Vincotech

10-FZ122PB040FV-M817F88
datasheet

flow PHASE 0	1200 V / 40 A

Features

- High efficiency fast Fairchild IGBT
- Full current fast FWD
- Thermistor

Target applications

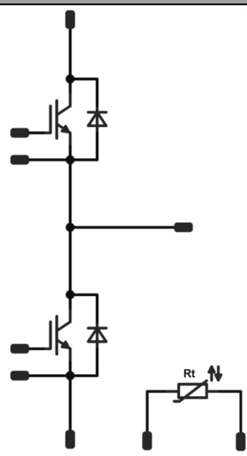
- Industrial Drives
- Power Supply
- Solar
- UPS
- Welding

Types

- 10-FZ122PB040FV-M817F88

flow 0 12mm housing

Schematic



Maximum Ratings

T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Condition		Value	Unit
Half Bridge Switch					
Collector-emitter voltage	V_{CES}			1200	V
Collector current	I_C	$T_j = T_{jmax}$	T_s = 80 °C	55	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}		160	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	117	W
Gate-emitter voltage	V_{GES}			±25	V
Maximum Junction Temperature	T_{jmax}			175	°C

Maximum Ratings

T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Condition		Value	Unit
Half Bridge FWD					
Peak Repetitive Reverse Voltage	V_{RRM}			1200	V
Continuous (direct) forward current	I_F	$T_j = T_{jmax}$	T_s = 80 °C	33	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	73	W
Maximum Junction Temperature	T_{jmax}			175	°C
Module Properties					
Thermal Properties					
Storage temperature	T_{stg}			-40…+125	°C
Operation temperature under switching condition	T_{jop}			-40…(T_{jmax} - 25)	°C
Isolation Properties					
Isolation voltage	V_{isol}	DC Test Voltage	t_p = 2 s	4000	V
Creepage distance				min. 12,7	mm
Clearance with solder pin				9,12	mm
Comparative Tracking Index	CTI			> 200	

Characteristic Values

Parameter	Symbol	Conditions	V_{GE} [V] V_{GS} [V]	V_{CE} [V] V_{DS} [V] V_F [V]	I_C [A] I_D [A] I_F [A]	T_j [°C]	Min	Typ	Max	Unit
Half Bridge Switch										
Static										
Gate-emitter threshold voltage	$V_{GE(th)}$	$V_{GE} = V_{CE}$			0,04	25	5	6,8	7,3	V
Collector-emitter saturation voltage	V_{CEsat}		15		40	25 125 150	1,5	1,65 1,77 1,79	2,5	V
Collector-emitter cut-off current	I_{CES}		0	1200		25			50	µA
Gate-emitter leakage current	I_{GES}		25	0		25			250	nA
Internal gate resistance	r_g							none		Ω
Input capacitance	C_{ies}	f = 1 MHz	0	30		25		4300		pF
Output capacitance	C_{oes}							180		
Reverse transfer capacitance	C_{res}							100		
Gate charge	Q_g		15	600	40	25		370		nC
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	phase-change material λ = 3,4 W/mK						0,81		K/W
Dynamic										
Turn-on delay time	$t_{d(on)}$	R_{goff} = 8 Ω R_{gon} = 8 Ω	±15	600	40	25 125 150		131 134 134		ns
Rise time	t_r					25 125 150		22 27 30		
Turn-off delay time	$t_{d(off)}$					25 125 150		229 277 293		
Fall time	t_f					25 125 150		11 28 42		
Turn-on energy (per pulse)	E_{on}	Q_{rFWD} = 3,1 µC Q_{rFWD} = 5,8 µC Q_{rFWD} = 6,6 µC				25 125 150		1,999 3,219 3,628		mWs
Turn-off energy (per pulse)	E_{off}					25 125 150		1,378 2,363 2,720		

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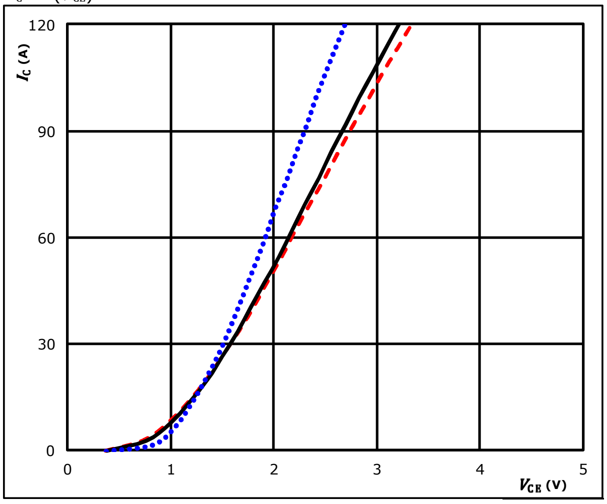
Characteristic Values

Parameter	Symbol	Conditions	V_{GE} [V] V_{GS} [V]	V_{CE} [V] V_{DS} [V] V_F [V]	I_C [A] I_D [A] I_F [A]	T_j [°C]	Min	Typ	Max	Unit
Half Bridge FWD										
Static										
Forward voltage	V_F				35	25 150		2,30 2,29	2,62	V
Reverse leakage current	I_r			1200		25 150			60 5500	µA
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	phase-change material λ = 3,4 W/mK						1,30		K/W
Dynamic										
Peak recovery current	I_{RRM}					25 125 150		37 37 39		A
Reverse recovery time	t_{rr}					25 125 150		154 459 476		ns
Recovered charge	Q_r	di/dt = 2193 A/µs di/dt = 1850 A/µs di/dt = 2283 A/µs	±15	600	40	25 125 150		3,090 5,814 6,633		µC
Reverse recovered energy	E_{rec}					25 125 150		1,252 2,406 2,701		mWs
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 125 150		806 400 352		A/µs
Thermistor										
Rated resistance	R					25		22		kΩ
Deviation of R_{100}	$\Delta_{R/R}$	R_{100} = 1484 Ω				100	-5		5	%
Power dissipation	P					25		5		mW
Power dissipation constant						25		1,5		mW/K
B-value	$B_{(25/50)}$	Tol. ±1 %				25		3962		K
B-value	$B_{(25/100)}$	Tol. ±1 %				25		4000		K
Vincotech NTC Reference									I	

