10-FZ126PA025M7-P869F78
datasheet

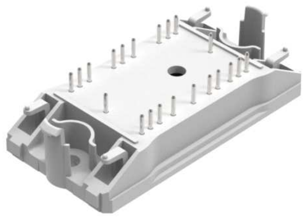
Vincotech

***flow* PACK 0** | **1200 V / 25 A**

Features

- IGBT M7 with low V_{CEsat} and improved EMC behavior
- Compact and low inductive design
- Built-in NTC

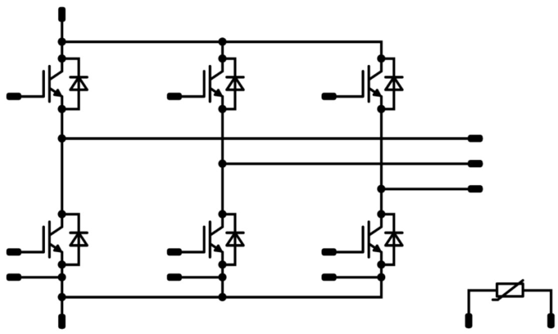
flow 0 12 mm housing



Target applications

- Industrial Drives

Schematic



Types

- 10-FZ126PA025M7-P869F78

Maximum Ratings

T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Condition		Value	Unit
Inverter Switch					
Collector-emitter voltage	V_{CES}			1200	V
Collector current	I_C	$T_j = T_{jmax}$	T_s = 80 °C	34	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}		50	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	82	W
Gate-emitter voltage	V_{GES}			±20	V
Maximum junction temperature	T_{jmax}			175	°C

Maximum Ratings

T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Condition		Value	Unit
Inverter Diode					
Peak repetitive reverse voltage	V_{RRM}			1200	V
Continuous (direct) forward current	I_F	$T_j = T_{jmax}$	T_s = 80 °C	33	A
Repetitive peak forward current	I_{FRM}			50	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	62	W
Maximum junction temperature	T_{jmax}			175	°C

Module Properties

Thermal Properties

Parameter	Symbol	Condition		Value	Unit
Storage temperature	T_{stg}			-40…+125	°C
Operation temperature under switching condition	T_{jop}			-40…(T_{jmax} - 25)	°C

Isolation Properties

Parameter	Symbol	Condition		Value	Unit
Isolation voltage	V_{isol}	DC Test Voltage*	t_p = 2 s	6000	V
		AC Voltage	t_p = 1 min	2500	V
Creepage distance				>12,7	mm
Clearance				9,22	mm
Comparative Tracking Index	CTI			> 200	

*100 % tested in production

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	
Inverter Switch										
Static										
Gate-emitter threshold voltage	$V_{GE(th)}$	$V_{GE} = V_{CE}$			0,0025	25	5,4	6	6,6	V
Collector-emitter saturation voltage	V_{CEsat}		15		25	25 125 150		1,65 1,89 1,95	1,95	V
Collector-emitter cut-off current	I_{CES}		0	1200		25			70	µA
Gate-emitter leakage current	I_{GES}		20	0		25			500	nA
Input capacitance	C_{ies}		0	10		25		4800		pF
Output capacitance	C_{oes}							170		
Reverse transfer capacitance	C_{res}							57		
Gate charge	Q_g		15	600	25	25		180		nC
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						1,16		K/W
Dynamic										
Turn-on delay time	$t_{d(on)}$	R_{goff} = 16 Ω R_{gon} = 16 Ω	±15	600	25	25 125 150		147 149 145		ns
Rise time	t_r					25 125 150		29 33 34		
Turn-off delay time	$t_{d(off)}$					25 125 150		171 191 196		
Fall time	t_f					25 125 150		95 110 115		
Turn-on energy (per pulse)	E_{on}	Q_{rFWD} = 2,5 µC Q_{rFWD} = 3,9 µC Q_{rFWD} = 4,3 µC				25 125 150		2,060 2,664 2,816		mWs
Turn-off energy (per pulse)	E_{off}					25 125 150		1,666 2,178 2,290		

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	
Inverter Diode										
Static										
Forward voltage	V_F				25	25 125 150		1,63 1,70 1,69	2,1	V
Reverse leakage current	I_R			1200		25			35	µA
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						1,54		K/W
Dynamic										
Peak recovery current	I_{RRM}	di/dt = 645 A/µs di/dt = 673 A/µs di/dt = 633 A/µs	±15	600	25	25 125 150		21 23 23		A
Reverse recovery time	t_{rr}					25 125 150		254 367 404		ns
Recovered charge	Q_r					25 125 150		2,543 3,878 4,279		µC
Reverse recovered energy	E_{rec}					25 125 150		0,885 1,448 1,610		mWs
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 125 150		217 134 132		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	

