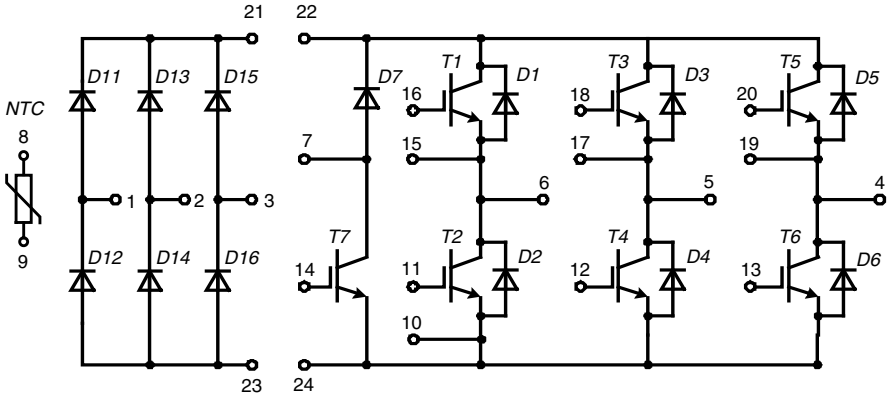
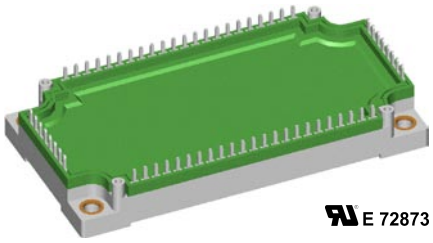
Converter - Brake - Inverter Module (CBI3) with Trench IGBT technology





Three Phase Rectifier	Brake Chopper	Three Phase Inverter
V_{RRM} = 1600 V	V_{CES} = 1200 V	V_{CES} = 1200 V
I_{FAVM} = 65 A	I_{C25} = 55 A	I_{C25} = 110 A
I_{FSM} = 1100 A	$V_{CE(sat)}$ = 1.7 V	$V_{CE(sat)}$ = 1.7 V

Input Rectifier Bridge D11 - D16

Symbol	Conditions	Maximum Ratings	
V_{RRM}		1600	V
I_{FAV}	T_C = 80°C; sine 180°	65	A
I_{DAVM}	T_C = 80°C; rectangular; d = $^1/_3$; bridge	180	A
I_{FSM}	T_C = 25°C; t = 10 ms; sine 50 Hz	1100	A
P_{tot}	T_C = 25°C	155	W

Symbol	Conditions		Characteristic Values (T_{VJ} = 25°C, unless otherwise specified) min.	typ.	max.	
V_F	I_F = 75 A;	T_{VJ} = 25°C		1.15	1.3	V
		T_{VJ} = 125°C		1.05		V
I_R	$V_R = V_{RRM}$;	T_{VJ} = 25°C			0.05	mA
		T_{VJ} = 125°C		0.8		mA
R_{thJC}	(per diode)				0.8	K/W

Application: AC motor drives with

- Input from single or three phase grid
- Three phase synchronous or asynchronous motor
- Electric braking operation

Features

- High level of integration - only one power semiconductor module required for the whole drive
- IGBT technology with low saturation voltage, low switching losses and tail current, high RBSOA and short circuit ruggedness
- Epitaxial free wheeling diodes with Hiperfast and soft reverse recovery
- Industry standard package with insulated copper base plate and soldering pins for PCB mounting
- Temperature sense included

Output Inverter T1 - T6

Symbol	Conditions	Maximum Ratings	
V_{CES}	T_{VJ} = 25°C to 150°C	1200	V
V_{GES}	Continuous	± 20	V
I_{C25}	T_C = 25°C	110	A
I_{C80}	T_C = 80°C	75	A
I_{CM}	T_C = 80°C; t_p = 1 ms	150	A
P_{tot}	T_C = 25°C	355	W