Half Bridge Switch Characteristics

Typical output characteristics **IGBT**

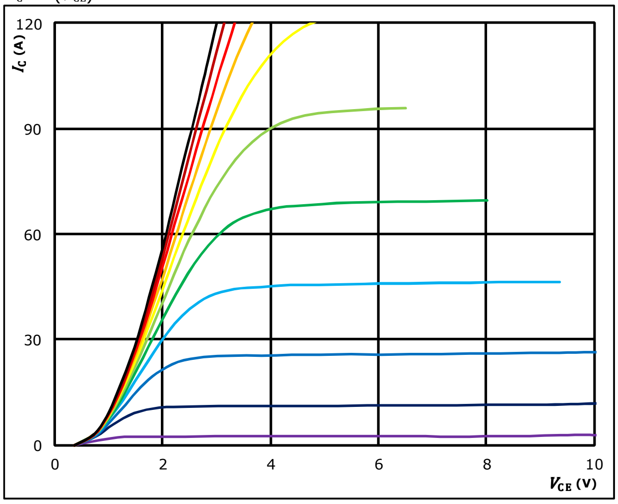
$I_C = f(V_{CE})$



t_p =	250	μs		25 °C	···········
V_{GE} =	15	V	T_j:	125 °C	———
				150 °C	– – –

Typical output characteristics **IGBT**

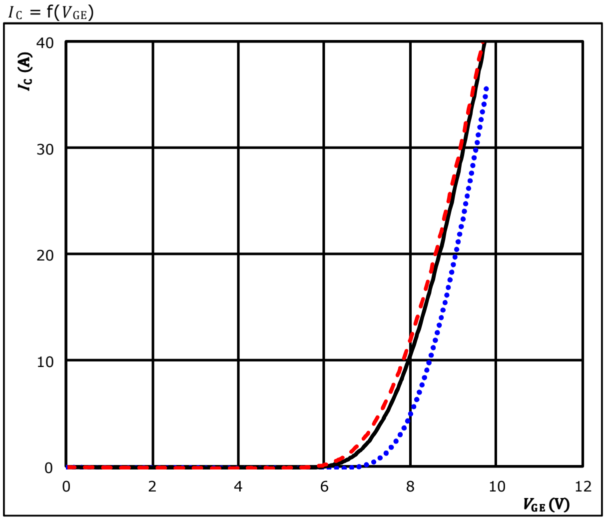
$I_C = f(V_{CE})$



t_p =	250	μs
T_j =	150	°C
V_{GE} from	7 V to 17 V in steps of 1 V	

Typical transfer characteristics **IGBT**

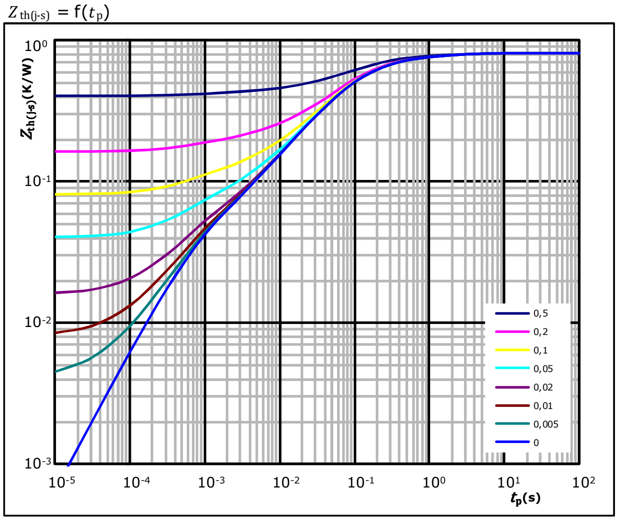
$I_C = f(V_{GE})$



t_p =	100	μs		25 °C	···········
V_{CE} =	10	V	T_j:	125 °C	———
				150 °C	– – –

Transient Thermal Impedance as function of Pulse duration **IGBT**

$Z_{th(j-s)} = f(t_p)$



D =	t_p / T	
$R_{th(j-s)}$ =	0,81	K/W

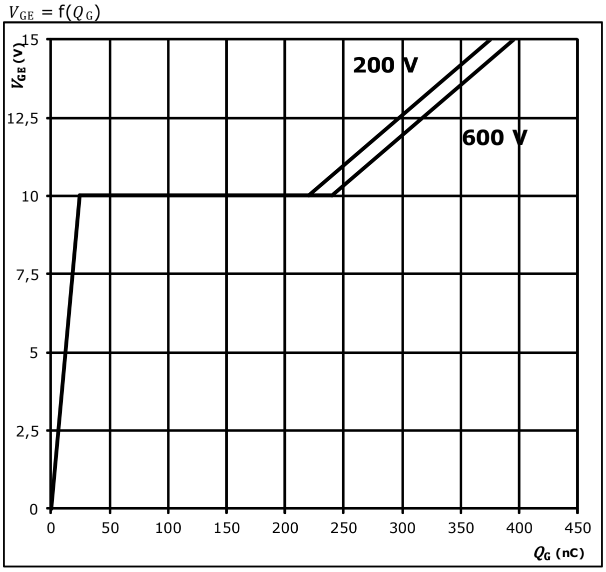
IGBT thermal model values

R (K/W)	τ (s)
9,05E-02	1,57E+00
2,50E-01	2,08E-01
3,60E-01	5,82E-02
7,42E-02	9,04E-03
3,66E-02	7,39E-04

Half Bridge Switch Characteristics

Gate voltage vs Gate charge — **IGBT**

$V_{GE} = f(Q_G)$

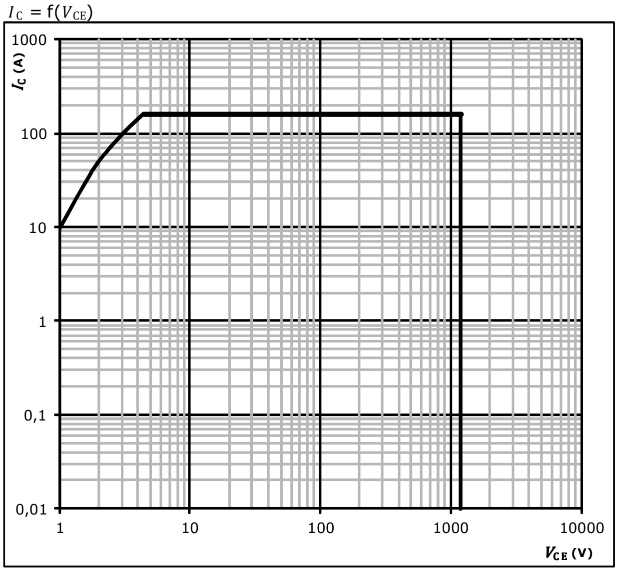


At

I_C= 40 A

Safe operating area — **IGBT**

$I_C = f(V_{CE})$



At