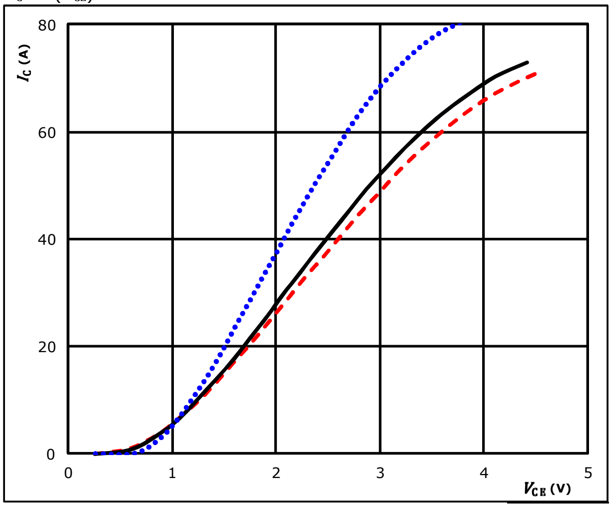
Vincotech

Inverter Switch Characteristics

figure 1. **IGBT**

Typical output characteristics

$I_C = f(V_{CE})$

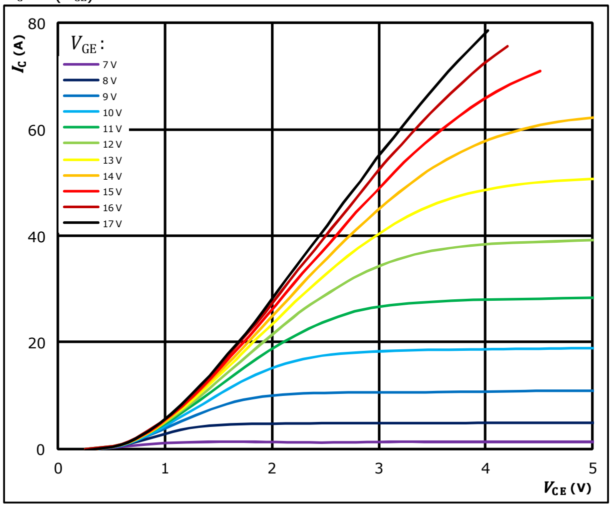


t_p =	250	μs		25	°C
V_{GE} =	15	V	T_j:	125	°C
				150	°C

figure 2. **IGBT**

Typical output characteristics

$I_C = f(V_{CE})$

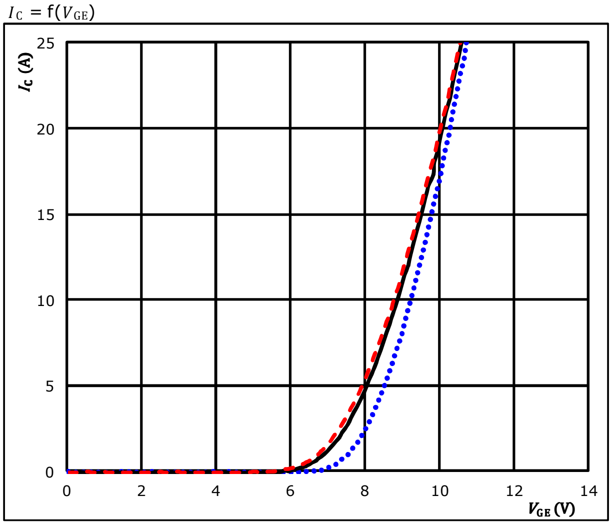


t_p = 250 μs
T_j = 125 °C
V_{GE} from 7 V to 17 V in steps of 1 V

figure 3. **IGBT**

Typical transfer characteristics

$I_C = f(V_{GE})$

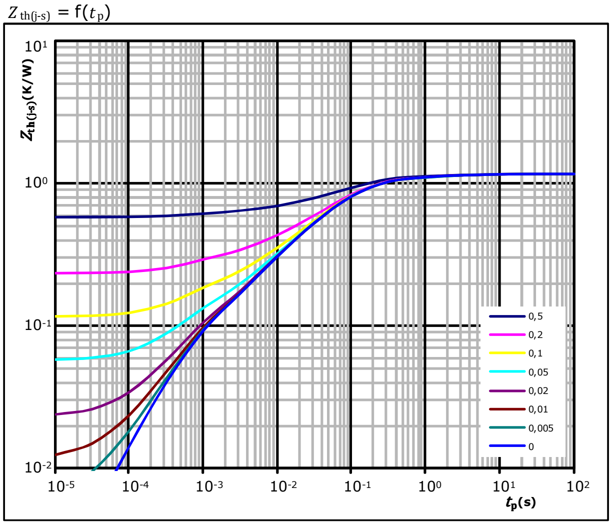


t_p =	100	μs		25	°C
V_{CE} =	10	V	T_j:	125	°C
				150	°C

figure 4. **IGBT**

Transient thermal impedance as function of pulse duration

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



D = t_p / T
$R_{th(j-s)}$ = 1,16 K/W

IGBT thermal model values

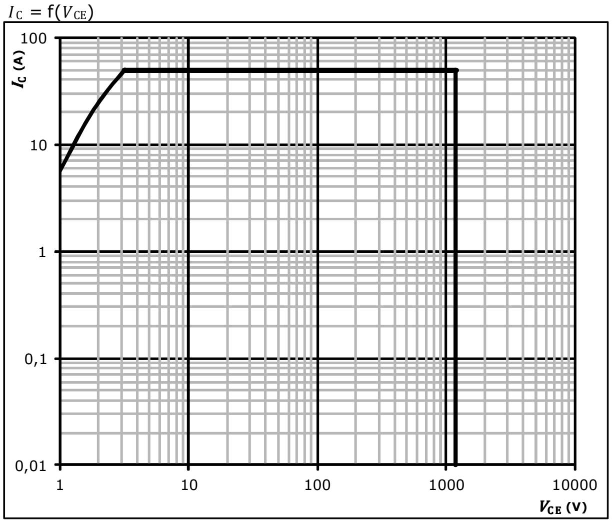
R (K/W)	τ (s)
5,33E-02	3,54E+00
1,07E-01	5,75E-01
5,05E-01	1,04E-01
2,68E-01	3,30E-02
1,51E-01	7,35E-03
7,80E-02	6,52E-04

Inverter Switch Characteristics

figure 6. **IGBT**

Safe operating area

$I_C = f(V_{CE})$



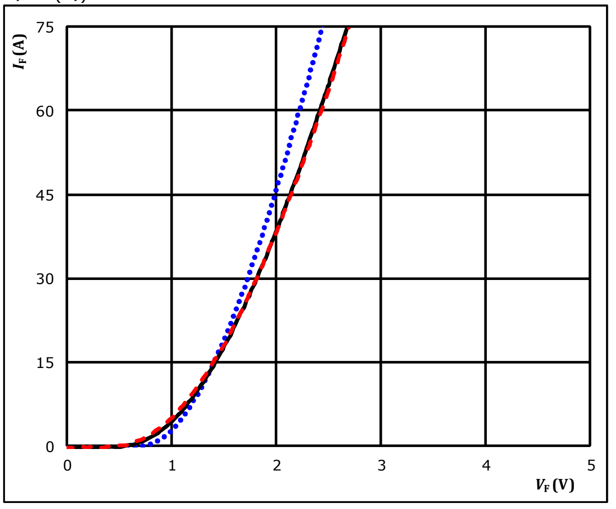
D =	single pulse	
T_s =	80	ºC
V_{GE} =	±15	V
T_j =	T_{jmax}	

