Vincotech

10-FZ122PB100SH-M819F28
10-PZ122PB100SH-M819F28Y
datasheet

flow **PHASE 0**	**1200 V / 100 A**

Features

- High efficiency fast IGBT4 HS half-bridge
- Full current fast FWD
- Thermistor

flow 0 housing

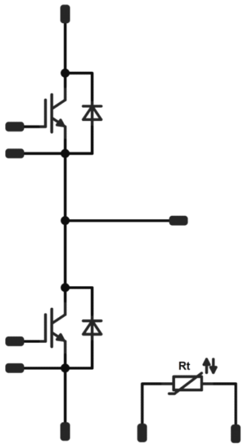
Press-fit

solder pin

Target applications

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

Schematic



Types

- 10-FZ122PB100SH-M819F28
- 10-PZ122PB100SH-M819F28Y

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	87	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}		300	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	201	W
Gate-emitter voltage	V_{GES}			±20	V
Short circuit ratings	t_{SC} V_{CC}	$T_j \leq$ 150°C V_{GE} = 15V		10 800	µs V
Maximum Junction Temperature	T_{jmax}			175	°C

Maximum Ratings

T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Condition		Value	Unit
Half-Bridge Diode					
Peak Repetitive Reverse Voltage	V_{RRM}			1200	V
Continuous (direct) forward current	I_F	$T_j = T_{jmax}$	T_s = 80 °C	66	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	122	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		solder pin / Press-fit pin		9,12 / 9,54	mm
Comparative Tracking Index	CTI			> 200	

Characteristic Values

Parameter	Symbol	Conditions					Value			Unit
			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	
Half-Bridge Switch										
Static										
Gate-emitter threshold voltage	$V_{GE(th)}$	$V_{GE} = V_{CE}$			0,0038	25	5,1	5,8	6,4	V
Collector-emitter saturation voltage	V_{CEsat}		15		100	25 150	1,78	1,95 2,39	2,42	V
Collector-emitter cut-off current	I_{CES}		0	1200		25			1,3	µA
Gate-emitter leakage current	I_{GES}		20	0		25			120	nA
Internal gate resistance	r_g							7,5		Ω
Input capacitance	C_{ies}	f = 1 MHz	0	25		25		6150		pF
Reverse transfer capacitance	C_{res}							345		
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	phase-change material λ = 3,4 W/mK						0,47		K/W
Dynamic										
Turn-on delay time	$t_{d(on)}$	R_{goff} = 1 Ω R_{gon} = 1 Ω	±15	600	99	25 125 150		129 143 145		ns
Rise time	t_r					25 125 150		28 30 34		
Turn-off delay time	$t_{d(off)}$					25 125 150		214 269 282		
Fall time	t_f					25 125 150		26 67 77		
Turn-on energy (per pulse)	E_{on}	Q_{rFWD} = 6,7 µC Q_{rFWD} = 13,3 µC Q_{rFWD} = 16,2 µC				25 125 150		4,847 7,396 8,502		mWs
Turn-off energy (per pulse)	E_{off}					25 125 150		4,118 6,198 6,891		

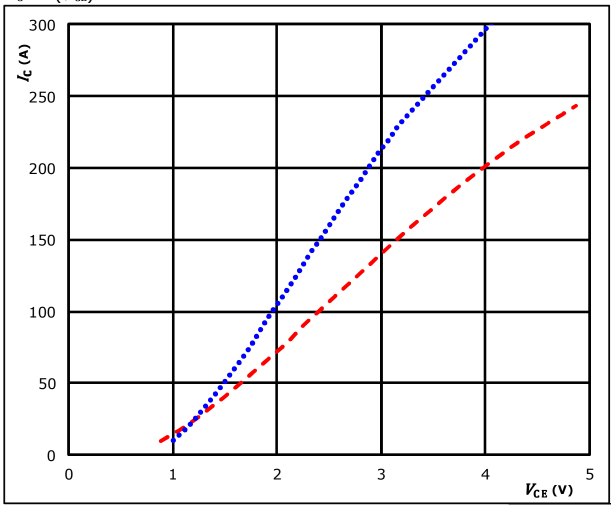
Characteristic Values

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 Diode										
Static										
Forward voltage	V_F				100	25 125 150		2,50 2,46 2,37	2,7	V
Reverse leakage current	I_r			1200		25 150			120 17700	µA
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	phase-change material λ = 3,4 W/mK						0,78		K/W
Dynamic										
Peak recovery current	I_{RRM}	di/dt = 3967 A/µs di/dt = 3671 A/µs di/dt = 3881 A/µs	±15	600	99	25 125 150		101 120 130		A
Reverse recovery time	t_{rr}					25 125 150		158 337 370		ns
Recovered charge	Q_r					25 125 150		6,657 13,250 16,156		µC
Reverse recovered energy	E_{rec}					25 125 150		2,525 5,295 6,436		mWs
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 125 150		4584 3088 2896		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**

