30-P2126PA150SC-L280F09Y

datasheet

Vincotech

***flow* PACK 2** | **1200 V / 150 A**

Features

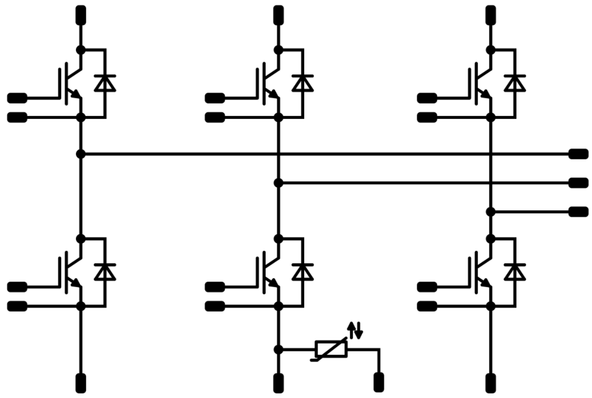
- Trench Fieldstop IGBTs for low saturation losses
- Open emitter configuration
- Compact and low inductive design
- Integrated NTC

flow 2 17 mm housing

Target applications

- Industrial drives

Schematic



Types

- 30-P2126PA150SC-L280F09Y

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	144	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}	450	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ T_s = 80 °C	354	W
Gate-emitter voltage	V_{GES}		±20	V
Short circuit ratings	t_{SC} V_{CC}	T_j ≤ 150 °C V_{GE} = 15 V	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	128	A
Repetitive peak forward current	I_{FRM}			300	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80°C	212	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
		AC Voltage	t_p = 1 min	2500	V
Creepage distance				min. 12,7	mm
Clearance				min. 12,7	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	$V_{GE(th)}$	$V_{GE} = V_{CE}$			0,0052	25	5,3	5,8	6,3	V
Collector-emitter saturation voltage	V_{CEsat}		15		150	25 150	1,58	1,93 2,39	2,07	V
Collector-emitter cut-off current	I_{CES}		0	1200		25			2	µA
Gate-emitter leakage current	I_{GES}		20	0		25			240	nA
Internal gate resistance	r_g							5		Ω
Input capacitance	C_{ies}	f = 1 MHz	0	25		25		8600		pF
Reverse transfer capacitance	C_{res}							320		
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	phase-change material λ = 3,4 W/mK						0,27		K/W
Dynamic										
Turn-on delay time	$t_{d(on)}$	R_{goff} = 4 Ω R_{gon} = 4 Ω	±15	600	150	25 150		213 229		ns
Rise time	t_r					25 150		35 44		
Turn-off delay time	$t_{d(off)}$					25 150		326 410		
Fall time	t_f					25 150		68 104		
Turn-on energy (per pulse)	E_{on}	Q_{rFWD} = 15,6 µC Q_{rFWD} = 29,2 µC				25 150		12,684 18,795		mWs
Turn-off energy (per pulse)	E_{off}					25 150		8,071 12,853		

Characteristic Values

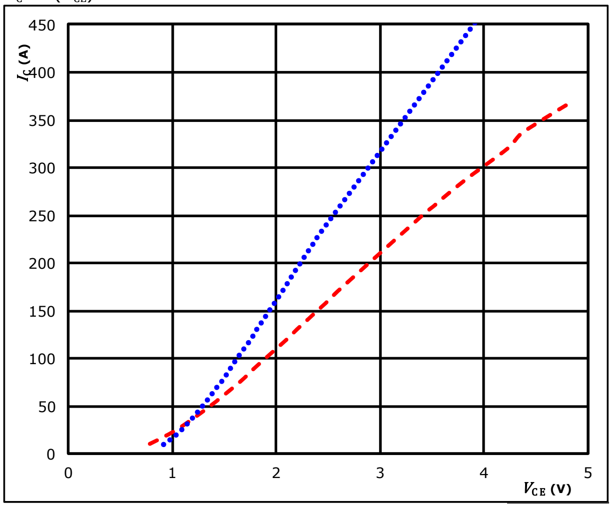
Parameter	Symbol	Conditions					Value			Unit
			V_{GE} [V] V_{GS} [V]	V_{CE} [V] V_{DS} [V] V_F [V]	I_C [A] I_D [A] I_F [A]	T_j [°C]	Min	Typ	Max	
Inverter Diode										
Static										
Forward voltage	V_F				150	25 125 150		1,81 1,82 1,80	2,05	V
Reverse leakage current	I_r			1200		25			26	µA
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	phase-change material λ = 3,4 W/mK						0,45		K/W
Dynamic										
Peak recovery current	I_{RRM}	di/dt = 4656 A/µs di/dt = 4044 A/µs	±15	600	150	25 150		143 168		A
Reverse recovery time	t_{rr}					25 150		287 465		ns
Recovered charge	Q_r					25 150		15,555 29,157		µC
Reverse recovered energy	E_{rec}					25 150		5,706 10,813		mWs
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 150		3267 1615		A/µs
Thermistor										
Rated resistance	R					25		22		kΩ
Deviation of R_{100}	$\Delta_{R/R}$	R_{100} = 1486 Ω				100	-12		+14	%
Power dissipation	P					25		200		mW
Power dissipation constant						25		2		mW/K
B-value	$B_{(25/50)}$	Tol. ±3%				25		3950		K
B-value	$B_{(25/100)}$	Tol. ±3%				25		3998		K
Vincotech NTC Reference									B	

