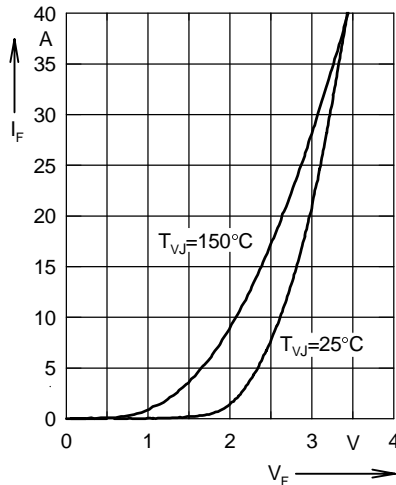


Fig. 12 Forward current versus voltage drop (Fast Diode)

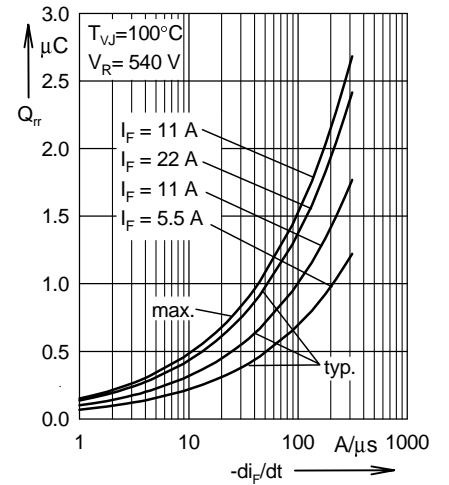


Fig. 13 Recovery charge versus  $-di_F/dt$  (Fast Diode)

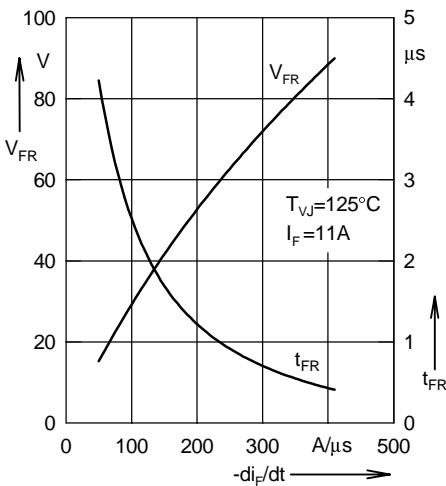


Fig. 14 Peak forward voltage and recovery time versus  $-di_F/dt$  (Fast Diode)

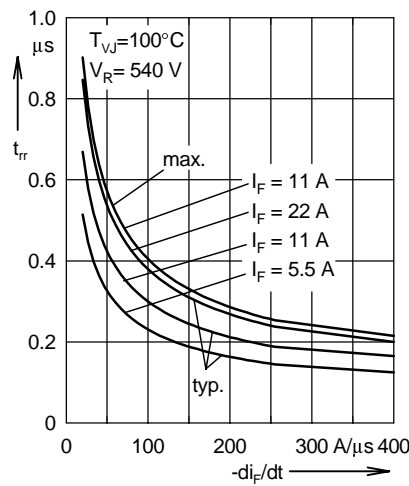


Fig. 15 Recovery time versus  $-di_F/dt$  (Fast Diode)

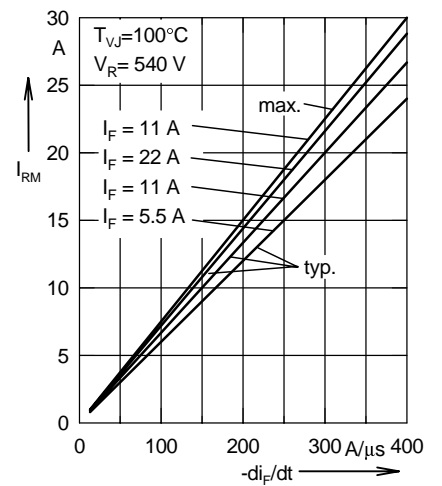


Fig. 16 Peak reverse current versus  $-di_F/dt$  (Fast Diode)

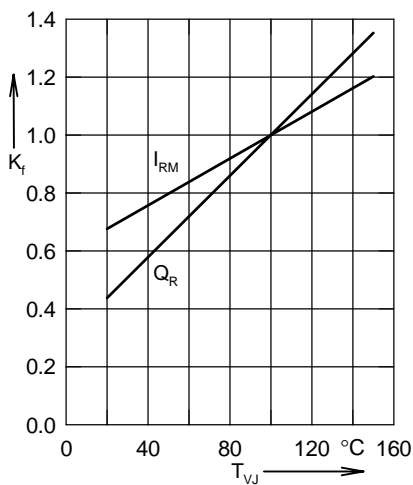


Fig. 17 Dynamic parameters versus junction temperature (Fast Diode)

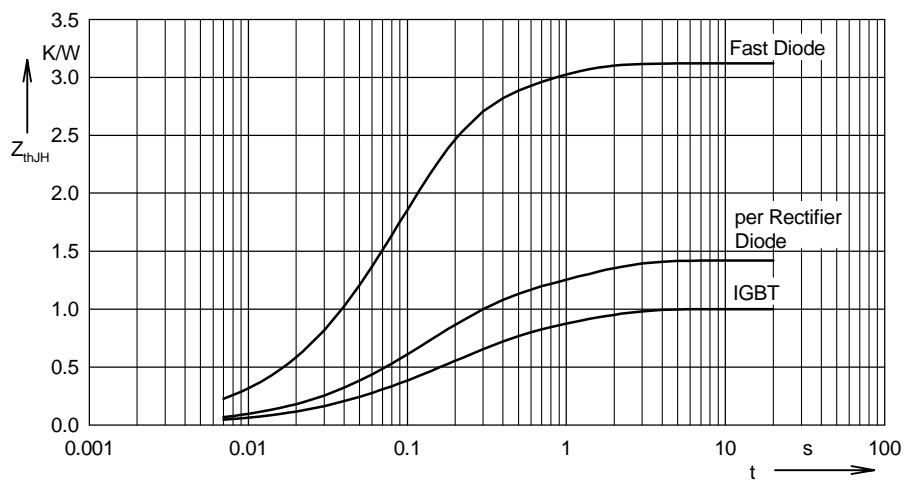


Fig. 18 Transient thermal impedance junction to heatsink  $Z_{thJH}$