Vincotech

10-PD126PA025SH-LA09F57Y
datasheet

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

Features

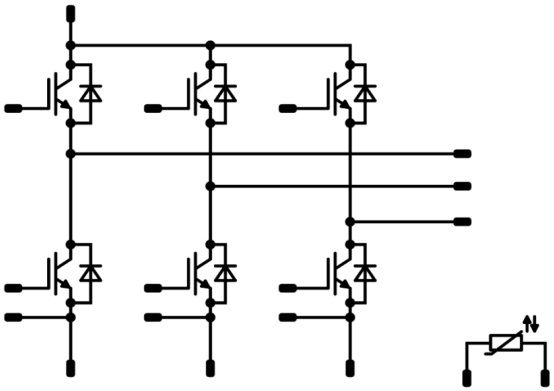
- Trench + Field stop IGBT4 HS3 technology
- Fast switching and high efficient
- Open emitter configuration
- Compact and low inductance design
- Built-in NTC

flow 0 17mm housing

Target applications

- Industrial Drives
- Solar

Schematic



Types

- 10-PD126PA025SH-LA09F57Y

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	31	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}	75	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ T_s = 80 °C	94	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
Inverter Diode				
Peak Repetitive Reverse Voltage	V_{RRM}		1200	V
Continuous (direct) forward current	I_F	T_j = T_{jmax} T_s = 80 °C	25	A
Surge (non-repetitive) forward current	I_{FSM}	50 Hz Single Half Sine Wave t_p = 10 ms T_j = 150 °C	100	A
Surge current capability	I^2t		50	A^2s
Total power dissipation	P_{tot}	T_j = T_{jmax} T_s = 80 °C	61	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			min. 12,7	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	
Inverter Switch										
Static										
Gate-emitter threshold voltage	$V_{GE(th)}$	$V_{GE} = V_{CE}$			0,00085	25	5,3	5,8	6,3	V
Collector-emitter saturation voltage	V_{CEsat}		15		25	25 125 150	1,78	1,98 2,38 2,49	2,42	V
Collector-emitter cut-off current	I_{CES}		0	1200		25			2,4	µA
Gate-emitter leakage current	I_{GES}		20	0		25			120	nA
Internal gate resistance	r_g							none		Ω
Input capacitance	C_{ies}	f= 1 MHz	0	25		25		1430		pF
Output capacitance	C_{oes}							115		
Reverse transfer capacitance	C_{res}							75		
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	phase-change material λ = 3,4 W/mK						1,01		K/W
IGBT Dynamic										
Turn-on delay time	$t_{d(on)}$	R_{goff} = 32 Ω R_{gon} = 32 Ω	±15	600	25	25 125 150		127 130 130		ns
Rise time	t_r					25 125 150		35 37 37		
Turn-off delay time	$t_{d(off)}$					25 125 150		210 265 277		
Fall time	t_f					25 125 150		49 93 104		
Turn-on energy (per pulse)	E_{on}	Q_{rFWD} = 1,6 µC Q_{rFWD} = 3,1 µC Q_{rFWD} = 4 µC				25 125 150		1,939 2,581 2,863		mWs
Turn-off energy (per pulse)	E_{off}					25 125 150		1,005 1,689 1,881		

Characteristic Values

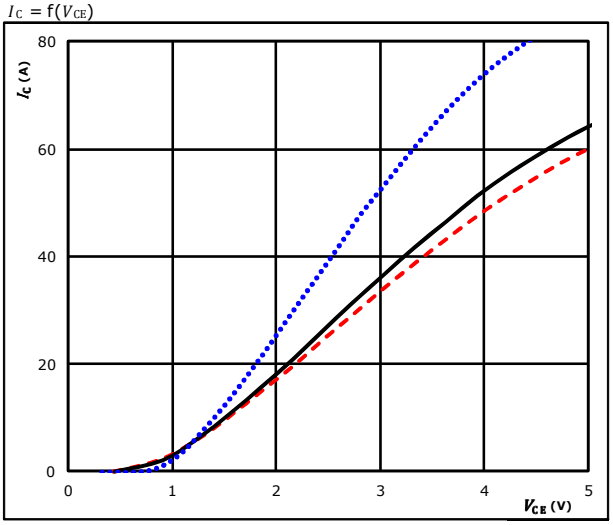
Parameter	Symbol	Conditions					Value			Unit
			V_{GE} [V] V_{GS} [V]	V_{CE} [V] V_{DS} [V] V_F [V]	I_C [A] I_D [A] I_F [A]	T_j [°C]	Min	Typ	Max	
Inverter Diode										
Static										
Forward voltage	V_F				25	25 150		2,47 2,49	2,74	V
Reverse leakage current	I_r			1200		25 150			60 3300	µA
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	phase-change material λ = 3,4 W/mK						1,56		K/W
FWD Dynamic										
Peak recovery current	I_{RRM}	di/dt = 559 A/µs di/dt = 571 A/µs di/dt = 555 A/µs	±15	600	25	25 125 150		12 16 17		A
Reverse recovery time	t_{rr}					25 125 150		341 502 591		ns
Recovered charge	Q_r					25 125 150		1,608 3,148 3,956		µC
Reverse recovered energy	E_{rec}					25 125 150		0,603 1,247 1,594		mWs
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 125 150		96 54 60		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	