Inverter Switch Characteristics

figure 1. **IGBT**

Typical output characteristics

$I_C = f(V_{CE})$

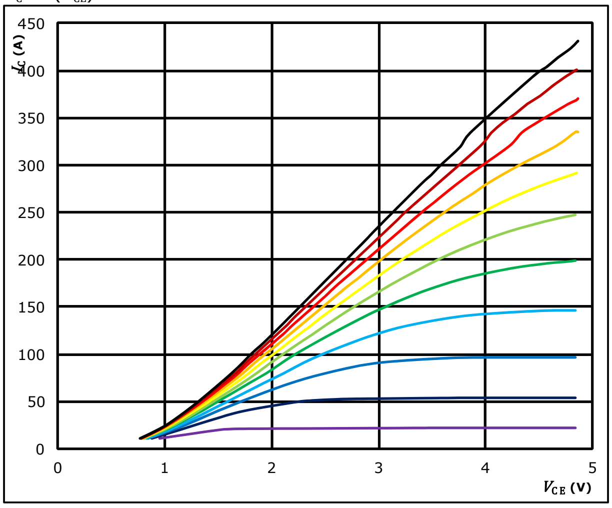


t_p =	250	μs		25	°C
V_{GE} =	15	V	T_j:	150	°C

figure 2. **IGBT**

Typical output characteristics

$I_C = f(V_{CE})$

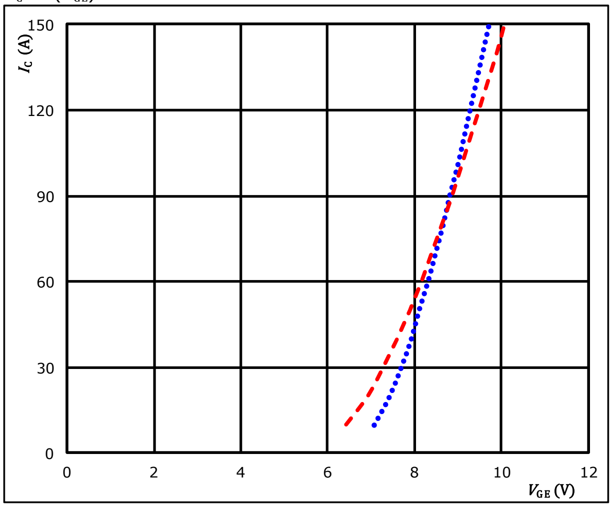


t_p =	250	μs
T_j =	150	°C
V_{GE} from	7 V to 17 V in steps of 1 V	

figure 3. **IGBT**

Typical transfer characteristics

$I_C = f(V_{GE})$

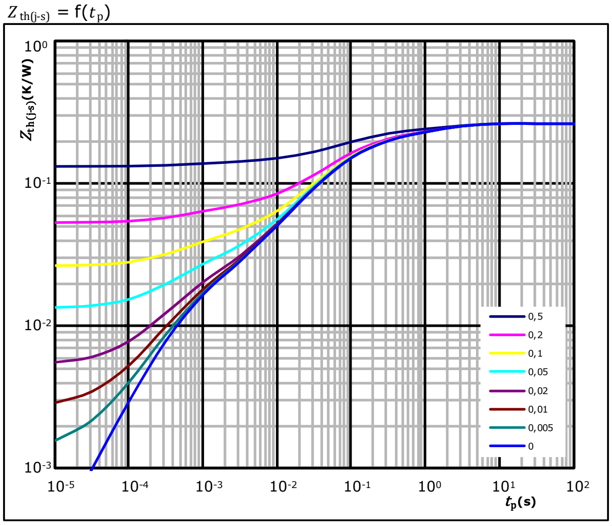


t_p =	100	μs		25	°C
V_{CE} =	10	V	T_j:	150	°C

figure 4. **IGBT**

Transient Thermal Impedance as function of Pulse duration

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



D =	t_p / T	
$R_{th(j\text{-}s)}$ =	0,27	K/W

IGBT thermal model values

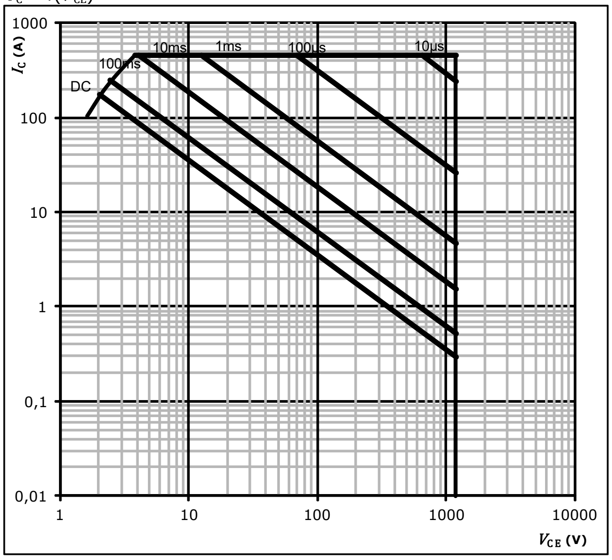
R (K/W)	τ (s)
5,73E-02	1,79E+00
6,23E-02	2,33E-01
9,18E-02	6,24E-02
3,46E-02	2,03E-02
1,02E-02	2,96E-03
1,19E-02	4,61E-04

Inverter Switch Characteristics

figure 5.	IGBT

Safe operating area

$I_C = f(V_{CE})$



At

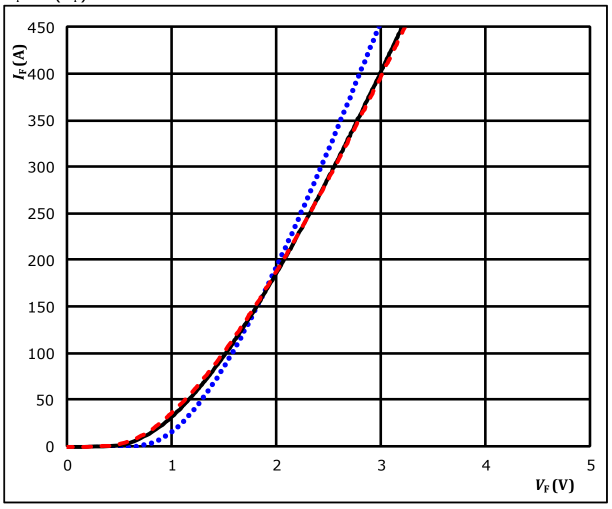
D =	single pulse	
T_s =	80	ºC
V_{GE} =	±15	V
T_j =	T_{jmax}	