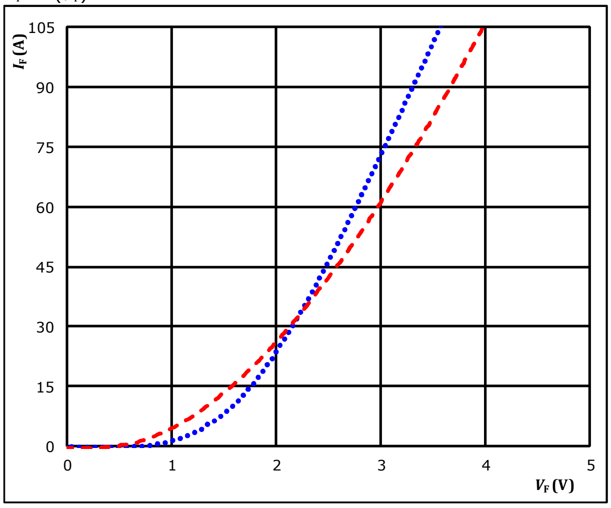
D =	single pulse	
T_s =	80	ºC
V_{GE} =	±15	V
T_j =	T_{jmax}	ºC

Half Bridge FWD Characteristics

figure 1. **FWD**

Typical forward characteristics

$I_F = f(V_F)$



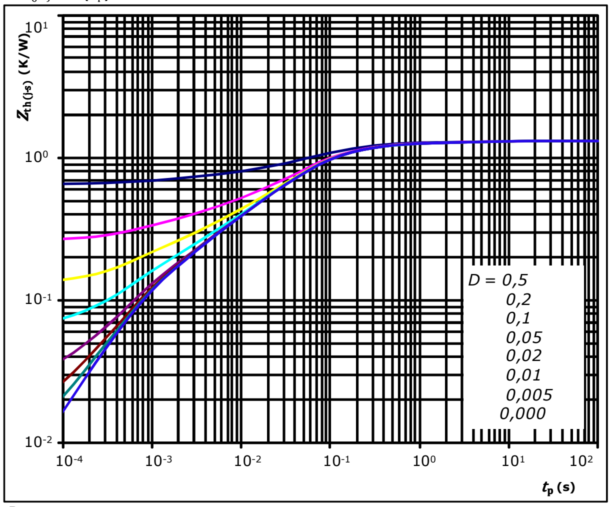
t_p = 250 µs

T_j: 25 °C ········ / 150 °C - - - -

figure 2. **FWD**

Transient thermal impedance as a function of pulse width

$Z_{th(j-s)} = f(t_p)$



D = t_p / T

$R_{th(j-s)}$ = 1,30 K/W

FWD thermal model values

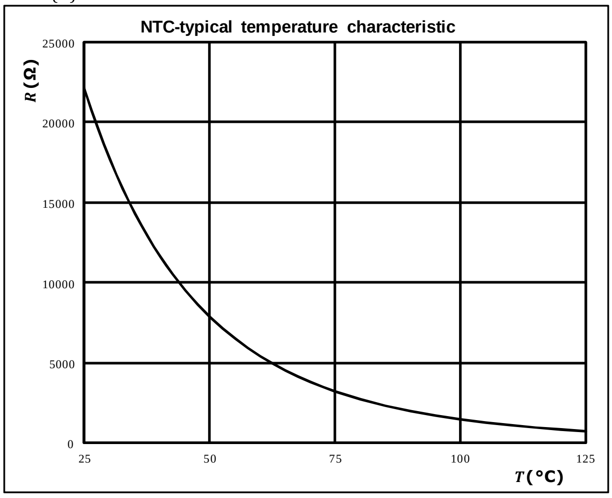
R (K/W)	τ (s)
6,4490E-02	2,7130E+00
2,1750E-01	2,7510E-01
6,8560E-01	5,7320E-02
2,1790E-01	8,3410E-03
1,1710E-01	8,8590E-04

Thermistor Characteristics

figure 1. **Thermistor**

Typical NTC characteristic as a function of temperature

$R = f(T)$

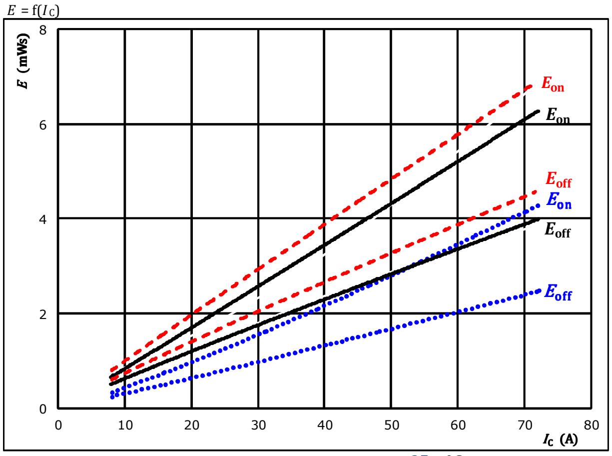


Half Bridge Switching Characteristics

figure 1. IGBT

Typical switching energy losses as a function of collector current

$E = f(I_C)$



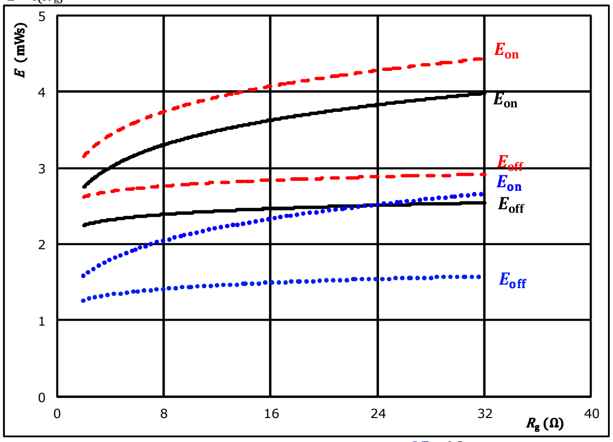
With an inductive load at

V_{CE} =	600	V	T_j:	25 °C	dotted
V_{GE} =	±15	V		125 °C	solid
R_{gon} =	8	Ω		150 °C	dashed
R_{goff} =	8	Ω			