Inverter Switch Characteristics

figure 1. **IGBT**

Typical output characteristics

$I_C = f(V_{CE})$

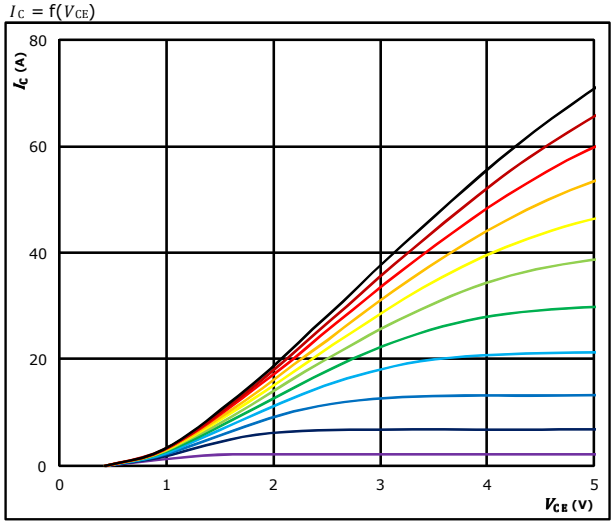


t_p =	250	µs		
V_{GE} =	15	V	T_j:	25 °C
				125 °C
				150 °C

figure 2. **IGBT**

Typical output characteristics

$I_C = f(V_{CE})$

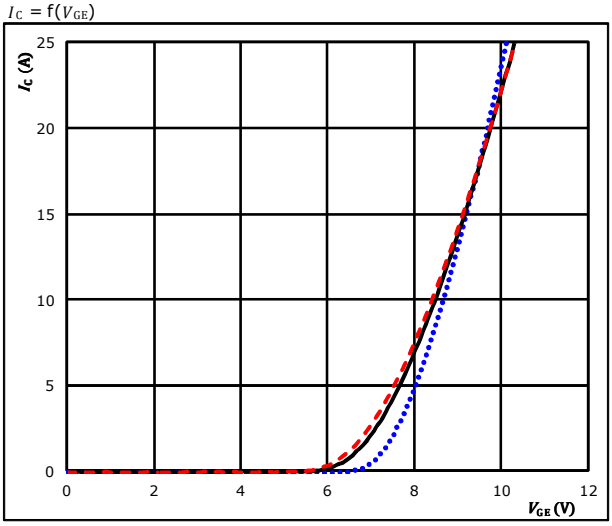


t_p =	250	µs
T_j =	150	°C
V_{GE} from	7 V to 17 V in steps of 1 V	

figure 3. **IGBT**

Typical transfer characteristics

$I_C = f(V_{GE})$

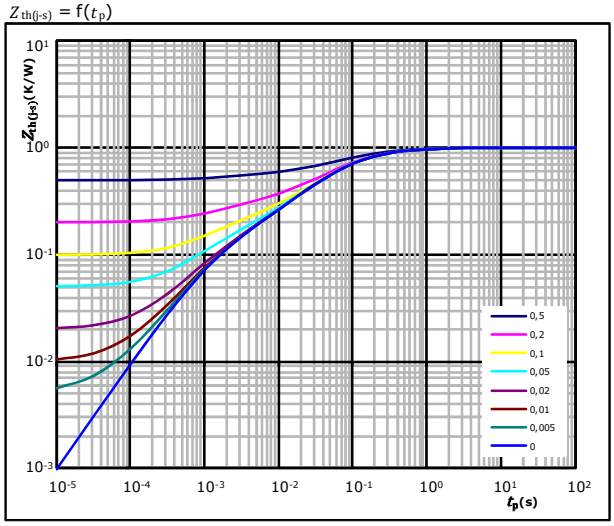


t_p =	100	µs		
V_{CE} =	10	V	T_j:	25 °C
				125 °C
				150 °C

figure 4. **IGBT**

Transient Thermal Impedance as function of Pulse duration

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



D =	t_p / T	
$R_{th(j-s)}$ =	1,01	K/W

IGBT thermal model values

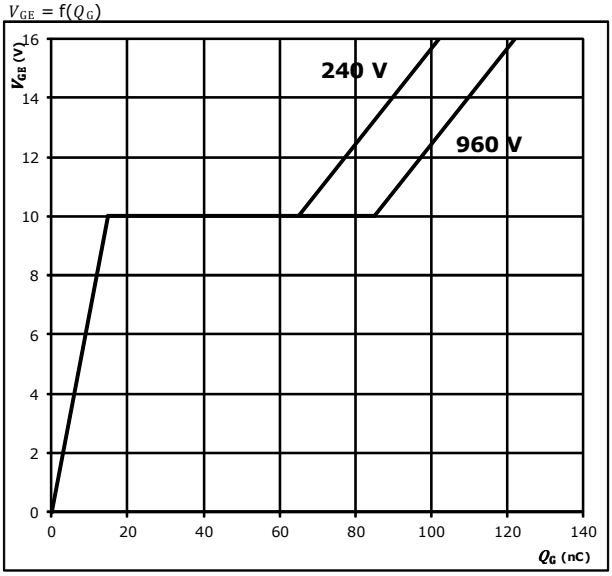
R (K/W)	τ (s)
8,44E-02	1,03E+00
2,46E-01	1,79E-01
4,48E-01	5,38E-02
1,38E-01	1,04E-02
5,48E-02	1,66E-03
3,85E-02	8,73E-04

