



flowPIM 2

1200 V / 50 A

Topology features

- Converter+Inverter
- Open Emitter configuration
- Temperature sensor

Component features

- Easy paralleling
- Low turn-off losses
- Low collector emitter saturation voltage
- Positive temperature coefficient
- Short tail current
- Switching optimized for EMC

Housing features

- Base isolation: Al₂O₃
- Convex shaped baseplate for superior thermal contact
- Cu baseplate
- Thermo-mechanical push-and-pull force relief
- Press-fit pin
- Reliable cold welding connection

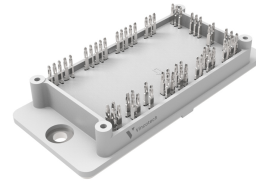
Target applications

- Industrial Drives

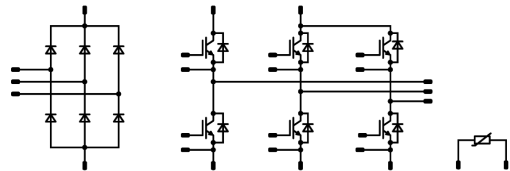
Types

- 30-P212PNA050M7-L888C79Y

flow 2 17 mm housing



Schematic





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Maximum Ratings

$T_j = 25\text{ °C}$, unless otherwise specified

Parameter	Symbol	Conditions	Value	Unit
Inverter Switch				
Collector-emitter voltage	V_{CES}		1200	V
Collector current (DC current)	I_C	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	71	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}	100	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	162	W
Gate-emitter voltage	V_{GES}		± 20	V
Short circuit ratings	t_{SC}	$V_{GE} = 15\text{ V}$, $V_{CC} = 800\text{ V}$ $T_j = 150\text{ °C}$	9,5	μs
Maximum junction temperature	T_{jmax}		175	$^{\circ}\text{C}$
Inverter Diode				
Peak repetitive reverse voltage	V_{RRM}		1200	V
Forward current (DC current)	I_F	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	54	A
Repetitive peak forward current	I_{FRM}	t_p limited by T_{jmax}	100	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	101	W
Maximum junction temperature	T_{jmax}		175	$^{\circ}\text{C}$
Rectifier Diode				
Peak repetitive reverse voltage	V_{RRM}		1600	V
Forward current (DC current)	I_F	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	83	A
Surge (non-repetitive) forward current	I_{FSM}	Single Half Sine Wave, $t_p = 10\text{ ms}$ $T_j = 150\text{ °C}$	490	A
Surge current capability	I^2t		1200	A^2s
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	106	W
Maximum junction temperature	T_{jmax}		150	$^{\circ}\text{C}$



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30-P212PNA050M7-L888C79Y
datasheet

Maximum Ratings

$T_j = 25\text{ °C}$, unless otherwise specified

Parameter	Symbol	Conditions	Value	Unit
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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* $t_p = 2\text{ s}$	6000	V
Creepage distance			>12,7	mm
Clearance			11,72	mm
Comparative Tracking Index	CTI		≥ 200	

*100 % tested in production



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Characteristic Values

Parameter	Symbol	Conditions					Values			Unit
		V_{GS} [V]	V_{GE} [V]	V_{DS} [V]	I_D [A]	T_j [°C]	Min	Typ	Max	

Inverter Switch

Static

Gate-emitter threshold voltage	$V_{GE(th)}$			10	0,005	25	5,4	6	6,6	V
Collector-emitter saturation voltage	$V_{CE(sat)}$		15		50	25 125 150		1,55 1,77 1,83	1,9 ⁽¹⁾	V
Collector-emitter cut-off current	I_{CES}		0	1200		25			0,09	mA
Gate-emitter leakage current	I_{GES}		20	0		25			0,5	μA
Internal gate resistance	r_g							None		Ω
Input capacitance	C_{ies}							10000		pF
Output capacitance	C_{oes}		0	10		25		350		pF
Reverse transfer capacitance	C_{res}							130		pF
Gate charge	Q_g	$V_{CC} = 600$ V	0/15		50	25		380		nC

Thermal

Thermal resistance junction to sink ⁽²⁾	$R_{th(j-s)}$	$\lambda_{paste} = 3,4$ W/mK (PSX)						0,59		K/W
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Dynamic

Turn-on delay time	$t_{d(on)}$	$R_{gon} = 8 \Omega$ $R_{goff} = 8 \Omega$	± 15	600	50	25		176		ns				
						125		176						
						150		190						
Rise time	t_r									25		52		ns
										125		58		
										150		60		
Turn-off delay time	$t_{d(off)}$									25		206		ns
						125		229						
						150		241						
Fall time	t_f					25		92,14		ns				
						125		124,72						
						150		122,14						
Turn-on energy (per pulse)	E_{on}	$Q_{tFWD} = 4,93 \mu C$ $Q_{tFWD} = 7,08 \mu C$ $Q_{tFWD} = 8,04 \mu C$				25		4,82		mWs				
						125		6,38						
						150		6,25						
Turn-off energy (per pulse)	E_{off}					25		2,98		mWs				
						125		4,25						
						150		5,03						



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datasheet

Characteristic Values

Parameter	Symbol	Conditions					Values			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			50	25 125 150		1,66 1,78 1,79	2,1 ⁽¹⁾		V
Reverse leakage current	I_R	$V_r = 1200$ V			25			40		μA
Thermal										
Thermal resistance junction to sink ⁽²⁾	$R_{th(j-s)}$	$\lambda_{paste} = 3,4$ W/mK (PSX)					0,94			K/W
Dynamic										
Peak recovery current	I_{RM}	$di/dt=338$ A/μs $di/dt=450$ A/μs $di/dt=498$ A/μs	±15	600	50	25		28,72		A
Reverse recovery time	t_{rr}					125		32,83		
						150		32,97		
						25		339,05		
Recovered charge	Q_r					125		434,87		
						150		511,31		
		25		4,93						
Reverse recovered energy	E_{rec}	125		7,08						
		150		8,04						
		25		1,79						
Peak rate of fall of recovery current	$(di_r/dt)_{max}$	125		2,59						
		150		3,33						
		25		194,94						
							128,35		A/μs	
							114,47			



Characteristic Values

Parameter	Symbol	Conditions					Values			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		

Rectifier Diode

Static

Forward voltage	V_F				25	25 125		1 0,915	1,21 ⁽¹⁾ 1,1 ⁽¹⁾	V
Reverse leakage current	I_R	$V_r = 1600$ V				25			50	μA

Thermal

Thermal resistance junction to sink ⁽²⁾	$R_{th(j-s)}$	$\lambda_{paste} = 3,4$ W/mK (PSX)						0,66		K/W
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Thermistor

Static

Rated resistance	R					25		22		kΩ
Deviation of R100	$\Delta_{R/R}$	$R_{100} = 1484$ Ω				100	-5		5	%
Power dissipation	P					25		130		mW
Power dissipation constant	d					25		1,5		mW/K
B-value	$B_{(25/50)}$	Tol. ±1 %						3962		K
B-value	$B_{(25/100)}$	Tol. ±1 %						4000		K
Vincotech Thermistor Reference									I	

⁽¹⁾ Value at chip level

⁽²⁾ Only valid with pre-applied Vincotech thermal interface material.