Inverter Diode Characteristics

figure 1. **FWD**

Typical forward characteristics

$I_F = f(V_F)$



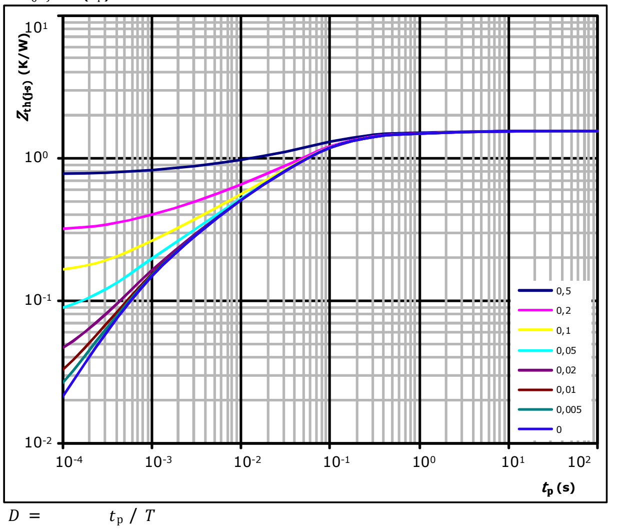
t_p = 250 μs

T_j: 25 °C; 125 °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

$R_{th(j-s)}$ = 1,54 K/W

FWD thermal model values

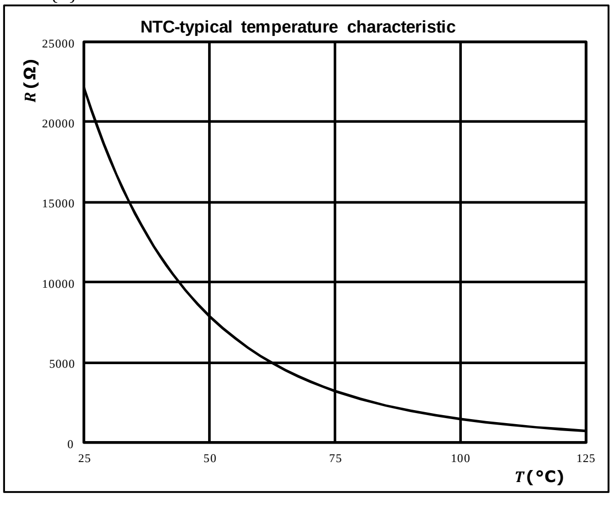
R (K/W)	τ (s)
4,69E-02	5,05E+00
1,06E-01	7,09E-01
5,57E-01	1,01E-01
4,68E-01	3,22E-02
2,35E-01	5,52E-03
8,77E-02	1,01E-03
4,01E-02	5,52E-04

Thermistor Characteristics

figure 1. **Thermistor**

Typical NTC characteristic
as a function of temperature

$R = f(T)$

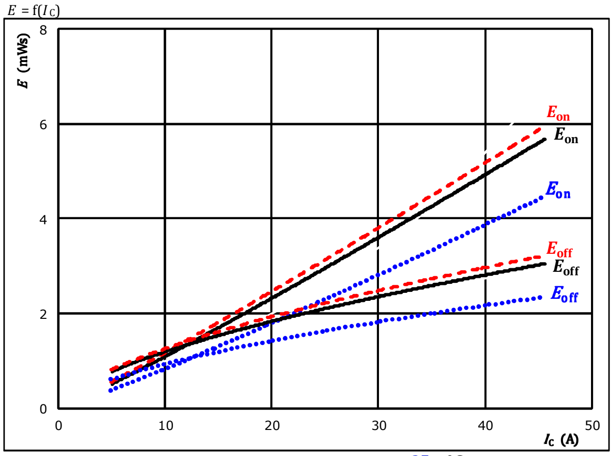


Inverter Switching Characteristics

figure 1. **IGBT**

Typical switching energy losses as a function of collector current

$E = f(I_C)$



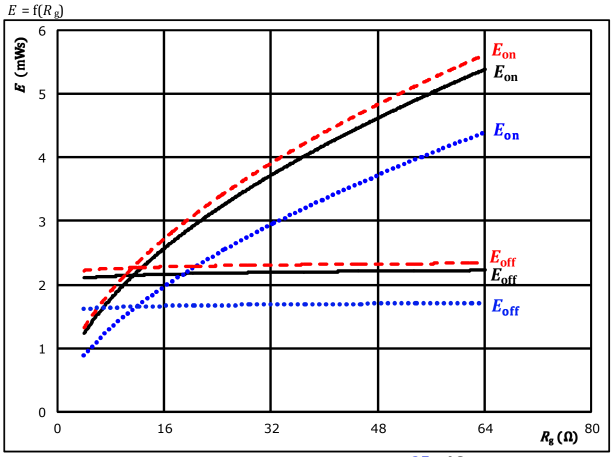
With an inductive load at

$V_{CE} =$ 600 V	T_j:	25 °C	··········
$V_{GE} =$ ±15 V		125 °C	———
$R_{gon} =$ 16 Ω		150 °C	– – –
$R_{goff} =$ 16 Ω			