Inverter Switch Characteristics

figure 5. **IGBT**

Gate voltage vs Gate charge

$V_{GE} = f(Q_G)$



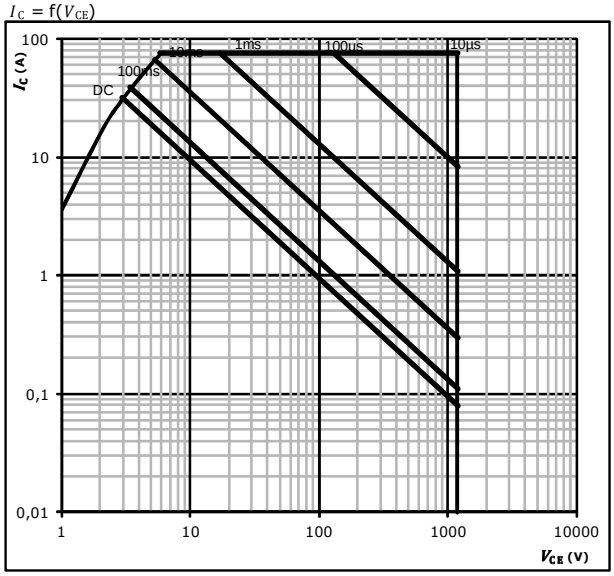
At

I_C= 25 A

figure 6. **IGBT**

Safe operating area

$I_C = f(V_{CE})$



At

D = single pulse

T_s = 80 °C

V_{GE} = ±15 V

T_j = T_{jmax}

figure 7. **IGBT**

Short circuit duration as a function of VGE

$t_{pSC} = f(V_{GE})$

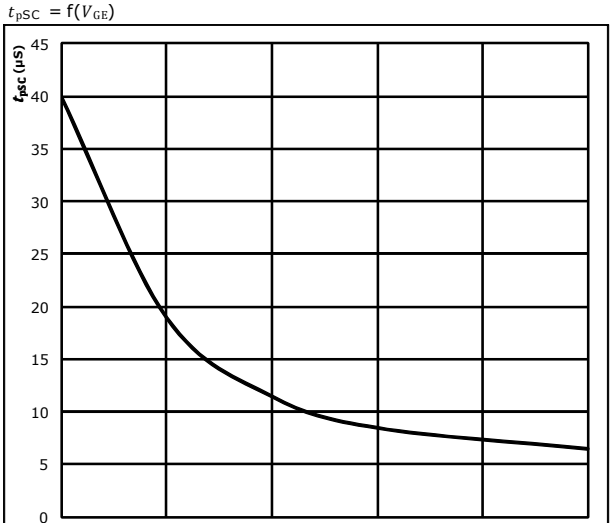
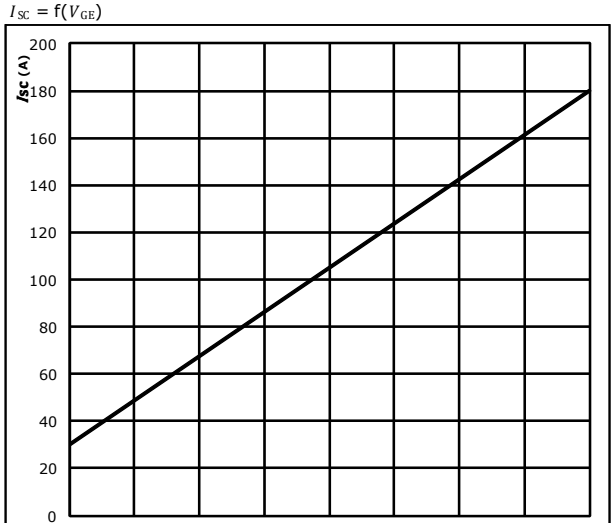


figure 8. **IGBT**

Typical short circuit current as a function of VGE

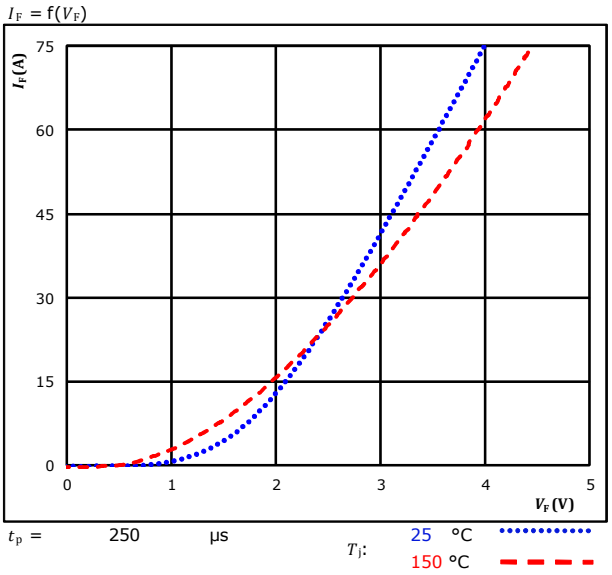
$I_{SC} = f(V_{GE})$



Inverter Diode Characteristics

figure 1. **FWD**

Typical forward characteristics



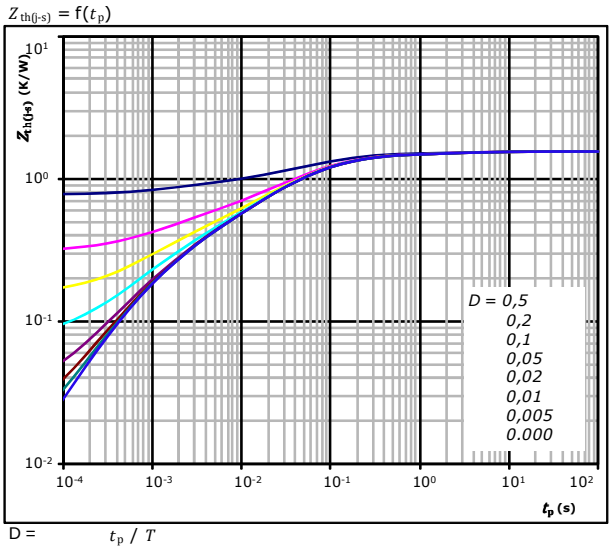
t_p = 250 µs

T_j: 25 °C

150 °C

figure 2. **FWD**

Transient thermal impedance as a function of pulse width



D = t_p / T

$R_{th(j-s)}$ = 1,56 K/W

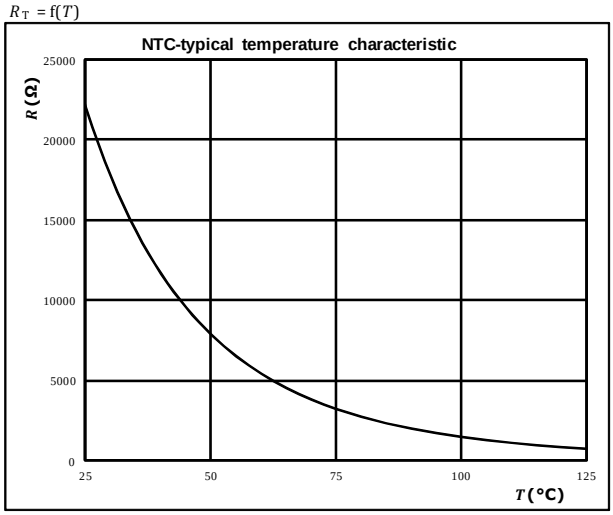
FWD thermal model values

R (K/W)	τ (s)
4,65E-02	4,86E+00
1,06E-01	8,11E-01
4,71E-01	1,09E-01
4,83E-01	3,07E-02
2,34E-01	7,03E-03
1,81E-01	1,25E-03
3,38E-02	3,28E-04

