Vincotech

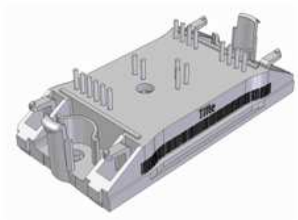
10-FZ122PA100SC02-P999F78
datasheet

flow **PHASE 0** — **1200 V / 100 A**

Features

- Trench Fieldstop IGBT4 HS3 technology
- SiC Schottky diode
- Compact and low inductance design

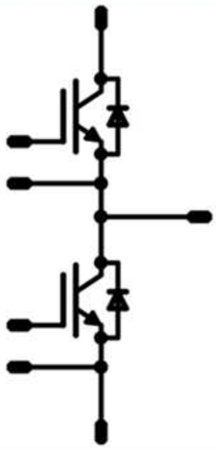
flow 0 12mm housing



Target applications

- Industrial Drive
- Solar Inverter
- UPS
- Welding
- Power Supply

Schematic



Types

- 10-FZ122PA100SC02-P999F78

Maximum Ratings

Parameter	Symbol	Condition		Value	Unit
Buck Switch					
Collector-emitter voltage	V_{CES}			1200	V
Collector current	I_C	$T_j = T_j\text{max}$	T_S=80 °C	113	A
Repetitive peak collector current	I_{CRM}	t_p limited by $T_j\text{max}$		300	A
Total power dissipation	P_{tot}	$T_j = T_j\text{max}$	T_S=80 °C	307	W
Gate-emitter voltage	V_{GES}			±20	V
Maximum Junction Temperature	T_{jmax}			175	°C

Parameter	Symbol	Conditions		Value	Unit
Buck Diode					
Peak Repetitive Reverse Voltage	V_{RRM}			1200	V
Continuous (direct) forward current	I_F	$T_j=T_{jmax}$	T_h=80°C	52	A
Repetitive peak forward current	I_{FRM}			154	A
Surge (non-repetitive) forward current	I_{FSM}	50Hz Single Half Sine Wave		256	A
Total power dissipation	P_{tot}	$T_j=T_{jmax}$	T_h=80°C	160	W
Maximum Junction Temperature	T_{jmax}			175	°C

Parameter	Symbol	Conditions		Value	Unit
Module Properties					
Thermal Properties					
Storage temperature	T_{stg}			-40…+125	°C
Operation Junction Temperature	T_{jop}			-40…+(T_{jmax} - 25)	°C
Isolation Properties					
Isolation voltage	V_{isol}	DC voltage	t_p=2s	4000	V
Creepage distance				min 12,7	mm
Clearance				min 12,7	mm
Comparative Tracking Index	CTI			>200	

Characteristic Values

Buck Switch

Parameter	Symbol	Conditions	V_{GE} [V]	V_{CE} [V]	I_C [A]	T_j [°C]	Min	Typ	Max	Unit
Static										
Gate-emitter threshold voltage	$V_{GE(th)}$	$V_{GE}=V_{CE}$			0,0015	25 125	5	5,8	6,5	V
Collector-emitter saturation voltage	V_{CEsat}		15		35	25 125 150	1,35	1,75 1,95 -	2,05	V
Collector-emitter cut-off current	I_{CES}		0	1200		25 125			250	µA
Gate-emitter leakage current	I_{GES}		20	0		25 125			600	nA
Internal gate resistance	r_g							6		Ω
Input capacitance	C_{ies}	f=1 MHz	0	25		25		2500		pF
Output capacitance	C_{oes}							130		
Reverse transfer capacitance	C_{res}							110		
Gate charge	Q_g		15	600	35	25		203		nC
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	Thermal foil thickness=76um Kunze foil KU-ALF5						1,10		K/W
IGBT Switching										
Turn-on delay time	$t_{d(on)}$	R_{goff} = 4 Ω R_{gon} = 4 Ω	±15	600	100	25 125 150		203 218 221		ns
Rise time	t_r					25 125 150		38 41 44		
Turn-off delay time	$t_{d(off)}$					25 125 150		295 358 372		
Fall time	t_f					25 125 150		37 73 87		
Turn-on energy (per pulse)	E_{on}	Q_{rFWD} = 0,5 µC Q_{rFWD} = 0,8 µC Q_{rFWD} = 0,6 µC				25 125 150		5,967 6,790 7,094		mWs
Turn-off energy (per pulse)	E_{off}					25 125 150		3,827 5,751 6,447		

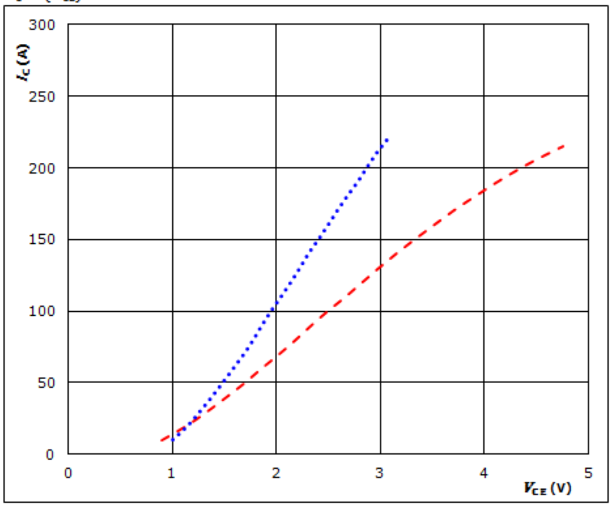
Buck Diode

Parameter	Symbol	Conditions					Value			Unit
				V_r [V]	I_F [A]	T_j [°C]	Min	Typ	Max	
Static										
Forward voltage	V_F				30	25 125 150		1,48 1,83 1,96	1,8	V
Reverse leakage current	I_r			1200		25 150			250 350	µA
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	Thermal foil thickness=76um Kunze foil KU-ALF5						0,59		K/W
FWD Switching										
Peak recovery current	I_{RRM}	di/dt = 1950 A/µs di/dt = 4681 A/µs di/dt = 3200 A/µs	±15	600	100	25 125 150		17 18 15		A
Reverse recovery time	t_{rr}					25 125 150		16 17 16		ns
Recovered charge	Q_r					25 125 150		0,549 0,849 0,554		µC
Reverse recovered energy	E_{rec}					25 125 150		0,118 0,246 0,146		mWs
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 125 150		3566 3120 1280		A/µs