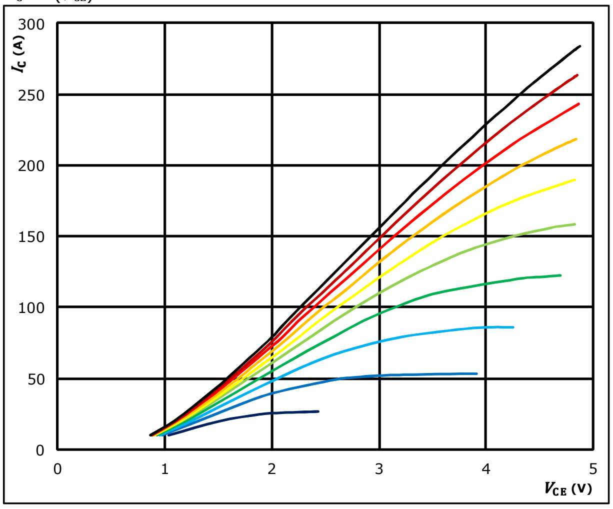
$I_C = f(V_{CE})$



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

Typical output characteristics **IGBT**

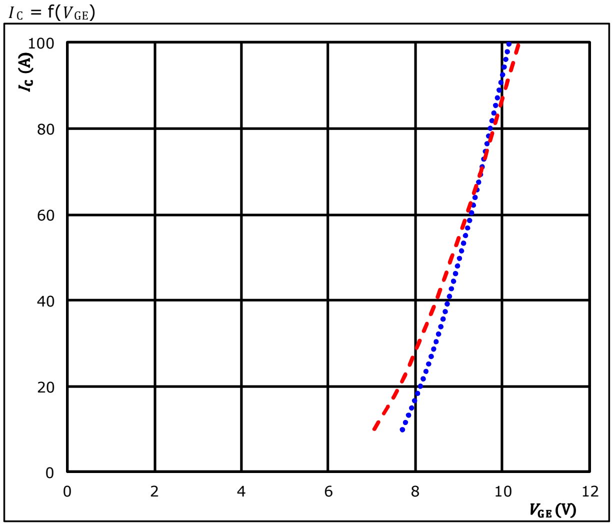
$I_C = f(V_{CE})$



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**

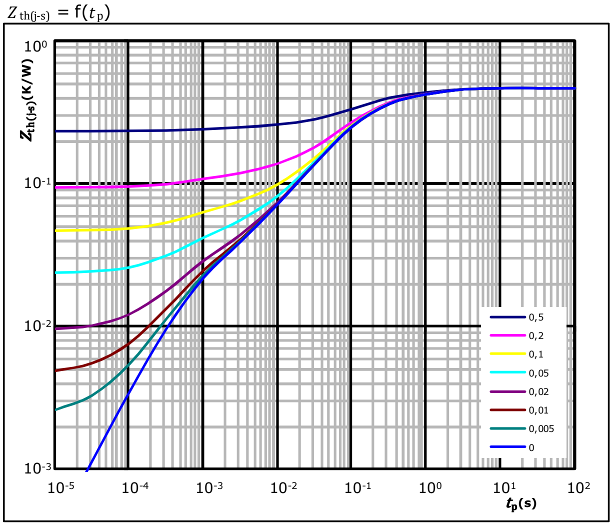
$I_C = f(V_{GE})$



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

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

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



D =	t_p / T	
$R_{th(j\text{-}s)}$ =	0,47	K/W

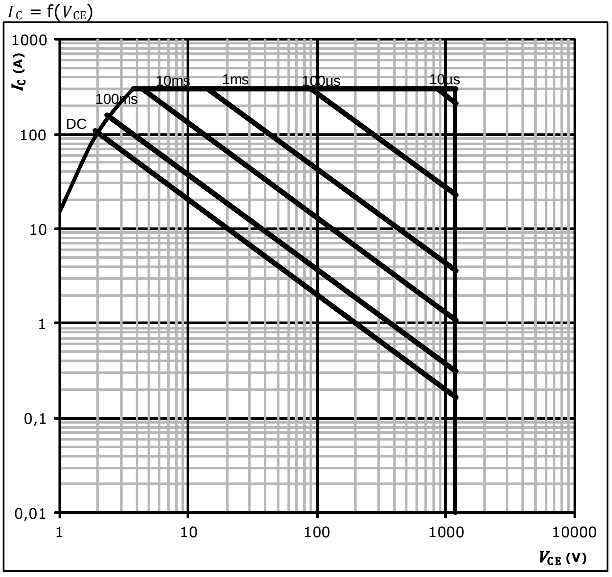
IGBT thermal model values

R (K/W)	τ (s)
8,95E-02	1,40E+00
1,91E-01	1,86E-01
1,52E-01	5,52E-02
2,19E-02	5,98E-03
1,89E-02	6,39E-04

Half-Bridge Switch Characteristics

Safe operating area **IGBT**

$I_C = f(V_{CE})$



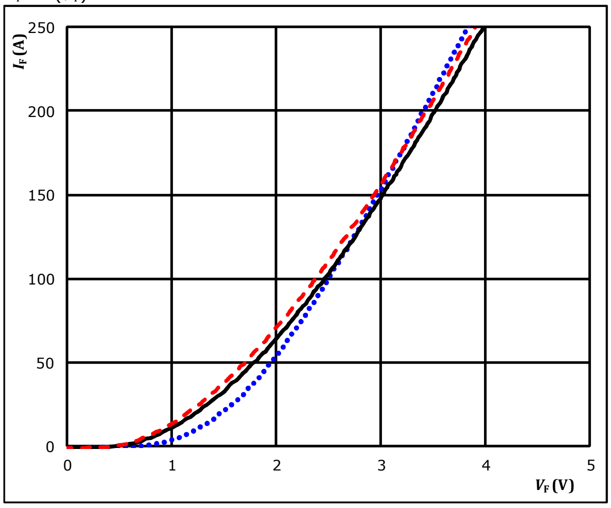
At

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

Half-Bridge Diode Characteristics