figure 2. **IGBT**

Typical switching energy losses as a function of gate resistor

$E = f(R_g)$



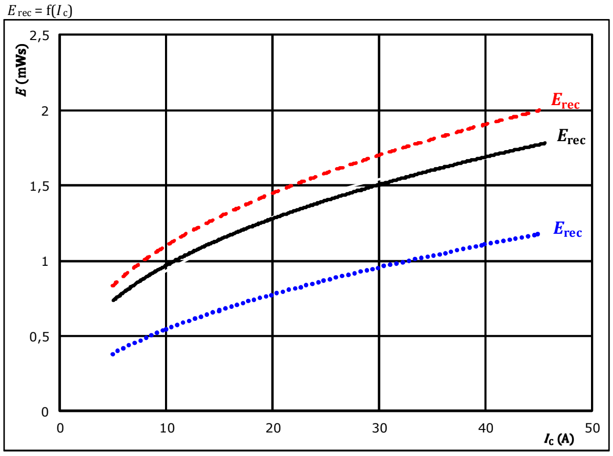
With an inductive load at

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

figure 3. **FWD**

Typical reverse recovered energy loss as a function of collector current

$E_{rec} = f(I_c)$



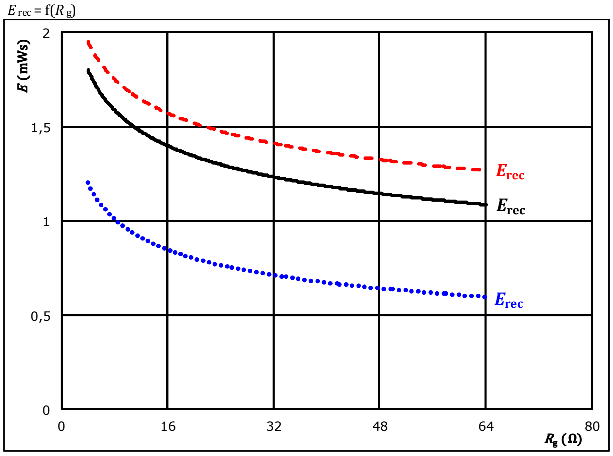
With an inductive load at

$V_{CE} =$ 600 V	T_j:	25 °C	··········
$V_{GE} =$ ±15 V		125 °C	———
$R_{gon} =$ 16 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

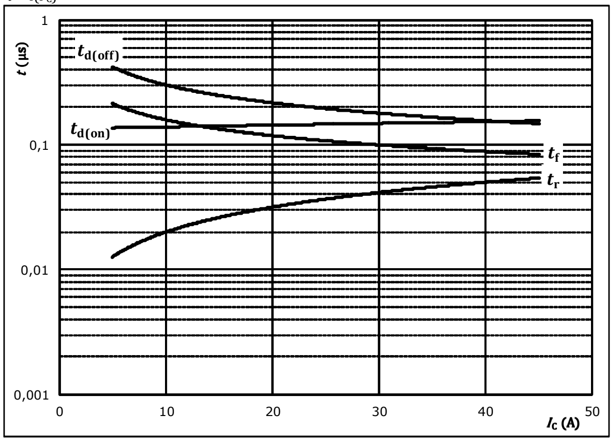
$V_{CE} =$ 600 V	T_j:	25 °C	··········
$V_{GE} =$ ±15 V		125 °C	———
$I_C =$ 25 A		150 °C	– – –

Inverter Switching Characteristics

figure 5. IGBT

Typical switching times as a function of collector current

$t = f(I_C)$



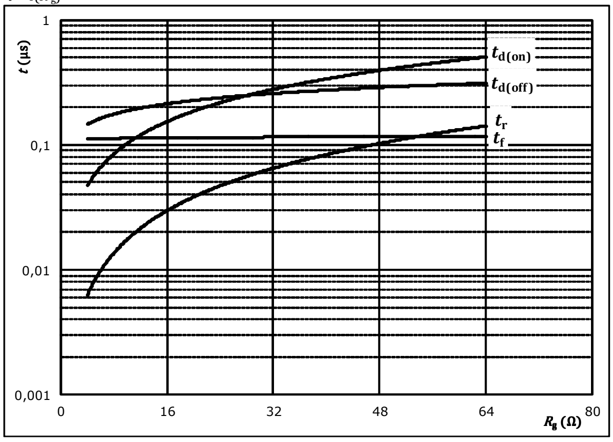
With an inductive load at

T_j =	150	°C
V_{CE} =	600	V
V_{GE} =	±15	V
R_{gon} =	16	Ω
R_{goff} =	16	Ω

figure 6. IGBT

Typical switching times as a function of gate resistor

$t = f(R_g)$



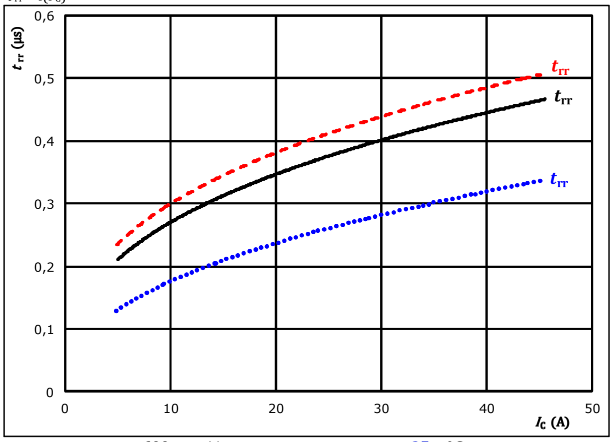
With an inductive load at

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

figure 7. FWD

Typical reverse recovery time as a function of collector current

$t_{rr} = f(I_C)$

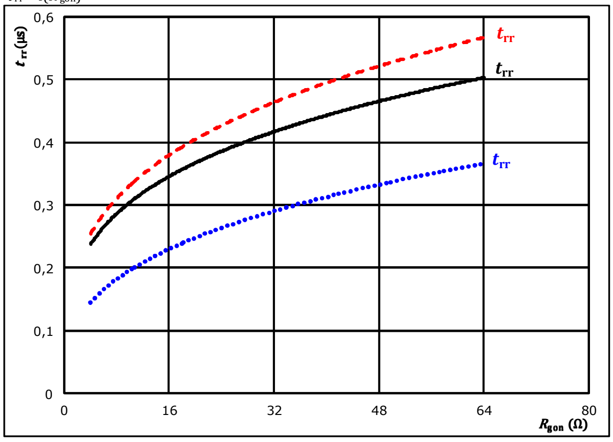


At					
V_{CE} =	600	V	T_j:	25 °C	dotted
V_{GE} =	±15	V		125 °C	solid
R_{gon} =	16	Ω		150 °C	dashed

figure 8. FWD

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

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



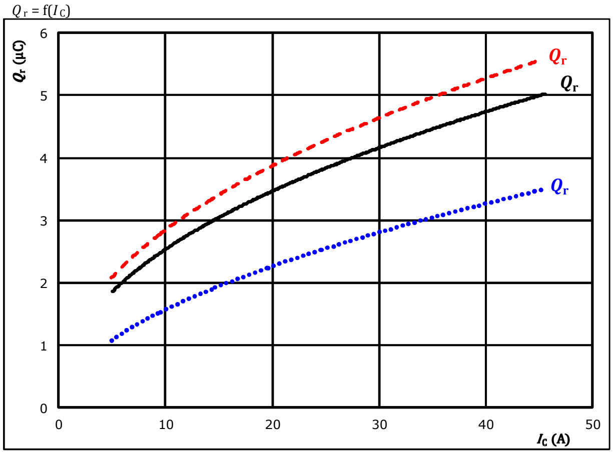
At					
V_{CE} =	600	V	T_j:	25 °C	dotted
V_{GE} =	±15	V		125 °C	solid
I_C =	25	A		150 °C	dashed