Inverter Diode Characteristics

figure 1. **FWD**

Typical forward characteristics

$I_F = f(V_F)$



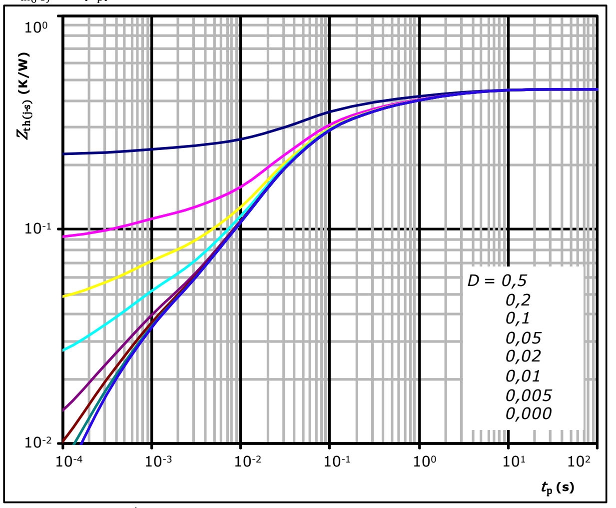
t_p = 250 µs

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

$R_{th(j-s)}$ = 0,45 K/W

FWD thermal model values

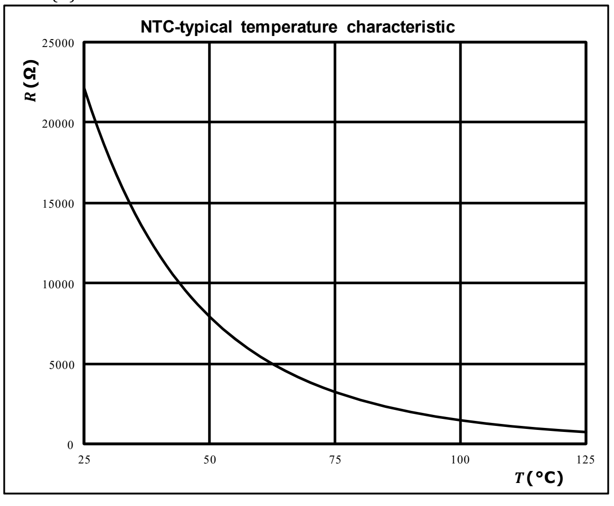
R (K/W)	τ (s)
3,47E-02	4,61E+00
6,68E-02	8,80E-01
9,40E-02	1,70E-01
1,62E-01	4,03E-02
5,35E-02	1,34E-02
1,57E-02	2,01E-03
2,15E-02	4,00E-04

Thermistor Characteristics

figure 1. **Thermistor**

Typical NTC characteristic as a function of temperature

$R = f(T)$



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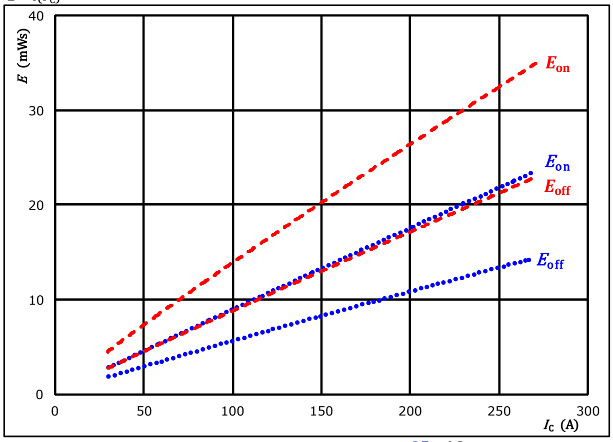
Inverter Switching Characteristics