Typical forward characteristics **FWD**

$I_F = f(V_F)$

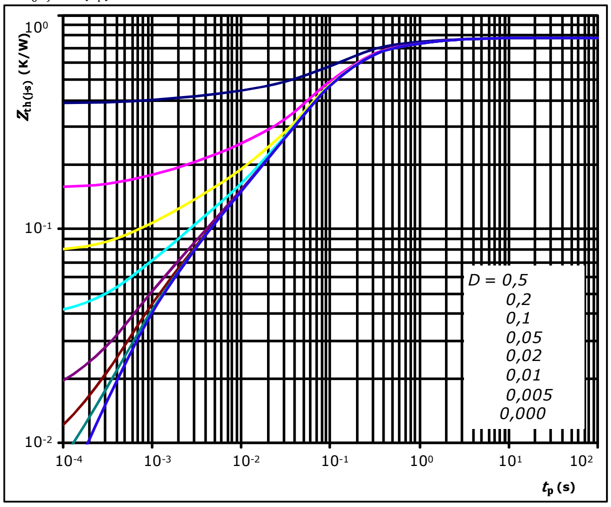


t_p = 250 μs

T_j: 25 °C, 125 °C, 150 °C

Transient thermal impedance as a function of pulse width **FWD**

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



D = t_p / T

$R_{th(j\text{-}s)}$ = 0,78 K/W

FWD thermal model values

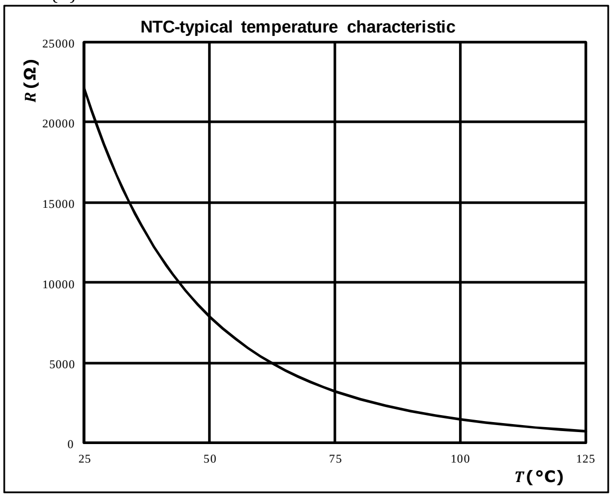
R (K/W)	τ (s)
7,81E-02	1,59E+00
1,93E-01	2,55E-01
3,99E-01	7,68E-02
7,07E-02	6,98E-03
3,88E-02	9,88E-04

Thermistor Characteristics

figure 1. **Thermistor**

Typical NTC characteristic as a function of temperature

$R = f(T)$

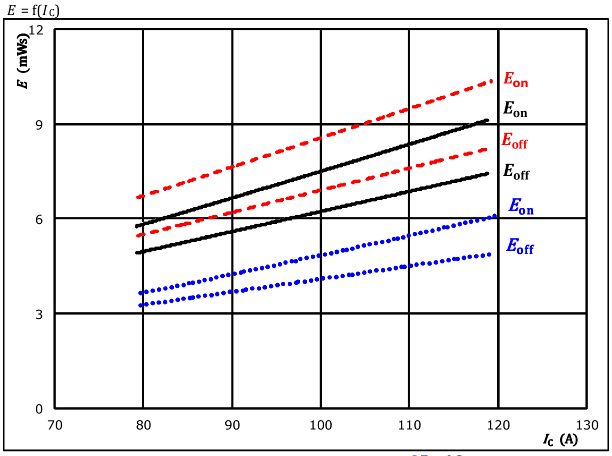


Half-Bridge Switching Characteristics

figure 1. **IGBT**

Typical switching energy losses as a function of collector current

$E = f(I_C)$



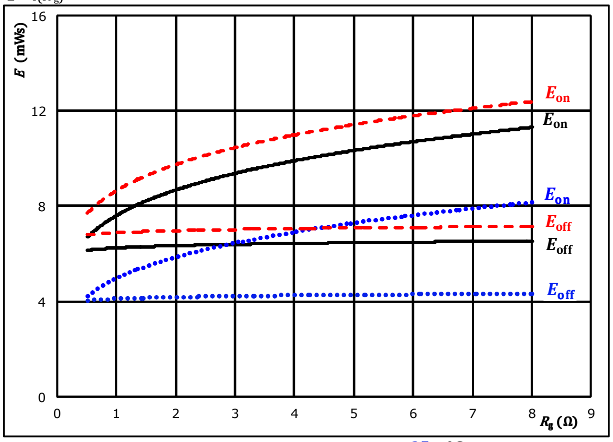
With an inductive load at

V_{CE} =	600	V	T_j:	25 °C	···········
V_{GE} =	±15	V		125 °C	———
R_{gon} =	1	Ω		150 °C	– – –
R_{goff} =	1	Ω			