Buck Switch Characteristics

Typical output characteristics — IGBT

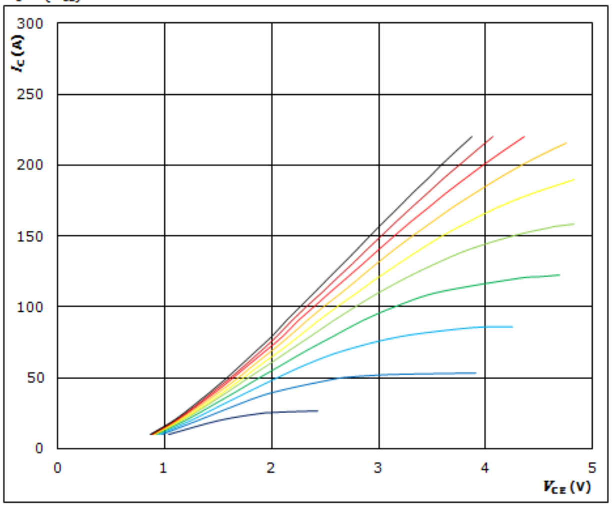
$I_C = f(V_{CE})$



t_p =	250	µs	25 °C	dotted
V_{GE} =	15	V	125 °C	solid
			150 °C	dashed

Typical output characteristics — IGBT

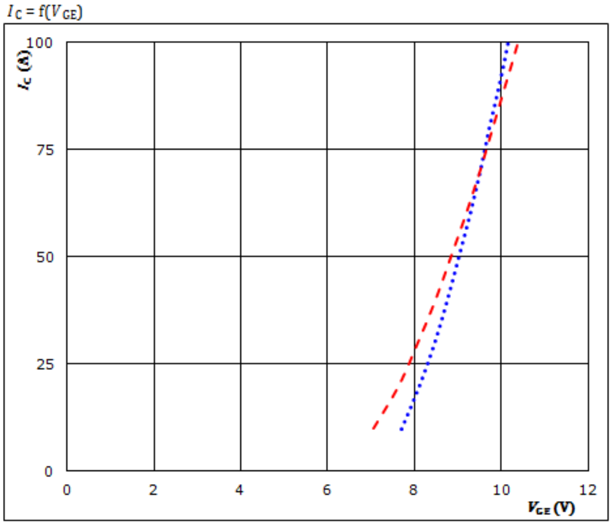
$I_C = f(V_{CE})$



t_p =	250	µs
T_j =	150	°C
V_{GE} from	8 V to 17 V in steps of 1 V	

Typical transfer characteristics — IGBT

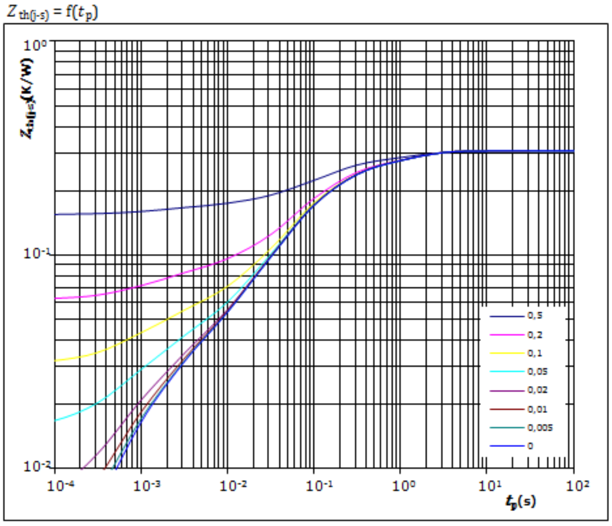
$I_C = f(V_{GE})$



t_p =	100	µs	25 °C	dotted
V_{CE} =	20	V	125 °C	solid
			150 °C	dashed

Transient Thermal Impedance as function of Pulse duration — IGBT

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



D = t_p / T

$R_{th(j-s)}$ = 0,31 K/W

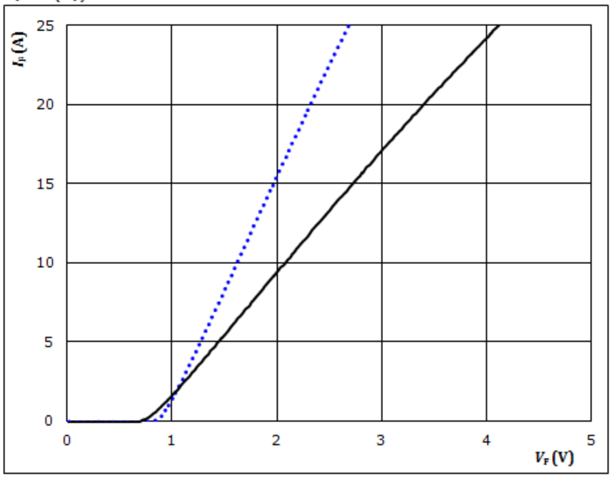
IGBT thermal model values

R_{th} (K/W)	τ (s)
6,86E-02	1,22E+00
9,04E-02	1,80E-01
1,14E-01	6,14E-02
1,66E-02	8,17E-03
2,00E-02	1,06E-03