Symbol	Conditions		Characteristic Values (T_{VJ} = 25°C, unless otherwise specified) min.	typ.	max.	
$V_{CE(sat)}$	I_C = 75 A; V_{GE} = 15 V	T_{VJ} = 25°C		1.7	2.15	V
		T_{VJ} = 125°C		2.0		V
$V_{GE(th)}$	I_C = 3 mA; V_{GE} = V_{CE}		5	5.8	6.5	V
I_{CES}	V_{CE} = V_{CES}; V_{GE} = 0 V	T_{VJ} = 25°C			4	mA
		T_{VJ} = 125°C		1		mA
I_{GES}	V_{CE} = 0 V; V_{GE} = ± 20 V				400	nA
C_{ies}	V_{CE} = 25 V; V_{GE} = 0 V; f = 1 MHz			5.35		nF
Q_{Gon}	V_{CE} = 600 V; V_{GE} = 15 V; I_C = 75 A			700		nC
$t_{d(on)}$	Inductive load, T_{VJ} = 125°C			290		ns
t_r	V_{CE} = 600 V; I_C = 75 A			50		ns
$t_{d(off)}$	V_{GE} = ±15 V; R_G = 4.7 Ω			520		ns
t_f				90		ns
E_{on}				7		mJ
E_{off}				9.5		mJ
RBSOA	I_C = I_{CM}; V_{GE} = 15 V; R_G = 4.7 Ω; T_{VJ} = 125°C		$V_{CEK} \leq V_{CES}$ - L_S di/dt			V
t_{SC} (SCSOA)	V_{CE} = 720 V; V_{GE} = ±15 V; R_G = 4.7 Ω; $t_P \leq$ 10 µs; non-repetitive; T_{VJ} = 125°C			300		A
R_{thJC}					0.35	K/W

Output Inverter D1 - D6

Symbol	Conditions	Maximum Ratings	
I_{F25}	T_C = 25°C	155	A
I_{F80}	T_C = 80°C	75	A

Symbol	Conditions		Characteristic Values min.	typ.	max.	
V_F	I_F = 75 A;	T_{VJ} = 25°C		2.1	2.6	V
		T_{VJ} = 125°C		1.6		V
I_{RM}	I_F = 75 A; di_F/dt = -1500 A/µs;			135		A
Q_{rr}	T_{VJ} = 125°C; V_R = 600 V; V_{GE} = 0 V			15		µC
t_{rr}				160		ns
E_{rec}				6		mJ
R_{thJC}	(per diode)				0.4	K/W

Brake Chopper T7

Symbol	Conditions	Maximum Ratings	
V_{CES}	T_{VJ} = 25°C to 150°C	1200	V
V_{GES}	Continuous	± 20	V
I_{C25}	T_C = 25°C	55	A
I_{C80}	T_C = 80°C	35	A
I_{CM}	T_C = 80°C; t_p = 1 ms	70	A
P_{tot}	T_C = 25°C	200	W

Symbol	Conditions		Characteristic Values (T_{VJ} = 25°C, unless otherwise specified) min.	typ.	max.	
$V_{CE(sat)}$	I_C = 35 A; V_{GE} = 15 V	T_{VJ} = 25°C		1.7	2.15	V
		T_{VJ} = 125°C		2.0		V
$V_{GE(th)}$	I_C = 1.5 mA; V_{GE} = V_{CE}		5	5.8	6.5	V
I_{CES}	V_{CE} = V_{CES}; V_{GE} = 0 V	T_{VJ} = 25°C			0.25	mA
		T_{VJ} = 125°C		0.3		mA
I_{GES}	V_{CE} = 0 V; V_{GE} = ± 20 V				400	nA
C_{ies}	V_{CE} = 25 V; V_{GE} = 0 V; f = 1 MHz			2.5		nF
Q_{Gon}	V_{CE} = 600 V; V_{GE} = 15 V; I_C = 35 A			330		nC
$t_{d(on)}$	Inductive load, T_{VJ} = 125°C			90		ns
t_r	V_{CE} = 600 V; I_C = 35 A			50		ns
$t_{d(off)}$	V_{GE} = ±15 V; R_G = 27 Ω			520		ns
t_f				90		ns
E_{off}				4.8		mJ
RBSOA	I_C = I_{CM}; V_{GE} = 15 V; R_G = 27 Ω; T_{VJ} = 125°C		$V_{CEK} \leq V_{CES} - L_S$ di/dt			V
t_{SC} **(SCSOA)**	V_{CE} = 720 V; V_{GE} = ±15 V; R_G = 27 Ω; $t_P \leq$ 10 µs; non-repetitive; T_{VJ} = 125°C			140		A
R_{thJC}					0.62	K/W

Brake Chopper D7

Symbol	Conditions	Maximum Ratings	
V_{RRM}	T_{VJ} = 25°C to 150°C	1200	V
I_{F25}	T_C = 25°C	50	A
I_{F80}	T_C = 80°C	30	A