Thermistor Characteristics

figure 1. **Thermistor**

Thermistor typical temperature characteristic

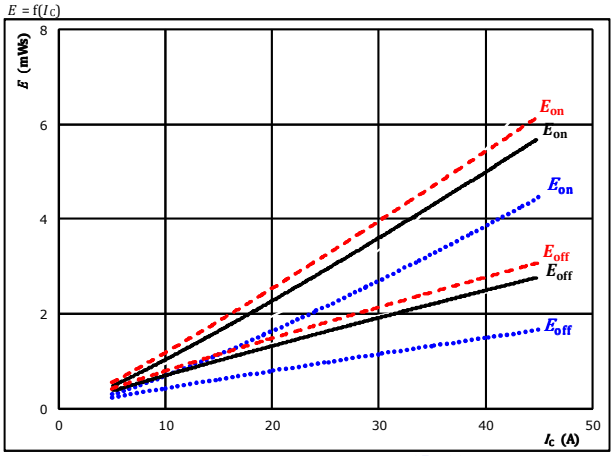


Inverter Switching Characteristics

figure 1. **IGBT**

Typical switching energy losses as a function of collector current

$E = f(I_C)$



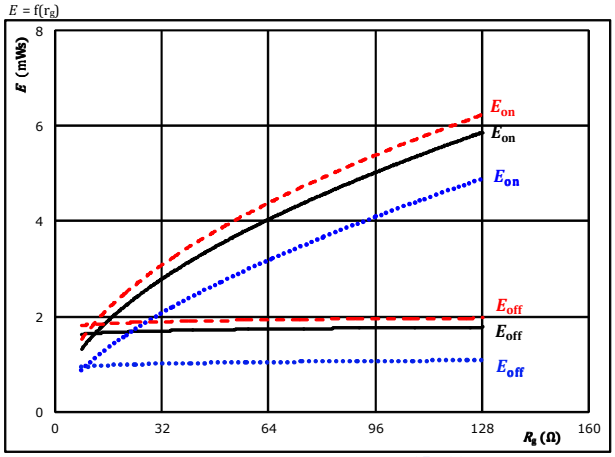
With an inductive load at

V_{CE} =	600	V	T_j:	25 °C	·····
V_{GE} =	±15	V		125 °C	———
R_{gon} =	32	Ω		150 °C	– – –
R_{goff} =	32	Ω			

figure 2. **IGBT**

Typical switching energy losses as a function of gate resistor

$E = f(r_G)$



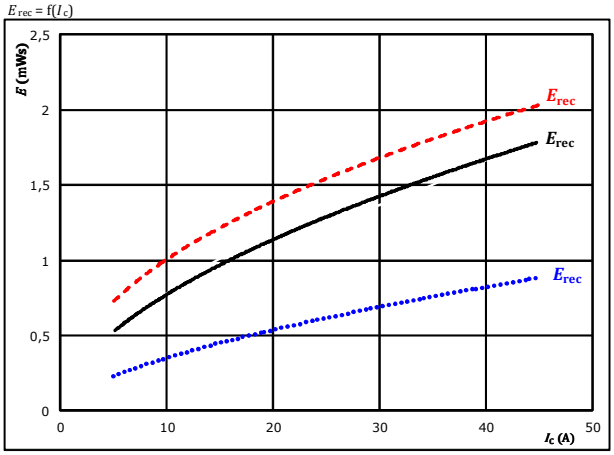
With an inductive load at

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

$E_{rec} = f(I_c)$



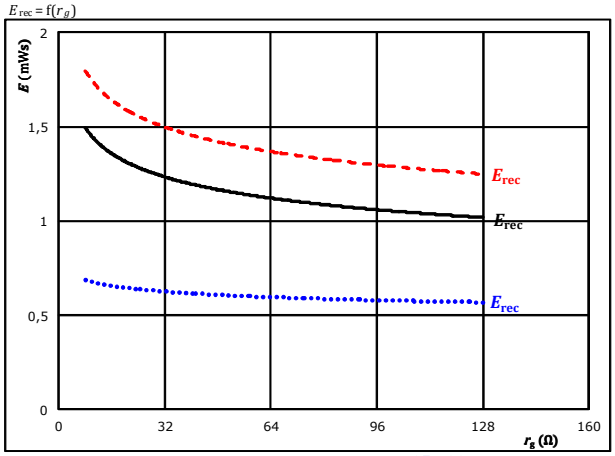
With an inductive load at

V_{CE} =	600	V	T_j:	25 °C	·····
V_{GE} =	±15	V		125 °C	———
R_{gon} =	32	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

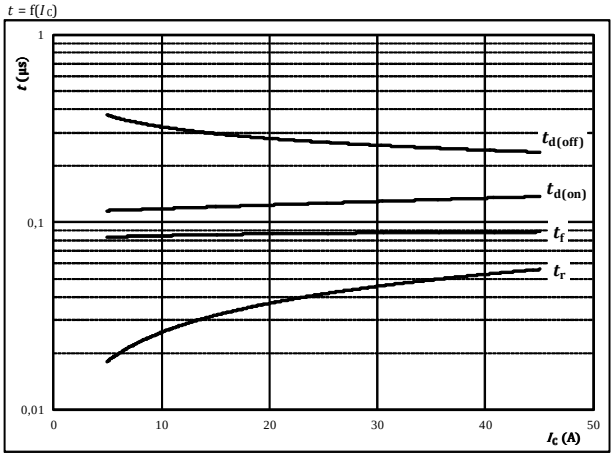
V_{CE} =	600	V	T_j:	25 °C	·····
V_{GE} =	±15	V		125 °C	———
I_C =	25	A		150 °C	– – –