Inverter Switching Characteristics

figure 9. FWD

Typical recovered charge as a function of collector current

$Q_r = f(I_C)$

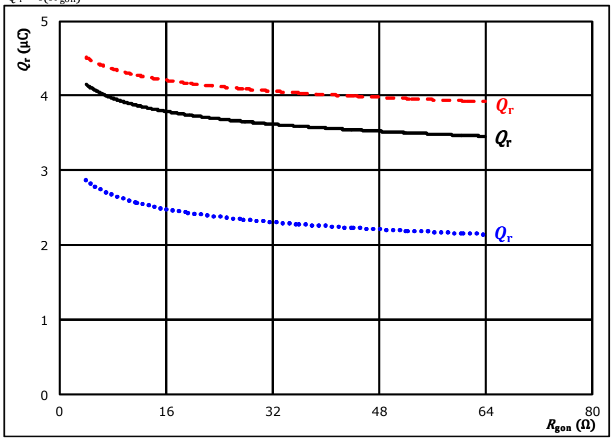


At	V_{CE} =	600	V		25	°C
	V_{GE} =	±15	V	T_j:	125	°C
	R_{gon} =	16	Ω		150	°C

figure 10. FWD

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

$Q_r = f(R_{gon})$

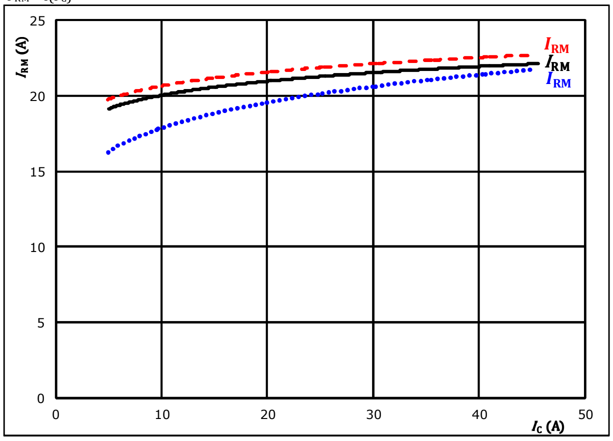


At	V_{CE}=	600	V		25	°C
	V_{GE} =	±15	V	T_j:	125	°C
	I_C=	25	A		150	°C

figure 11. FWD

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

$I_{RM} = f(I_C)$

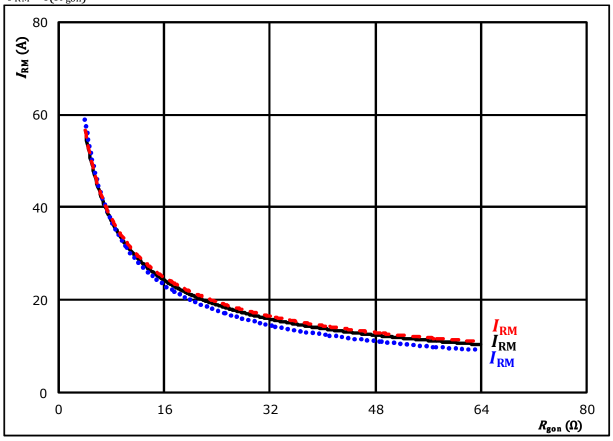


At	V_{CE}:	600	V		25	°C
	V_{GE} =	±15	V	T_j:	125	°C
	R_{gon} =	16	Ω		150	°C

figure 12. FWD

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

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



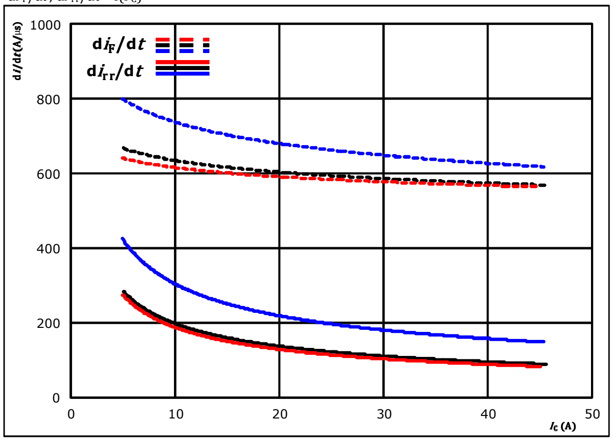
At	V_{CE} =	600	V		25	°C
	V_{GE} =	±15	V	T_j:	125	°C
	I_C =	25	A		150	°C

Inverter Switching Characteristics

figure 13.	FWD

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

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

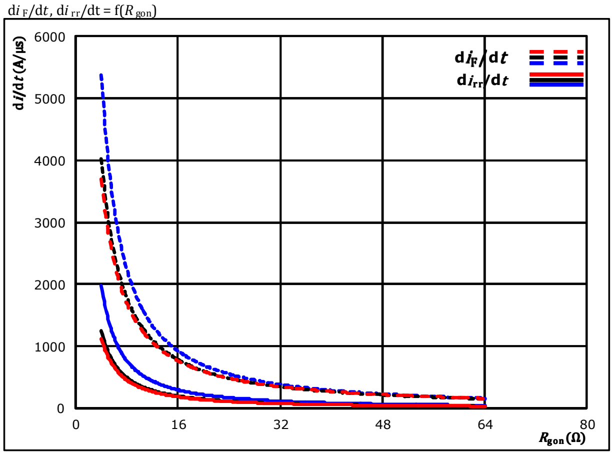


At						
	V_{CE} =	600	V		25 °C	···········
	V_{GE} =	±15	V	T_j:	125 °C	———
	R_{gon} =	16	Ω		150 °C	– – –

