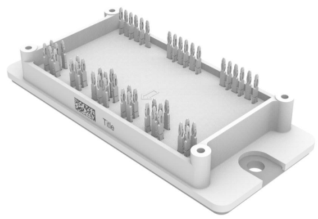
30-P2126PA050NB-L287F69Y
datasheet

flow PACK 2 — **1200 V / 50 A**

Features

- Mitsubishi generation 6.1 (1200V) technology for low saturation losses and improved EMC behavior
- Compact and low inductive design
- Integrated temperature sensor

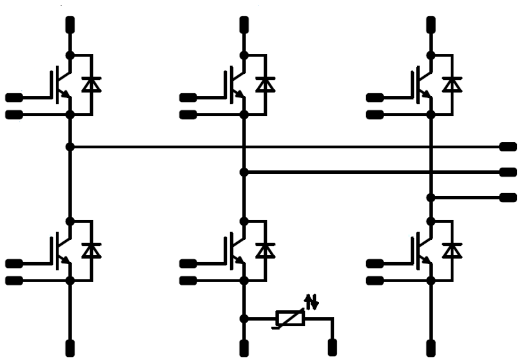
flow 2 17mm housing



Target applications

- Industrial drives

Schematic



Types

- 30-P2126PA050NB-L287F69Y

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=$T_j$max	T_s=80°C	74	A
Repetitive peak collector current	I_{CRM}	t_p limited by $T_j$max		300	A
Total power dissipation	P_{tot}	T_j=$T_j$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

Inverter Diode

Parameter	Symbol	Conditions		Value	Unit
Peak Repetitive Reverse Voltage	V_{RRM}			1200	V
Continuous (direct) forward current	I_F	$T_j = T_{jmax}$	$T_h = 80°C$	96	A
Repetitive peak forward current	I_{FRM}			200	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	$T_h = 80°C$	176	W
Maximum Junction Temperature	T_{jmax}			175	°C

Module Properties

Parameter	Symbol	Conditions		Value	Unit
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

Inverter 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_{CE}=V_{GE}			0,0017	25 125	5,3	5,8	6,3	V
Collector-emitter saturation voltage	V_{CEsat}		15		100	25 125 150	1,58	1,88 2,26 3,79	2,07	V
Collector-emitter cut-off current	I_{CES}		0	1200		25 125			2	µA
Gate-emitter leakage current	I_{GES}		20	0		25 125			240	nA
Internal gate resistance	r_g							2		Ω
Input capacitance	C_{ies}	f=1MHz	0	25		25		5600		pF
Reverse transfer capacitance	C_{res}	f=1MHz	0	25		25		200		pF
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	Phase-Change Material λ=3,4W/mK						0,31		K/W
IGBT Switching										
Turn-on delay time	$t_{d(on)}$	R_{goff} = 4 Ω R_{gon} = 4 Ω	±15	600	100	25 150		104 108		ns
Rise time	t_r	R_{goff} = 4 Ω R_{gon} = 4 Ω	±15	600	100	25 150		18 23		ns
Turn-off delay time	$t_{d(off)}$	R_{goff} = 4 Ω R_{gon} = 4 Ω	±15	600	100	25 150		219 293		ns
Fall time	t_f	R_{goff} = 4 Ω R_{gon} = 4 Ω	±15	600	100	25 150		72 111		ns
Turn-on energy (per pulse)	E_{on}	Q_{rFWD} = 9,3 µC Q_{rFWD} = 18,7 µC	±15	600	100	25 150		4,040 6,729		mWs
Turn-off energy (per pulse)	E_{off}		±15	600	100	25 150		5,249 8,769		mWs

Inverter Diode

Parameter	Symbol	Conditions					Value			Unit
				V_r [V]	I_F [A]	T_j [°C]	Min	Typ	Max	
Static										
Forward voltage	V_F				100	25 125 150		1,83 1,86 -	2,05	V
Reverse leakage current	I_r			1200		25 150			18 -	µA
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	Phase-Change Material λ=3,4W/mK						0,54		K/W
FWD Switching										
Peak recovery current	I_{RRM}	di/dt = 6900 A/µs di/dt = 5512 A/µs	±15	600	100	25 150		164 187		A
Reverse recovery time	t_{rr}					25 150		130 294		ns
Recovered charge	Q_r					25 150		9,320 18,656		µC
Reverse recovered energy	E_{rec}					25 150		3,869 7,956		mWs
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 150		8743 3702		A/µs

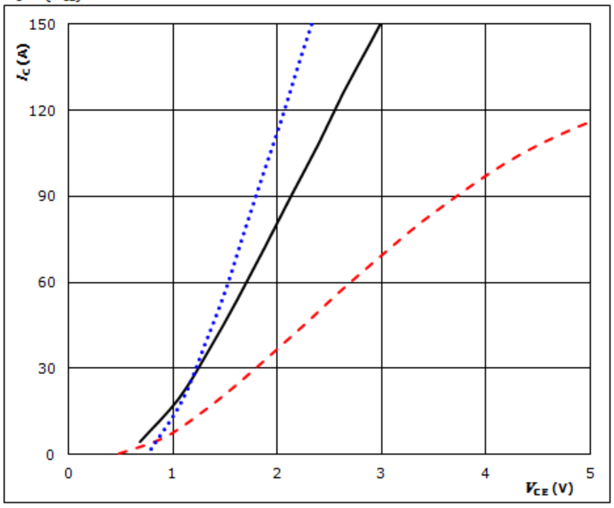
Thermistor

Parameter	Symbol	Conditions					Value			Unit
			V_{GE} [V]	V_{CE} [V]	I_C [A]	T_j [°C]	Min	Typ	Max	
Rated resistance	R					25		22		kΩ
Deviation of R100	$\Delta_{R/R}$	R100=1486 Ω				100	-12		+12	%
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