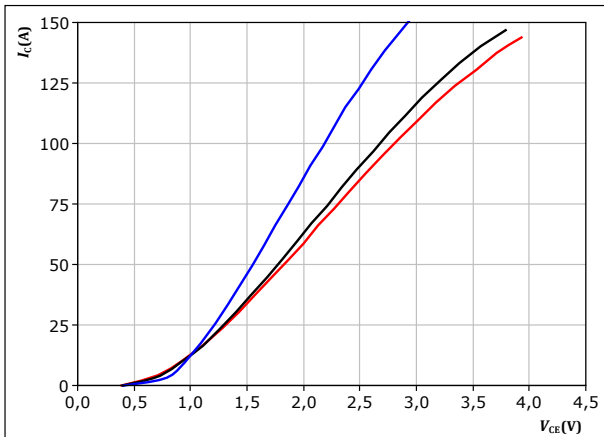


Inverter Switch Characteristics

figure 1. IGBT

Typical output characteristics

$$I_C = f(V_{CE})$$



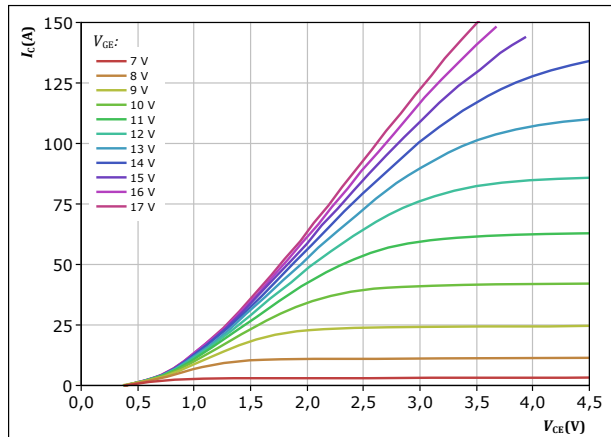
$t_p = 250 \mu s$
 $V_{GE} = 15 V$

$T_j:$ — 25 °C
— 125 °C
— 150 °C

figure 2. IGBT

Typical output characteristics

$$I_C = f(V_{CE})$$

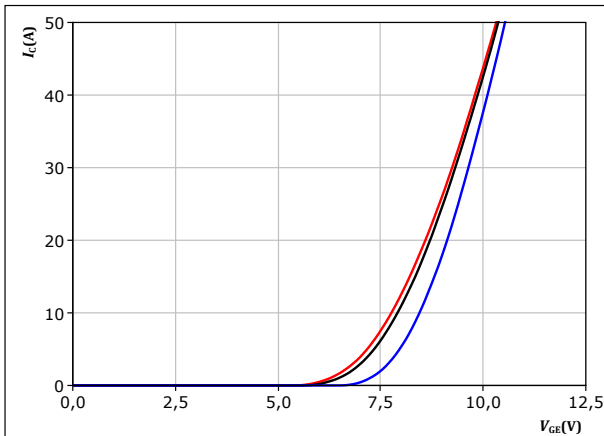


$t_p = 250 \mu s$
 $T_j = 150 \text{ °C}$
 V_{GE} from 7 V to 17 V in steps of 1 V

figure 3. IGBT

Typical transfer characteristics

$$I_C = f(V_{GE})$$



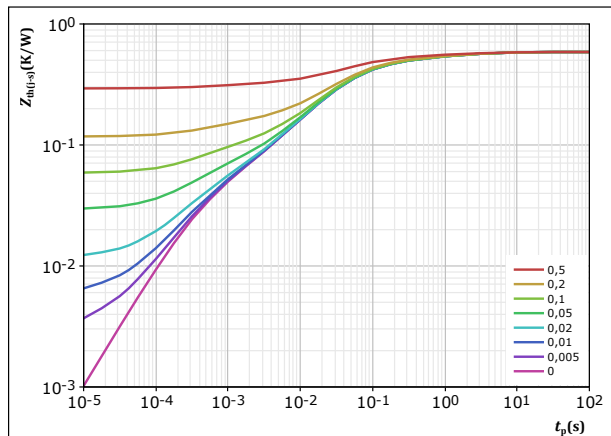
$t_p = 250 \mu s$
 $V_{CE} = 10 V$

$T_j:$ — 25 °C
— 125 °C
— 150 °C

figure 4. IGBT

Transient thermal impedance as a function of pulse width

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



$D = t_p / T$
 $R_{th(j-s)} = 0,586 \text{ K/W}$

IGBT thermal model values

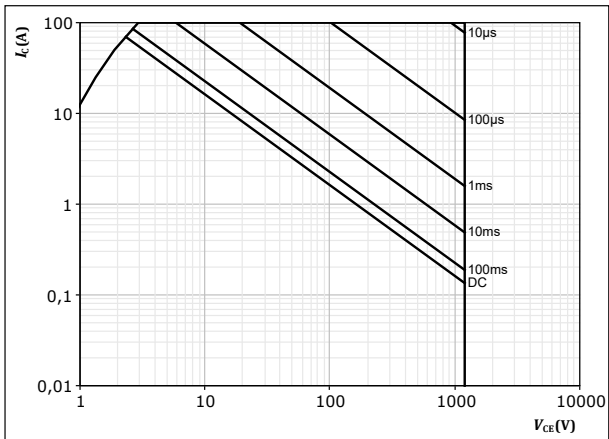
R (K/W)	τ (s)
3,16E-02	4,80E+00
5,30E-02	1,05E+00
1,21E-01	1,71E-01
2,39E-01	4,01E-02
9,09E-02	1,21E-02
2,38E-02	1,71E-03
2,73E-02	3,65E-04



