10-FY124PA080FV-L589F88
10-PY124PA080FV-L589F88Y
datasheet

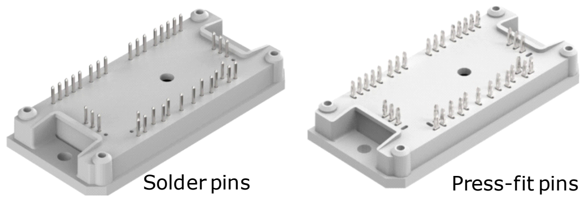
Vincotech

flow **PACK 1 H** — **1200 V / 80 A**

Features

- High speed IGBT
- Fast, soft reverse Diode
- Open emitter topology
- Integrated thermistor

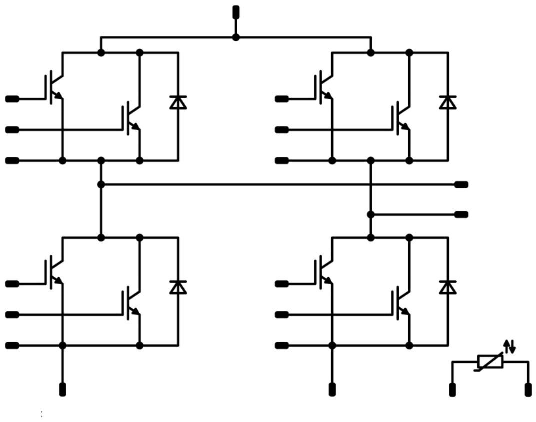
flow 1 12 mm housing



Target applications

- Charging Stations
- Power Supply
- Solar Inverters
- Welding & Cutting

Schematic



Types

- 10-FY124PA080FV-L589F88
- 10-PY124PA080FV-L589F88Y

Maximum Ratings

T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Condition		Value	Unit
H-Bridge Switch - Lo side / H-Bridge Switch - Hi side					
Collector-emitter voltage	V_{CES}			1200	V
Collector current	I_C			80	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}		320	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	179	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
H-Bridge Diode - Lo side / H-Bridge Diode - Hi side					
Peak repetitive reverse voltage	V_{RRM}			1200	V
Continuous (direct) forward current	I_F	$T_j = T_{jmax}$	T_s = 80 °C	46	A
Surge (non-repetitive) forward current	I_{FSM}	50 Hz Single Half Sine Wave t_p = 8,3 ms	T_j = 150 °C	270	A
Surge current capability	I^2t			365	A^2s
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	94	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		Press-fit pins / Solder pins		min. 12,7	mm
Clearance		Press-fit pins		7,92	mm
		Solder pins		8,1	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	
H-Bridge Switch - Lo side / H-Bridge Switch - Hi side										
Static										
Gate-emitter threshold voltage	$V_{GE(th)}$	$V_{GE} = V_{CE}$			0,08	25	5	6,2	7,3	V
Collector-emitter saturation voltage	V_{CEsat}		15		80	25 125 150	1,5	1,65 1,77 1,79	2,5	V
Collector-emitter cut-off current	I_{CES}		0	1200		25			100	µA
Gate-emitter leakage current	I_{GES}		25	0		25			500	nA
Internal gate resistance	r_g							none		Ω
Input capacitance	C_{ies}	f = 1 MHz	0	30		25		8600		pF
Output capacitance	C_{oes}							360		
Reverse transfer capacitance	C_{res}							200		
Gate charge	Q_g		15	600	80	25		740		nC
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						0,53		K/W
Dynamic										
Turn-on delay time	$t_{d(on)}$	R_{goff} = 4 Ω R_{gon} = 4 Ω	±15	600	80	25 125 150		148 149 148		ns
Rise time	t_r					25 125 150		24 30 32		
Turn-off delay time	$t_{d(off)}$					25 125 150		215 264 279		
Fall time	t_f					25 125 150		10 27 30		
Turn-on energy (per pulse)	E_{on}	Q_{rFWD} = 4,9 µC Q_{rFWD} = 9,4 µC Q_{rFWD} = 11,3 µC				25 125 150		4,25 6,67 7,34		mWs
Turn-off energy (per pulse)	E_{off}					25 125 150		1,97 3,97 4,65		