figure 2. IGBT

Typical switching energy losses as a function of gate resistor

$E = f(R_g)$



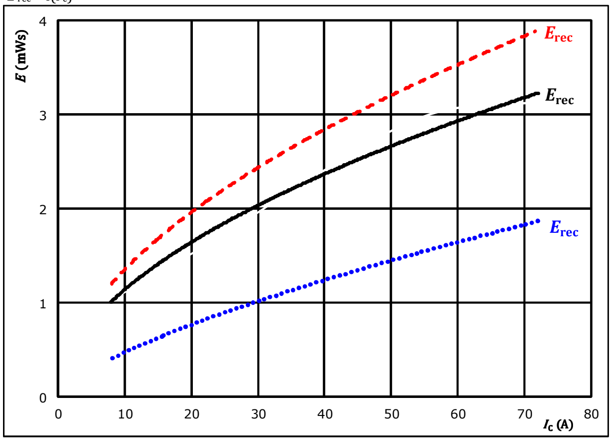
With an inductive load at

V_{CE} =	600	V	T_j:	25 °C	dotted
V_{GE} =	±15	V		125 °C	solid
I_C =	40	A		150 °C	dashed

figure 3. FWD

Typical reverse recovered energy loss as a function of collector current

$E_{rec} = f(I_C)$



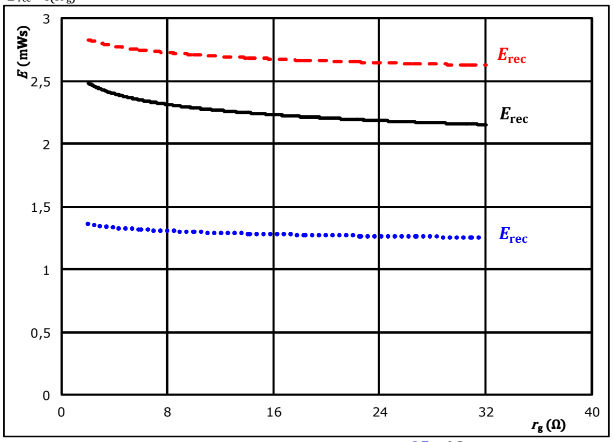
With an inductive load at

V_{CE} =	600	V	T_j:	25 °C	dotted
V_{GE} =	±15	V		125 °C	solid
R_{gon} =	8	Ω		150 °C	dashed

figure 4. FWD

Typical reverse recovered energy loss as a function of gate resistor

$E_{rec} = f(R_g)$



With an inductive load at

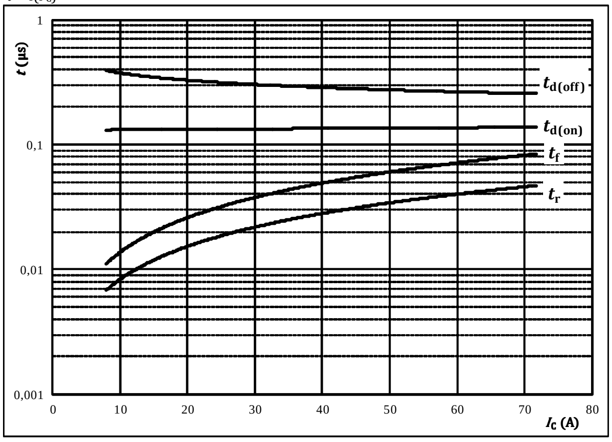
V_{CE} =	600	V	T_j:	25 °C	dotted
V_{GE} =	±15	V		125 °C	solid
I_C =	40	A		150 °C	dashed

Half Bridge Switching Characteristics

figure 5. IGBT

Typical switching times as a function of collector current

$t = f(I_C)$



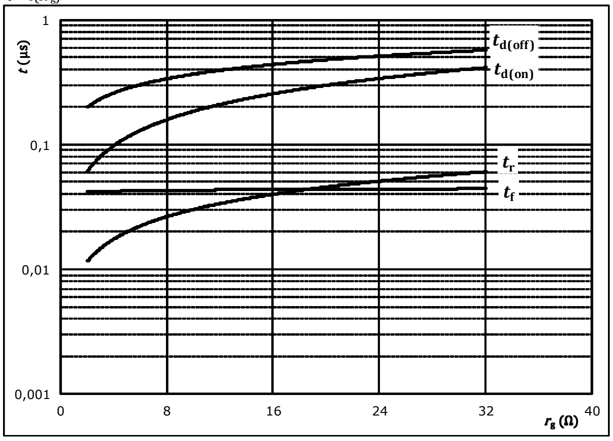
With an inductive load at

T_j =	150	°C
V_{CE} =	600	V
V_{GE} =	±15	V
R_{gon} =	8	Ω
R_{goff} =	8	Ω

figure 6. IGBT

Typical switching times as a function of gate resistor

$t = f(R_g)$



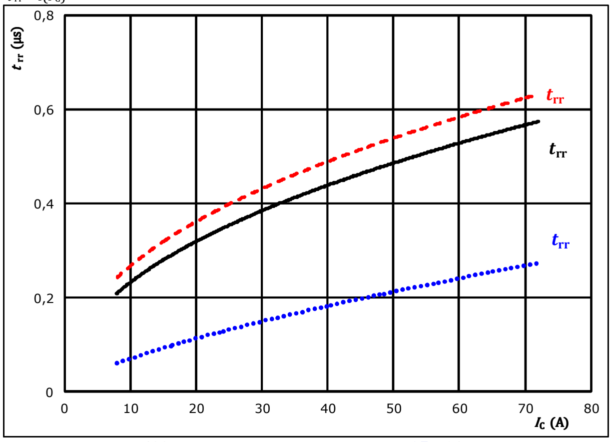
With an inductive load at

T_j =	150	°C
V_{CE} =	600	V
V_{GE} =	±15	V
I_C =	40	A

figure 7. FWD

Typical reverse recovery time as a function of collector current

$t_{rr} = f(I_C)$

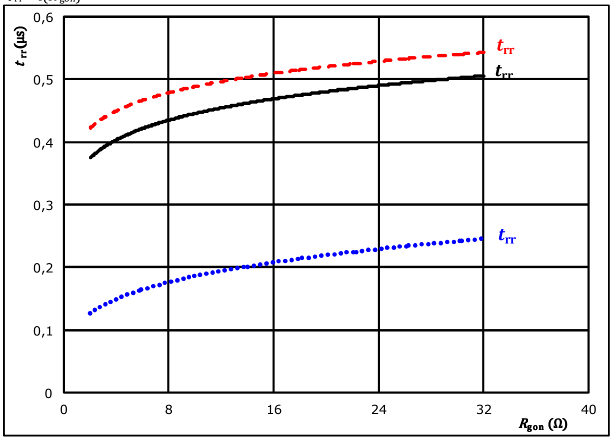


At						
V_{CE}=	600	V		25	°C	···········
V_{GE} =	±15	V	T_j:	125	°C	———
R_{gon} =	8	Ω		150	°C	– – –