Inverter Switching Characteristics

figure 5. **IGBT**

Typical switching times as a function of collector current

$t = f(I_C)$



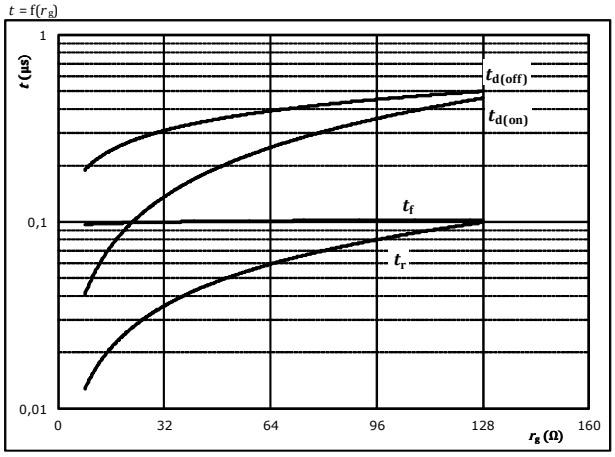
With an inductive load at

T_j =	150	°C
V_{CE} =	600	V
V_{GE} =	±15	V
R_{gon} =	32	Ω
R_{goff} =	32	Ω

figure 6. **IGBT**

Typical switching times as a function of gate resistor

$t = f(r_g)$



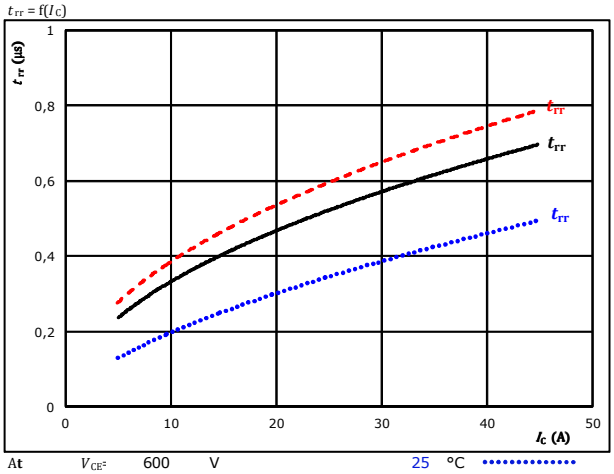
With an inductive load at

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

$t_{rr} = f(I_C)$

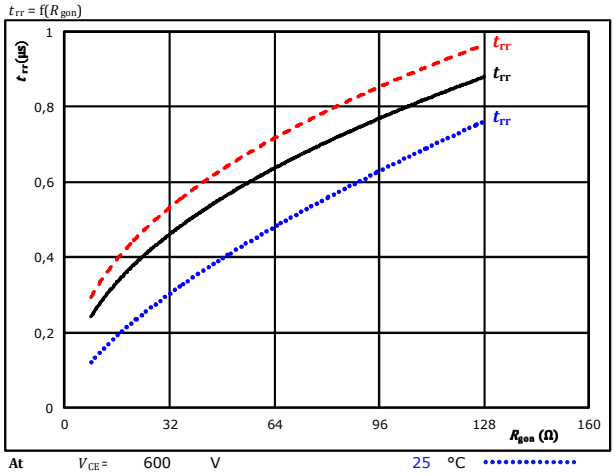


At	V_{CE} =	600	V		25 °C
	V_{GE} =	±15	V	T_j:	125 °C
	R_{gon} =	32	Ω		150 °C

figure 8. **FWD**

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

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



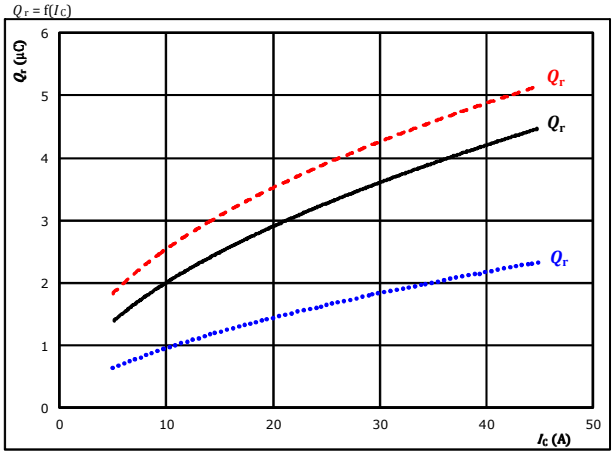
At	V_{CE} =	600	V		25 °C
	V_{GE} =	±15	V	T_j:	125 °C
	I_C =	25	A		150 °C

Inverter Switching Characteristics

figure 9. **FWD**

Typical recovered charge as a function of collector current

$Q_r = f(I_C)$

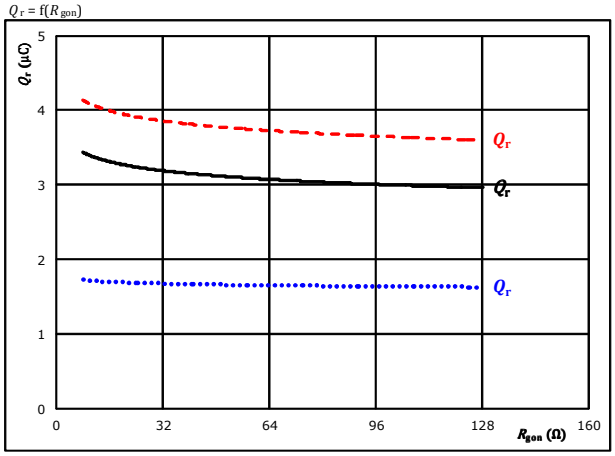


At						
	V_{CE} =	600	V		25 °C	
	V_{GE} =	±15	V	T_j:	125 °C	
	R_{gon} =	32	Ω		150 °C	

figure 10. **FWD**

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

$Q_r = f(R_{gon})$

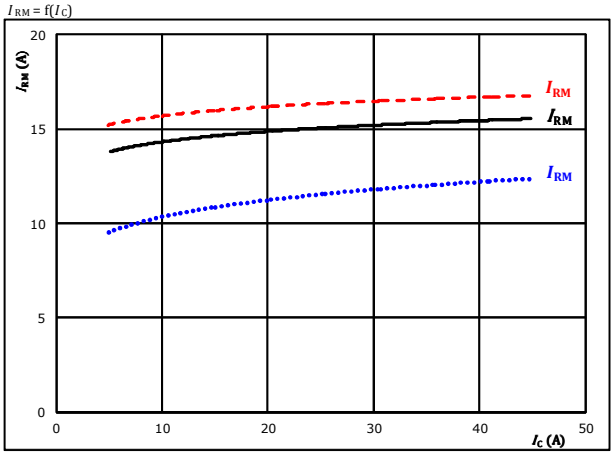


At						
	V_{CE}=	600	V		25 °C	
	V_{GE} =	±15	V	T_j:	125 °C	
	I_C=	25	A		150 °C	

figure 11. **FWD**

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

$I_{RM} = f(I_C)$

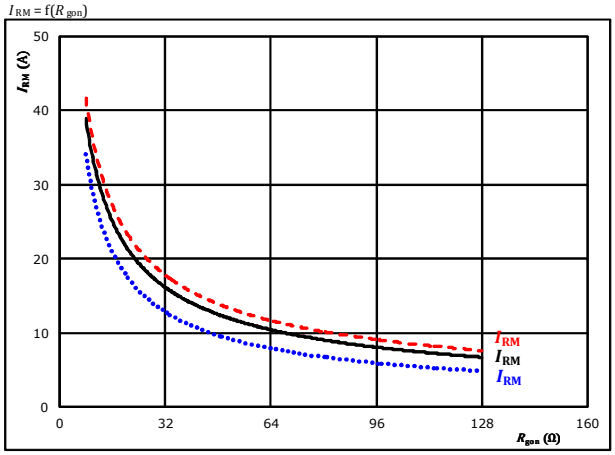


At						
	V_{CE}:	600	V		25 °C	
	V_{GE} =	±15	V	T_j:	125 °C	
	R_{gon} =	32	Ω		150 °C	

figure 12. **FWD**

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

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



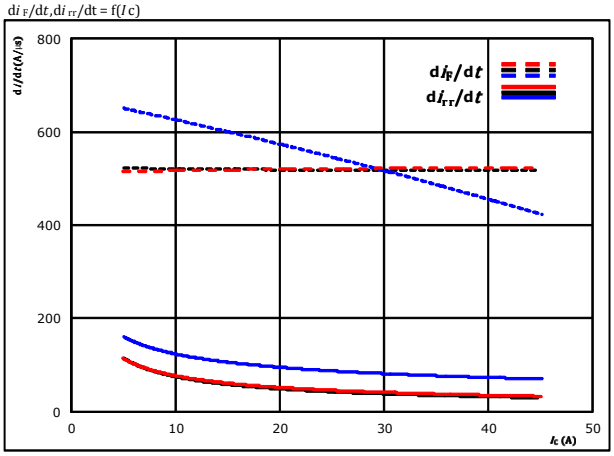
At						
	V_{CE} =	600	V		25 °C	
	V_{GE} =	±15	V	T_j:	125 °C	
	I_C =	25	A		150 °C	