Buck Diode Characteristics

Typical forward characteristics **FWD**

$I_F = f(V_F)$

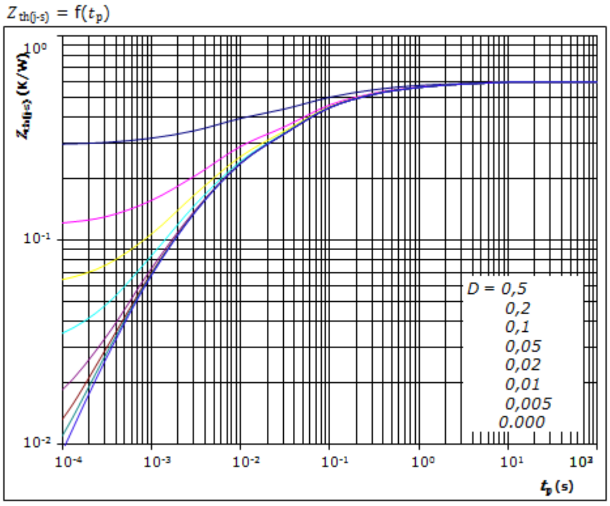


t_p = 250 μs

T_j: 25 °C, 125 °C, 150 °C

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

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



D = t_p / T

$R_{th(j-s)}$ = 0,59 K/W

FWD thermal model values

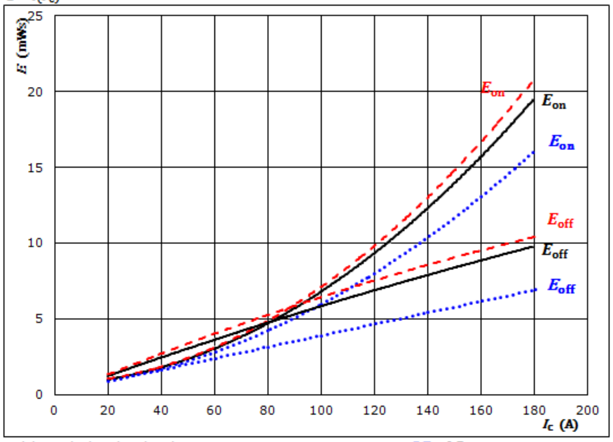
R (K/W)	τ (s)
5,08E-02	2,31E+00
1,15E-01	2,42E-01
2,22E-01	4,47E-02
1,70E-01	4,43E-03
3,53E-02	6,74E-04

Buck Switching Characteristics

Figure 1. **IGBT**

Typical switching energy losses as a function of collector current

$E = f(I_C)$



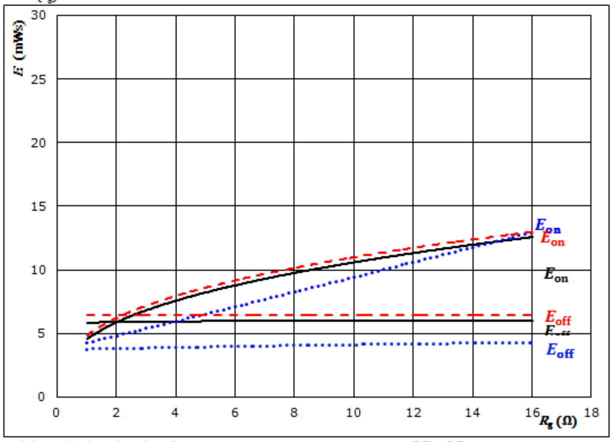
With an inductive load at

V_{CE} =	600	V	T_j:	25 °C	···········
V_{GE} =	±15	V		125 °C	———
R_{gon} =	4	Ω		150 °C	– – –
R_{goff} =	4	Ω			

Figure 2. **IGBT**

Typical switching energy losses as a function of gate resistor

$E = f(r_g)$



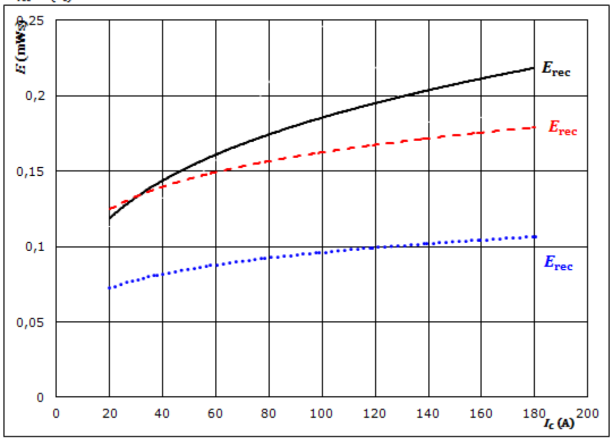
With an inductive load at

V_{CE} =	600	V	T_j:	25 °C	···········
V_{GE} =	±15	V		125 °C	———
I_C =	100	A		150 °C	– – –

Figure 3. **FWD**

Typical reverse recovered energy loss as a function of collector current

$E_{rec} = f(I_C)$



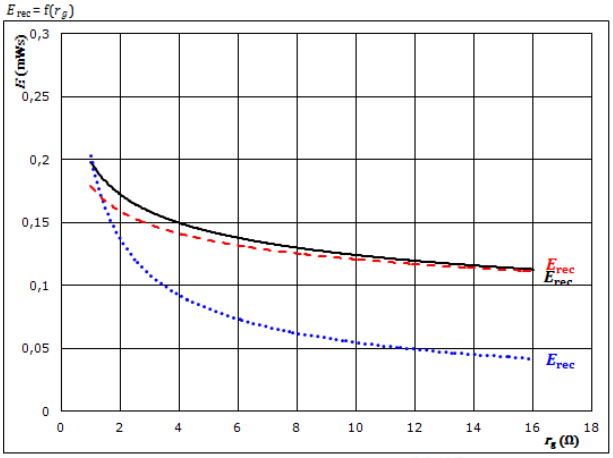
With an inductive load at

V_{CE} =	600	V	T_j:	25 °C	···········
V_{GE} =	±15	V		125 °C	———
R_{gon} =	4	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