Typical output characteristics IGBT

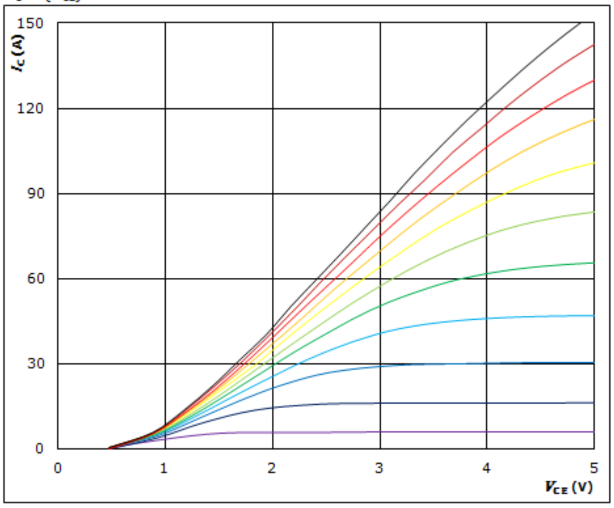
$I_C = f(V_{CE})$



t_p =	250	μs	25 °C	············
V_{GE}=	15	V	125 °C	———
			150 °C	– – – –

Typical output characteristics IGBT

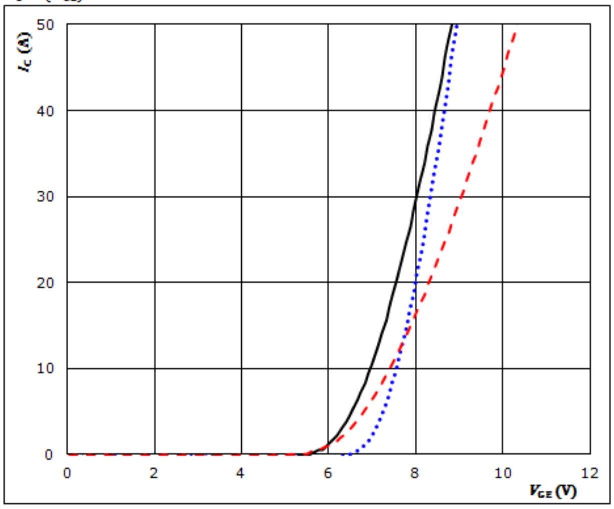
$I_C = f(V_{CE})$



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

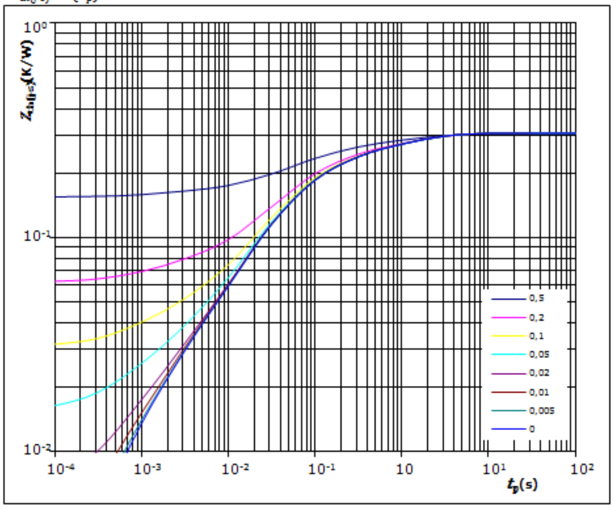
$I_C = f(V_{GE})$



t_p =	100	μs	25 °C	············
V_{CE} =	10	V	125 °C	———
			150 °C	– – – –

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

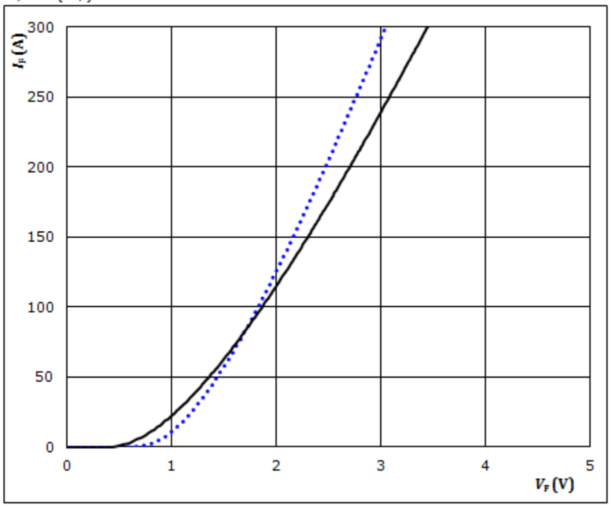
IGBT thermal model values

R_{th} (K/W)	τ (s)
6,00E-02	1,67E+00
7,30E-02	2,35E-01
1,19E-01	5,35E-02
4,31E-02	1,45E-02
1,45E-02	1,21E-03