Inverter Switching Characteristics

figure 13. **FWD**

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

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

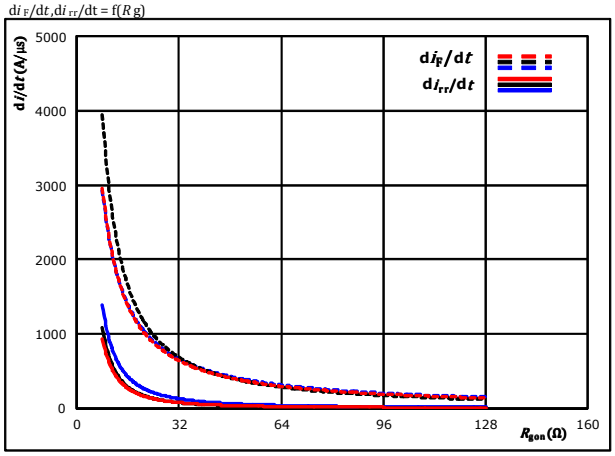


At						
V_{CE} =	600	V		25	°C	
V_{GE} =	±15	V	T_j:	125	°C	
R_{gon} =	32	Ω		150	°C	

figure 14. **FWD**

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

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

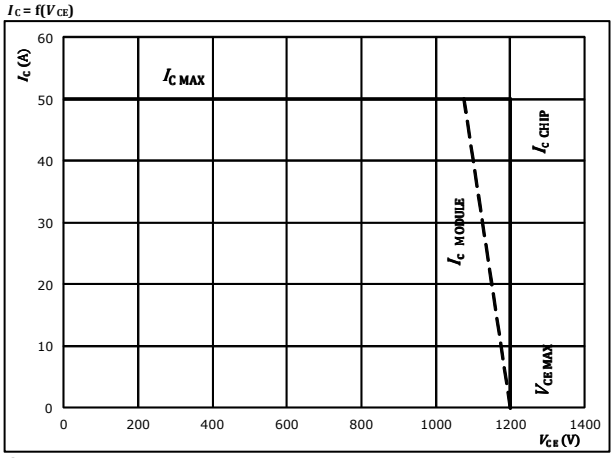


At						
V_{CE} =	600	V		25	°C	
V_{GE} =	±15	V	T_j:	125	°C	
I_C =	25	A		150	°C	

figure 15. **IGBT**

Reverse bias safe operating area

$I_C = f(V_{CE})$



At		
T_j =	175	°C
R_{gon} =	32	Ω
R_{goff} =	32	Ω

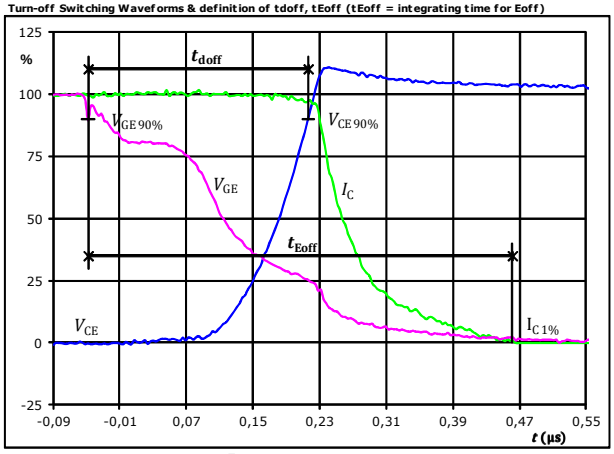
Inverter Switching Definitions

General conditions

T_j	=	**125 °C**
R_{gon}	=	**32 Ω**
R_{goff}	=	**32 Ω**

figure 1. **IGBT**

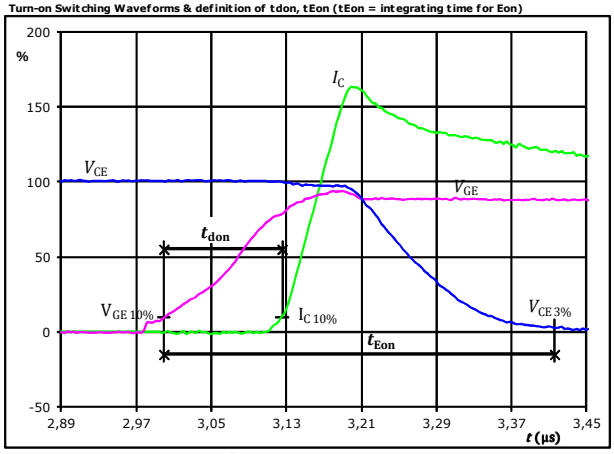
Turn-off Switching Waveforms & definition of tdoff, tEoff (tEoff = integrating time for Eoff)



$V_{GE}(0\%)$ =	-15	V
$V_{GE}(100\%)$ =	15	V
$V_C(100\%)$ =	600	V
$I_C(100\%)$ =	25	A
t_{doff} =	0,264	µs
t_{Eoff} =	0,509	µs

figure 2. **IGBT**

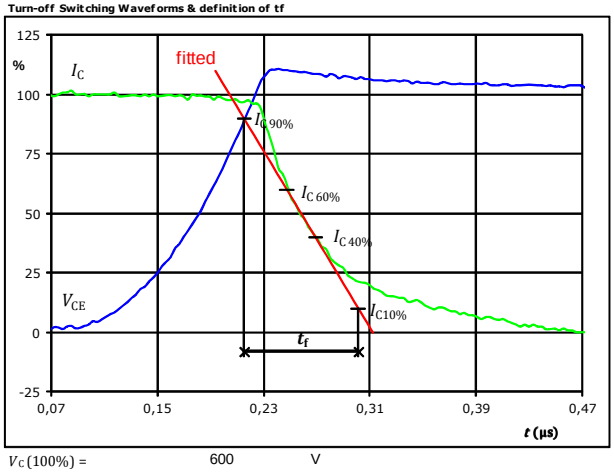
Turn-on Switching Waveforms & definition of tdon, tEon (tEon = integrating time for Eon)