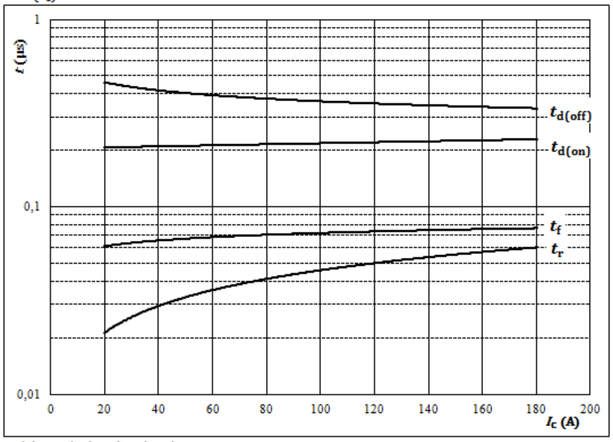
V_{CE} =	600	V	T_j:	25 °C	···········
V_{GE} =	±15	V		125 °C	———
I_C =	100	A		150 °C	– – –

Buck Switching Characteristics

Figure 5. **IGBT**

Typical switching times as a function of collector current

$t = f(I_C)$



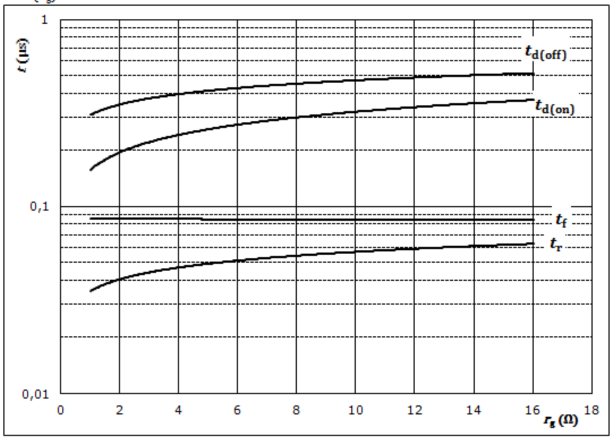
With an inductive load at

T_j =	150	°C
V_{CE} =	600	V
V_{GE} =	±15	V
R_{gon} =	4	Ω
R_{goff} =	4	Ω

Figure 6. **IGBT**

Typical switching times as a function of gate resistor

$t = f(r_g)$



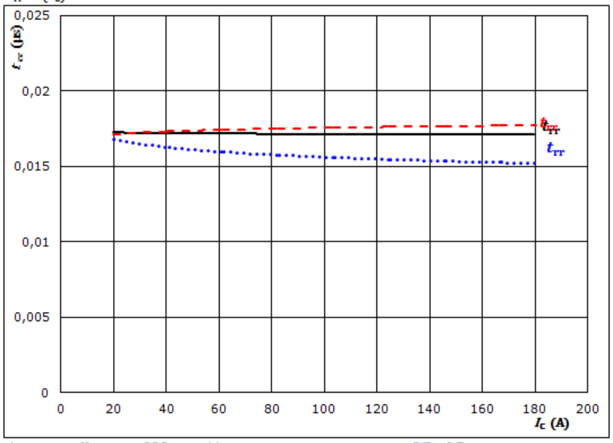
With an inductive load at

T_j =	150	°C
V_{CE} =	600	V
V_{GE} =	±15	V
I_C =	100	A

Figure 7. **FWD**

Typical reverse recovery time as a function of collector current

$t_{rr} = f(I_C)$

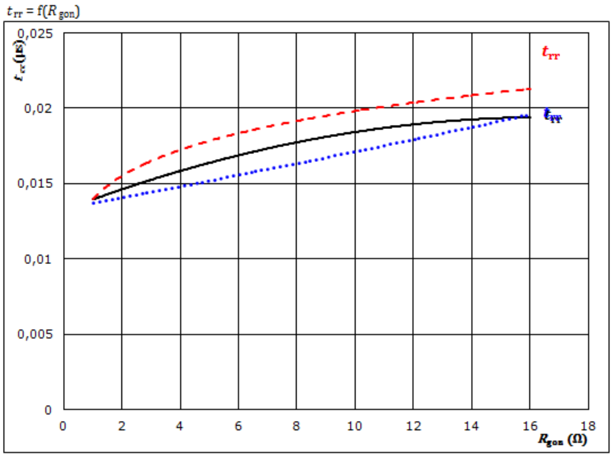


At					
V_{CE} =	600	V		25 °C	···········
V_{GE} =	±15	V	T_j:	125 °C	———
R_{gon} =	4	Ω		150 °C	— — —