Inverter Switch Characteristics

figure 5. IGBT

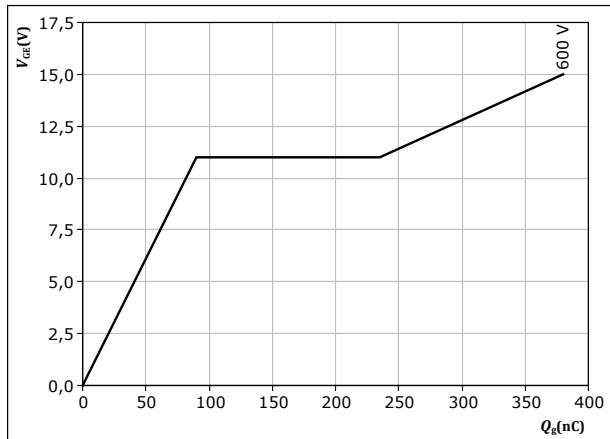
Safe operating area
 $I_C = f(V_{CE})$



$D =$ single pulse
 $T_s = 80$ °C
 $V_{GE} = 15$ V
 $T_j = T_{jmax}$

figure 6. IGBT

Gate voltage vs gate charge
 $V_{GE} = f(Q_g)$



$I_C = 50$ A
 $T_j = 25$ °C



Inverter Diode Characteristics

figure 7. FWD

Typical forward characteristics

$$I_F = f(V_F)$$

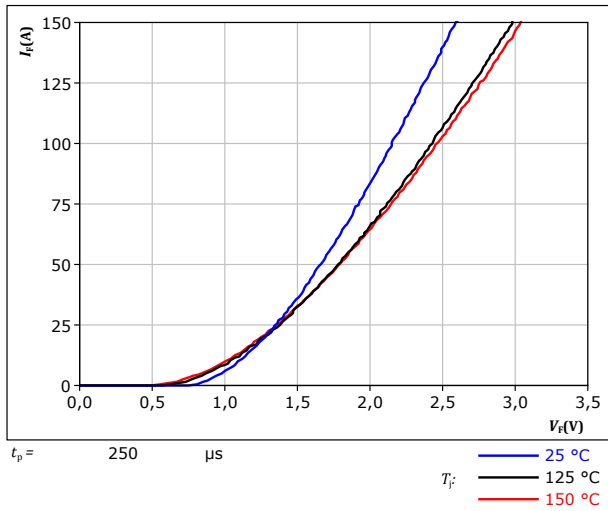
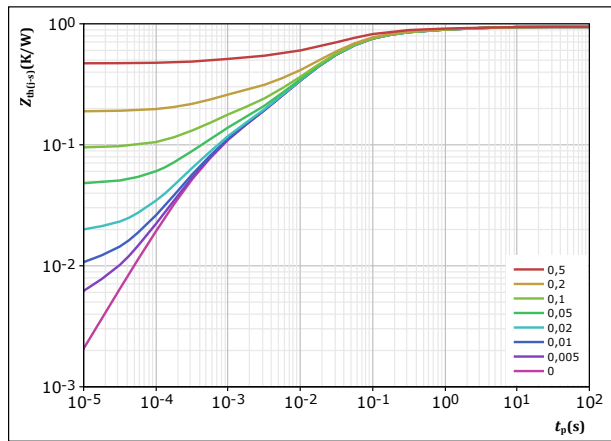


figure 8. FWD

Transient thermal impedance as a function of pulse width

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



$D = t_p / T$
 $R_{th(j-s)} = 0,942 \text{ K/W}$
 FWD thermal model values

R (K/W)	τ (s)
5,03E-02	3,45E+00
8,14E-02	4,50E-01
2,71E-01	7,41E-02
3,67E-01	2,11E-02
9,51E-02	3,99E-03
7,76E-02	4,74E-04



Rectifier Diode Characteristics

figure 9. Rectifier

Typical forward characteristics

$$I_F = f(V_F)$$

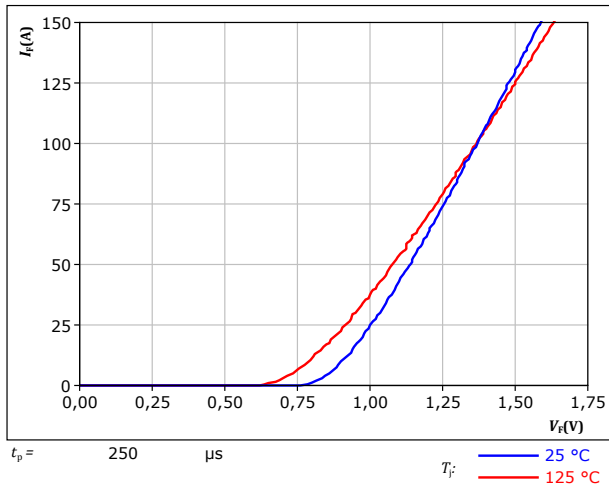
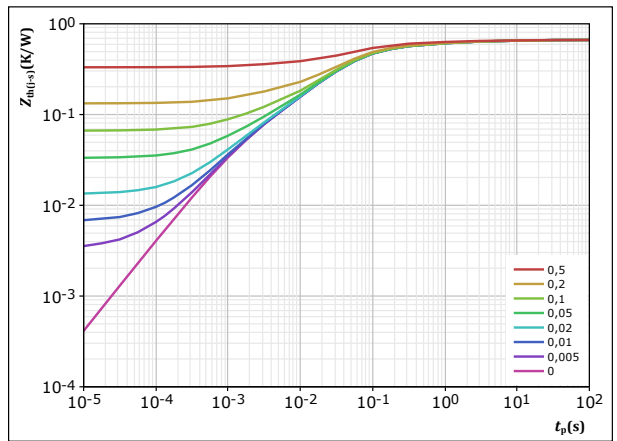


figure 10. Rectifier

Transient thermal impedance as a function of pulse width

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



$D =$ t_p / T
 $R_{th(j-s)} =$ 0,664 K/W
 Rectifier thermal model values

R (K/W)	τ (s)
2,64E-02	1,18E+01
6,63E-02	1,18E+00
1,36E-01	1,65E-01
3,29E-01	4,29E-02
6,63E-02	1,04E-02
3,95E-02	1,49E-03