figure 8. FWD

Typical reverse recovery time as a function of IGBT turn on gate resistor

$t_{rr} = f(R_{gon})$



At						
V_{CE} =	600	V		25	°C	···········
V_{GE} =	±15	V	T_j:	125	°C	———
I_C =	40	A		150	°C	– – –

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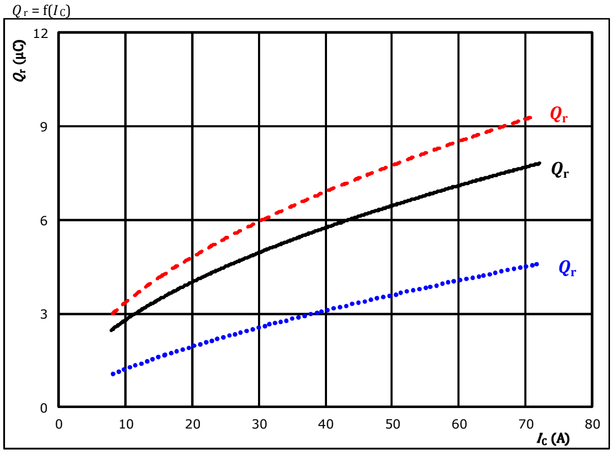
Half Bridge Switching Characteristics

figure 9. **FWD**

Typical recovered charge as a function of collector current

$Q_r = f(I_C)$

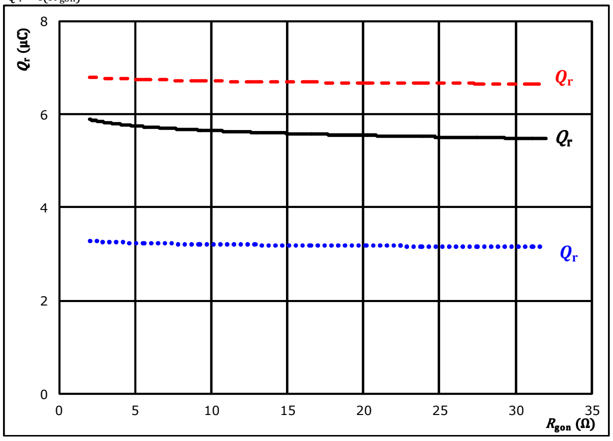


At					
V_{CE} =	600	V		25	°C
V_{GE} =	±15	V	T_j:	125	°C
R_{gon} =	8	Ω		150	°C

figure 10. **FWD**

Typical recoved charge as a function of IGBT turn on gate resistor

$Q_r = f(R_{gon})$

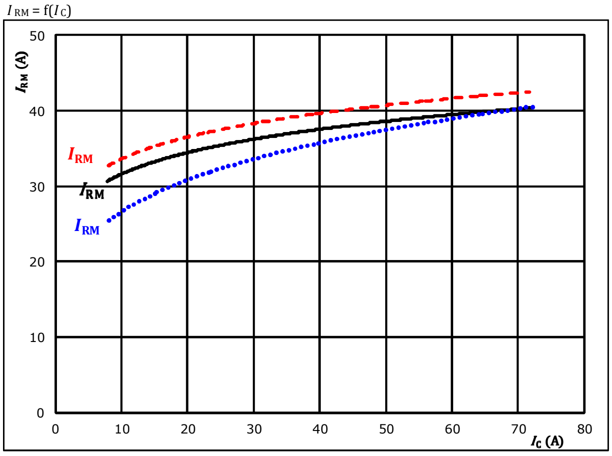


At					
V_{CE}=	600	V		25	°C
V_{GE} =	±15	V	T_j:	125	°C
I_C=	40	A		150	°C

figure 11. **FWD**

Typical peak reverse recovery current current as a function of collector current

$I_{RM} = f(I_C)$

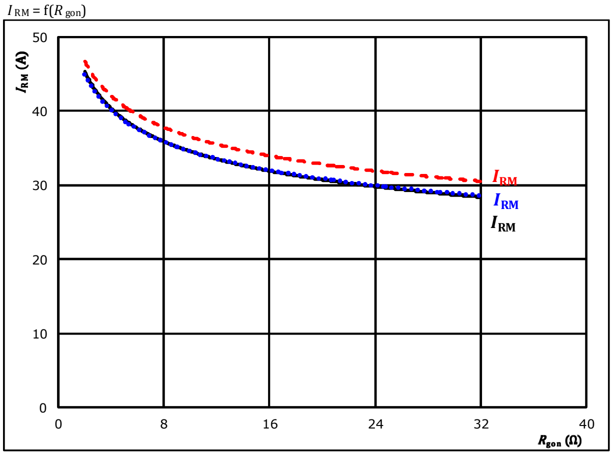


At					
V_{CE}:	600	V		25	°C
V_{GE} =	±15	V	T_j:	125	°C
R_{gon} =	8	Ω		150	°C

figure 12. **FWD**

Typical peak reverse recovery current as a function of IGBT turn on gate resistor

$I_{RM} = f(R_{gon})$



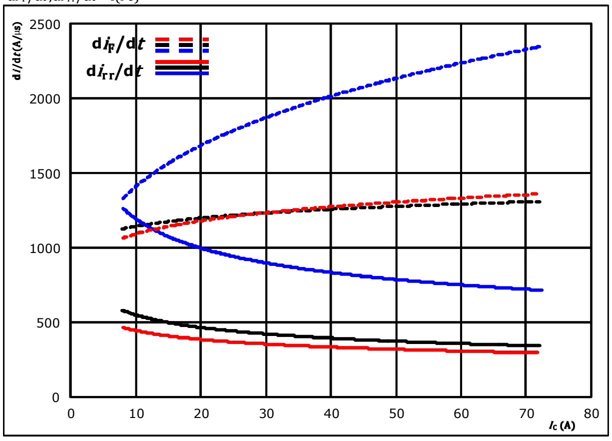
At					
V_{CE} =	600	V		25	°C
V_{GE} =	±15	V	T_j:	125	°C
I_C =	40	A		150	°C