Figure 8. **FWD**

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

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



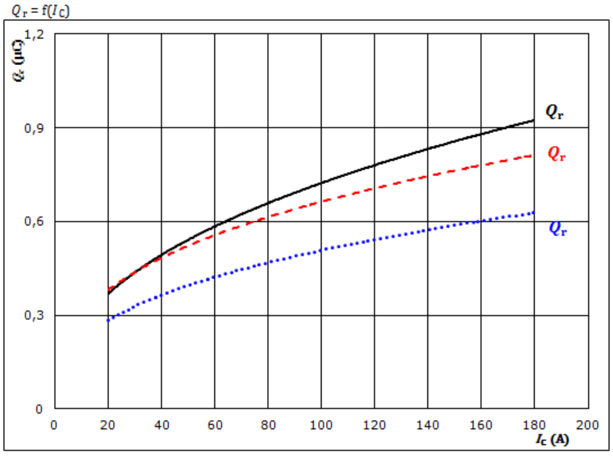
At					
V_{CE} =	600	V		25 °C	···········
V_{GE} =	±15	V	T_j:	125 °C	———
I_C =	100	A		150 °C	— — —

Buck Switching Characteristics

Figure 9. **FWD**

Typical recovered charge as a function of collector current

$Q_r = f(I_C)$

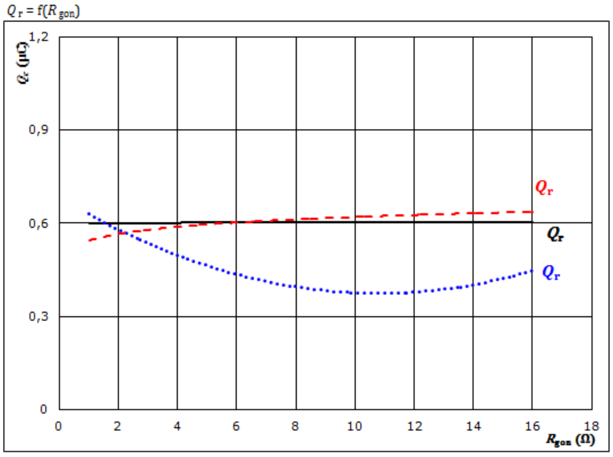


At						
	V_{CE} =	600	V		25 °C	···········
	V_{GE} =	±15	V	T_j:	125 °C	———
	R_{gon} =	4	Ω		150 °C	– – –

Figure 10. **FWD**

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

$Q_r = f(R_{gon})$

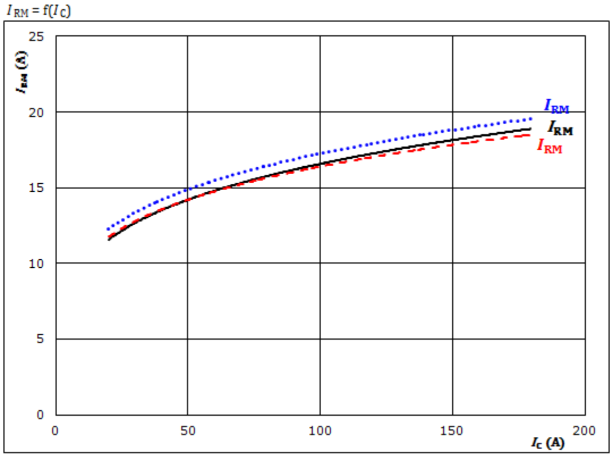


At						
	V_{CE} =	600	V		25 °C	···········
	V_{GE} =	±15	V	T_j:	125 °C	———
	I_C =	100	A		150 °C	– – –

Figure 11. **FWD**

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

$I_{RM} = f(I_C)$

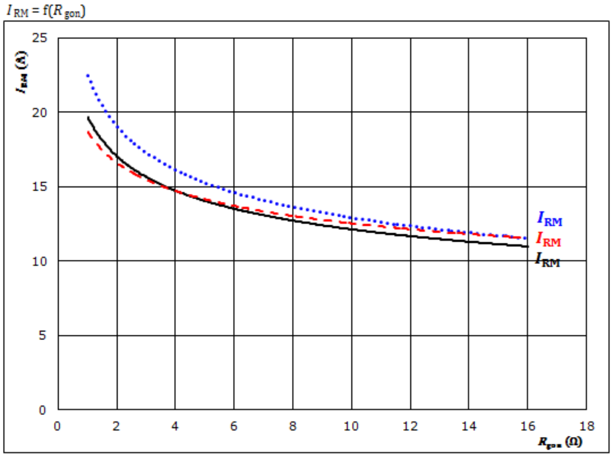


At						
	V_{CE} =	600	V		25 °C	···········
	V_{GE} =	±15	V	T_j:	125 °C	———
	R_{gon} =	4	Ω		150 °C	– – –

Figure 12. **FWD**

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

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



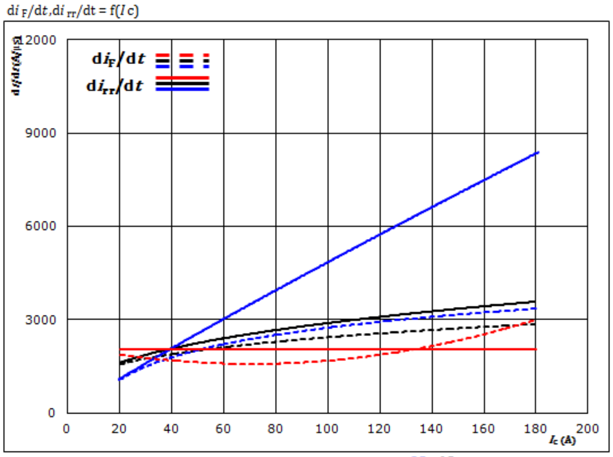
At						
	V_{CE} =	600	V		25 °C	···········
	V_{GE} =	±15	V	T_j:	125 °C	———
	I_C =	100	A		150 °C	– – –