figure 14.	FWD

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

$di_F/dt,\ di_{rr}/dt = f(R_{gon})$

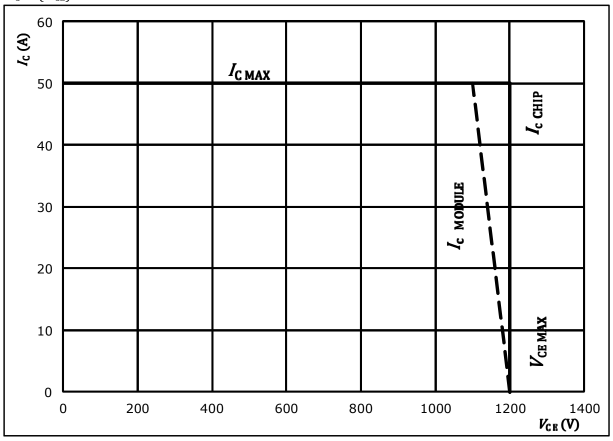


At						
	V_{CE} =	600	V		25 °C	···········
	V_{GE} =	±15	V	T_j:	125 °C	———
	I_C=	25	A		150 °C	– – –

figure 15.	IGBT

Reverse bias safe operating area

$I_C = f(V_{CE})$



At			
	T_j =	175	°C
	R_{gon} =	16	Ω
	R_{goff} =	16	Ω

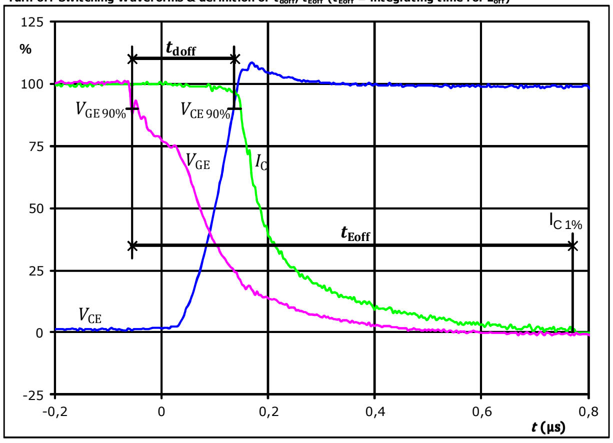
Inverter Switching Definitions

General conditions

T_j	=	125 °C
R_{gon}	=	16 Ω
R_{goff}	=	16 Ω

figure 1. IGBT

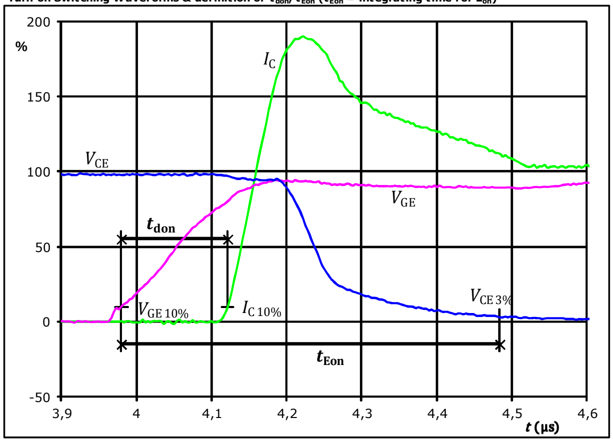
Turn-off Switching Waveforms & definition of t_{doff}, t_{Eoff} (t_{Eoff} = integrating time for E_{off})



$V_{GE}(0\%)$ =	-15	V
$V_{GE}(100\%)$ =	15	V
$V_C(100\%)$ =	600	V
$I_C(100\%)$ =	25	A
t_{doff} =	0,191	µs
t_{Eoff} =	0,826	µs

figure 2. IGBT

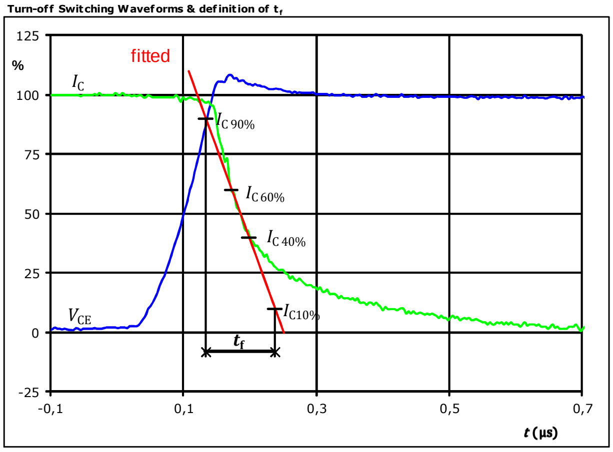
Turn-on Switching Waveforms & definition of t_{don}, t_{Eon} (t_{Eon} = integrating time for E_{on})



$V_{GE}(0\%)$ =	-15	V
$V_{GE}(100\%)$ =	15	V
$V_C(100\%)$ =	600	V
$I_C(100\%)$ =	25	A
t_{don} =	0,149	µs
t_{Eon} =	0,504	µs

figure 3. IGBT

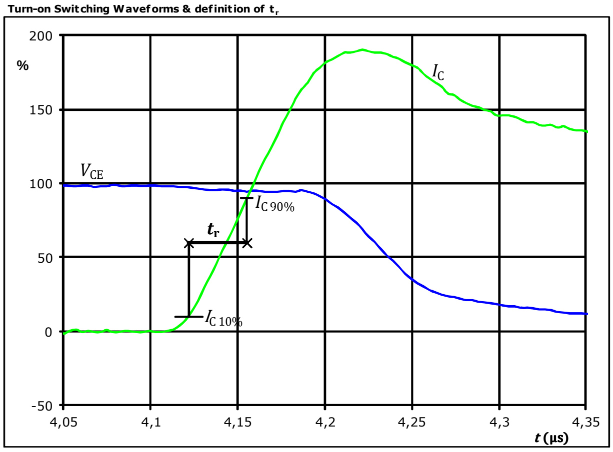
Turn-off Switching Waveforms & definition of t_f