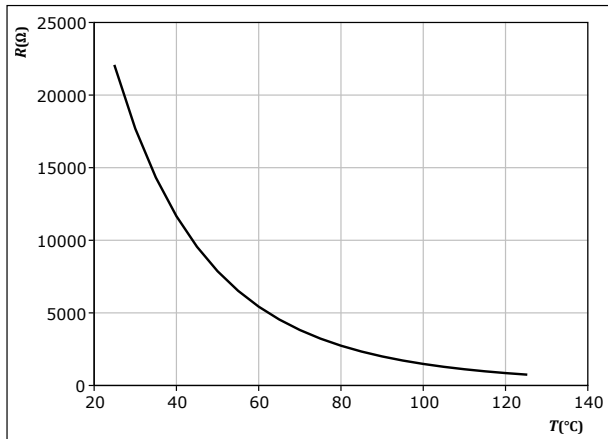


Thermistor Characteristics

figure 11. Thermistor

Typical NTC characteristic as function of temperature

$$R_T = f(T)$$

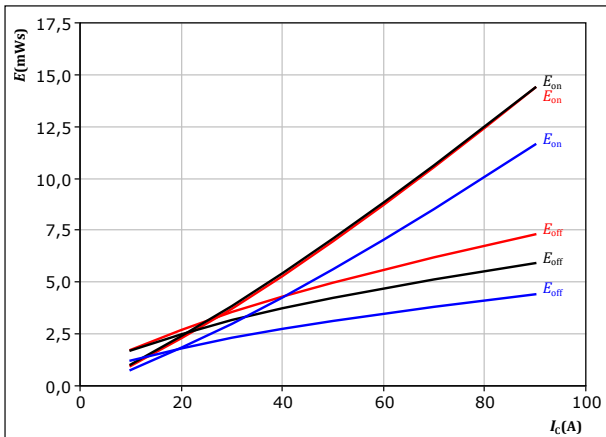




Inverter Switching Characteristics

figure 12. IGBT

Typical switching energy losses as a function of collector current
 $E = f(I_c)$

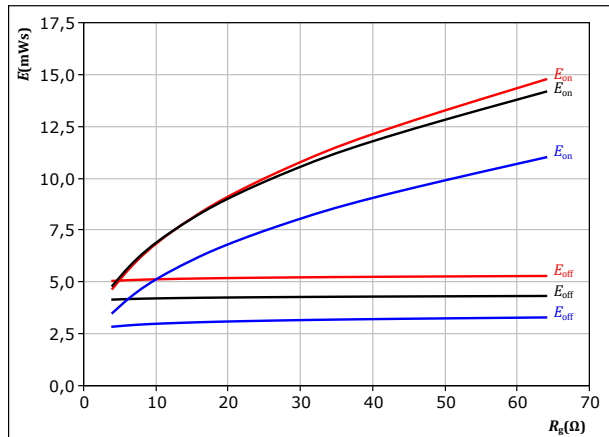


With an inductive load at
 $V_{CE} = 600$ V
 $V_{GE} = \pm 15$ V
 $R_{g(on)} = 8$ Ω
 $R_{g(off)} = 8$ Ω

T_j : — 25 °C
 — 125 °C
 — 150 °C

figure 13. IGBT

Typical switching energy losses as a function of IGBT turn on gate resistor
 $E = f(R_g)$

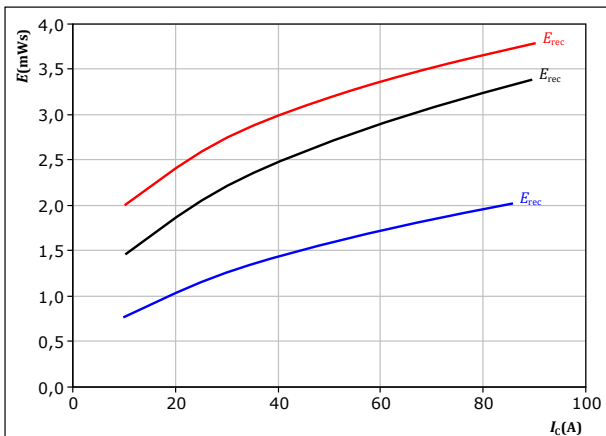


With an inductive load at
 $V_{CE} = 600$ V
 $V_{GE} = \pm 15$ V
 $I_c = 50$ A

T_j : — 25 °C
 — 125 °C
 — 150 °C

figure 14. FWD

Typical reverse recovered energy loss as a function of collector current
 $E_{rec} = f(I_c)$

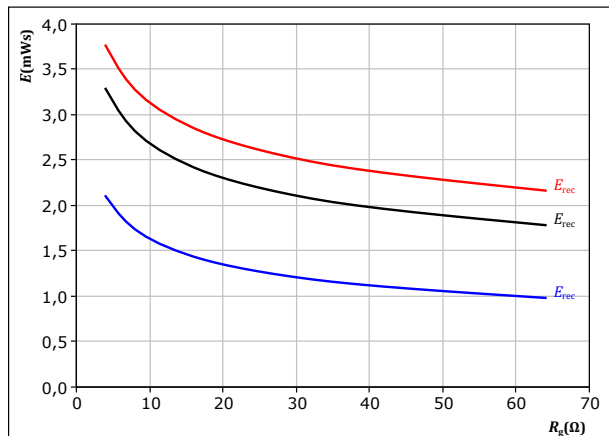


With an inductive load at
 $V_{CE} = 600$ V
 $V_{GE} = \pm 15$ V
 $R_{g(on)} = 8$ Ω

T_j : — 25 °C
 — 125 °C
 — 150 °C

figure 15. FWD

Typical reverse recovered energy loss as a function of IGBT turn on gate resistor
 $E_{rec} = f(R_g)$



With an inductive load at
 $V_{CE} = 600$ V
 $V_{GE} = \pm 15$ V
 $I_c = 50$ A

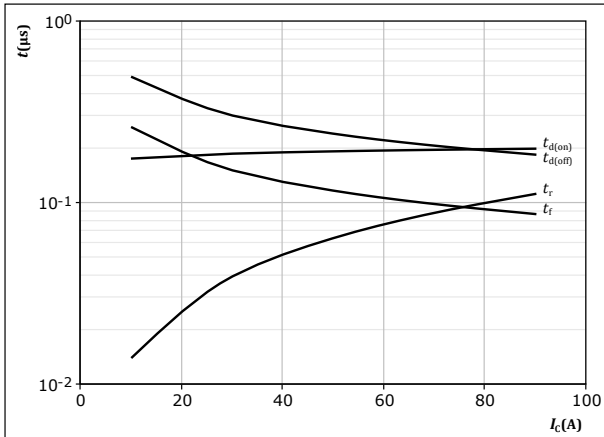
T_j : — 25 °C
 — 125 °C
 — 150 °C



Inverter Switching Characteristics

figure 16. IGBT

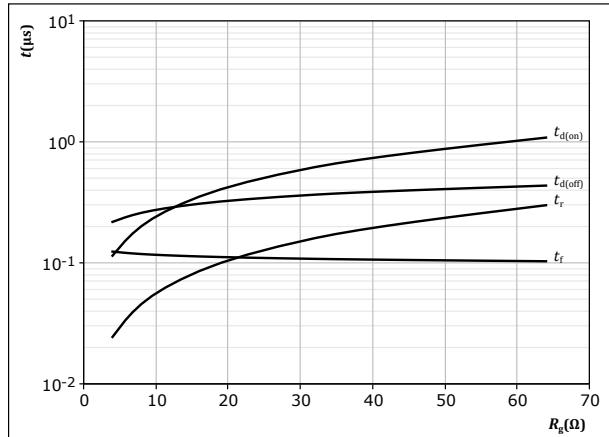
Typical switching times as a function of collector current
 $t = f(I_c)$