figure 2. **IGBT**

Typical switching energy losses as a function of gate resistor

$E = f(R_g)$



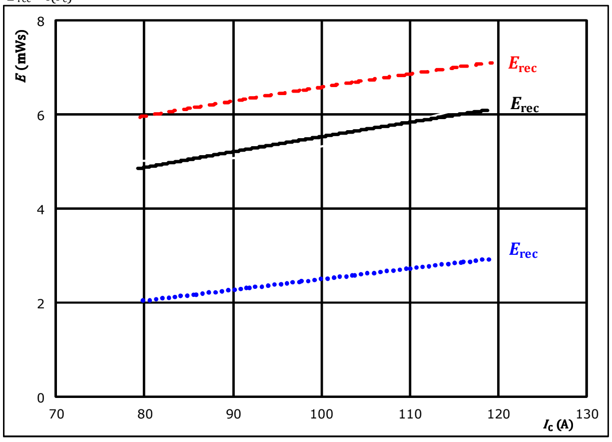
With an inductive load at

V_{CE} =	600	V	T_j:	25 °C	···········
V_{GE} =	±15	V		125 °C	———
I_C =	99	A		150 °C	– – –

figure 3. **FWD**

Typical reverse recovered energy loss as a function of collector current

$E_{rec} = f(I_C)$



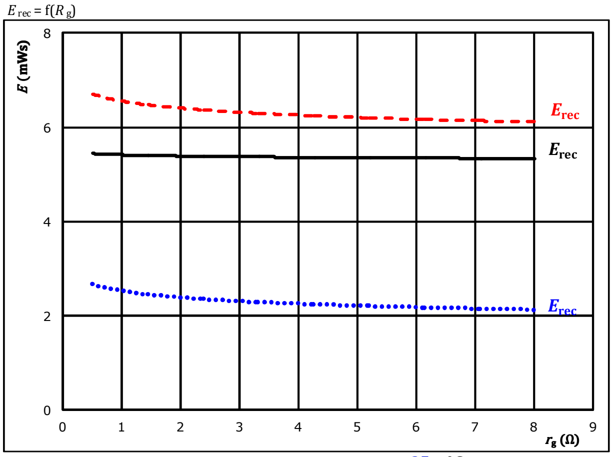
With an inductive load at

V_{CE} =	600	V	T_j:	25 °C	···········
V_{GE} =	±15	V		125 °C	———
R_{gon} =	1	Ω		150 °C	– – –

figure 4. **FWD**

Typical reverse recovered energy loss as a function of gate resistor

$E_{rec} = f(R_g)$



With an inductive load at

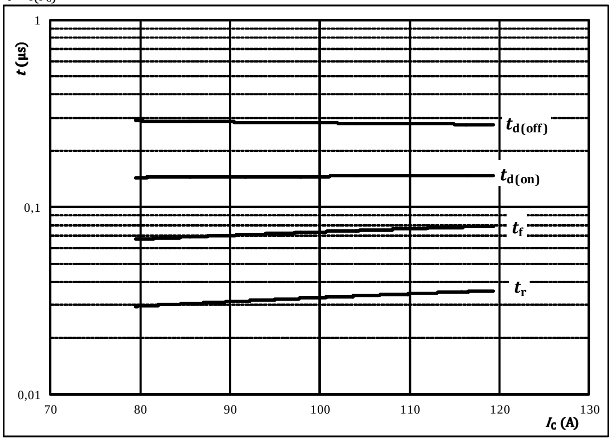
V_{CE} =	600	V	T_j:	25 °C	···········
V_{GE} =	±15	V		125 °C	———
I_C =	99	A		150 °C	– – –

Half-Bridge Switching Characteristics

figure 5. IGBT

Typical switching times as a function of collector current

$t = f(I_C)$



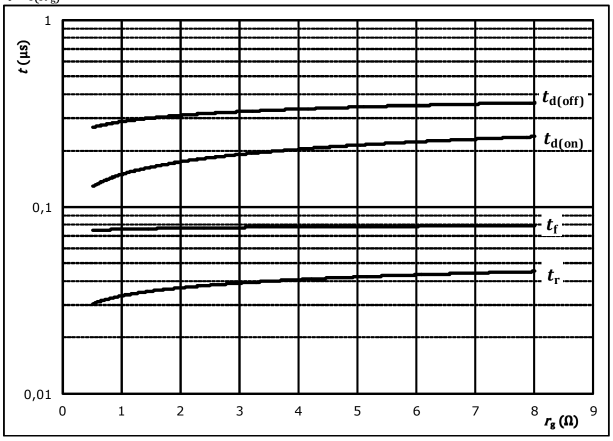
With an inductive load at

T_j =	150	°C
V_{CE} =	600	V
V_{GE} =	±15	V
R_{gon} =	1	Ω
R_{goff} =	1	Ω

figure 6. IGBT

Typical switching times as a function of gate resistor

$t = f(R_g)$



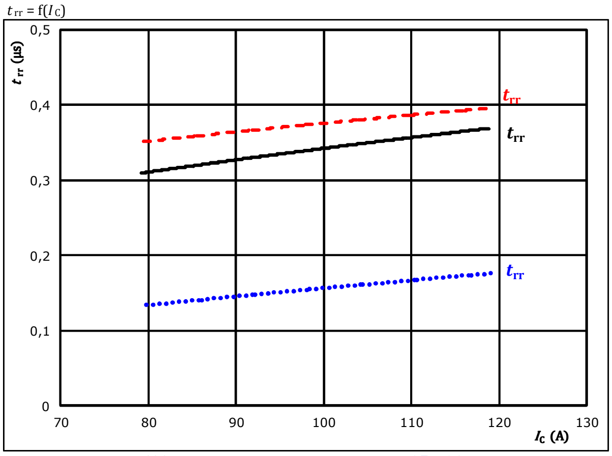
With an inductive load at

T_j =	150	°C
V_{CE} =	600	V
V_{GE} =	±15	V
I_C =	99	A

figure 7. FWD

Typical reverse recovery time as a function of collector current

$t_{rr} = f(I_C)$

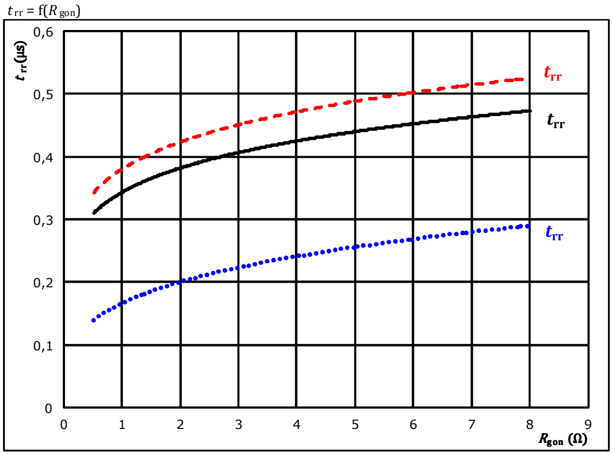


At					
V_{CE} =	600	V		25 °C	············
V_{GE} =	±15	V	T_j:	125 °C	———
R_{gon} =	1	Ω		150 °C	– – –