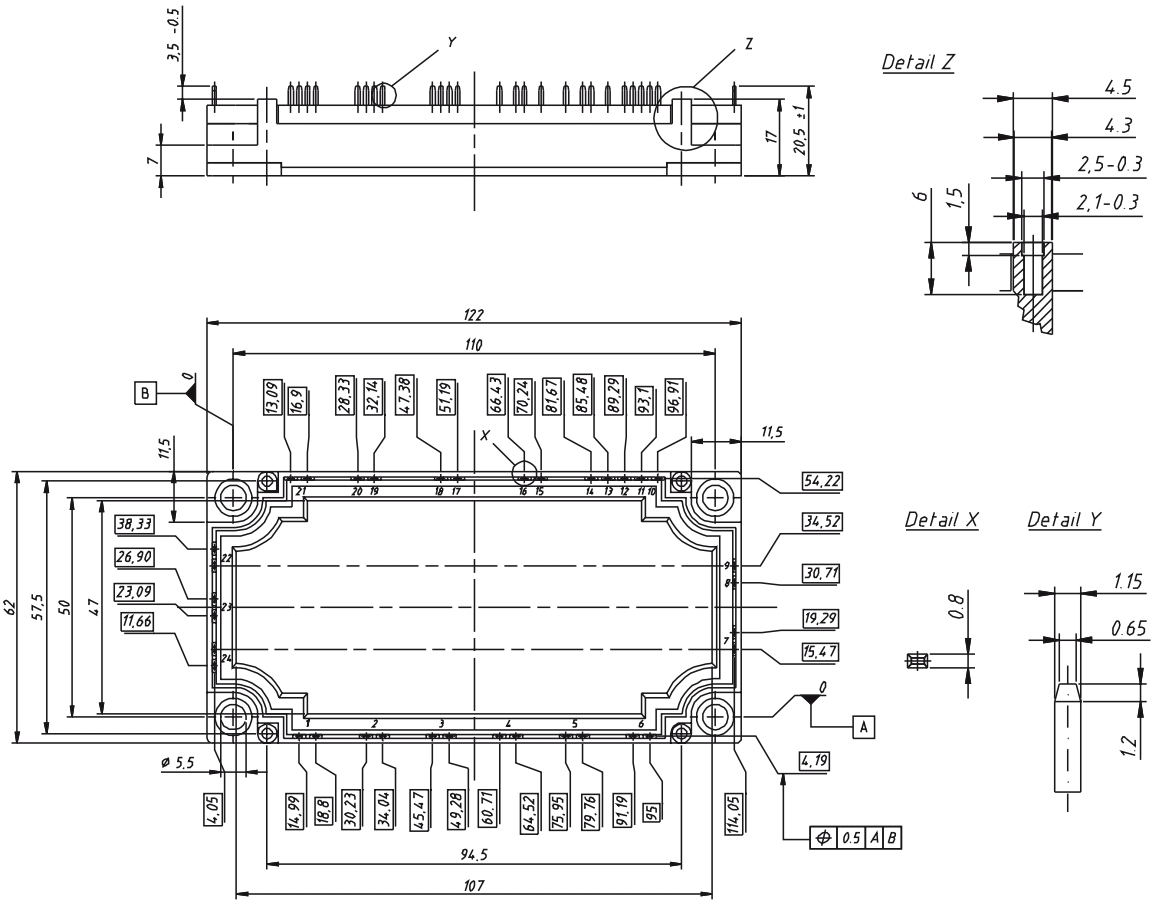
Symbol	Conditions		Characteristic Values min.	typ.	max.	
V_F	I_F = 35 A;	T_{VJ} = 25°C		2.5	3.3	V
		T_{VJ} = 125°C		2.0		V
I_R	V_R = V_{RRM};	T_{VJ} = 25°C			0.25	mA
		T_{VJ} = 125°C		0.5		mA
R_{thJC}	(per diode)				1.2	K/W

Temperature Sensor NTC					
Symbol	**Conditions**	**Characteristic Values**			
		min.	**typ.**	**max.**	
R_{25}	T = 25°C	4.75	5.0	5.25	kΩ
$B_{25/50}$			3375		K

Module			
Symbol	**Conditions**	**Maximum Ratings**	
T_{VJ}	operating	-40...+125	°C
T_{JM}		+150	°C
T_{stg}		-40...+125	°C
V_{ISO}	$I_{ISOL} \leq 1$ mA; 50/60 Hz	2500	V~
M_d	Mounting torque (M5)	3 - 6	Nm