Inverter Diode Characteristics

Typical forward characteristics FWD

$I_F = f(V_F)$

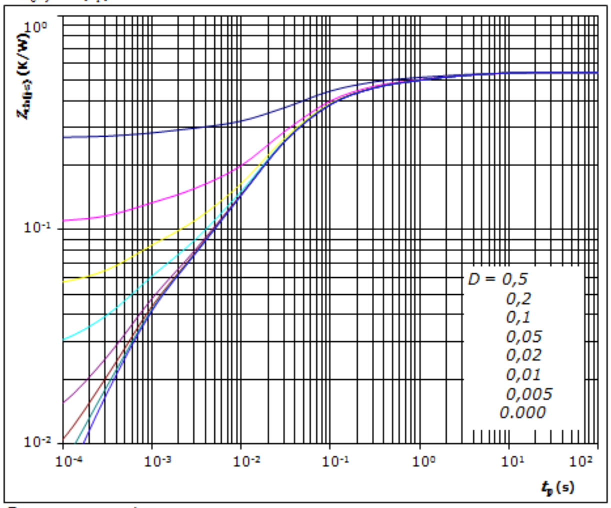


t_p = 250 µs

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

$R_{th(j-s)}$ = 0,54 K/W

FWD thermal model values

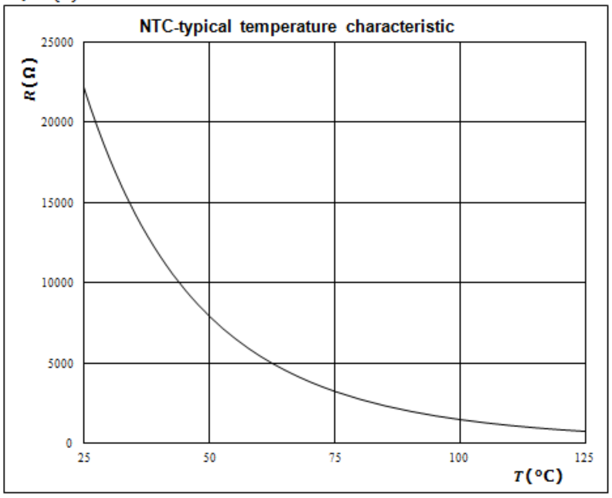
R (K/W)	τ (s)
3,25E-02	4,14E+00
5,01E-02	9,90E-01
1,38E-01	1,45E-01
2,22E-01	3,37E-02
5,69E-02	9,51E-03
3,92E-02	7,97E-04
3,26E-02	5,37E-04

Thermistor Characteristics

Thermistor typical temperature characteristic

Typical NTC characteristic as a function of temperature

$R_T = f(T)$

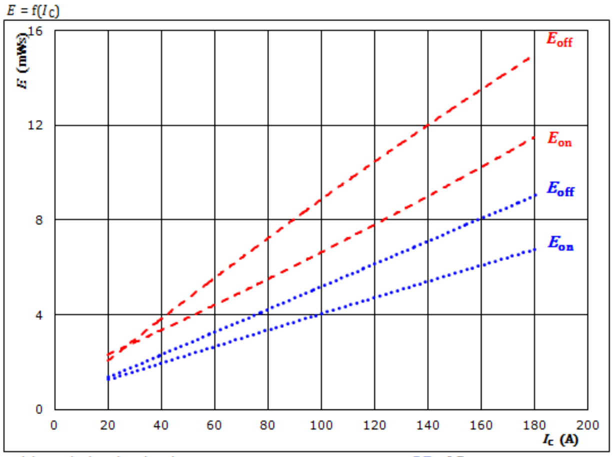


Inverter Switching Characteristics

Figure 1. **IGBT**

Typical switching energy losses as a function of collector current

$E = f(I_C)$



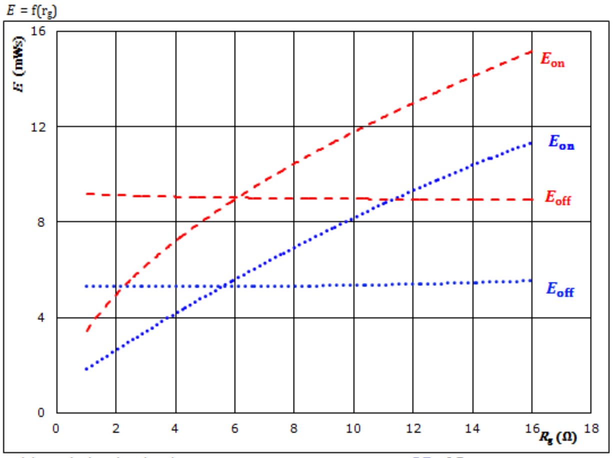
With an inductive load at

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

Figure 2. **IGBT**

Typical switching energy losses as a function of gate resistor

$E = f(r_g)$



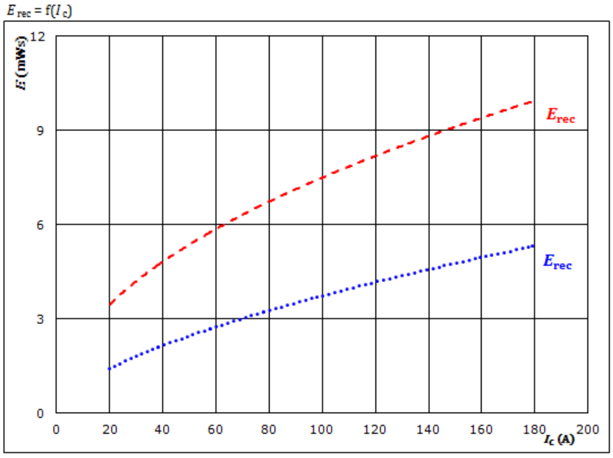
With an inductive load at

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

$E_{rec} = f(I_C)$



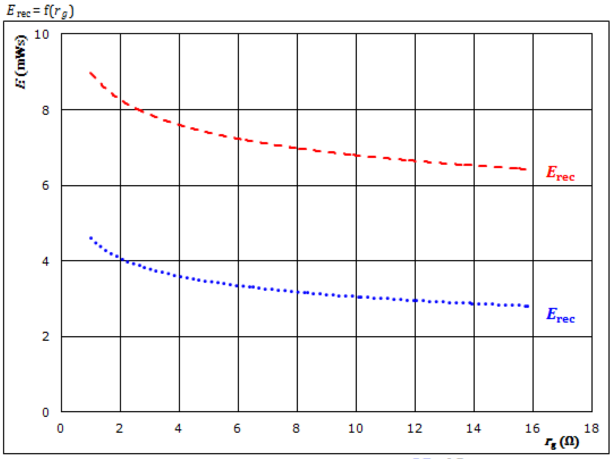
With an inductive load at

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

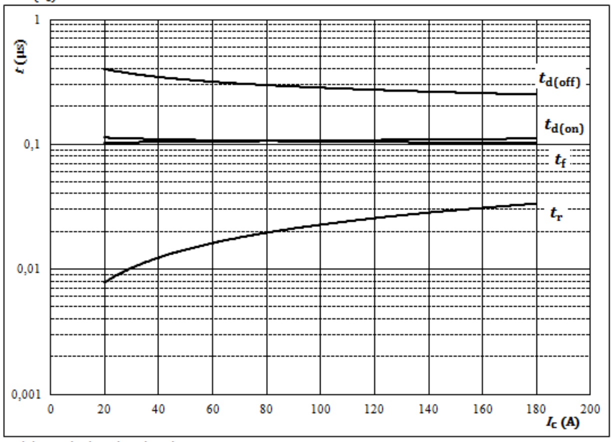
V_{CE} =	600	V	T_j:	25 °C
V_{GE} =	±15	V		125 °C
I_C =	100	A		150 °C