figure 8. FWD

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

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



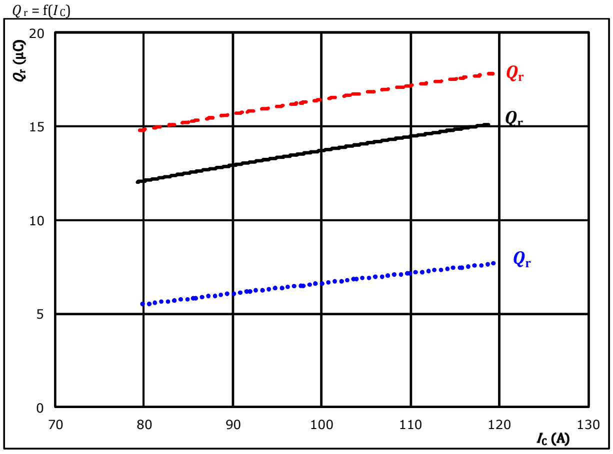
At					
V_{CE} =	600	V		25 °C	············
V_{GE} =	±15	V	T_j:	125 °C	———
I_C =	99	A		150 °C	– – –

Half-Bridge Switching Characteristics

figure 9. **FWD**

Typical recovered charge as a function of collector current

$Q_r = f(I_C)$

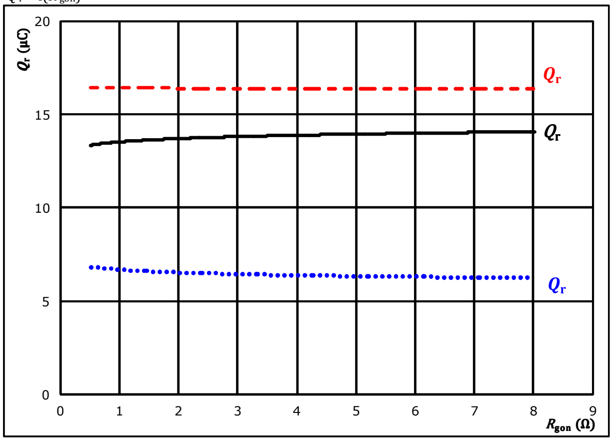


At					
V_{CE} =	600	V		25 °C	•••••••••••••
V_{GE} =	±15	V	T_j:	125 °C	———
R_{gon} =	1	Ω		150 °C	— — —

figure 10. **FWD**

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

$Q_r = f(R_{gon})$

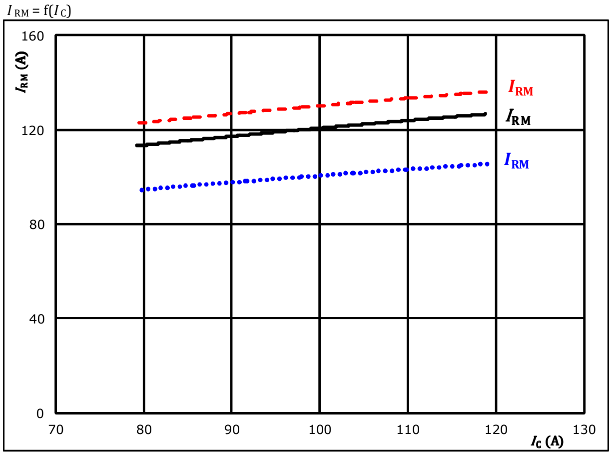


At					
V_{CE}=	600	V		25 °C	•••••••••••••
V_{GE} =	±15	V	T_j:	125 °C	———
I_C=	99	A		150 °C	— — —

figure 11. **FWD**

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

$I_{RM} = f(I_C)$

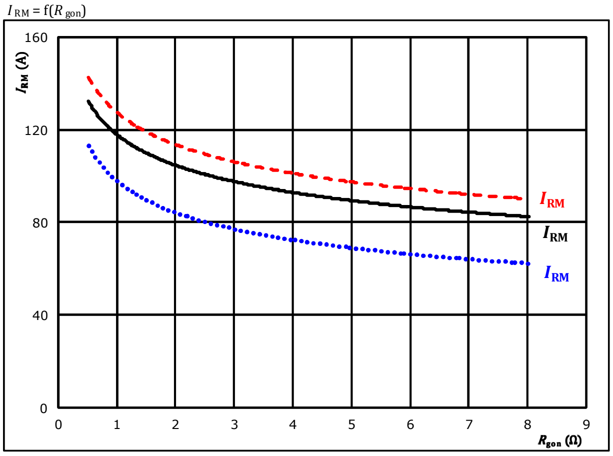


At					
V_{CE} :	600	V		25 °C	•••••••••••••
V_{GE} =	±15	V	T_j:	125 °C	———
R_{gon} =	1	Ω		150 °C	— — —

figure 12. **FWD**

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

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



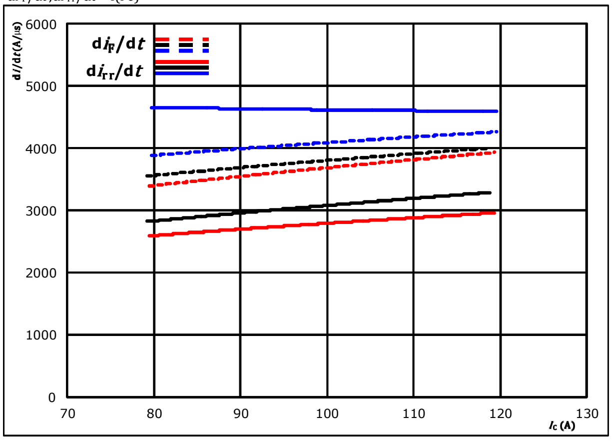
At					
V_{CE} =	600	V		25 °C	•••••••••••••
V_{GE} =	±15	V	T_j:	125 °C	———
I_C =	99	A		150 °C	— — —