With an inductive load at
 $T_j = 150 \text{ }^\circ\text{C}$
 $V_{CE} = 600 \text{ V}$
 $V_{GE} = \pm 15 \text{ V}$
 $R_{gon} = 8 \text{ } \Omega$
 $R_{goff} = 8 \text{ } \Omega$

figure 17. IGBT

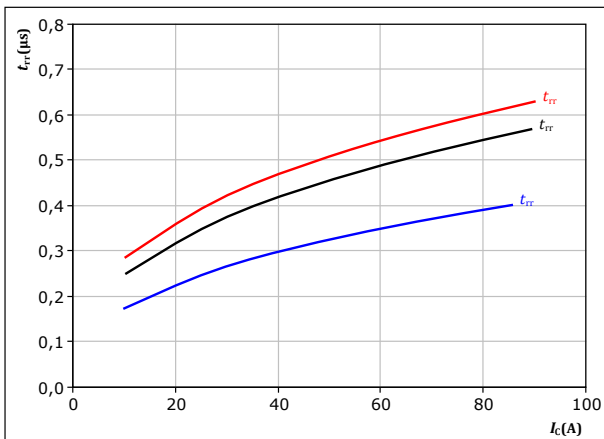
Typical switching times as a function of IGBT turn on gate resistor
 $t = f(R_g)$



With an inductive load at
 $T_j = 150 \text{ }^\circ\text{C}$
 $V_{CE} = 600 \text{ V}$
 $V_{GE} = \pm 15 \text{ V}$
 $I_c = 50 \text{ A}$

figure 18. FWD

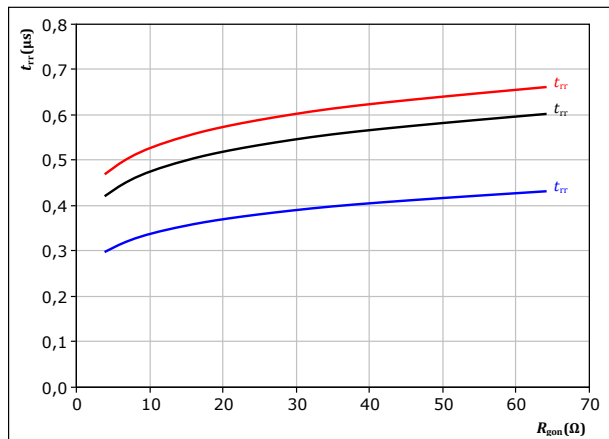
Typical reverse recovery time as a function of collector current
 $t_{rr} = f(I_c)$



With an inductive load at
 $V_{CE} = 600 \text{ V}$
 $V_{GE} = \pm 15 \text{ V}$
 $R_{gon} = 8 \text{ } \Omega$
 $T_j:$ — 25 °C
— 125 °C
— 150 °C

figure 19. FWD

Typical reverse recovery time as a function of IGBT turn on gate resistor
 $t_{rr} = f(R_{gon})$



With an inductive load at
 $V_{CE} = 600 \text{ V}$
 $V_{GE} = \pm 15 \text{ V}$
 $I_c = 50 \text{ A}$
 $T_j:$ — 25 °C
— 125 °C
— 150 °C

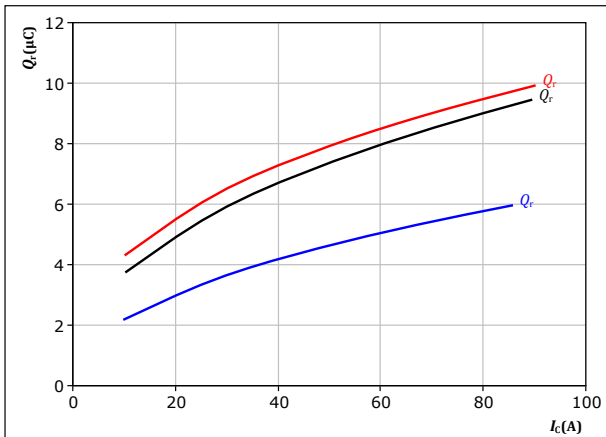


Inverter Switching Characteristics

figure 20. FWD

Typical recovered charge as a function of collector current

$$Q_r = f(I_c)$$



With an inductive load at

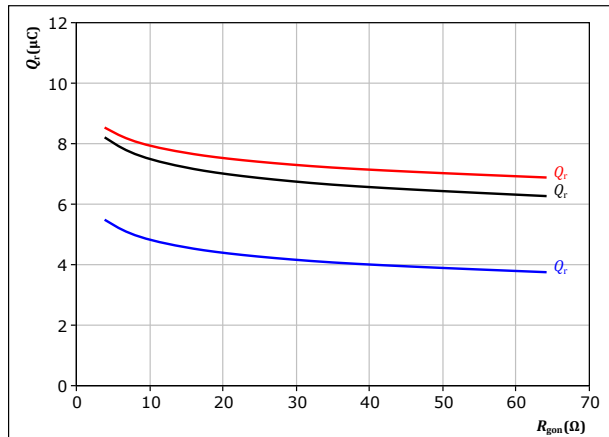
$V_{CE} = 600 \text{ V}$
 $V_{GE} = \pm 15 \text{ V}$
 $R_{gon} = 8 \ \Omega$