Symbol	**Conditions**	**Characteristic Values**			
		min.	**typ.**	**max.**	
$R_{therm-chip}$	Resistance terminal to chip		5		mΩ
d_S	Creepage distance on surface	6			mm
d_A	Strike distance in air	6			mm
R_{thCH}	with heatsink compound		0.01		K/W
Weight			300		g

Dimensions in mm (1 mm = 0.0394")



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Input Rectifier Bridge D11 - D16

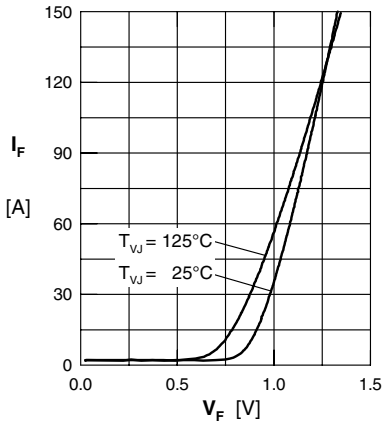

Fig. 1 Typ. forward current vs. voltage drop per diode

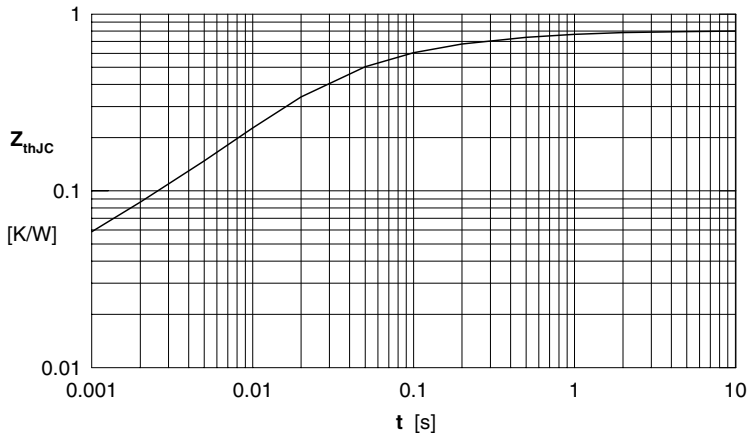

Fig. 2 Transient thermal impedance junction to case

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Output Inverter T1 - T6 / D1 - D6