Half-Bridge Switching Characteristics

figure 13. **FWD**

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

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

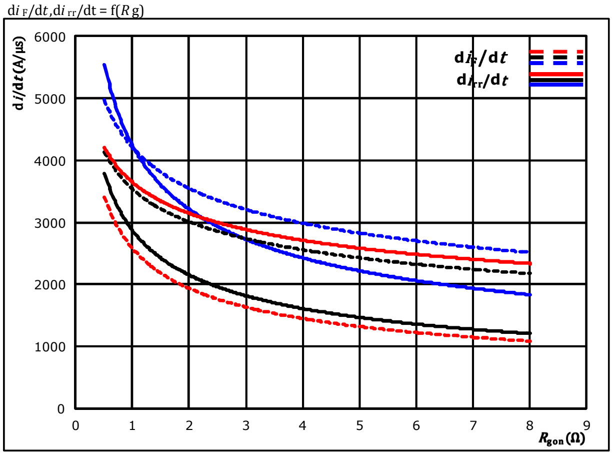


At						
V_{CE} =	600	V	T_j:	25	°C	···········
V_{GE} =	±15	V		125	°C	———
R_{gon} =	1	Ω		150	°C	– – –

figure 14. **FWD**

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

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

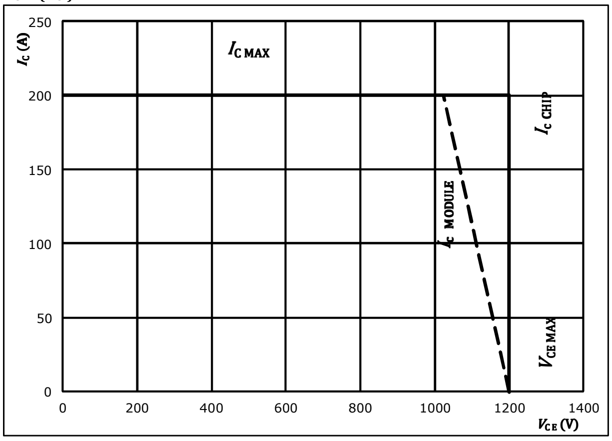


At						
V_{CE} =	600	V	T_j:	25	°C	···········
V_{GE} =	±15	V		125	°C	———
I_C=	99	A		150	°C	– – –

figure 15. **IGBT**

Reverse bias safe operating area

$I_C = f(V_{CE})$



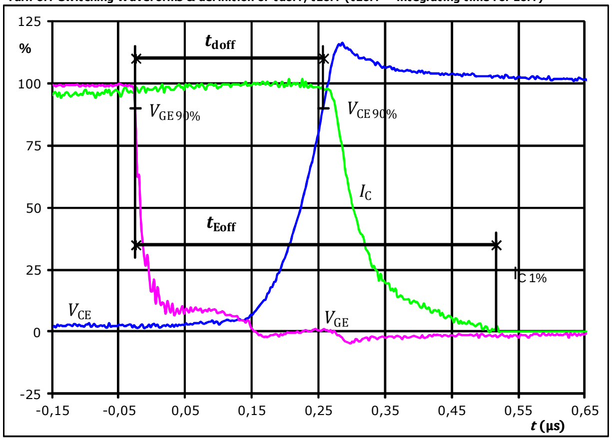
At		
T_j =	175	°C
R_{gon} =	1	Ω
R_{goff} =	1	Ω

Half-Bridge Switching Definitions

General conditions		
T_j	=	150 °C
R_{gon}	=	1 Ω
R_{goff}	=	1 Ω

figure 1. IGBT

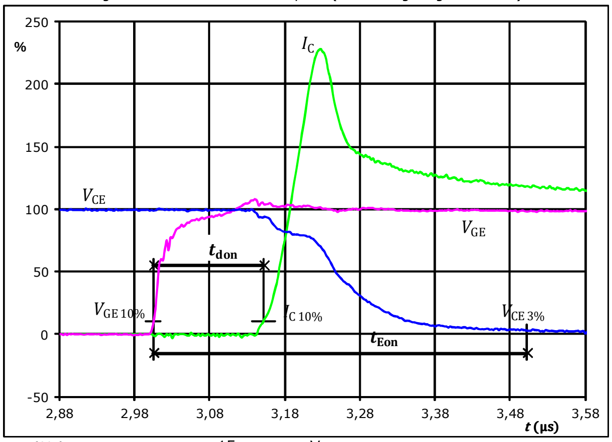
Turn-off Switching Waveforms & definition of tdoff, tEoff (tEoff = integrating time for Eoff)



$V_{GE}(0\%)$ =	-15	V
$V_{GE}(100\%)$ =	15	V
$V_C(100\%)$ =	600	V
$I_C(100\%)$ =	100	A
t_{doff} =	0,282	µs
t_{Eoff} =	0,541	µs

figure 2. IGBT

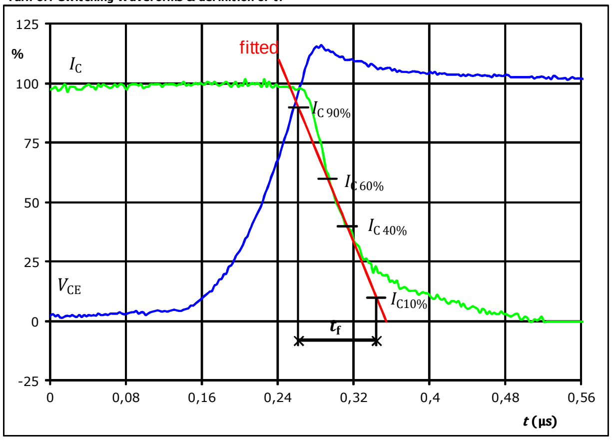
Turn-on Switching Waveforms & definition of tdon, tEon (tEon = integrating time for Eon)