Buck Switching Characteristics

Figure 13.	FWD

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

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

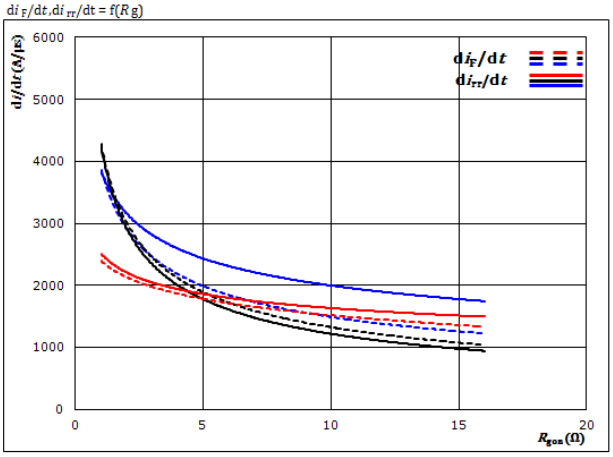


At					
V_{CE}	600	V	T_j:	25 °C	dotted
V_{GE} =	±15	V		125 °C	solid
R_{gon} =	4	Ω		150 °C	dashed

Figure 14.	FWD

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

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

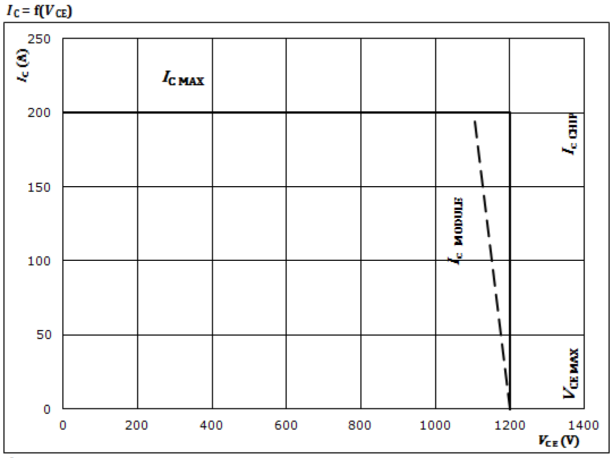


At		
V_{CE} =	600	V
V_{GE} =	±15	V
I_C =	100	A

Figure 15.	IGBT

Reverse bias safe operating area

$I_C = f(V_{CE})$



At

T_j =	175	°C
R_{gon} =	4	Ω
R_{goff} =	4	Ω

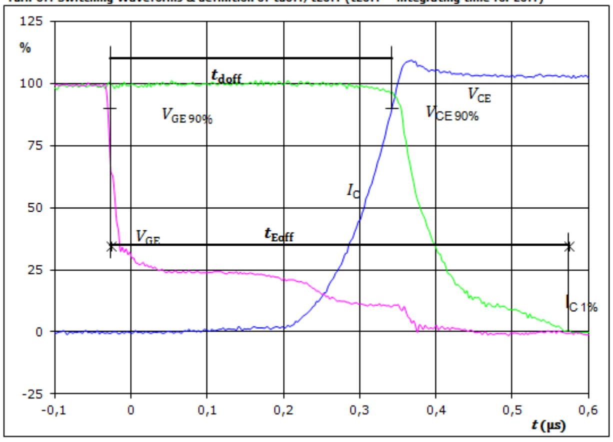
Swiching definition

General conditions

T_j	=	150 °C
R_{gon}	=	4 Ω
R_{goff}	=	4 Ω

Figure 1. **IGBT**

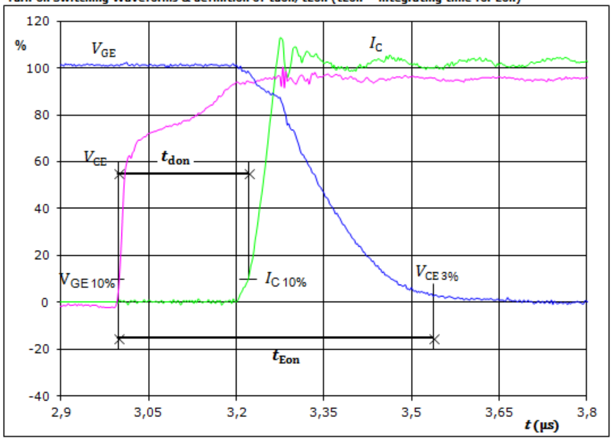
Turn-off Switching Waveforms & definition of tdoff, tEoff (tEoff = integrating time for Eoff)



V_{GE} (0%) =	-15	V
V_{GE} (100%) =	15	V
V_C (100%) =	600	V
I_C (100%) =	100	A
t_{doff} =	0,372	µs
t_{Eoff} =	0,601	µs

Figure 2. **IGBT**

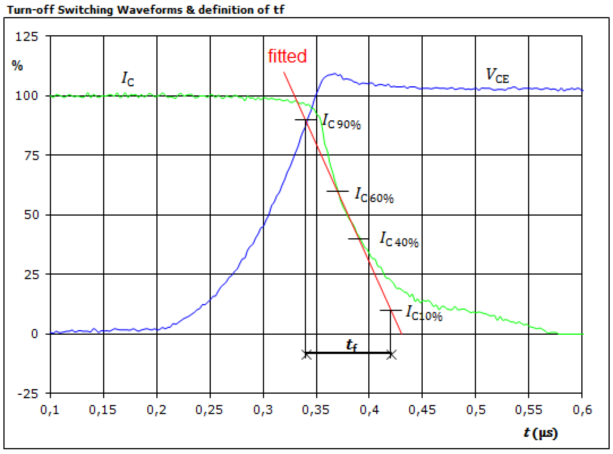
Turn-on Switching Waveforms & definition of tdon, tEon (tEon = integrating time for Eon)