Figure 1.	IGBT

Typical switching energy losses as a function of collector current

$E = f(I_C)$



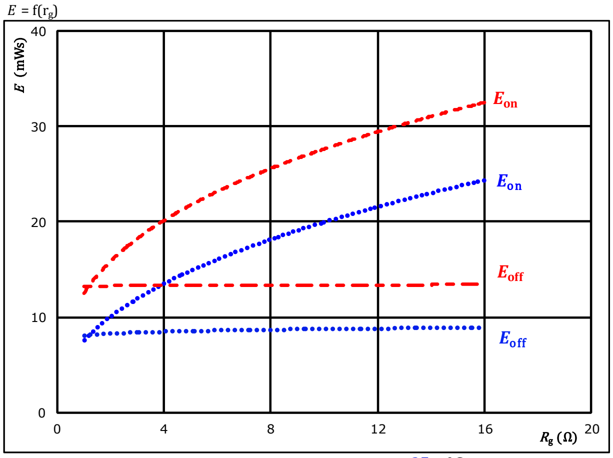
With an inductive load at

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

Figure 2.	IGBT

Typical switching energy losses as a function of gate resistor

$E = f(r_g)$



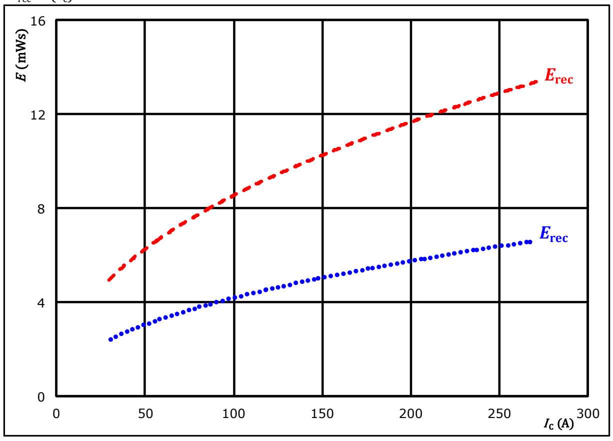
With an inductive load at

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

Figure 3.	FWD

Typical reverse recovered energy loss as a function of collector current

$E_{rec} = f(I_c)$



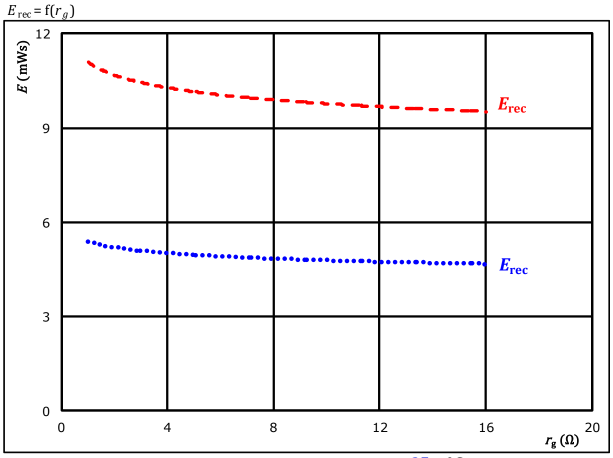
With an inductive load at

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

Figure 4.	FWD

Typical reverse recovered energy loss as a function of gate resistor

$E_{rec} = f(r_g)$



With an inductive load at

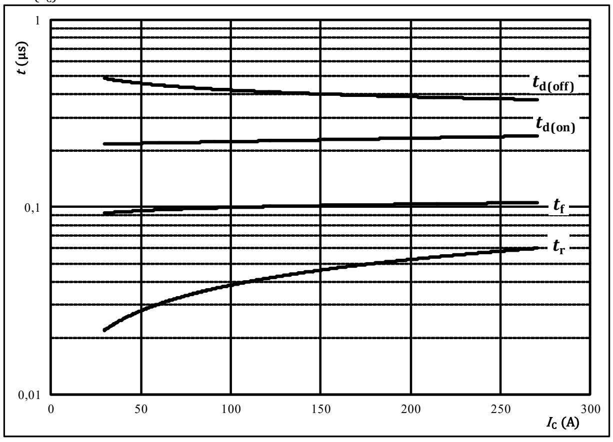
			T_j:		
V_{CE} =	600	V		25 °C	············
V_{GE} =	±15	V		150 °C	– – – –
I_C =	150	A			

Inverter Switching Characteristics

Figure 5.	**IGBT**

Typical switching times as a function of collector current

$t = f(I_C)$



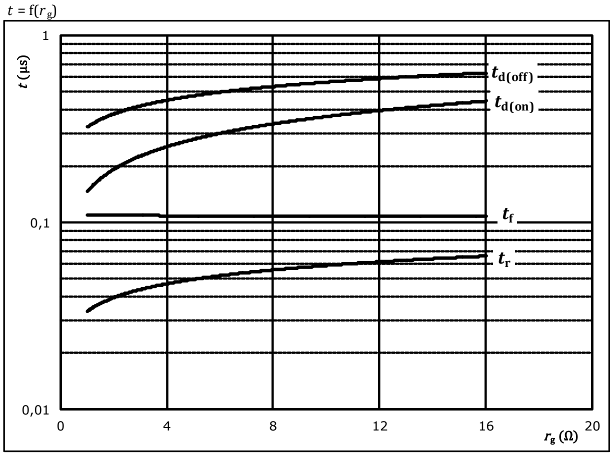
With an inductive load at

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

Figure 6.	**IGBT**

Typical switching times as a function of gate resistor

$t = f(r_g)$



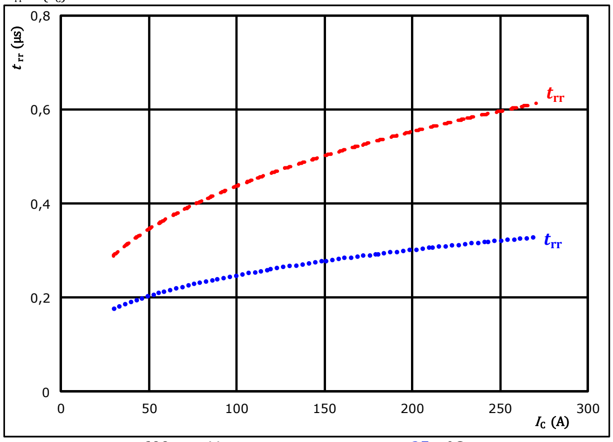
With an inductive load at

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

Figure 7.	**FWD**

Typical reverse recovery time as a function of collector current

$t_{rr} = f(I_C)$

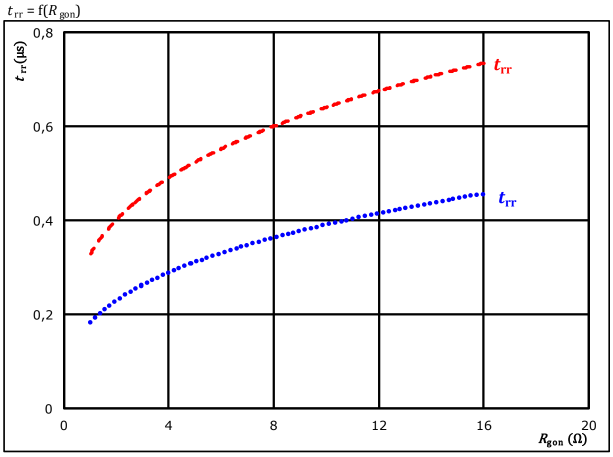


At V_{CE} =	600	V		25 °C	···········
V_{GE} =	±15	V	T_j:	150 °C	– – –
R_{gon} =	4	Ω			

Figure 8.	**FWD**

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

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



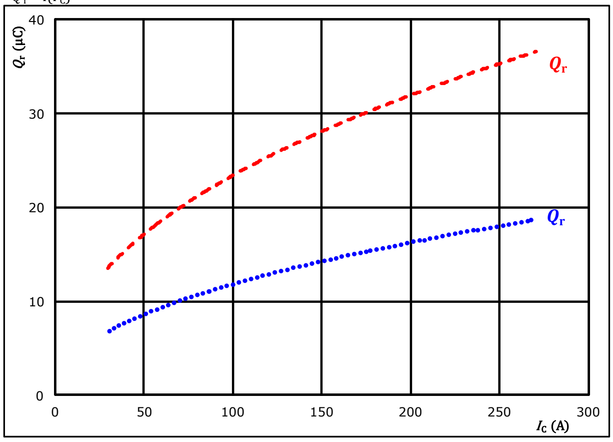
At V_{CE} =	600	V		25 °C	···········
V_{GE} =	±15	V	T_j:	150 °C	– – –
I_C =	150	A			