Half Bridge Switching Characteristics

figure 13. **FWD**

Typical rate of fall of forward and reverse recovery current as a function of collector current

$di_F/dt, di_{rr}/dt = f(I_C)$



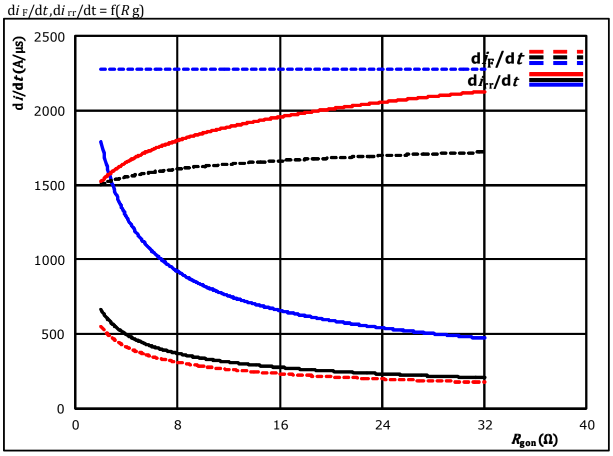
At

V_{CE} =	600	V	T_j:	25 °C	dotted
V_{GE} =	±15	V		125 °C	solid
R_{gon} =	8	Ω		150 °C	dashed

figure 14. **FWD**

Typical rate of fall of forward and reverse recovery current as a function of IGBT turn on gate resistor

$di_F/dt, di_{rr}/dt = f(R_g)$



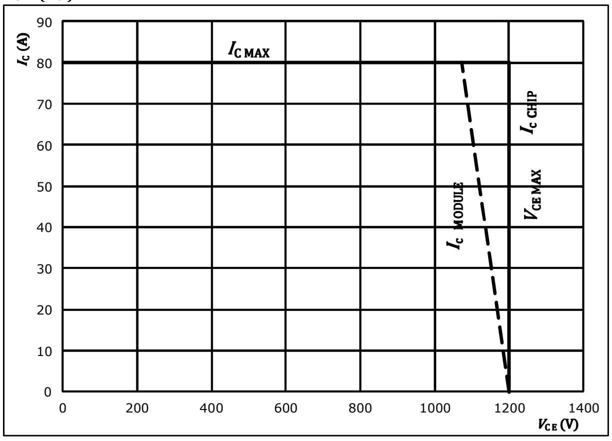
At

V_{CE} =	600	V	T_j:	25 °C	dotted
V_{GE} =	±15	V		125 °C	solid
I_C =	40	A		150 °C	dashed

figure 15. **IGBT**

Reverse bias safe operating area

$I_C = f(V_{CE})$



At

T_j =	175	°C
R_{gon} =	8	Ω
R_{goff} =	8	Ω

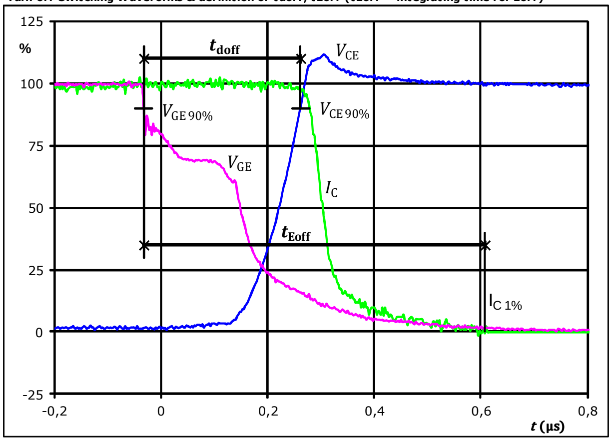
Half Bridge Switching Definitions

General conditions

T_j	=	150 °C
R_{gon}	=	8 Ω
R_{goff}	=	8 Ω

figure 1. IGBT

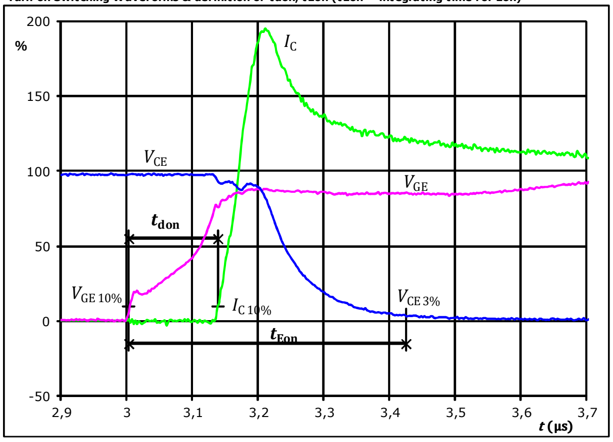
Turn-off Switching Waveforms & definition of tdoff, tEoff (tEoff = integrating time for Eoff)



$V_{GE}(0\%)$ =	-15	V
$V_{GE}(100\%)$ =	15	V
$V_C(100\%)$ =	600	V
$I_C(100\%)$ =	40	A
t_{doff} =	0,293	µs
t_{Eoff} =	0,640	µs

figure 2. IGBT

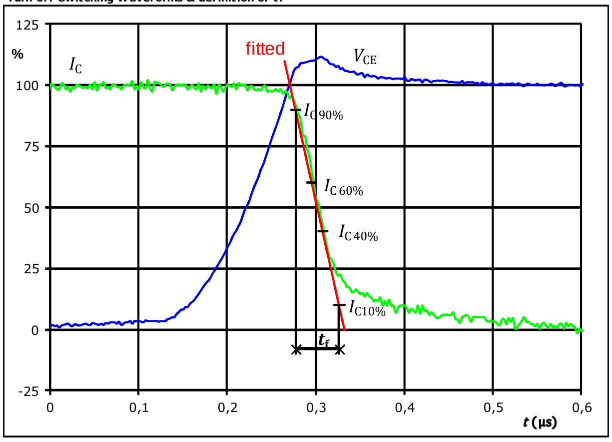
Turn-on Switching Waveforms & definition of tdon, tEon (tEon = integrating time for Eon)