$V_{GE}(0\%)$ =	-15	V
$V_{GE}(100\%)$ =	15	V
$V_C(100\%)$ =	600	V
$I_C(100\%)$ =	25	A
t_{don} =	0,126	µs
t_{Eon} =	0,416	µs

figure 3. **IGBT**

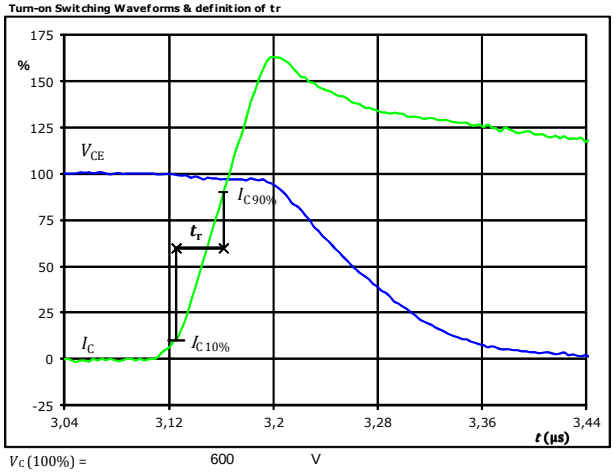
Turn-off Switching Waveforms & definition of tf



$V_C(100\%)$ =	600	V
$I_C(100\%)$ =	25	A
t_f =	0,085	µs

figure 4. **IGBT**

Turn-on Switching Waveforms & definition of tr

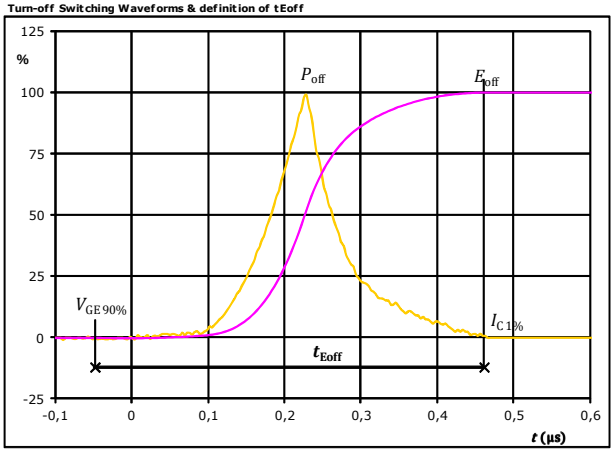


$V_C(100\%)$ =	600	V
$I_C(100\%)$ =	25	A
t_r =	0,037	µs

Inverter Switching Definitions

figure 5. IGBT

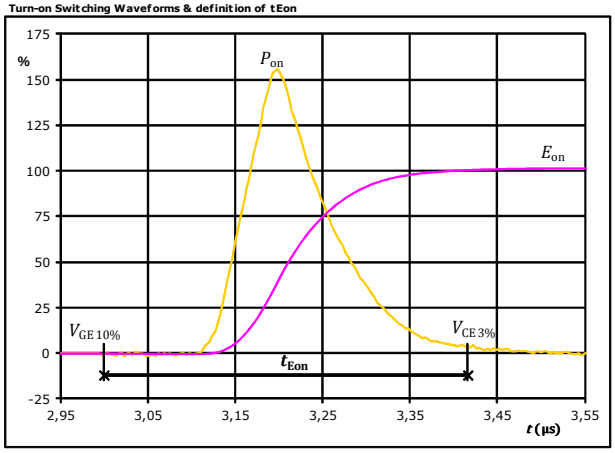
Turn-off Switching Waveforms & definition of tEoff



$P_{off}(100\%)$ =	15,01	kW
$E_{off}(100\%)$ =	1,62	mJ
t_{Eoff} =	0,51	µs

figure 6. IGBT

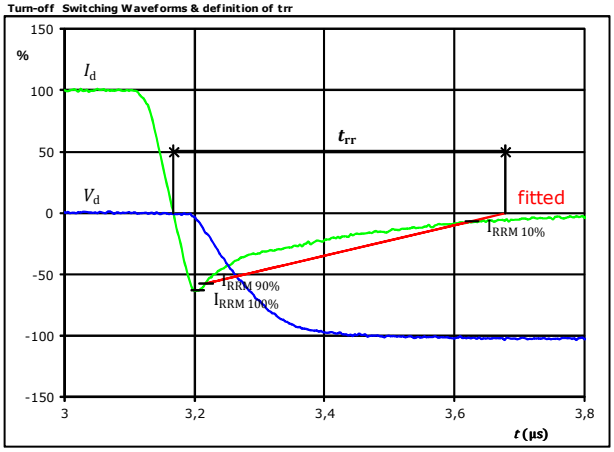
Turn-on Switching Waveforms & definition of tEon



$P_{on}(100\%)$ =	15,01	kW
$E_{on}(100\%)$ =	2,60	mJ
t_{Eon} =	0,42	µs

figure 7. FWD

Turn-off Switching Waveforms & definition of trr

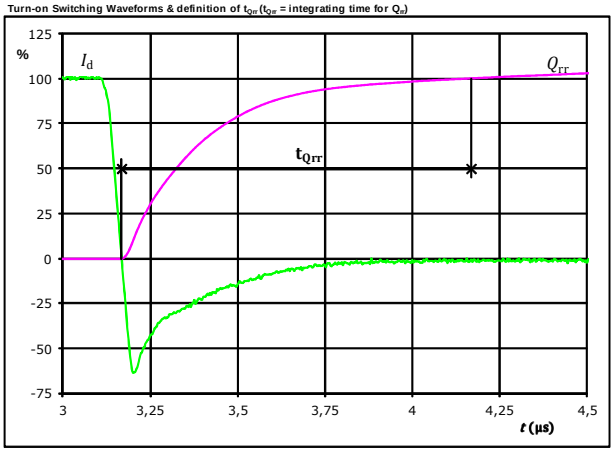


$V_d(100\%)$ =	600	V
$I_d(100\%)$ =	25	A
$I_{RRM}(100\%)$ =	-16	A
t_{rr} =	0,511	µs