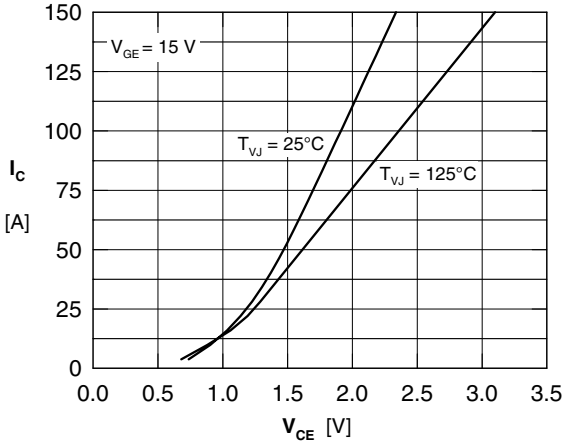

Fig. 3 Typical output characteristic

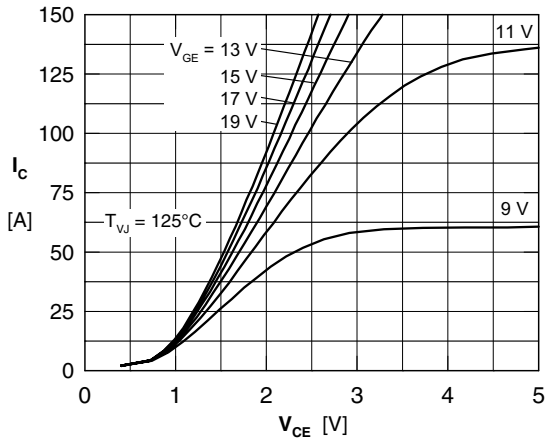

Fig. 4 Typical output characteristic

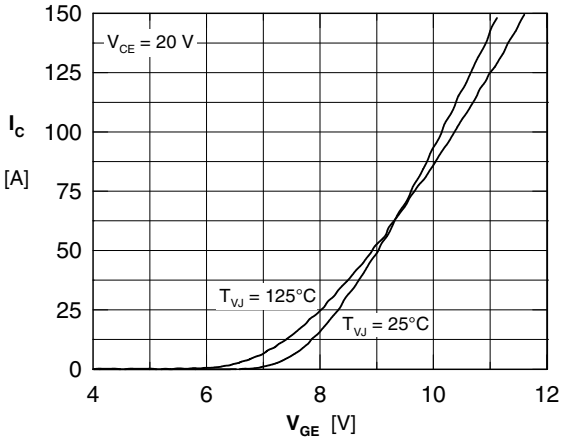

Fig. 5 Typical transfer characteristic

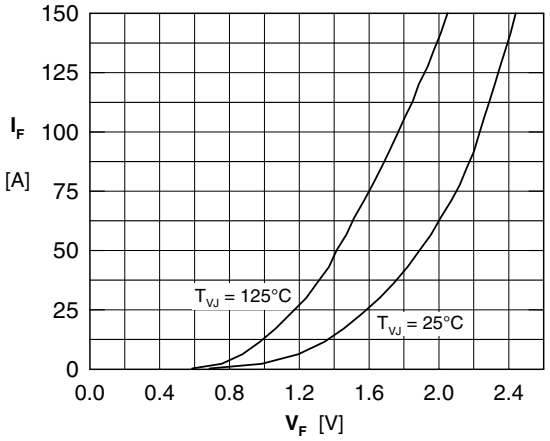

Fig. 6 Typical forward characteristic of free wheeling diode

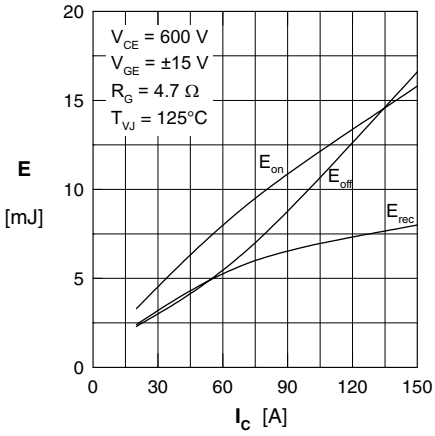

Fig. 7 Typical switching losses vs. collector current

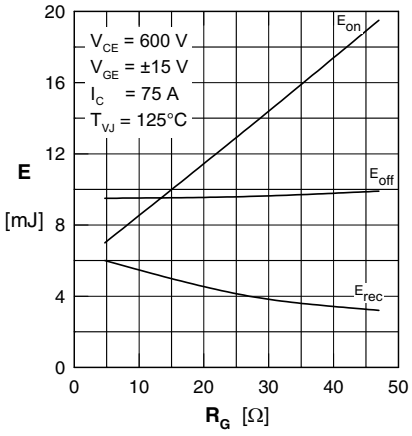

Fig. 8 Typ. switching losses vs. gate resistance

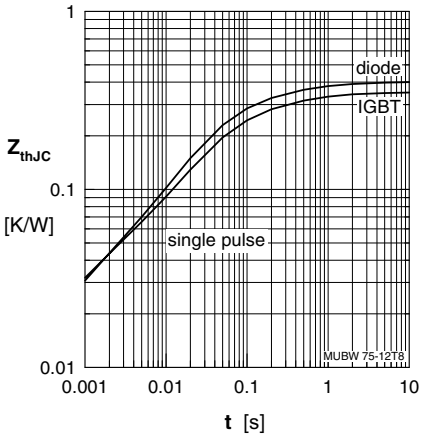

Fig. 9 Transient thermal impedance