T_j : — 25 °C
— 125 °C
— 150 °C

figure 21. FWD

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

$$Q_r = f(R_{gon})$$



With an inductive load at

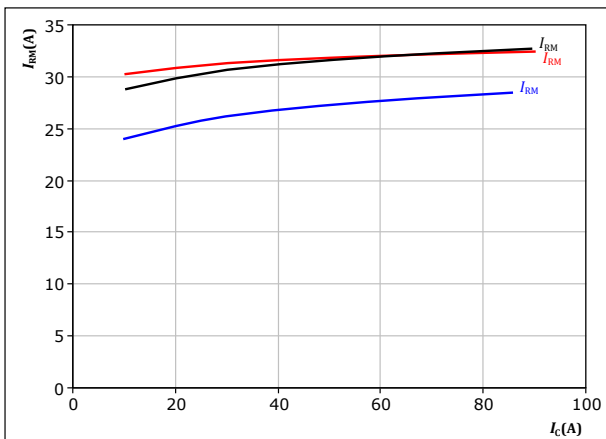
$V_{CE} = 600 \text{ V}$
 $V_{GE} = \pm 15 \text{ V}$
 $I_c = 50 \text{ A}$

T_j : — 25 °C
— 125 °C
— 150 °C

figure 22. FWD

Typical peak reverse recovery current as a function of collector current

$$I_{RM} = f(I_c)$$



With an inductive load at

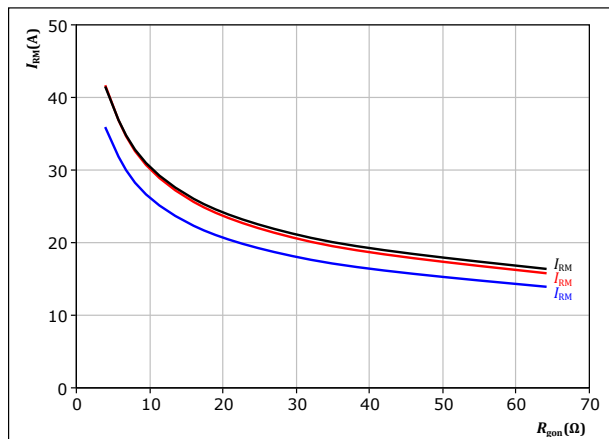
$V_{CE} = 600 \text{ V}$
 $V_{GE} = \pm 15 \text{ V}$
 $R_{gon} = 8 \ \Omega$

T_j : — 25 °C
— 125 °C
— 150 °C

figure 23. FWD

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

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



With an inductive load at

$V_{CE} = 600 \text{ V}$
 $V_{GE} = \pm 15 \text{ V}$
 $I_c = 50 \text{ A}$

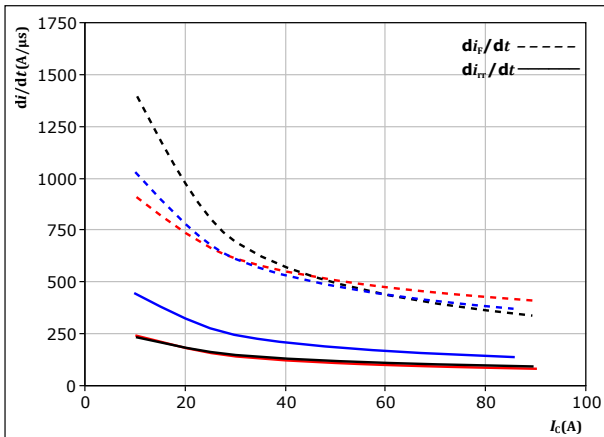
T_j : — 25 °C
— 125 °C
— 150 °C



Inverter Switching Characteristics

figure 24. FWD

Typical rate of fall of forward and reverse recovery current as a function of collector current
 $di_f/dt, di_r/dt = f(I_c)$

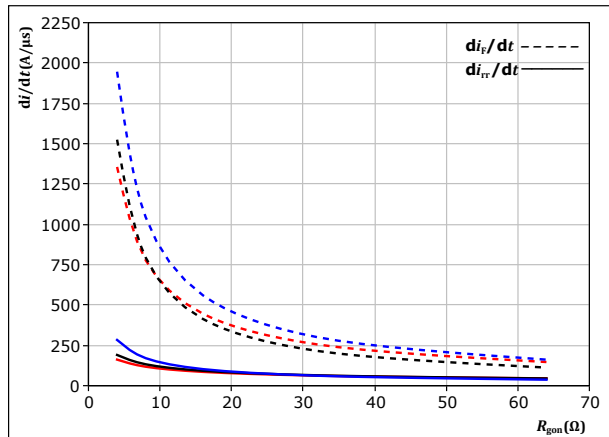


With an inductive load at

$V_{CE} = 600$ V	$T_j = 25$ °C
$V_{GE} = \pm 15$ V	$T_j = 125$ °C
$R_{gon} = 8$ Ω	$T_j = 150$ °C

figure 25. FWD

Typical rate of fall of forward and reverse recovery current as a function of turn on gate resistor
 $di_f/dt, di_r/dt = f(R_{gon})$



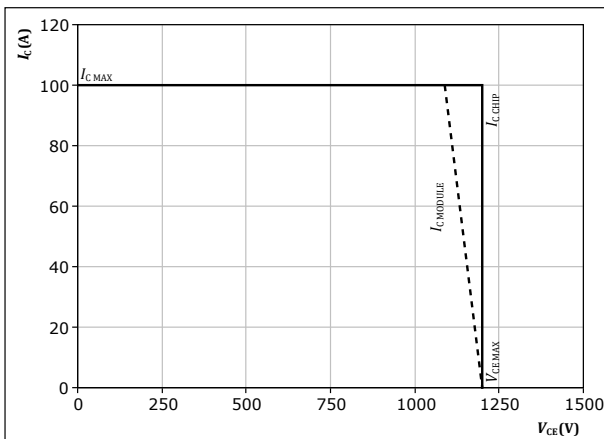
With an inductive load at

$V_{CE} = 600$ V	$T_j = 25$ °C
$V_{GE} = \pm 15$ V	$T_j = 125$ °C
$I_c = 50$ A	$T_j = 150$ °C