Characteristic Values

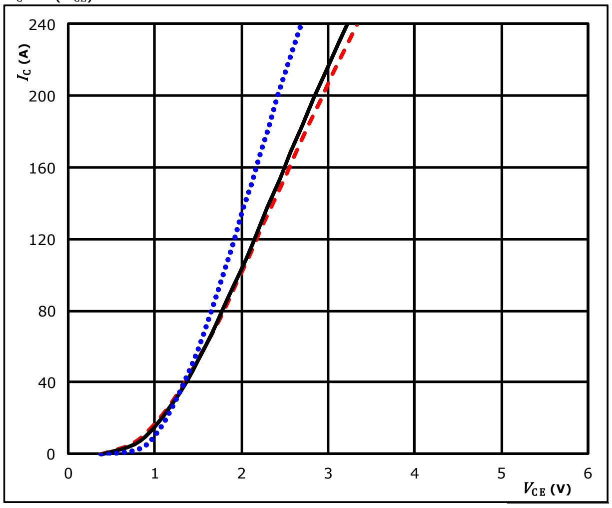
Parameter	Symbol	Conditions					Value			Unit
			V_{GE} [V] V_{GS} [V]	V_{CE} [V] V_{DS} [V] V_{F} [V]	I_{C} [A] I_{D} [A] I_{F} [A]	T_{j} [°C]	Min	Typ	Max	
H-Bridge Diode - Lo side / H-Bridge Diode - Hi side										
Static										
Forward voltage	V_{F}				50	25 125 150		2,21 2,31 2,22	2,54	V
Reverse leakage current	I_{R}			1200		25 150			60 8800	µA
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						1,02		K/W
Dynamic										
Peak recovery current	I_{RRM}					25 125 150		59 61 63		A
Reverse recovery time	t_{rr}					25 125 150		249 474 555		ns
Recovered charge	Q_{r}	di/dt = 3891 A/µs di/dt = 1748 A/µs di/dt = 1648 A/µs	±15	600	80	25 125 150		4,93 9,37 11,31		µC
Reverse recovered energy	E_{rec}					25 125 150		1,83 3,75 4,57		mWs
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 125 150		1170 575 489		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	