$V_{GE}(0\%)$ =	-15	V
$V_{GE}(100\%)$ =	15	V
$V_C(100\%)$ =	600	V
$I_C(100\%)$ =	100	A
t_{don} =	0,145	µs
t_{Eon} =	0,497	µs

figure 3. IGBT

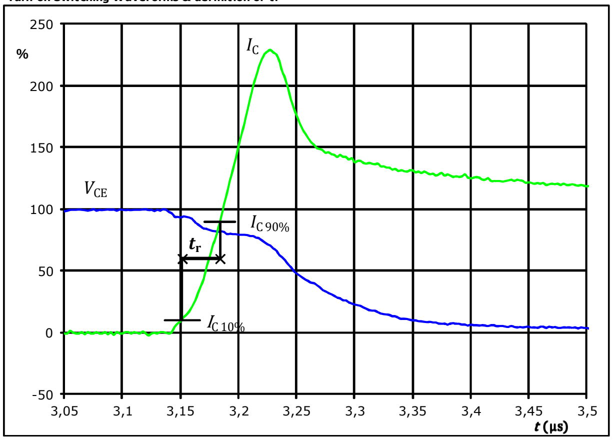
Turn-off Switching Waveforms & definition of tf



$V_C(100\%)$ =	600	V
$I_C(100\%)$ =	100	A
t_f =	0,077	µs

figure 4. IGBT

Turn-on Switching Waveforms & definition of tr

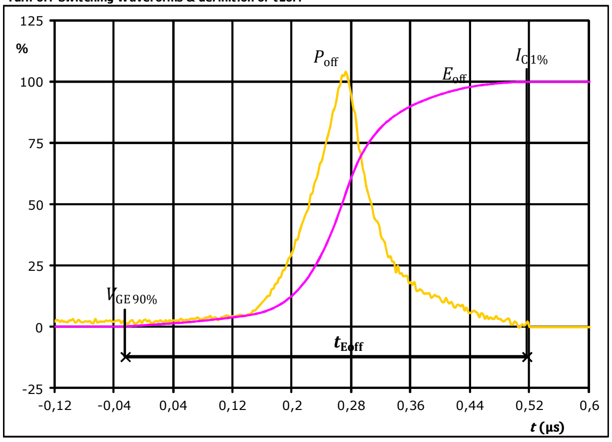


$V_C(100\%)$ =	600	V
$I_C(100\%)$ =	100	A
t_r =	0,034	µs

Half-Bridge Switching Definitions

figure 5. **IGBT**

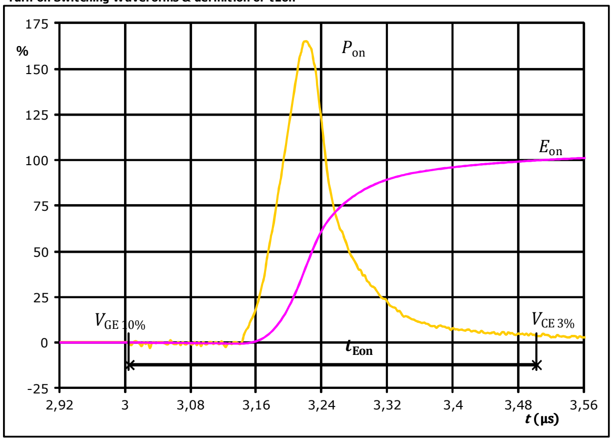
Turn-off Switching Waveforms & definition of tEoff



P_{off} (100%) =	59,83	kW
E_{off} (100%) =	6,89	mJ
t_{Eoff} =	0,54	µs

figure 6. **IGBT**

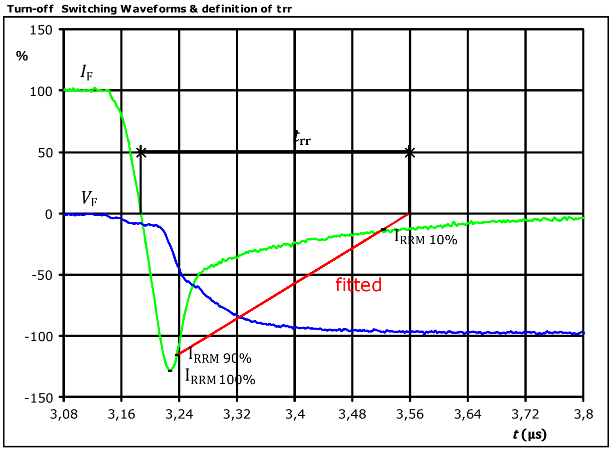
Turn-on Switching Waveforms & definition of tEon