Inverter Switching Characteristics

Figure 9. **FWD**

Typical recovered charge as a function of collector current

$Q_r = f(I_C)$

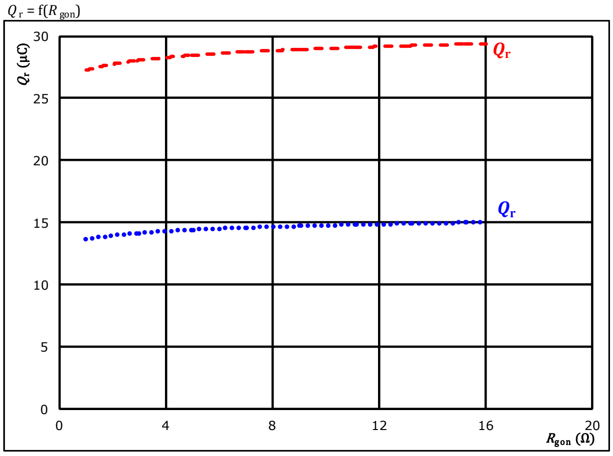


At	V_{CE} =	600	V		25	°C
	V_{GE} =	±15	V	T_j:	150	°C
	R_{gon} =	4	Ω			

Figure 10. **FWD**

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

$Q_r = f(R_{gon})$

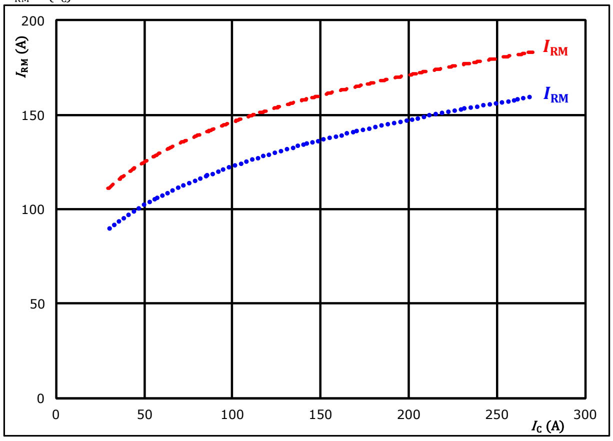


At	V_{CE}=	600	V		25	°C
	V_{GE} =	±15	V	T_j:	150	°C
	I_C=	150	A			

Figure 11. **FWD**

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

$I_{RM} = f(I_C)$

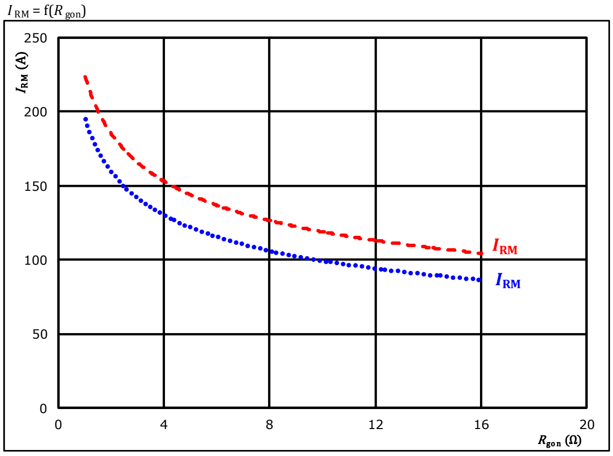


At	V_{CE}:	600	V		25	°C
	V_{GE} =	±15	V	T_j:	150	°C
	R_{gon} =	4	Ω			

Figure 12. **FWD**

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

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



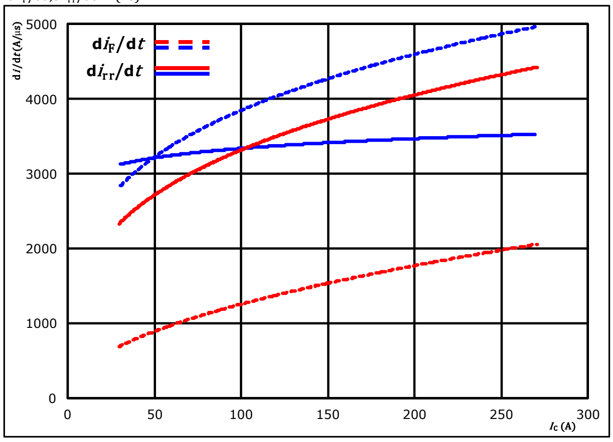
At	V_{CE} =	600	V		25	°C
	V_{GE} =	±15	V	T_j:	150	°C
	I_C =	150	A			

Inverter Switching Characteristics

Figure 13. **FWD**

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

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

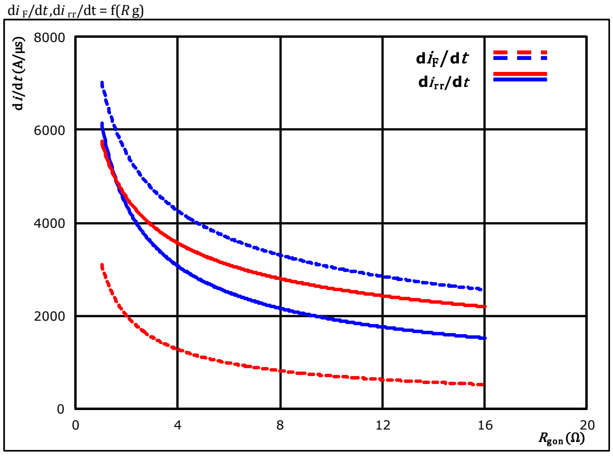


At					
V_{CE} =	600	V	T_j:	25	°C ········
V_{GE} =	±15	V		150	°C – – –
R_{gon} =	4	Ω			

Figure 14. **FWD**

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

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

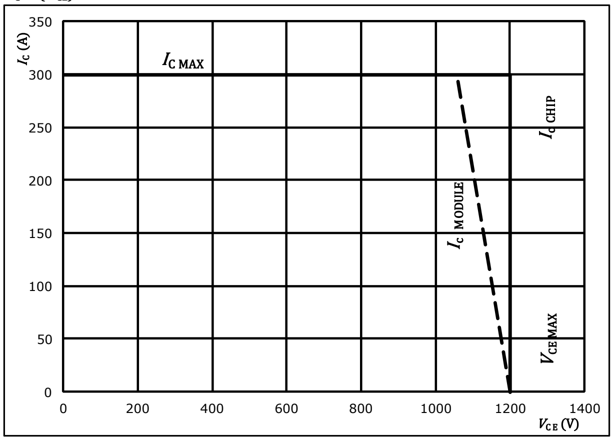


At					
V_{CE} =	600	V	T_j:	25	°C ········
V_{GE} =	±15	V		150	°C – – –
I_C =	150	A			

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

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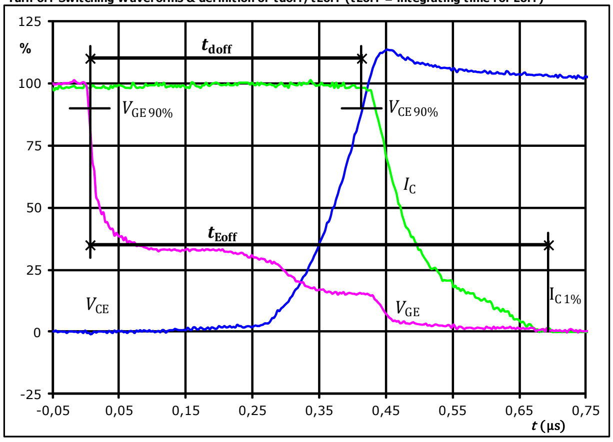
Inverter Switching Definitions