H-Bridge Switch - Lo side / H-Bridge Switch - Hi side Characteristics

figure 1. **IGBT**

Typical output characteristics

$I_C = f(V_{CE})$

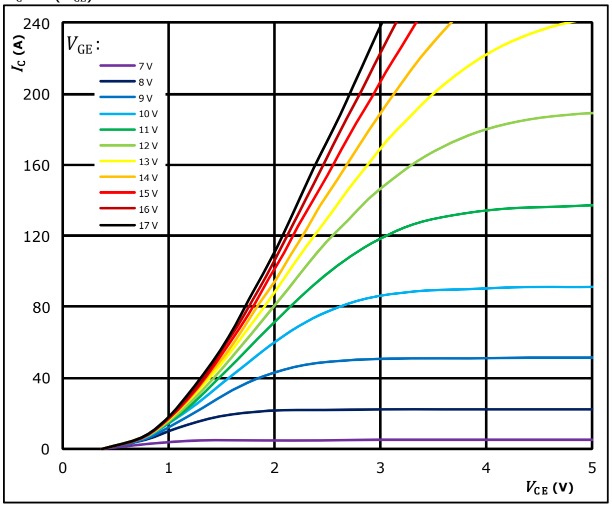


t_p =	250	µs		25 °C	dotted
V_{GE} =	15	V	T_j:	125 °C	solid
				150 °C	dashed

figure 2. **IGBT**

Typical output characteristics

$I_C = f(V_{CE})$



t_p = 250 µs

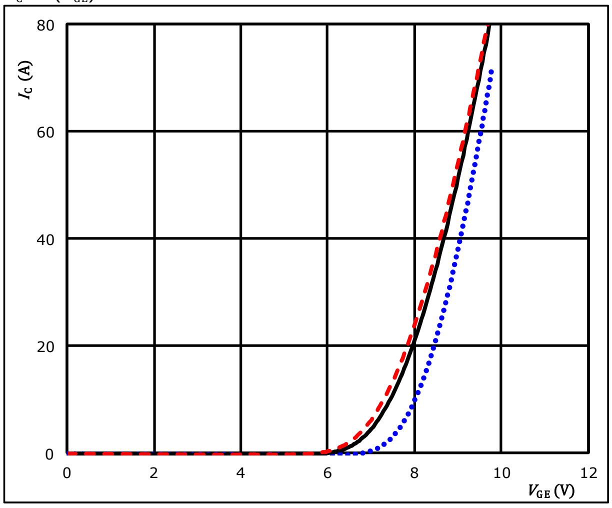
T_j = 150 °C

V_{GE} from 7 V to 17 V in steps of 1 V

figure 3. **IGBT**

Typical transfer characteristics

$I_C = f(V_{GE})$

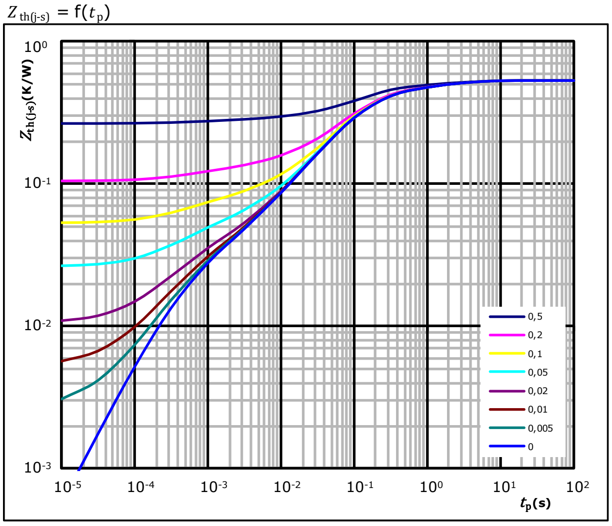


t_p =	100	µs		25 °C	dotted
V_{CE} =	10	V	T_j:	125 °C	solid
				150 °C	dashed

figure 4. **IGBT**

Transient thermal impedance as function of pulse duration

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



D = t_p / T

$R_{th(j-s)}$ = 0,53 K/W

IGBT thermal model values

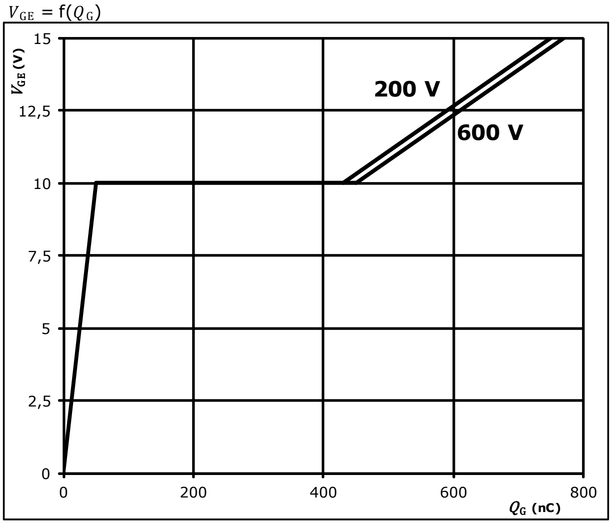
R (K/W)	τ (s)
6,58E-02	2,46E+00
9,27E-02	4,63E-01
2,62E-01	1,02E-01
6,13E-02	3,27E-02
2,32E-02	6,17E-03
1,53E-02	9,03E-04
9,83E-03	3,05E-04