$V_C(100\%)$ =	600	V
$I_C(100\%)$ =	25	A
t_f =	0,110	µs

figure 4. IGBT

Turn-on Switching Waveforms & definition of t_r

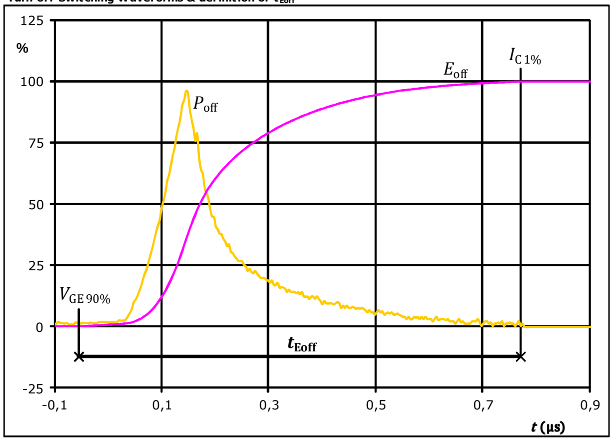


$V_C(100\%)$ =	600	V
$I_C(100\%)$ =	25	A
t_r =	0,033	µs

Inverter Switching Characteristics

figure 5. **IGBT**

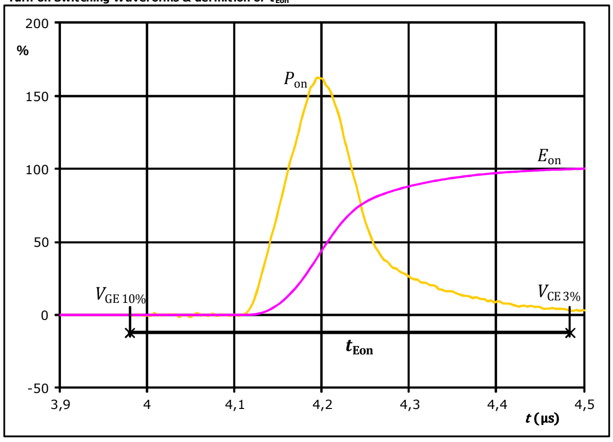
Turn-off Switching Waveforms & definition of t_{Eoff}



P_{off} (100%) =	15,13	kW
E_{off} (100%) =	2,18	mJ
t_{Eoff} =	0,83	µs

figure 6. **IGBT**

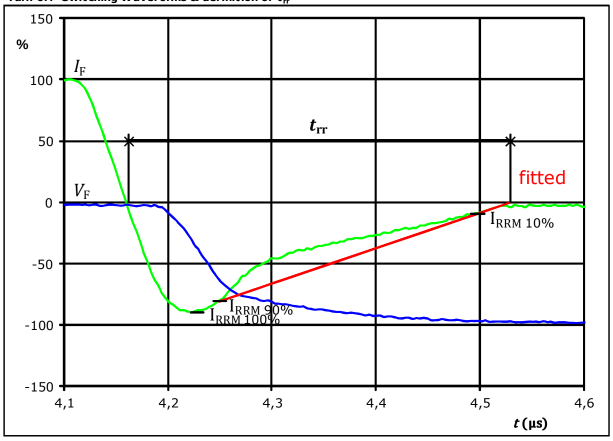
Turn-on Switching Waveforms & definition of t_{Eon}



P_{on} (100%) =	15,13	kW
E_{on} (100%) =	2,66	mJ
t_{Eon} =	0,50	µs

figure 7. **FWD**

Turn-off Switching Waveforms & definition of t_{rr}

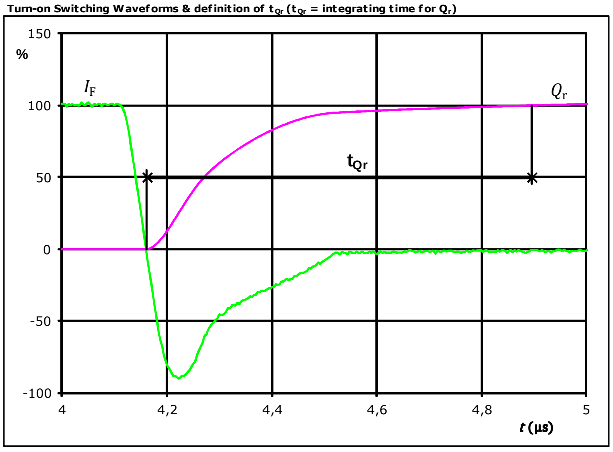


V_F (100%) =	600	V
I_F (100%) =	25	A
I_{RRM} (100%) =	-23	A
t_{rr} =	0,367	µs

Inverter Switching Characteristics

figure 8. **FWD**

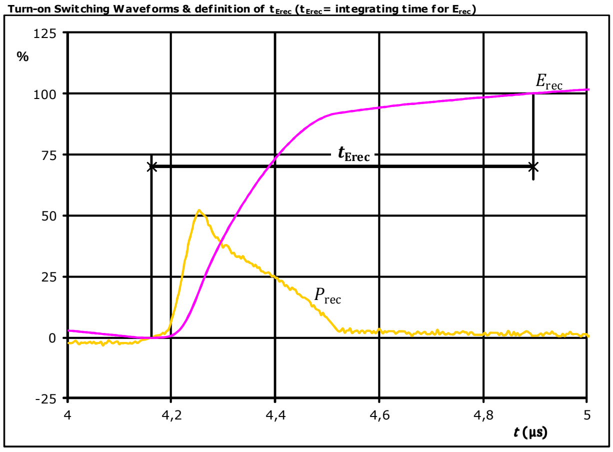
Turn-on Switching Waveforms & definition of t_{Qr} (t_{Qr} = integrating time for Q_r)



I_F (100%) =	25	A
Q_r (100%) =	3,88	µC
t_{Qr} =	0,73	µs

figure 9. **FWD**

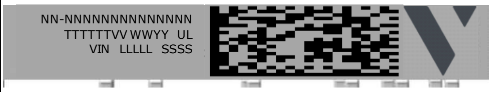
Turn-on Switching Waveforms & definition of t_{Erec} (t_{Erec} = integrating time for E_{rec})



P_{rec} (100%) =	15,13	kW
E_{rec} (100%) =	1,45	mJ
t_{Erec} =	0,73	µs

Ordering Code & Marking

Version	Ordering Code
without thermal paste 12 mm housing with solder pins	10-FZ126PA025M7-P869F78