Inverter Switching Characteristics

Figure 5. **IGBT**

Typical switching times as a function of collector current

$t = f(I_C)$



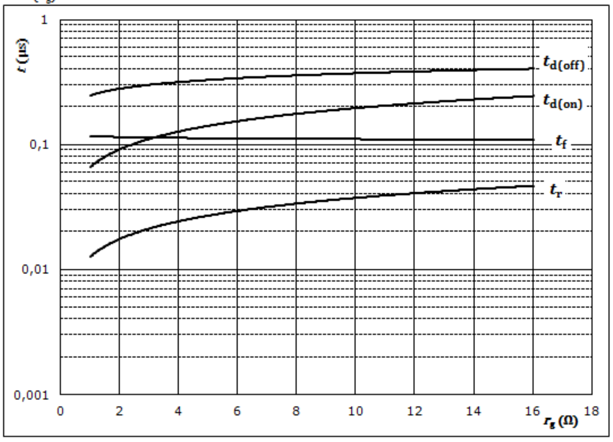
With an inductive load at

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

$t = f(r_g)$



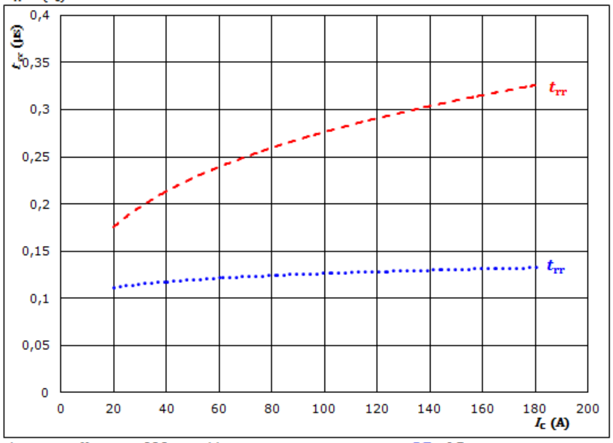
With an inductive load at

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

Figure 7. **FWD**

Typical reverse recovery time as a function of collector current

$t_{rr} = f(I_C)$

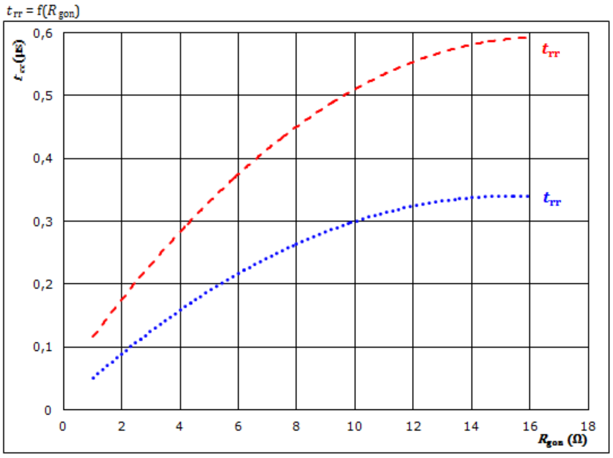


At	V_{CE} =	600	V		25 °C
	V_{GE} =	±15	V	T_j:	125 °C
	R_{gon} =	4	Ω		150 °C

Figure 8. **FWD**

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

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



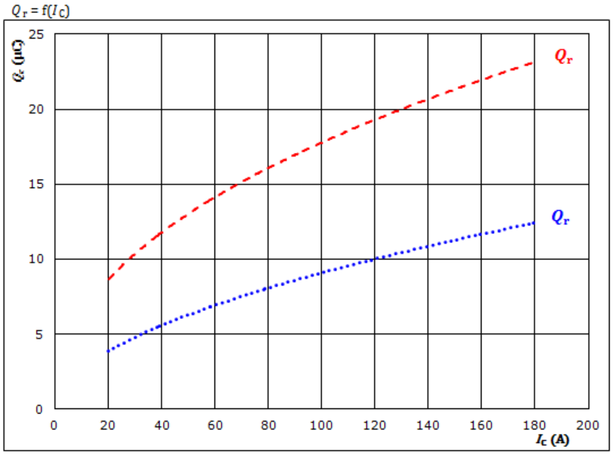
At	V_{CE} =	600	V		25 °C
	V_{GE} =	±15	V	T_j:	125 °C
	I_C =	100	A		150 °C

Inverter Switching Characteristics

Figure 9. **FWD**

Typical recovered charge as a function of collector current

$Q_r = f(I_C)$

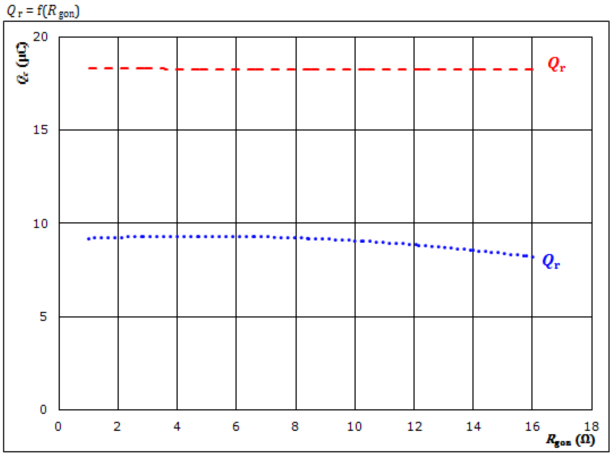


At					
V_{CE} =	600	V		25 °C	···········
V_{GE} =	±15	V	T_j:	125 °C	———
R_{gon} =	4	Ω		150 °C	– – –