H-Bridge Switch - Lo side / H-Bridge Switch - Hi side Characteristics

figure 5. **IGBT**

Gate voltage vs gate charge

$V_{GE} = f(Q_G)$

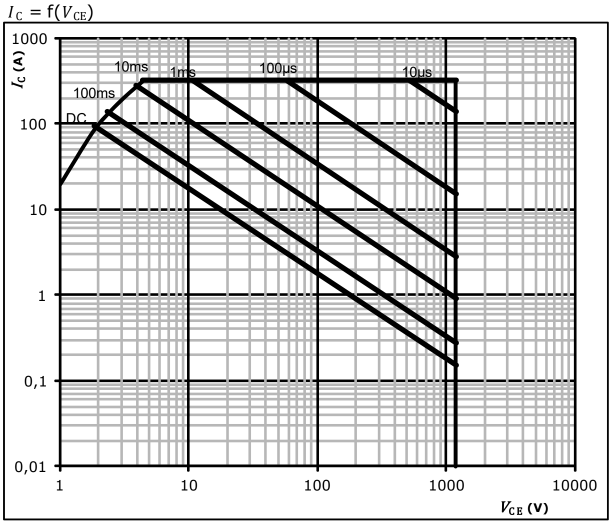


I_C= 80 A

figure 6. **IGBT**

Safe operating area

$I_C = f(V_{CE})$



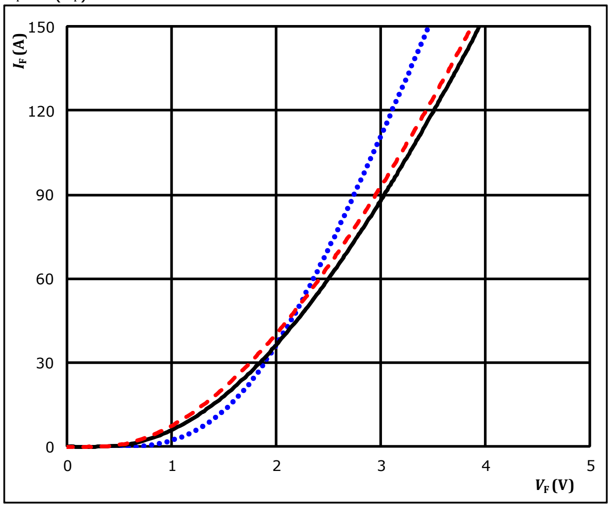
D =	single pulse	
T_s =	80	ºC
V_{GE} =	±15	V
T_j =	T_{jmax}	