P_{on} (100%) =	59,83	kW
E_{on} (100%) =	8,50	mJ
t_{Eon} =	0,50	µs

figure 7. **FWD**

Turn-off Switching Waveforms & definition of trr

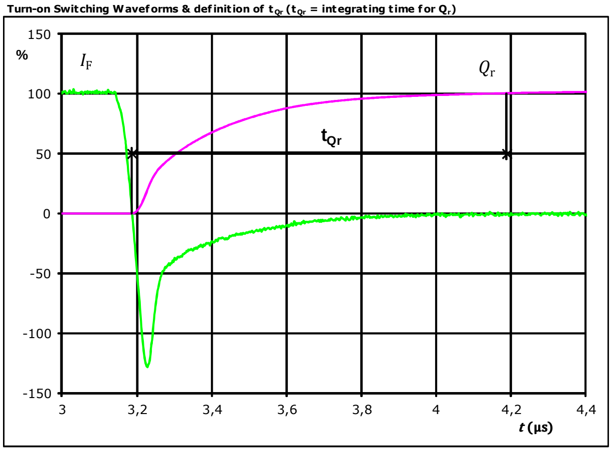


V_F (100%) =	600	V
I_F (100%) =	100	A
I_{RRM} (100%) =	-130	A
t_{rr} =	0,370	µs

Half-Bridge Switching Definitions

figure 8. **FWD**

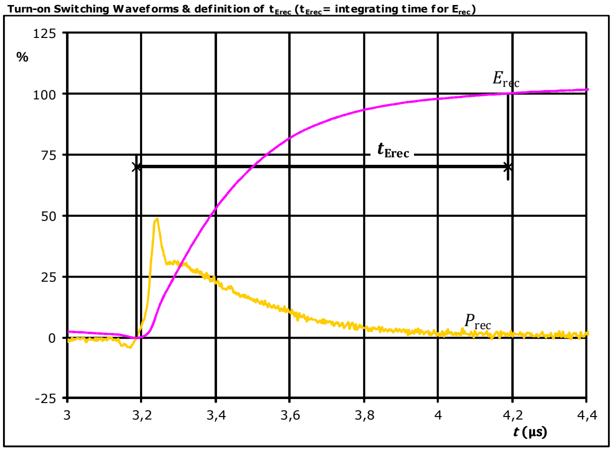
Turn-on Switching Waveforms & definition of t_{Qr} (t_{Qr} = integrating time for Q_r)



I_F (100%) =	100	A
Q_r (100%) =	16,16	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%) =	59,83	kW
E_{rec} (100%) =	6,44	mJ
t_{Erec} =	1,00	µs

10-FZ122PB100SH-M819F28
10-PZ122PB100SH-M819F28Y
datasheet

Ordering Code & Marking

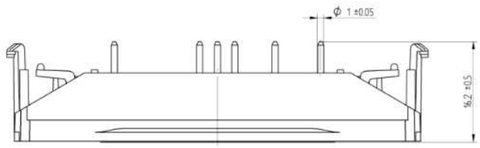
Version	Ordering Code
without thermal paste 12mm housing with solder pins	10-FZ122PB100SH-M819F28
without thermal paste 12mm housing with Press-fit pins	10-PZ122PB100SH-M819F28Y

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

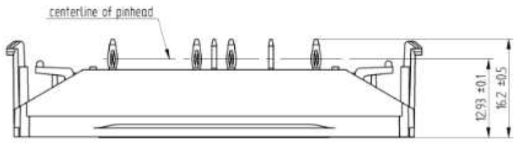
Outline

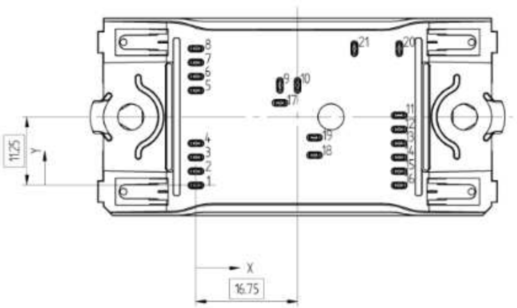
Pin table [mm]			
Pin	X	Y	Function
1	0	0	DC-
2	0	2,3	DC-
3	0	4,6	DC-
4	0	6,9	DC-
5	0	15,6	DC+
6	0	17,9	DC+
7	0	20,2	DC+
8	0	22,5	DC+
9	13,85	16,45	G12
10	16,75	16,45	S12
11	33,5	11,5	Ph
12	33,5	9,2	Ph
13	33,5	6,9	Ph
14	33,5	4,6	Ph
15	33,5	2,3	Ph
16	33,5	0	Ph
17	13,85	13,55	Ph
18	19,55	4,95	S11
19	19,55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

solder pin



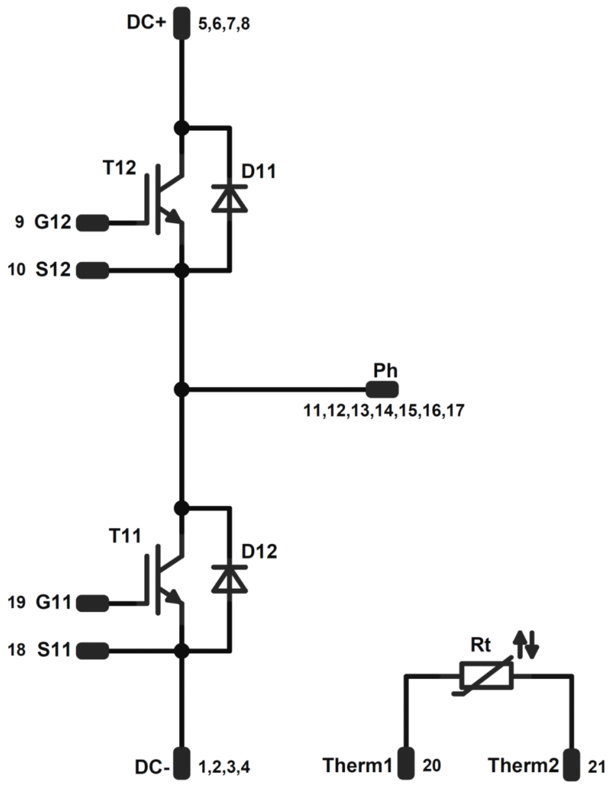
Press-fit pin





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	IGBT	1200 V	100 A	Half-Bridge Switch	
D11,D12	FWD	1200 V	100 A	Half-Bridge Diode	
Rt	Thermistor			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-xZ122PB100SH-M819F28x-D1-14	12 Okt. 2016		