V_{GE} (0%) =	-15	V
V_{GE} (100%) =	15	V
V_C (100%) =	600	V
I_C (100%) =	100	A
t_{don} =	0,221	µs
t_{Eon} =	0,540	µs

Figure 3. **IGBT**

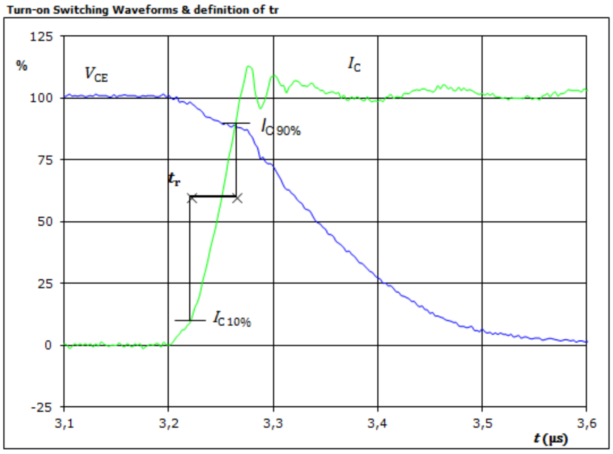
Turn-off Switching Waveforms & definition of tf



V_C (100%) =	600	V
I_C (100%) =	100	A
t_f =	0,087	µs

Figure 4. **IGBT**

Turn-on Switching Waveforms & definition of tr

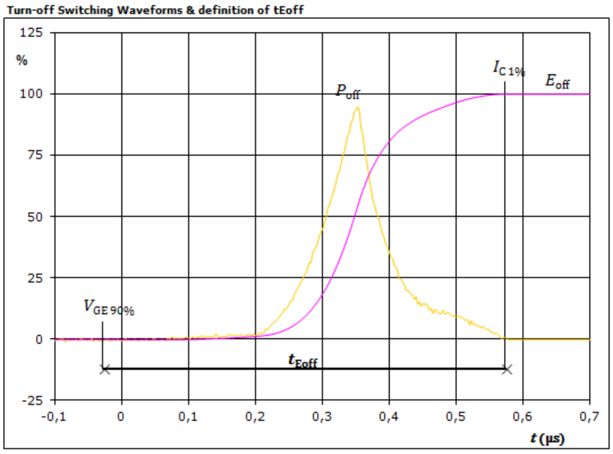


V_C (100%) =	600	V
I_C (100%) =	100	A
t_r =	0,044	µs

Swiching definition

Figure 5. IGBT

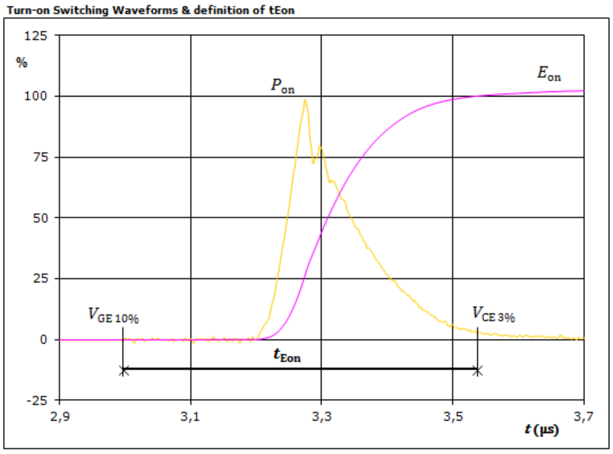
Turn-off Switching Waveforms & definition of tEoff



P_{off} (100%) =	60,00	kW
E_{off} (100%) =	6,45	mJ
t_{Eoff} =	0,60	μs

Figure 6. IGBT

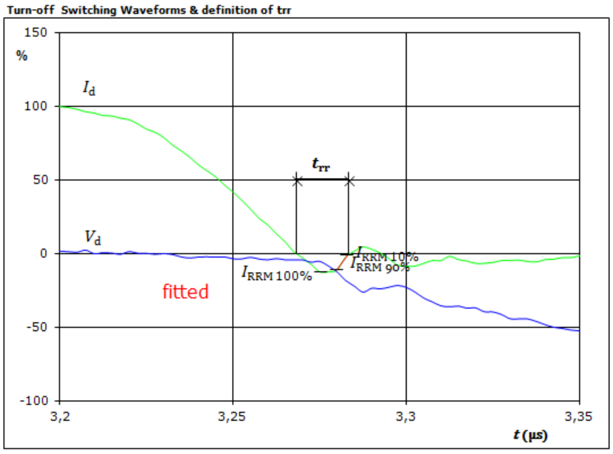
Turn-on Switching Waveforms & definition of tEon