Inverter Switching Definitions

figure 8. **FWD**

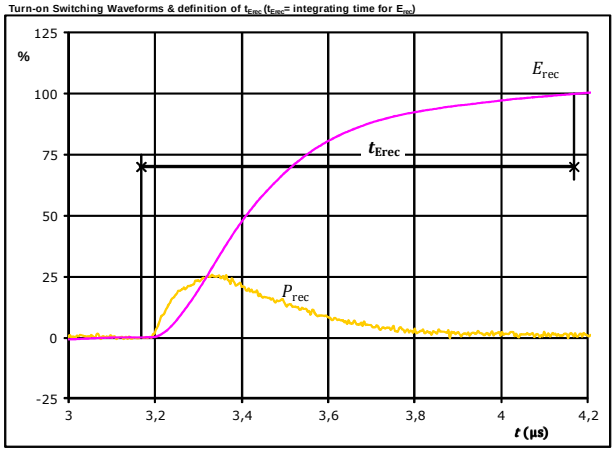
Turn-on Switching Waveforms & definition of t_{Qrr} (t_{Qrr} = integrating time for Q_{rr})



I_d (100%) =	25	A
Q_{rr} (100%) =	3,23	µC
t_{Qrr} =	1,00	µs

figure 9. **FWD**

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



P_{rec} (100%) =	15,01	kW
E_{rec} (100%) =	1,28	mJ
t_{Erec} =	1,00	µs

Vincotech

Ordering Code & Marking

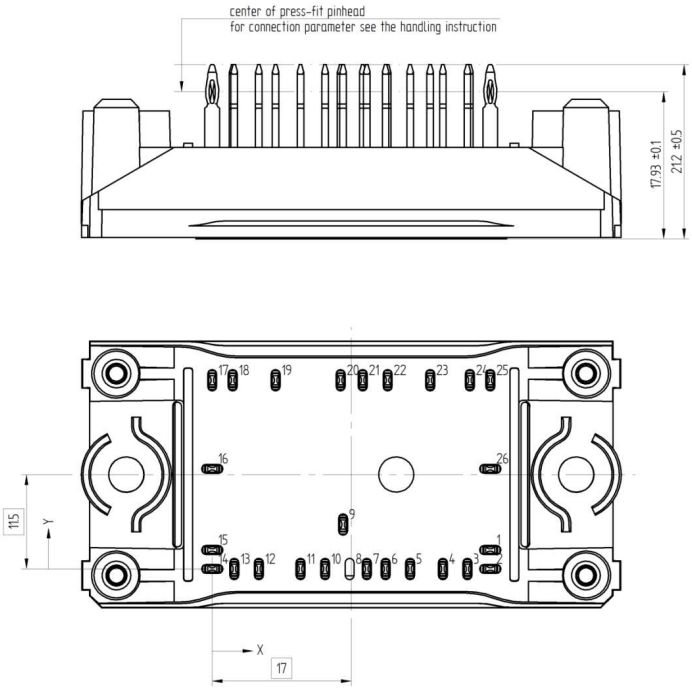
Version	Ordering Code
without thermal paste 17mm housing with Press-fit pins	10-PD126PA025SH-LA09F57Y

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

Outline

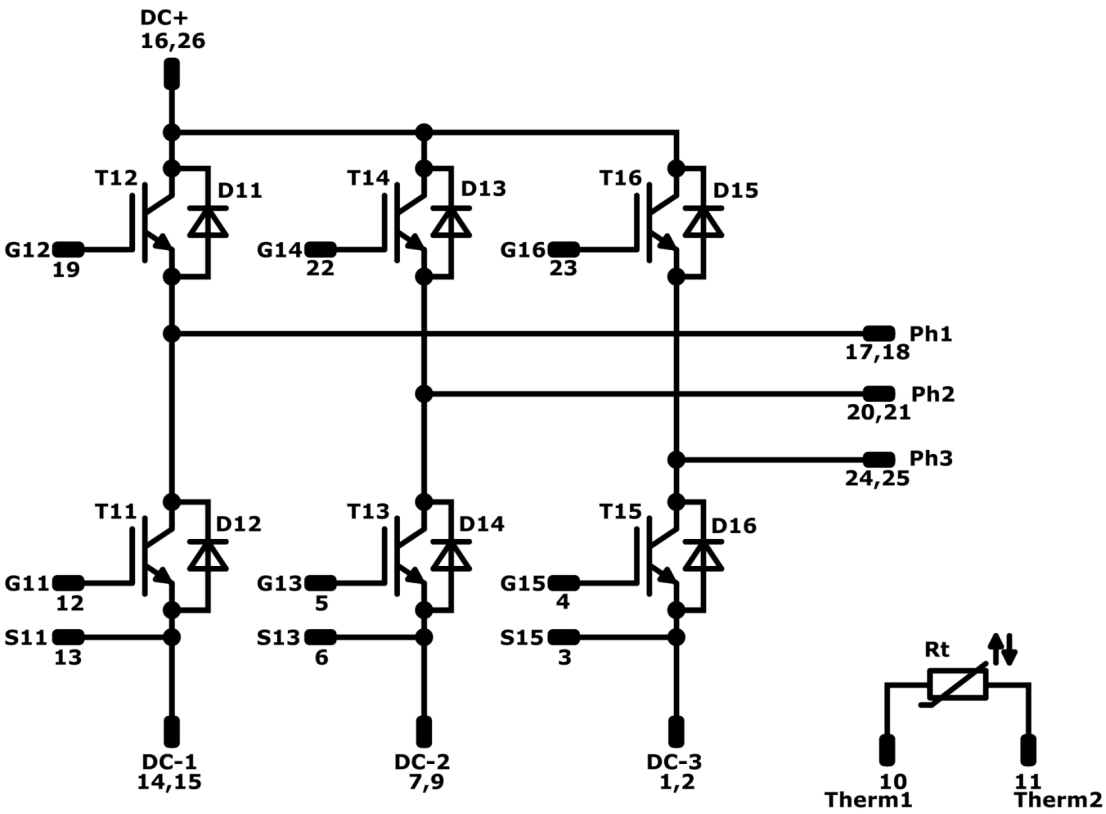
Pin table

Pin	X	Y	Function
1	34	2,3	DC-3
2	34	0	DC-3
3	31,2	0	S15
4	28,2	0	G15
5	24,2	0	G13
6	21,2	0	S13
7	18,9	0	DC-2
8	Not assembled		
9	16	5,4	DC-2
10	13,8	0	NTC2
11	10,8	0	NTC1
12	5,7	0	G11
13	2,7	0	S11
14	0	0	DC-1
15	0	2,3	DC-1
16	0	12,2	DC+
17	0	23	Ph1
18	2,5	23	Ph1
19	7,75	23	G12
20	15,7	23	Ph2
21	18,4	23	Ph2
22	21,45	23	G14
23	26,65	23	G16
24	31,5	23	Ph3
25	34	23	Ph3
26	34	12,2	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	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-PD126PA025SH-LA09F57Y-D1-14	08 Jul. 2016		