Figure 10. **FWD**

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

$Q_r = f(R_{gon})$

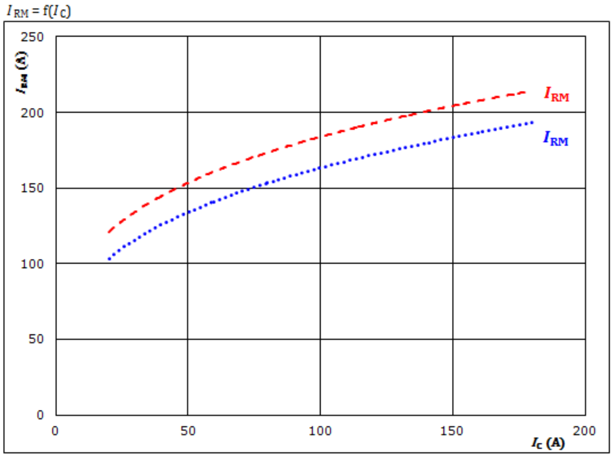


At					
V_{CE} =	600	V		25 °C	···········
V_{GE} =	±15	V	T_j:	125 °C	———
I_C =	100	A		150 °C	– – –

Figure 11. **FWD**

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

$I_{RM} = f(I_C)$

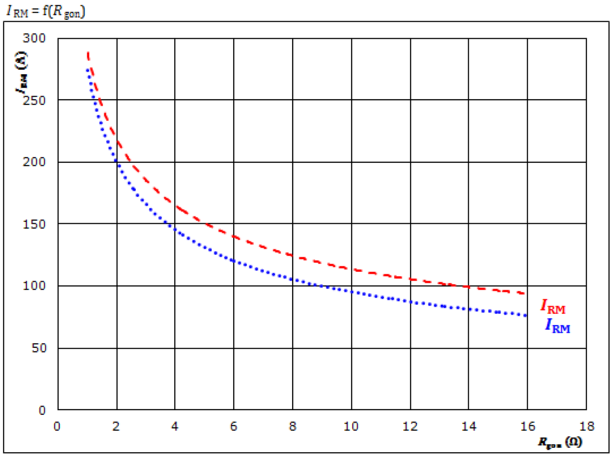


At					
V_{CE}	600	V		25 °C	···········
V_{GE} =	±15	V	T_j:	125 °C	———
R_{gon} =	4	Ω		150 °C	– – –

Figure 12. **FWD**

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

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



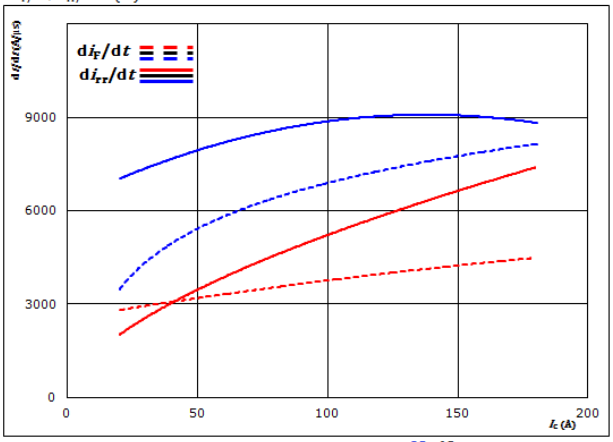
At					
V_{CE} =	600	V		25 °C	···········
V_{GE} =	±15	V	T_j:	125 °C	———
I_C =	100	A		150 °C	– – –

Inverter Switching Characteristics

Figure 13. **FWD**

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

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

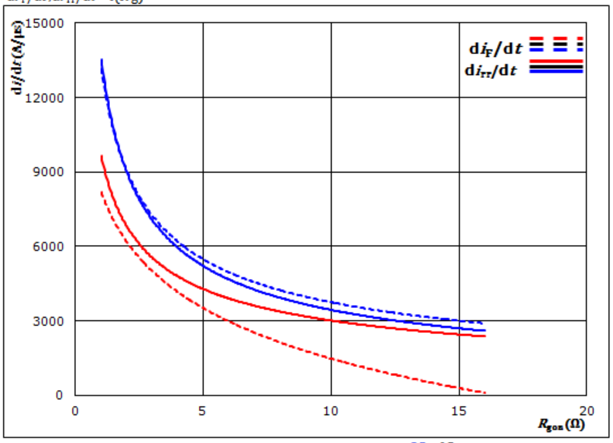


At						
V_{CE}	600	V		25	°C	dotted
V_{GE} =	±15	V	T_j:	125	°C	solid
R_{gon} =	4	Ω		150	°C	dashed

Figure 14. **FWD**

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

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

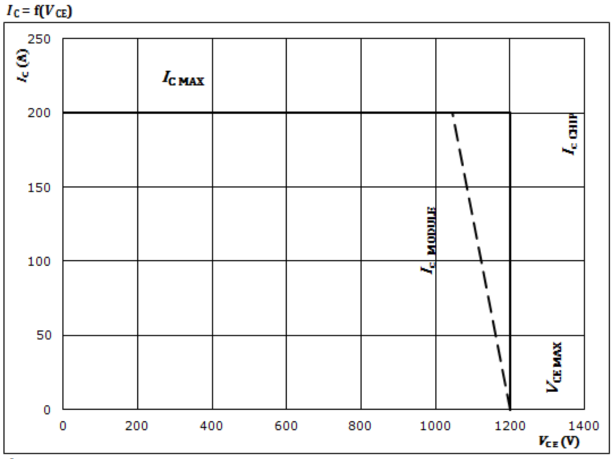


At						
V_{CE} =	600	V		25	°C	dotted
V_{GE} =	±15	V	T_j:	125	°C	solid
I_C=	100	A		150	°C	dashed