Brake Chopper T7 / D7

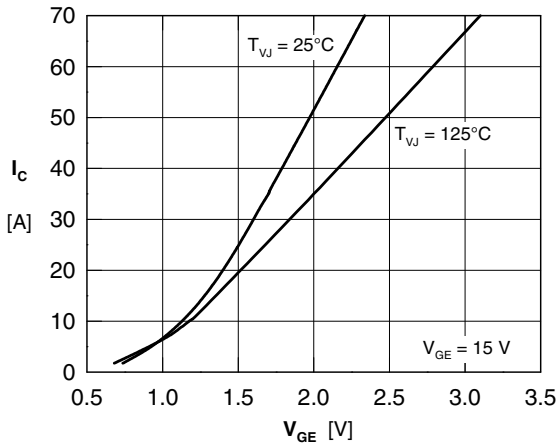

Fig. 10 Typical output characteristics

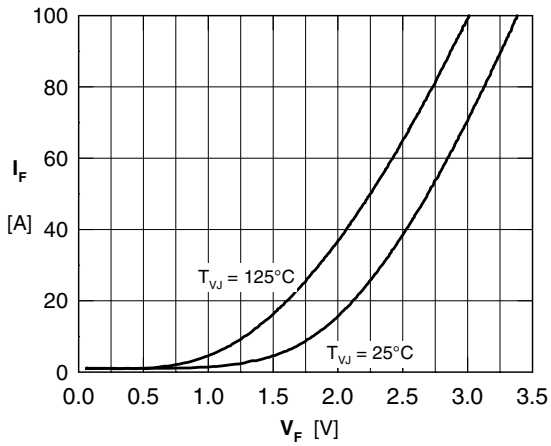

Fig. 11 Typical forward characteristics of free wheeling diode

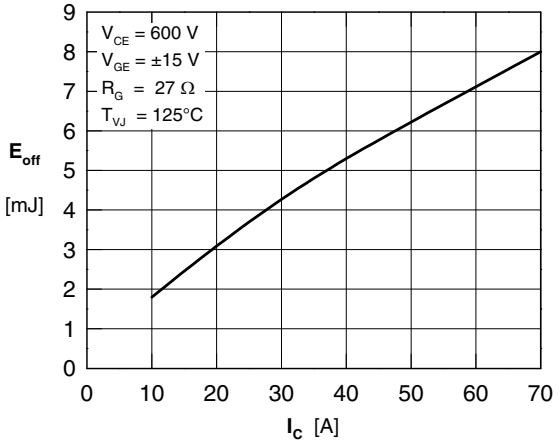

Fig. 12 Typ. turn off energy vs. collector current

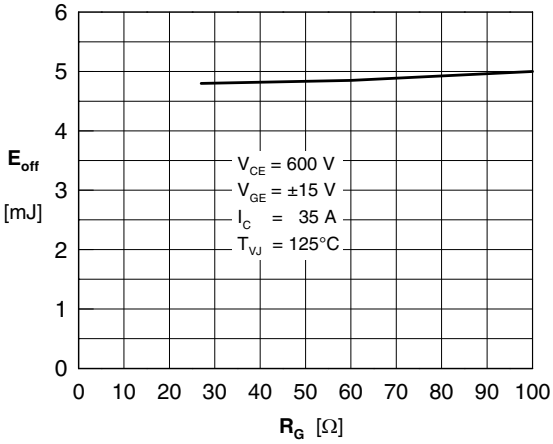

Fig. 13 Typ. turn off energy vs. gate resistor

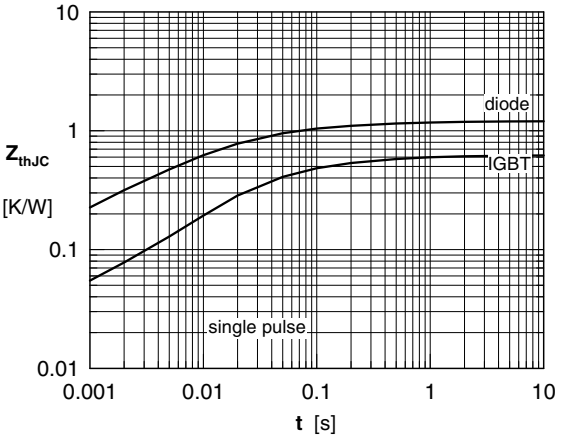

Fig. 14 Transient thermal impedance

Temperature Sensor NTC

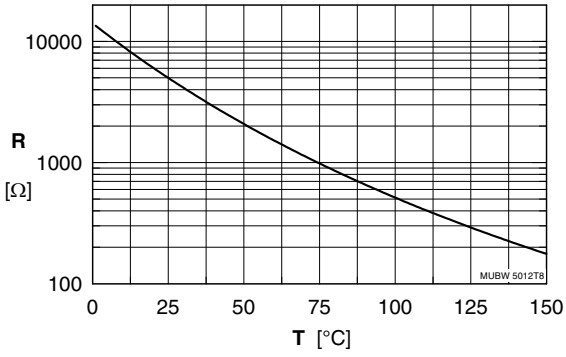

Fig. 15 Typ. termistor resistance versus temperature