figure 26. IGBT

Reverse bias safe operating area

$I_c = f(V_{CE})$



At $T_j = 150$ °C
 $R_{gon} = 8$ Ω
 $R_{goff} = 8$ Ω



Inverter Switching Definitions

figure 27. IGBT

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

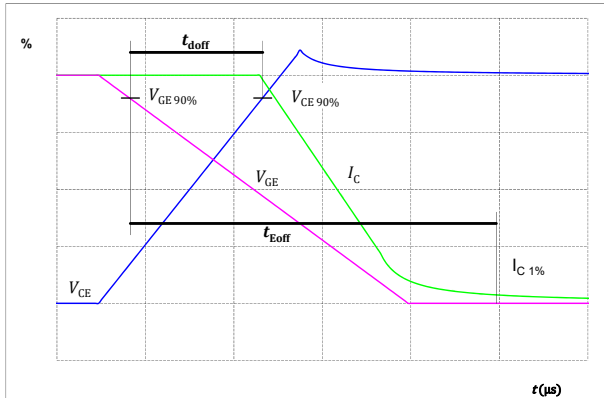


figure 28. IGBT

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

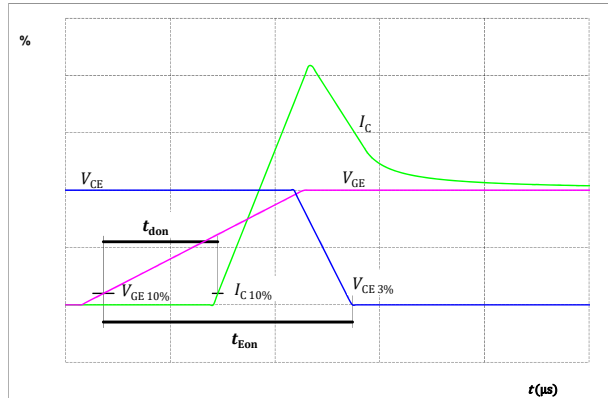


figure 29. IGBT

Turn-off Switching Waveforms & definition of t_f

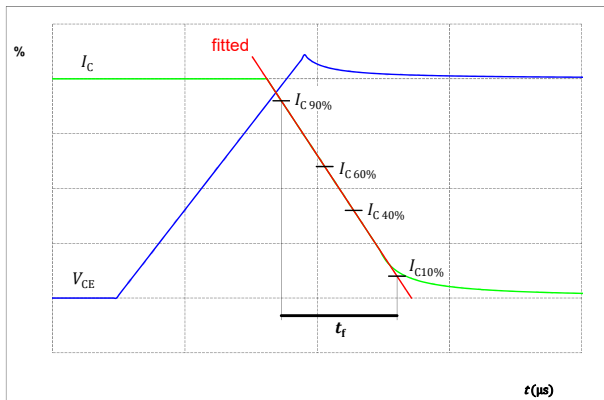
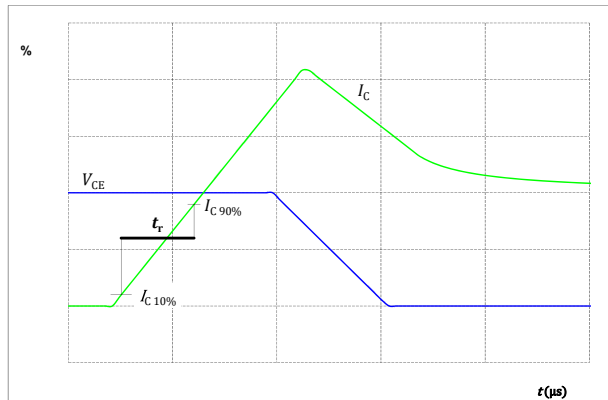


figure 30. IGBT

Turn-on Switching Waveforms & definition of t_r





Inverter Switching Definitions

figure 31. FWD

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

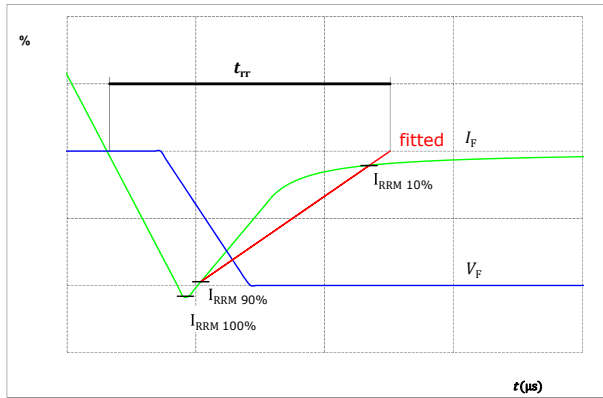
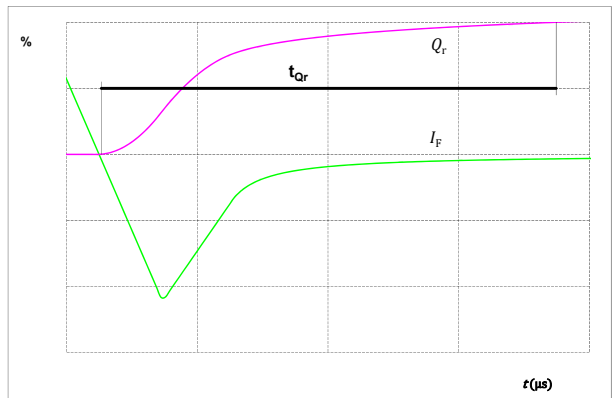


figure 32. FWD

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






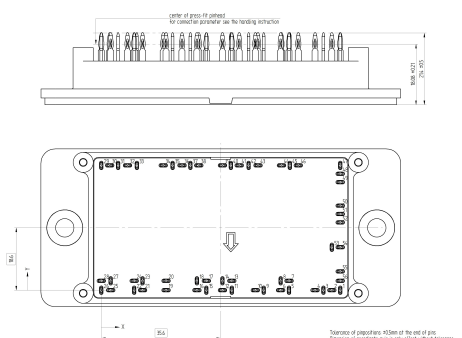
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30-P212PNA050M7-L888C79Y
datasheet

Ordering Code	
Version	Ordering Code
Without thermal paste	30-P212PNA050M7-L888C79Y
With thermal paste (3,4 W/mK, PSX-P7)	30-P212PNA050M7-L888C79Y-/3/