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

Figure 1. IGBT

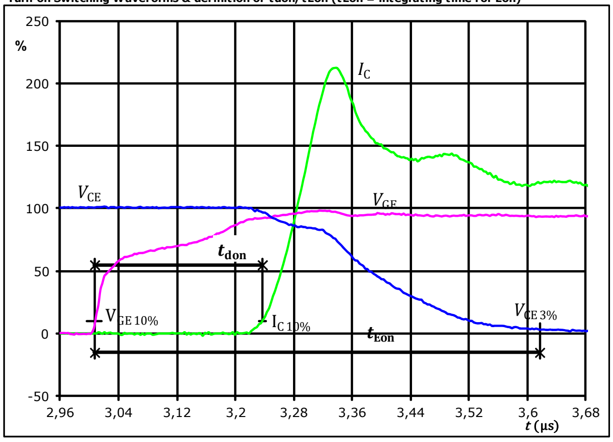
Turn-off Switching Waveforms & definition of tdoff, tEoff (tEoff = integrating time for Eoff)



$V_{GE}(0\%)$ =	-15	V
$V_{GE}(100\%)$ =	15	V
$V_C(100\%)$ =	600	V
$I_C(100\%)$ =	149	A
t_{doff} =	0,410	µs
t_{Eoff} =	0,687	µs

Figure 2. IGBT

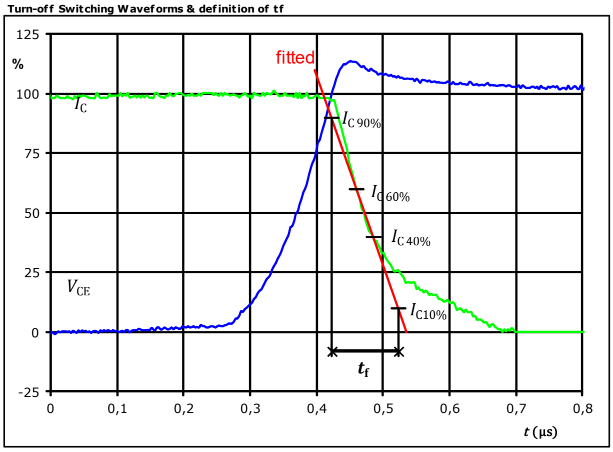
Turn-on Switching Waveforms & definition of tdon, tEon (tEon = integrating time for Eon)



$V_{GE}(0\%)$ =	-15	V
$V_{GE}(100\%)$ =	15	V
$V_C(100\%)$ =	600	V
$I_C(100\%)$ =	149	A
t_{don} =	0,229	µs
t_{Eon} =	0,609	µs

Figure 3. IGBT

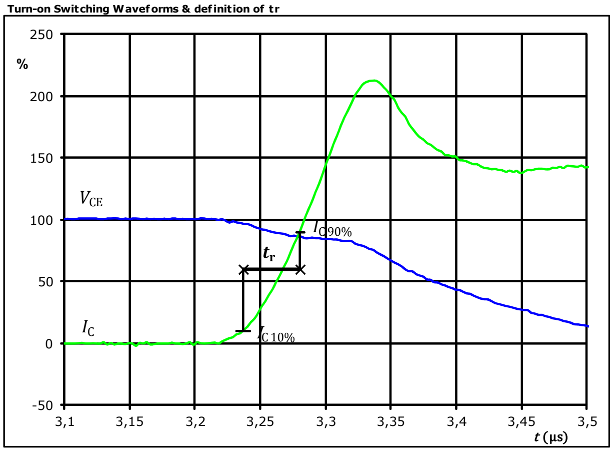
Turn-off Switching Waveforms & definition of tf



$V_C(100\%)$ =	600	V
$I_C(100\%)$ =	149	A
t_f =	0,104	µs

Figure 4. IGBT

Turn-on Switching Waveforms & definition of tr

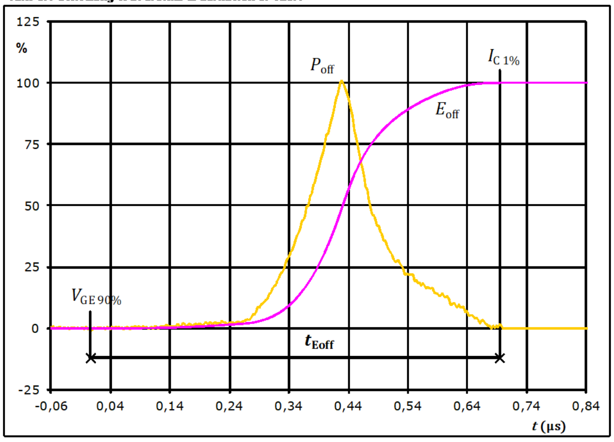


$V_C(100\%)$ =	600	V
$I_C(100\%)$ =	149	A
t_r =	0,044	µs

Inverter Switching Characteristics

Figure 5. **IGBT**

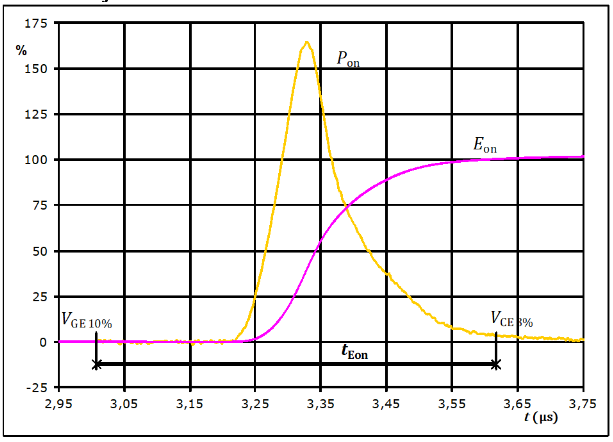
Turn-off Switching Waveforms & definition of tEoff