$V_{GE}(0\%)$ =	-15	V
$V_{GE}(100\%)$ =	15	V
$V_C(100\%)$ =	600	V
$I_C(100\%)$ =	40	A
t_{don} =	0,134	µs
t_{Eon} =	0,422	µs

figure 3. IGBT

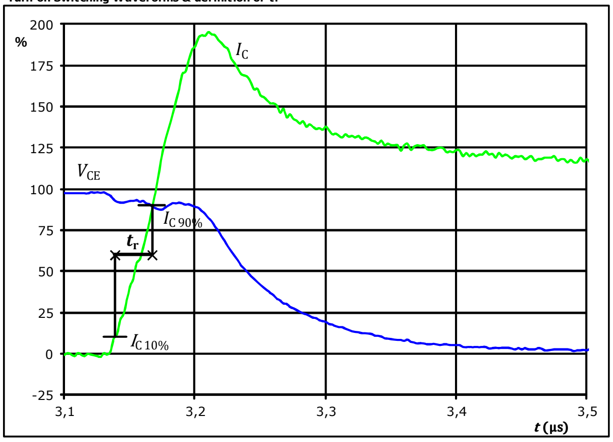
Turn-off Switching Waveforms & definition of tf



$V_C(100\%)$ =	600	V
$I_C(100\%)$ =	40	A
t_f =	0,042	µs

figure 4. IGBT

Turn-on Switching Waveforms & definition of tr

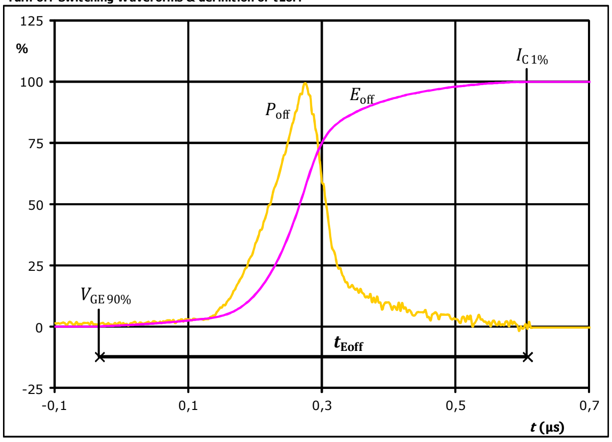


$V_C(100\%)$ =	600	V
$I_C(100\%)$ =	40	A
t_r =	0,030	µs

Half Bridge Switching Characteristics

figure 5. **IGBT**

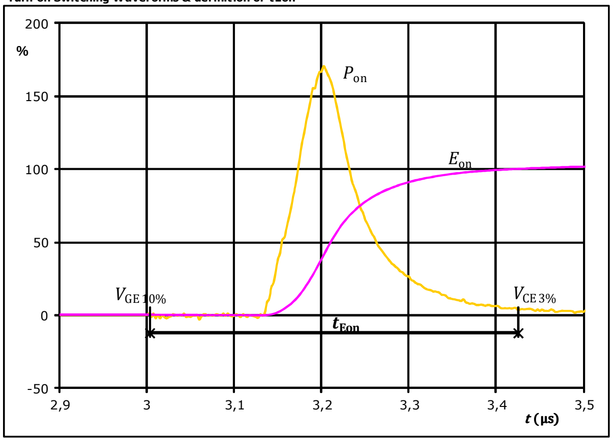
Turn-off Switching Waveforms & definition of tEoff



P_{off} (100%) =	23,96	kW
E_{off} (100%) =	2,72	mJ
t_{Eoff} =	0,64	µs

figure 6. **IGBT**

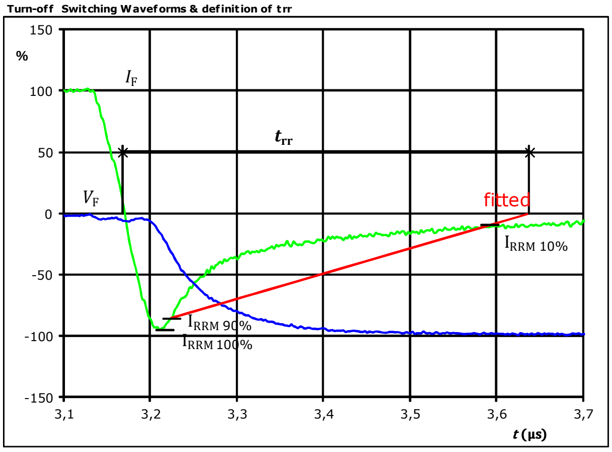
Turn-on Switching Waveforms & definition of tEon



P_{on} (100%) =	23,96	kW
E_{on} (100%) =	3,63	mJ
t_{Eon} =	0,42	µs

figure 7. **FWD**

Turn-off Switching Waveforms & definition of trr

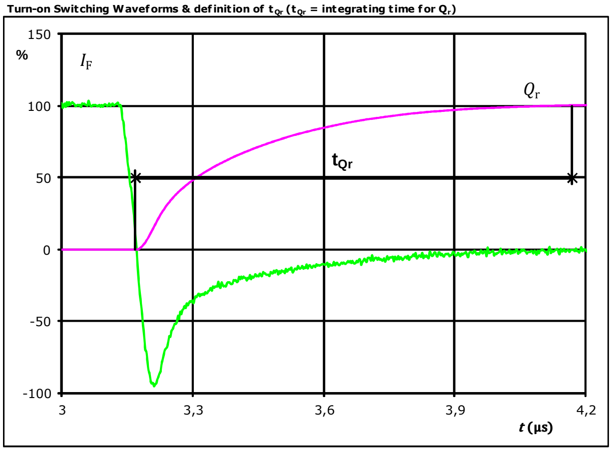


V_F (100%) =	600	V
I_F (100%) =	40	A
I_{RRM} (100%) =	-39	A
t_{rr} =	0,476	µs

Half Bridge Switching Characteristics

figure 8. FWD

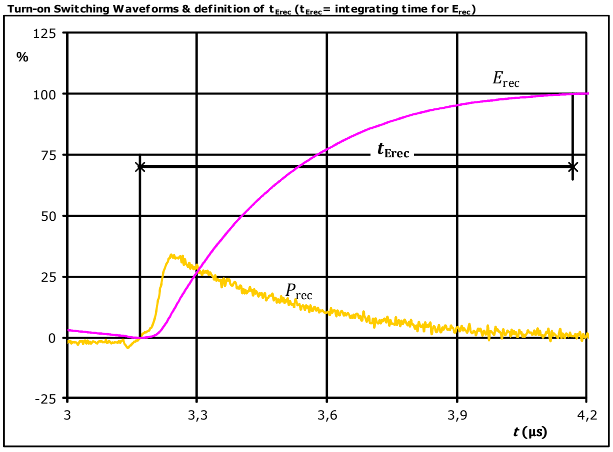
Turn-on Switching Waveforms & definition of t_{Qr} (t_{Qr} = integrating time for Q_r)