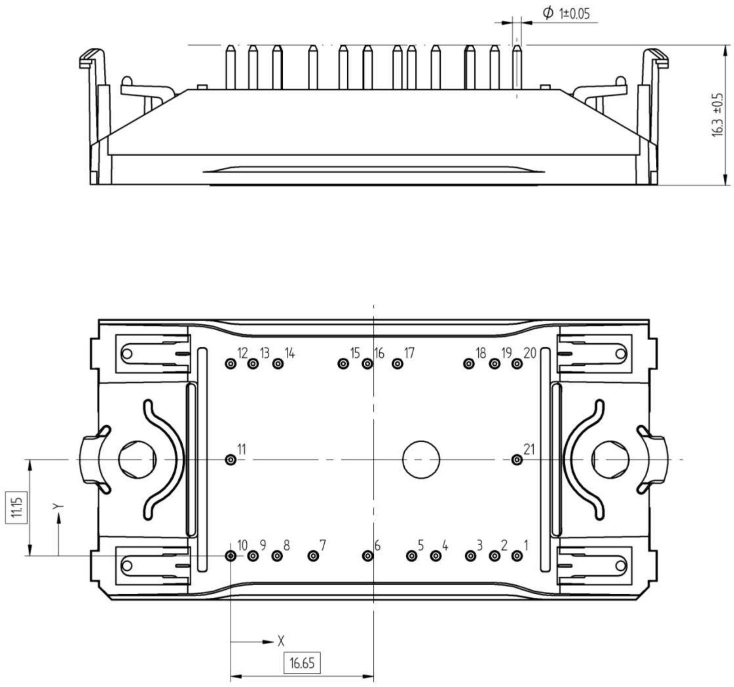


	Name		Date code	UL & VIN	Lot	Serial
Text	NN-NNNNNNNNNNNNNN-TTTTTTVV		WWYY	UL VIN	LLLLL	SSSS
Datamatrix	Type&Ver	Lot number	Serial	Date code		
	TTTTTTTVV	LLLLL	SSSS	WWYY		

Outline

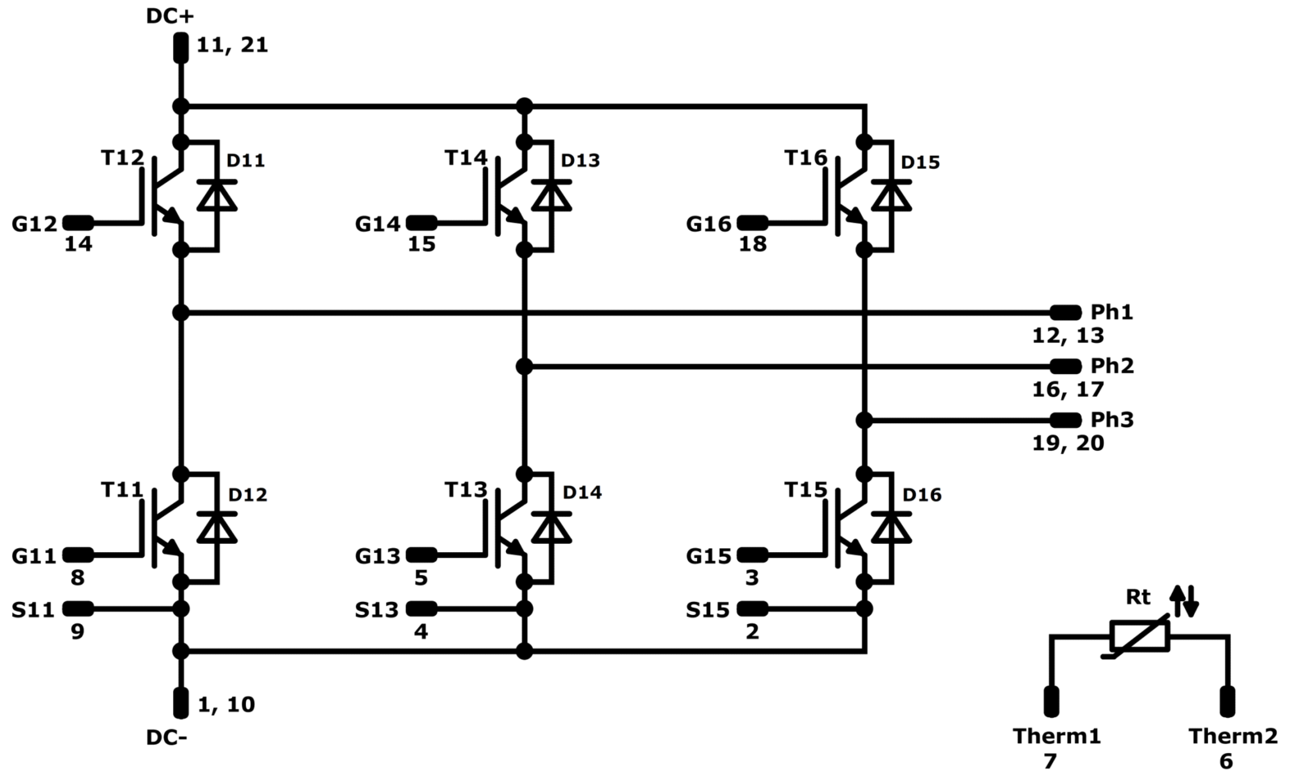
Pin table

Pin	X	Y	Function
1	33,3	0	DC-
2	30,7	0	S15
3	27,9	0	G15
4	23,85	0	S13
5	21,05	0	G13
6	15,95	0	Therm2
7	9,6	0	Therm1
8	5,4	0	G11
9	2,6	0	S11
10	0	0	DC-
11	0	11,15	DC+
12	0	22,3	Ph1
13	2,6	22,3	Ph1
14	5,5	22,3	G12
15	13,1	22,3	G14
16	15,9	22,3	Ph2
17	19,4	22,3	Ph2
18	27,7	22,3	G16
19	30,7	22,3	Ph3
20	33,3	22,3	Ph3
21	33,3	11,15	DC+



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-T16	IGBT	1200 V	25 A	Inverter Switch	
D11-D16	FWD	1200 V	25 A	Inverter 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-FZ126PA025M7-P869F78-D1-14	28 Sep. 2017		