P_{off} (100%) =	89,53	kW
E_{off} (100%) =	12,85	mJ
t_{Eoff} =	0,69	µs

Figure 6. **IGBT**

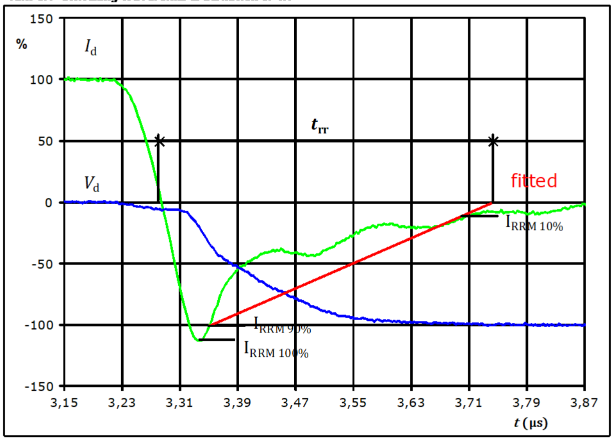
Turn-on Switching Waveforms & definition of tEon



P_{on} (100%) =	89,53	kW
E_{on} (100%) =	18,80	mJ
t_{Eon} =	0,61	µs

Figure 7. **FWD**

Turn-off Switching Waveforms & definition of trr

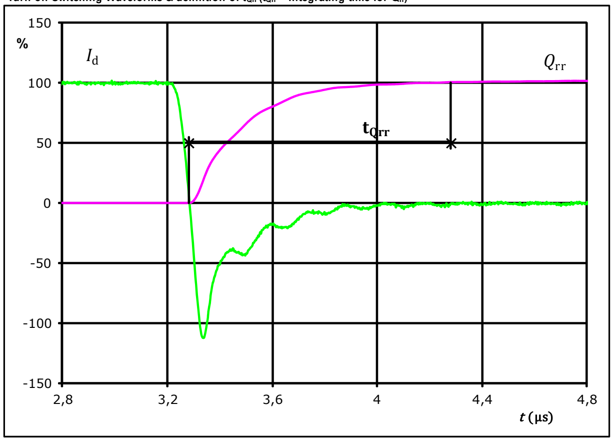


V_d (100%) =	600	V
I_d (100%) =	149	A
I_{RRM} (100%) =	-168	A
t_{rr} =	0,465	µs

Inverter Switching Characteristics

Figure 8. **FWD**

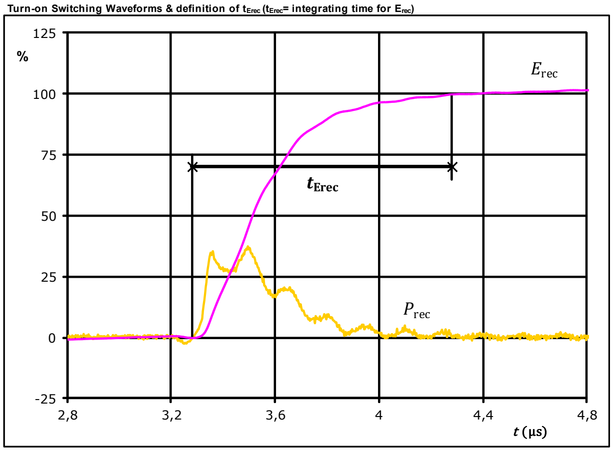
Turn-on Switching Waveforms & definition of t_{Qrr} (t_{Qrr} = integrating time for Q_{rr})



I_d (100%) =	149	A
Q_{rr} (100%) =	29,16	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%) =	89,53	kW
E_{rec} (100%) =	10,81	mJ
t_{Erec} =	1,00	µs

Ordering Code & Marking

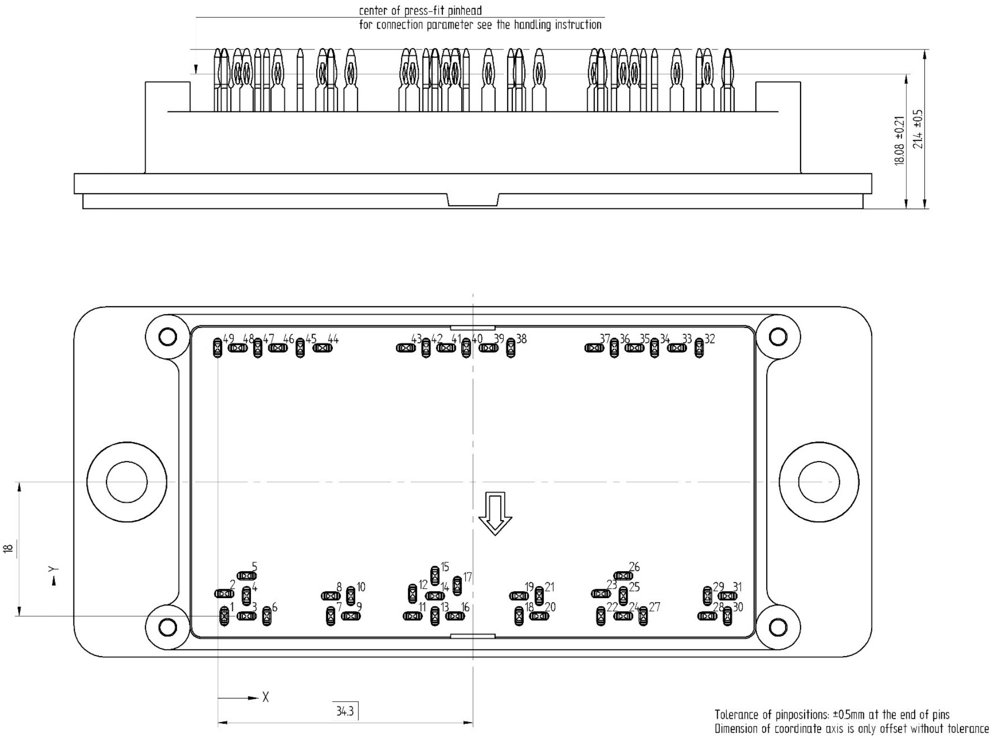
Version	Ordering Code
without thermal paste 17 mm housing with press-fit pins	30-P2126PA150SC-L280F09Y
with thermal paste 17 mm housing with press-fit pins	30-P2126PA150SC-L280F09Y-/3/