I_F (100%) =	40	A
Q_r (100%) =	6,63	µC
t_{Qr} =	1,00	µs

figure 9. FWD

Turn-on Switching Waveforms & definition of t_{Erec} (t_{Erec}= integrating time for E_{rec})



P_{rec} (100%) =	23,96	kW
E_{rec} (100%) =	2,70	mJ
t_{Erec} =	1,00	µs

Ordering Code & Marking

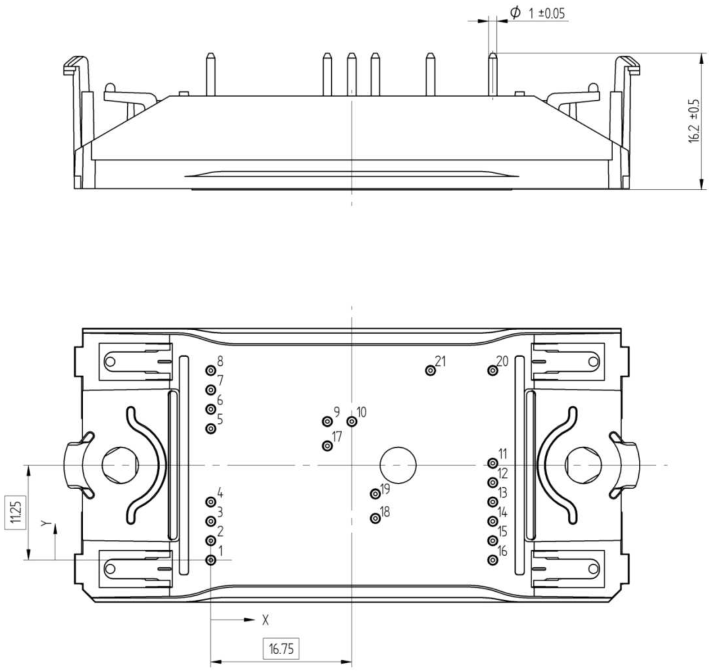
Version	Ordering Code
without thermal paste 12mm housing with Solder Pin	10-FZ122PB040FV-M817F88

	Name		Date code	UL & VIN	Lot	Serial
Text	NN-NNNNNNNNNNNNNN-TTTTTTVV		WWYY	UL VIN	LLLLL	SSSS
Datamatrix	Type&Ver	Lot number	Serial	Date code		
Datamatrix	TTTTTTTVV	LLLLL	SSSS	WWYY		

Outline

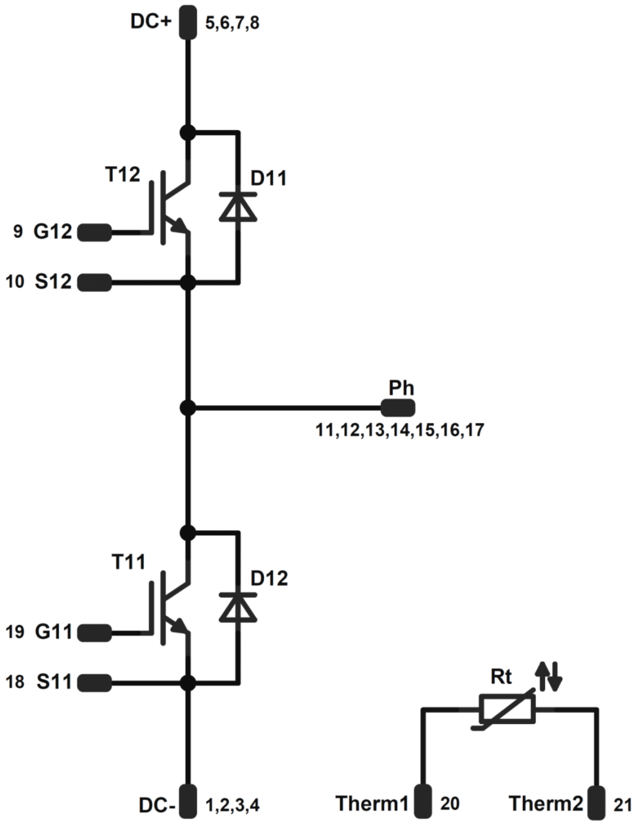
Pin table [mm]

Pin	X	Y	Function
1	0	0	DC-
2	0	2,3	DC-
3	0	4,6	DC-
4	0	6,9	DC-
5	0	15,6	DC+
6	0	17,9	DC+
7	0	20,2	DC+
8	0	22,5	DC+
9	13,85	16,45	G12
10	16,75	16,45	S12
11	33,5	11,5	Ph
12	33,5	9,2	Ph
13	33,5	6,9	Ph
14	33,5	4,6	Ph
15	33,5	2,3	Ph
16	33,5	0	Ph
17	13,85	13,55	Ph
18	19,55	4,95	S11
19	19,55	7,85	G11
20	33,5	22,5	Therm1
21	26,1	22,5	Therm2



Tolerance of pinpositions: ±0,5mm at the end of pins
Dimension of coordinate axis is only offset without tolerance

Pinout



Identification

ID	Component	Voltage	Current	Function	Comment
T11, T12	Switch	1200 V	40 A	Half Bridge Switch	
D11, D12	FWD	1200 V	35 A	Half Bridge Diode	
Rt	NTC			Thermistor	

Packaging instruction				
Standard packaging quantity (SPQ) 135	>SPQ	Standard	<SPQ	Sample

Handling instruction
Handling instructions for *flow* 0 packages see vincotech.com website.

Package data
Package data for *flow* 0 packages see vincotech.com website.

UL recognition and file number
This device is certified according to UL 1557 standard, UL file number E192116. For more information see vincotech.com website.

Document No.:	Date:	Modification:	Pages
10-FZ122PB040FV-M817F88 -D1-14	27 Jul. 2016		

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2. A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.