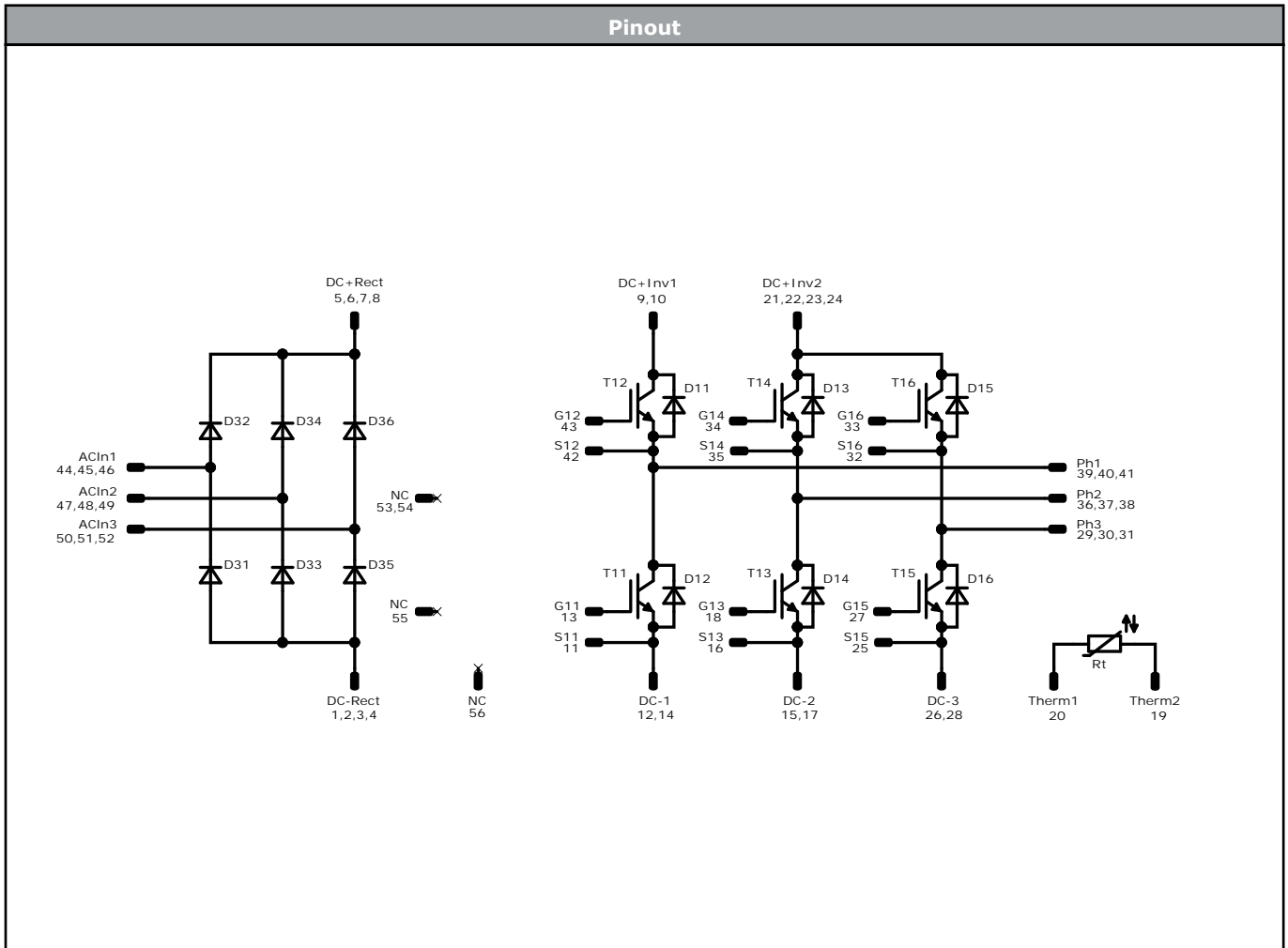
Marking						
	Text	Name NN-NNNNNNNNNNNNNN- TTTTTVV	Date code WWYY	UL & VIN UL VIN	Lot LLLLL	Serial SSSS
	Datamatrix	Type&Ver TTTTTVV	Lot number LLLLL	Serial SSSS	Date code WWYY	

Outline							
Pin table [mm]							
Pin	X	Y	Function	29	0	37,2	Ph3
1	71,2	0	DC-Rect	30	2,5	37,2	Ph3
2	68,7	0	DC-Rect	31	5	37,2	Ph3
3	66,2	0	DC-Rect	32	7,8	37,2	S16
4	63,7	0	DC-Rect	33	10,6	37,2	G16
5	55,95	0	DC+Rect	34	18,45	37,2	G14
6	53,45	0	DC+Rect	35	21,25	37,2	S14
7	55,95	2,8	DC+Rect	36	24,05	37,2	Ph2
8	53,45	2,8	DC+Rect	37	26,55	37,2	Ph2
9	48,4	0	DC+Inv1	38	29,05	37,2	Ph2
10	45,9	0	DC+Inv1	39	36,1	37,2	Ph1
11	38,9	0	S11	40	38,6	37,2	Ph1
12	36,1	0	DC-1	41	41,1	37,2	Ph1
13	38,9	2,8	G11	42	43,9	37,2	S12
14	36,1	2,8	DC-1	43	46,7	37,2	G12
15	31,3	0	DC-2	44	53,7	37,2	ACIn1
16	28,5	0	S13	45	56,2	37,2	ACIn1
17	31,3	2,8	DC-2	46	58,7	37,2	ACIn1
18	28,5	2,8	G13	47	71,2	37,2	ACIn2
19	19,3	0	Therm2	48	71,2	34,7	ACIn2
20	19,3	2,8	Therm1	49	71,2	32,2	ACIn2
21	12,3	0	DC+Inv2	50	71,2	25,2	ACIn3
22	9,8	0	DC+Inv2	51	71,2	22,7	ACIn3
23	12,3	2,8	DC+Inv2	52	71,2	20,2	ACIn3
24	9,8	2,8	DC+Inv2	53	71,2	12,8	NC
25	2,8	0	S15	54	68,7	12,8	NC
26	0	0	DC-3	55	71,2	5,6	NC
27	2,8	2,8	G15	56	71,2	2,8	NC
28	0	2,8	DC-3				





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Identification					
ID	Component	Voltage	Current	Function	Comment
T11, T12, T13, T14, T15, T16	IGBT	1200 V	50 A	Inverter Switch	
D11, D12, D13, D14, D15, D16	FWD	1200 V	50 A	Inverter Diode	
D31, D32, D33, D34, D35, D36	Rectifier	1600 V	50 A	Rectifier Diode	
Rt	NTC			Thermistor	



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

Handling instruction
Handling instructions for <i>flow 2</i> packages see vincotech.com website.

Package data
Package data for <i>flow 2</i> packages see vincotech.com website.

Vincotech thermistor reference
See Vincotech thermistor reference table at vincotech.com website.

UL recognition and file number
This device is UL 1557 recognized under E192116 up to a junction temperature under switching condition $T_{j,op}=175^{\circ}\text{C}$ and up to 3500VAC/1min isolation voltage. For more information see vincotech.com website.



Document No.:	Date:	Modification:	Pages
30-P212PNA050M7-L888C79Y-D1-14	17 Nov. 2024	Initial Release	

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2. A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.