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

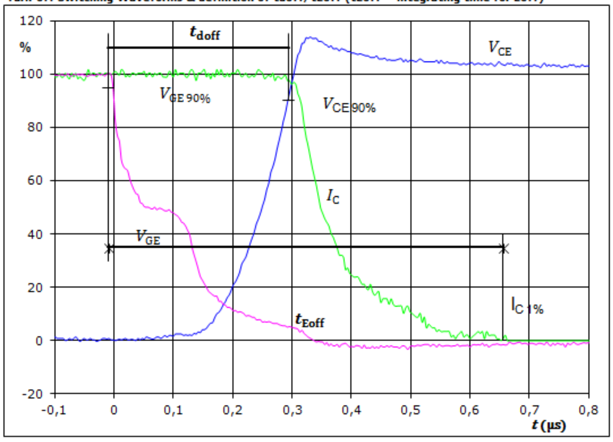
Inverter Switching Definitions

General conditions

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

Figure 1. **IGBT**

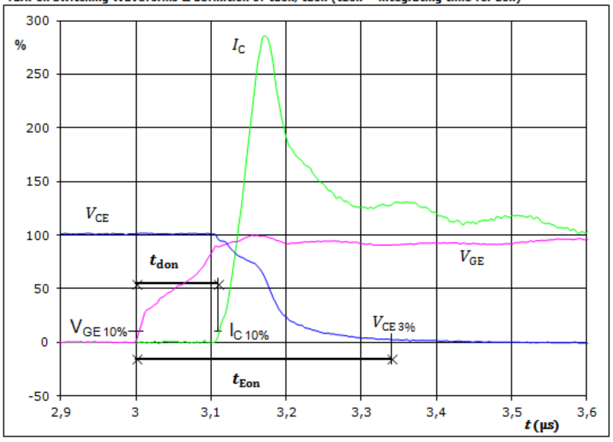
Turn-off Switching Waveforms & definition of tdoff, tEoff (tEoff = integrating time for Eoff)



$V_{GE}(0\%)$ =	-15	V
$V_{GE}(100\%)$ =	15	V
$V_C(100\%)$ =	600	V
$I_C(100\%)$ =	100	A
t_{doff} =	0,293	μs
t_{Eoff} =	0,665	μs

Figure 2. **IGBT**

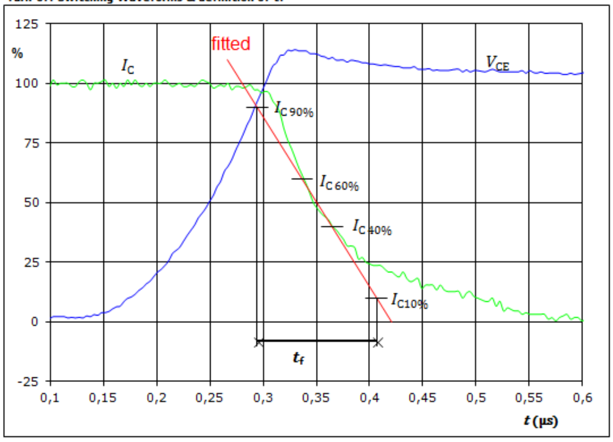
Turn-on Switching Waveforms & definition of tdon, tEon (tEon = integrating time for Eon)



$V_{GE}(0\%)$ =	-15	V
$V_{GE}(100\%)$ =	15	V
$V_C(100\%)$ =	600	V
$I_C(100\%)$ =	100	A
t_{don} =	0,108	μs
t_{Eon} =	0,339	μs

Figure 3. **IGBT**

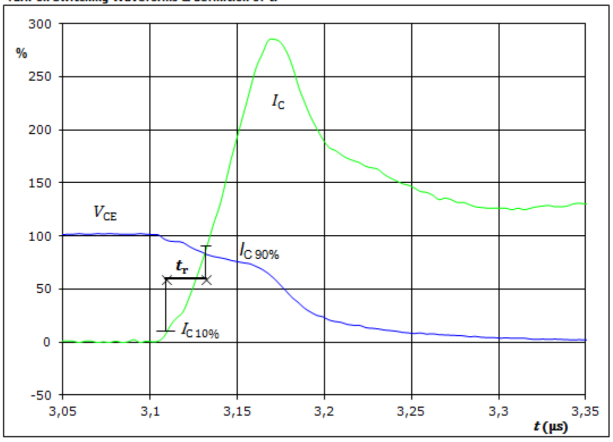
Turn-off Switching Waveforms & definition of tf