	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		

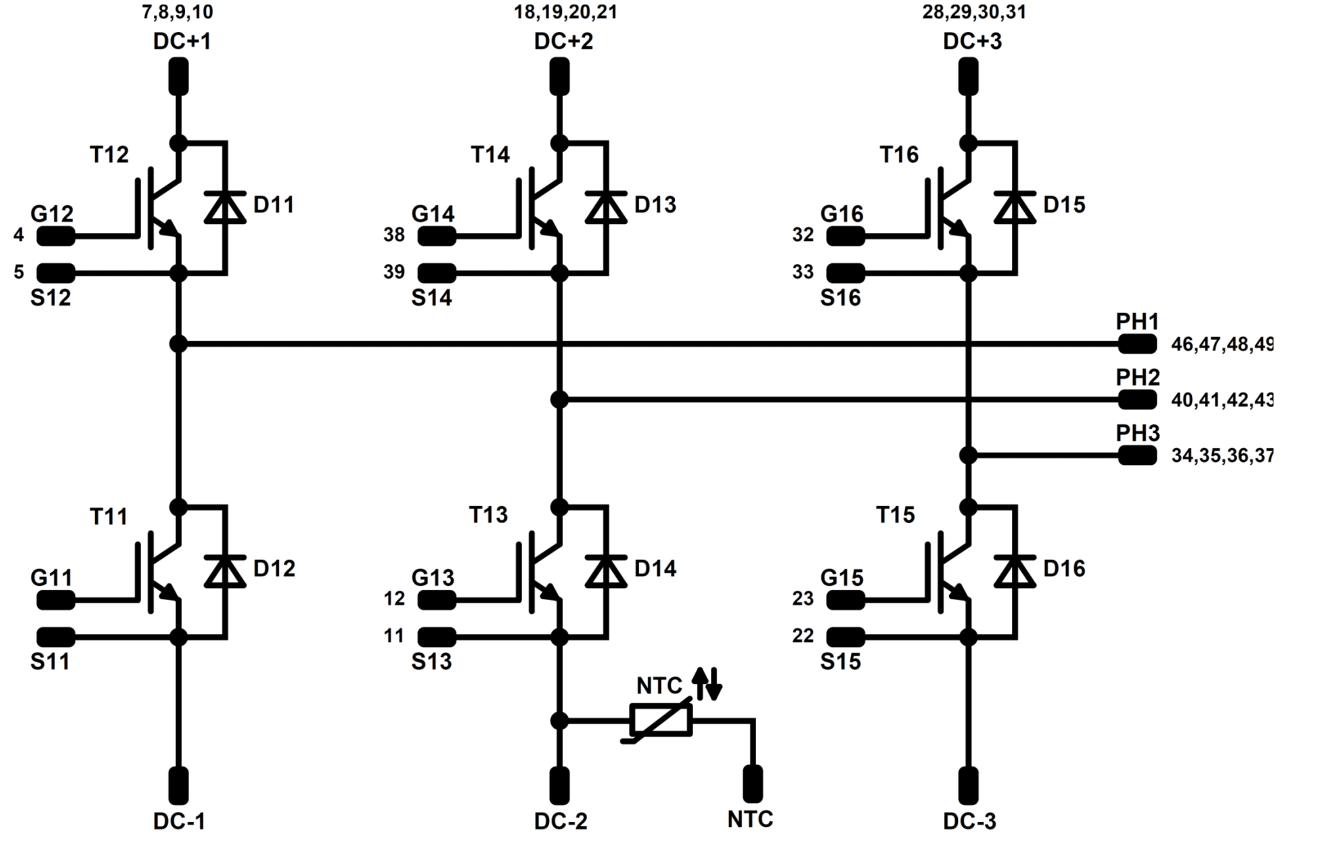
Outline

Pin table

Pin	X	Y	Function
1	0,9	0	S11
2	0,9	3	G11
3	3,9	0	DC-1
4	3,9	2,7	DC-1
5	3,9	5,4	DC-1
6	6,6	0	DC-1
7	15,2	0	DC+1
8	15,2	2,7	DC+1
9	17,9	0	DC+1
10	17,9	2,7	DC+1
11	26,2	0	S13
12	26,2	3	G13
13	29,2	0	DC-2
14	29,2	2,7	DC-2
15	29,2	5,4	DC-2
16	31,9	0	DC-2
17	32,2	4,05	NTC
18	40,5	0	DC+2
19	40,5	2,7	DC+2
20	43,2	0	DC+2
21	43,2	2,7	DC+2
22	51,5	0	S15
23	51,5	3	G15
24	54,5	0	DC-3
25	54,5	2,7	DC-3
26	54,5	5,4	DC-3
27	57,2	0	DC-3
28	65,8	0	DC+3
29	65,8	2,7	DC+3
30	68,5	0	DC+3
31	68,5	2,7	DC+3
32	64,7	36	G16
33	61,7	36	S16
34	58,7	36	PH3
35	56	36	PH3
36	53,3	36	PH3
37	50,6	36	PH3
38	39,4	36	G14
39	36,4	36	S14
40	33,4	36	PH2
41	30,7	36	PH2
42	28	36	PH2
43	25,3	36	PH2
44	14,1	36	G12
45	11,1	36	S12
46	8,1	36	PH1
47	5,4	36	PH1
48	2,7	36	PH1
49	0	36	PH1



Pinout



Identification

ID	Component	Voltage	Current	Function	Comment
T11, T12, T13, T14, T15, T16	IGBT	1200 V	150 A	Inverter Switch	
D11, D12, D13, D14, D15, D16	FWD	1200 V	150 A	Inverter Diode	
NTC	NTC			Thermistor	

Vincotech

Packaging instruction				
Standard packaging quantity (SPQ) 36	>SPQ	Standard	<SPQ	Sample

Handling instruction
Handling instructions for *flow* 2 packages see vincotech.com website.

Package data
Package data for *flow* 2 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
30-P2126PA150SC-L280F09Y-D2-14	17 Aug. 2017	Inverter diode characteristic values updated, SPQ changed	All
30-P2126PA150SC-L280F09Y-D3-14	1 Jul. 2020	Outline changed	1, 15