P_{on} (100%) =	60,00	kW
E_{on} (100%) =	7,09	mJ
t_{Eon} =	0,54	μs

Figure 7. FWD

Turn-off Switching Waveforms & definition of trr

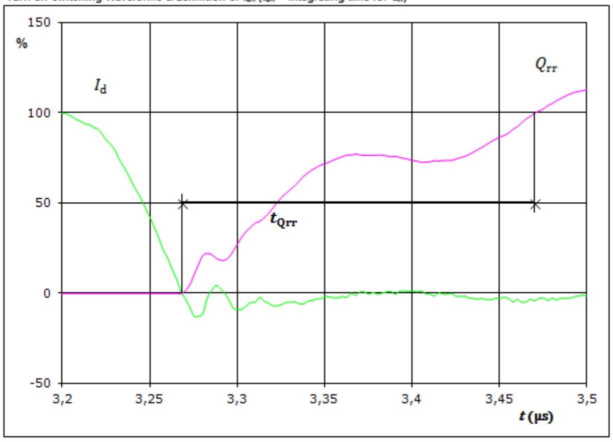


V_d (100%) =	600	V
I_d (100%) =	100	A
I_{RRM} (100%) =	-15	A
t_{rr} =	0,016	μs

Swiching definition

Figure 8. **FWD**

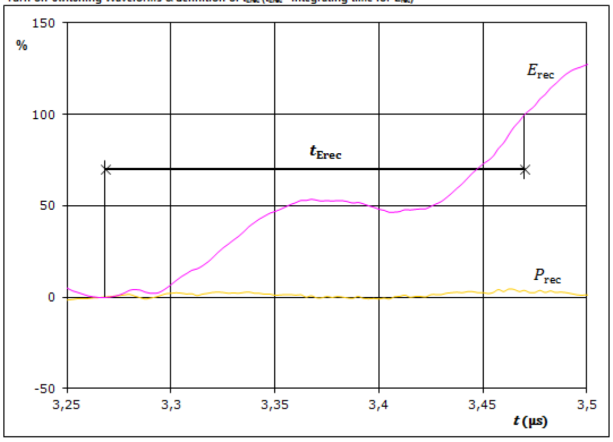
Turn-on Switching Waveforms & definition of t_{Qrr} (t_{Qrr} = integrating time for Q_{rr})



I_d (100%) =	100	A
Q_{rr} (100%) =	0,55	µC
t_{Qrr} =	0,20	µs

Figure 9. **FWD**

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



P_{rec} (100%) =	60,00	kW
E_{rec} (100%) =	0,15	mJ
t_{Erec} =	0,20	µs

Ordering Code & Marking

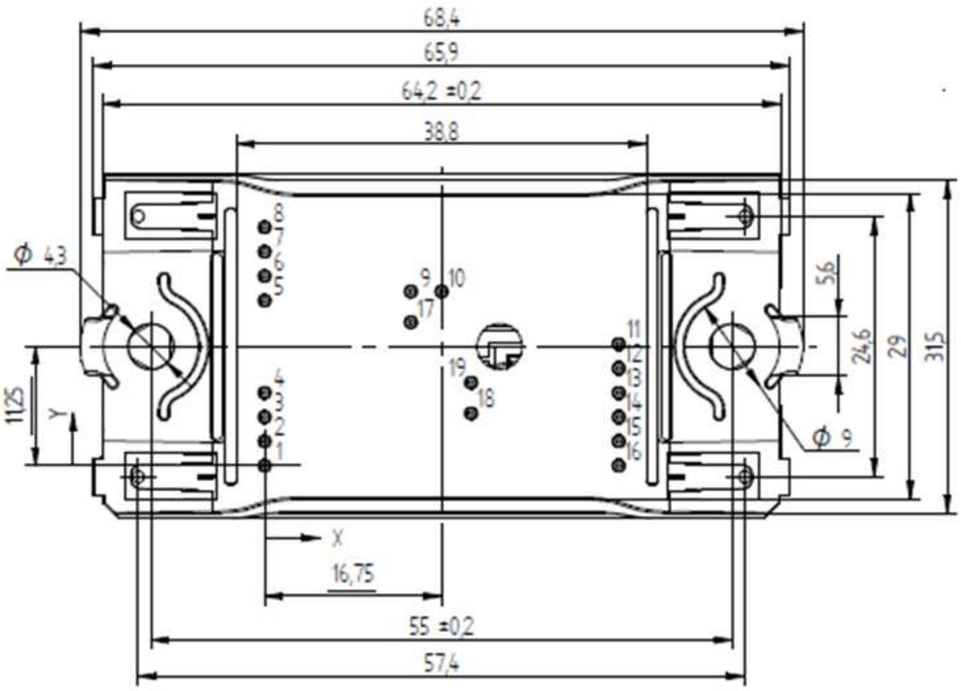
Version	Ordering Code	in DataMatrix as	in packaging barcode as
without thermal paste with solder pins	10-FZ122PA100SC02-P999F78	P999F78	P999F78

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

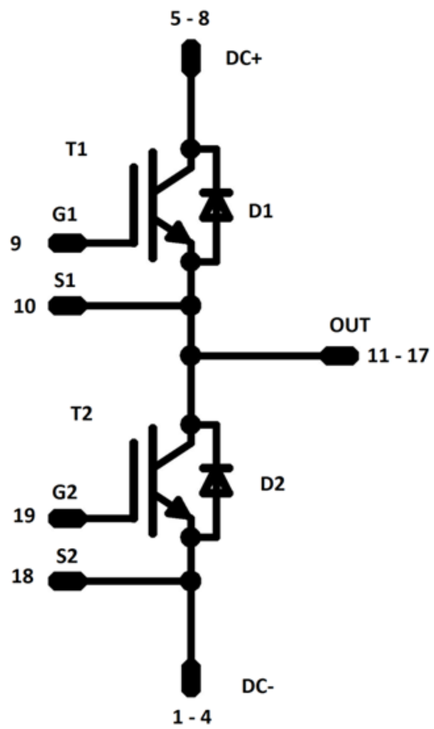
Outline

Pin table [mm]

Pin	X	Y
Pin	X	Y
1	0	0
2	0	2,3
3	0	4,6
4	0	6,9
5	0	15,6
6	0	17,9
7	0	20,2
8	0	22,5
9	13,85	16,45
10	16,75	16,45
11	33,5	11,5
12	33,5	9,2
13	33,5	6,9
14	33,5	4,6
15	33,5	2,3
16	33,5	0
17	13,85	13,55
18	19,55	4,95
19	19,55	7,85



Pinout



Identification

ID	Component	Voltage	Current	Function	Comment
T1,T2	IGBT	1200V	100A	Buck Switch	
D1,D2	FWD	1200V	60A	Buck Diode	

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

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

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