$V_C(100\%)$ =	600	V
$I_C(100\%)$ =	100	A
t_f =	0,111	μs

Figure 4. **IGBT**

Turn-on Switching Waveforms & definition of tr

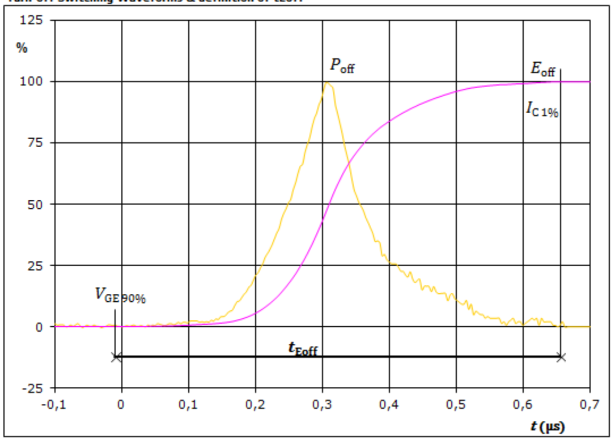


$V_C(100\%)$ =	600	V
$I_C(100\%)$ =	100	A
t_r =	0,023	μs

Inverter Switching Definitions

Figure 5. **IGBT**

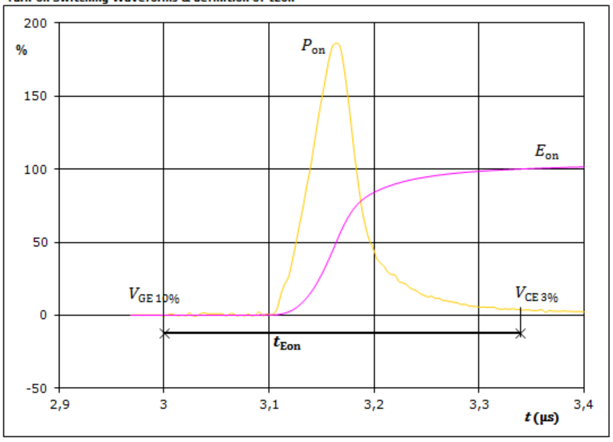
Turn-off Switching Waveforms & definition of tEoff



P_{off} (100%) =	60,25	kW
E_{off} (100%) =	8,77	mJ
t_{Eoff} =	0,67	µs

Figure 6. **IGBT**

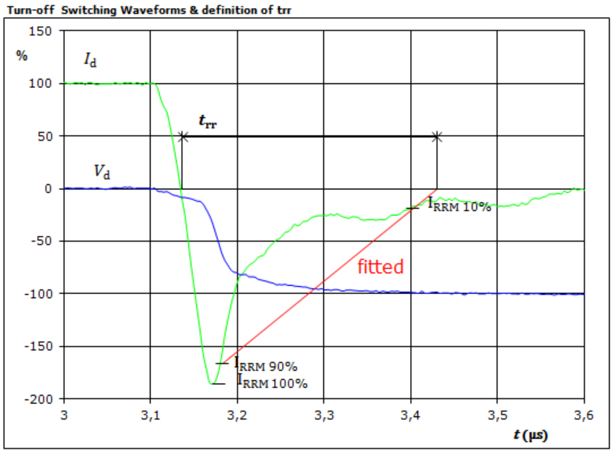
Turn-on Switching Waveforms & definition of tEon



P_{on} (100%) =	60,25	kW
E_{on} (100%) =	6,73	mJ
t_{Eon} =	0,34	µs

Figure 7. **FWD**

Turn-off Switching Waveforms & definition of trr

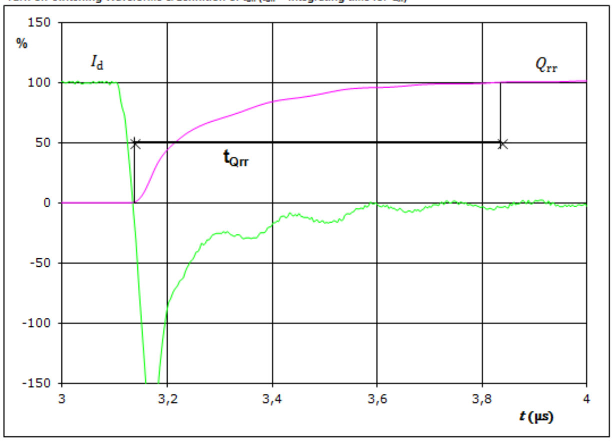


V_d (100%) =	600	V
I_d (100%) =	100	A
I_{RRM} (100%) =	-187	A
t_{rr} =	0,294	µs

Inverter Switching Definitions

Figure 8. **FWD**

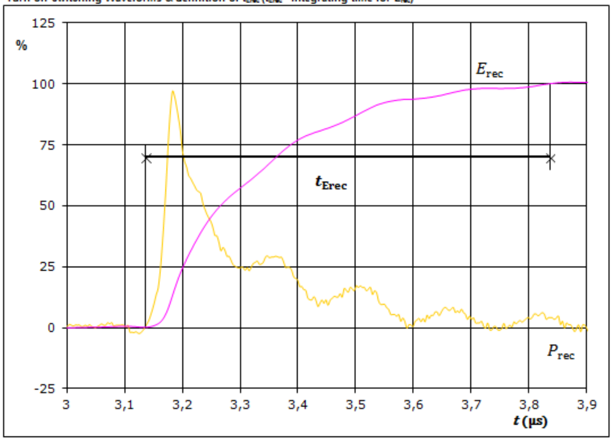
Turn-on Switching Waveforms & definition of t_{Qrr} (t_{Qrr} = integrating time for Q_{rr})



I_d (100%) =	100	A
Q_{rr} (100%) =	18,66	µC
t_{Qrr} =	0,70	µs

Figure 9. **FWD**

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



P_{rec} (100%) =	60,25	kW
E_{rec} (100%) =	7,96	mJ
t_{Erec} =	0,70	µs

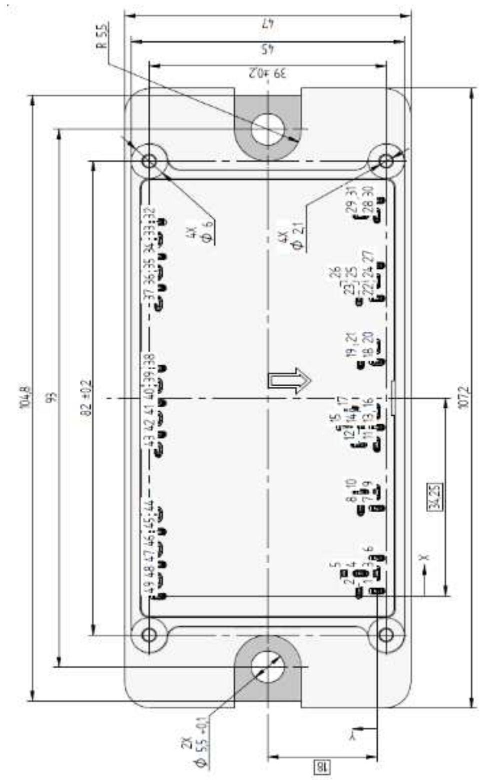
Ordering Code & Marking

Version	Ordering Code	in DataMatrix as	in packaging barcode as
without thermal paste 17mm housing	30-P2126PA050NB-L287F69Y	L287F69Y	L287F69Y
with thermal paste 17mm housing	30-P2126PA050NB-L287F69Y-/3/	L287F69Y-/3/	L287F69Y-/3/

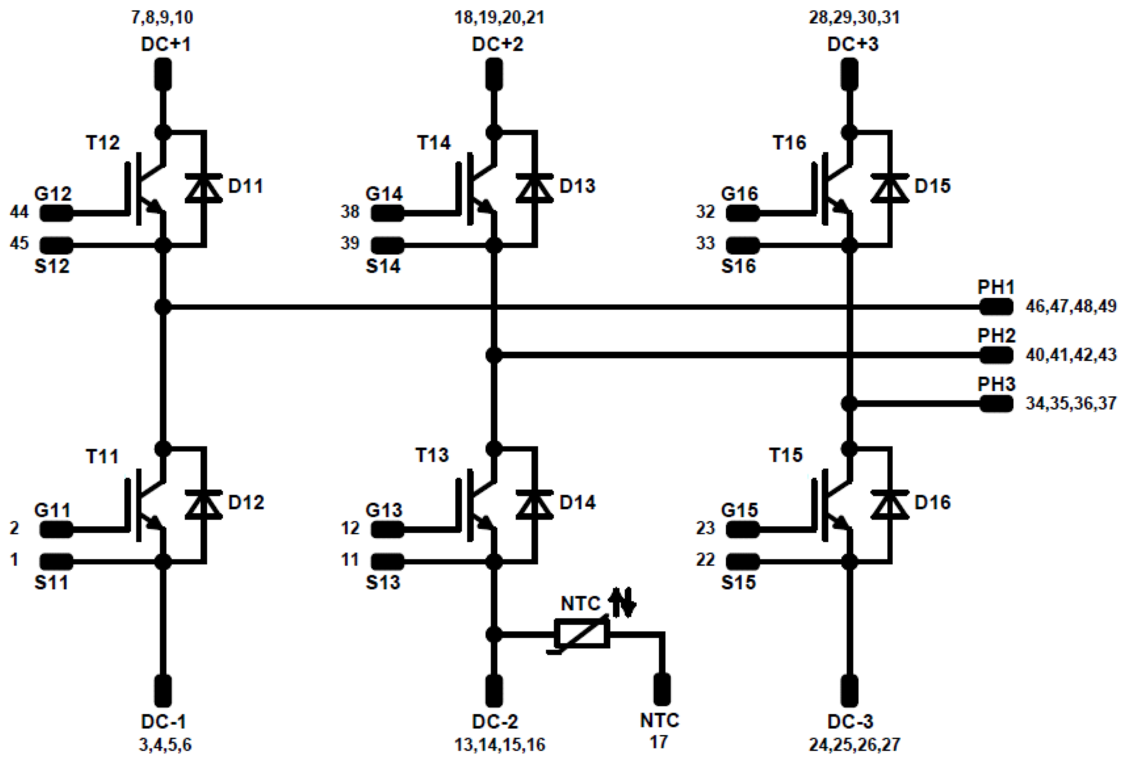
Text	Name		Date code	UL & Vinco	Lot	Serial
	NN-NNNNNNNNNNNNNN-NNNNNNNN		WWYY	UL Vinco	LLLLL	SSSS
Datamatrix	Type&Ver	Lot number	Serial	Date code		
	TTTTTTTVV	LLLLL	SSSS	WWYY		

Outline

Pin table [mm]				Pin table [mm]			
Pin	X	Y	Function	Pin	X	Y	Function
1	0,9	0	S11	30	68,5	0	DC+3
2	0,9	3	G11	31	68,5	2,7	DC+3
3	3,9	0	DC-1	32	64,7	36	G16
4	3,9	2,7	DC-1	33	61,7	36	S16
5	3,9	5,4	DC-1	34	58,7	36	PH3
6	6,6	0	DC-1	35	56	36	PH3
7	15,2	0	DC+1	36	53,3	36	PH3
8	15,2	2,7	DC+1	37	50,6	36	PH3
9	17,9	0	DC+1	38	39,4	36	G14
10	17,9	2,7	DC+1	39	36,4	36	S14
11	26,2	0	S13	40	33,4	36	PH2
12	26,2	3	G13	41	30,7	36	PH2
13	29,2	0	DC-2	42	28	36	PH2
14	29,2	2,7	DC-2	43	25,3	36	PH2
15	29,2	5,4	DC-2	44	14,1	36	G12
16	31,9	0	DC-2	45	11,1	36	S12
17	32,2	4,05	NTC	46	8,1	36	PH1
18	40,5	0	DC+2	47	5,4	36	PH1
19	40,5	2,7	DC+2	48	2,7	36	PH1
20	43,2	0	DC+2	49	0	36	Ph1
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				



Pinout



Identification

ID	Component	Voltage	Current	Function	Comment
T11,T12,T13,T14,T15, T16	IGBT	1200V	50A	Inverter Switch	CH0050C-1200S002
D11,D12,D13,D14,D15, D16	FWD	1200V	50A	Inverter Diode	CH0050R-1200S002
NTC	NTC	-	-	Thermistor	

Packaging instruction					
Standard packaging quantity (SPQ)	42	>SPQ	Standard	<SPQ	Sample

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

Document No.:	Date:	Modification:	Pages
30-P2126PA050NB-287F69Y-D1-14	01 Jun. 2015		