H-Bridge Diode - Lo side / H-Bridge Diode - Hi side Characteristics

figure 1. **FWD**

Typical forward characteristics

$I_F = f(V_F)$



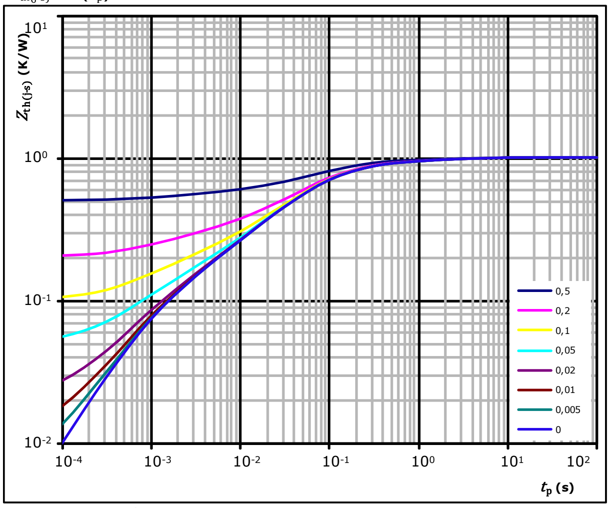
t_p = 250 μs

T_j: 25 °C; 125 °C; 150 °C

figure 2. **FWD**

Transient thermal impedance as a function of pulse width

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



$D = t_p / T$

$R_{th(j\text{-}s)}$ = 1,02 K/W

FWD thermal model values

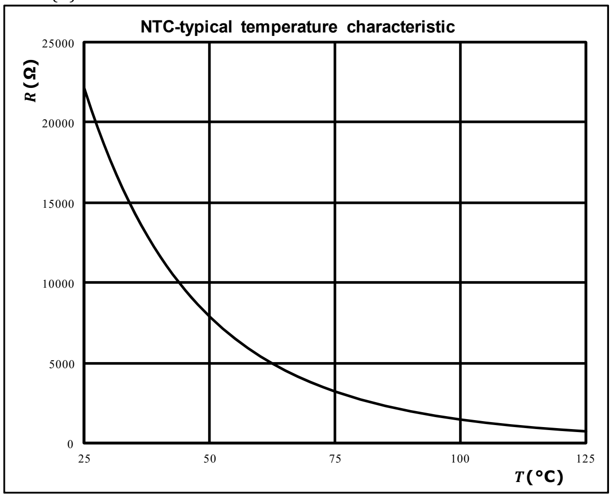
R (K/W)	τ (s)
5,56E-02	3,42E+00
1,14E-01	5,52E-01
4,09E-01	9,78E-02
2,64E-01	3,21E-02
9,94E-02	6,42E-03
7,49E-02	9,84E-04

Thermistor Characteristics

figure 1. **Thermistor**

Typical NTC characteristic as a function of temperature

$R = f(T)$

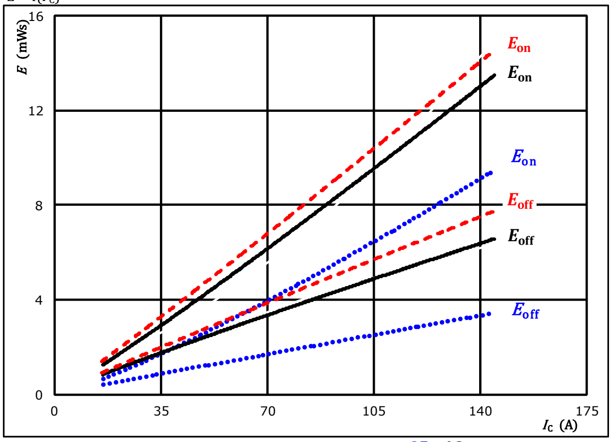


H-Bridge Switch - Lo side / H-Bridge Switch - Hi side Characteristics

figure 1. **IGBT**

Typical switching energy losses as a function of collector current

$E = f(I_C)$



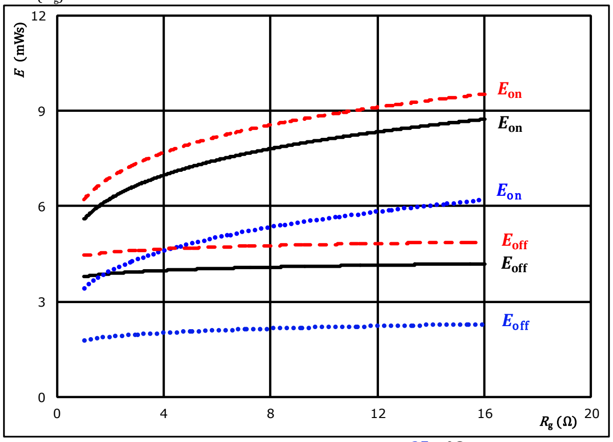
With an inductive load at

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

figure 2. **IGBT**

Typical switching energy losses as a function of gate resistor

$E = f(R_g)$



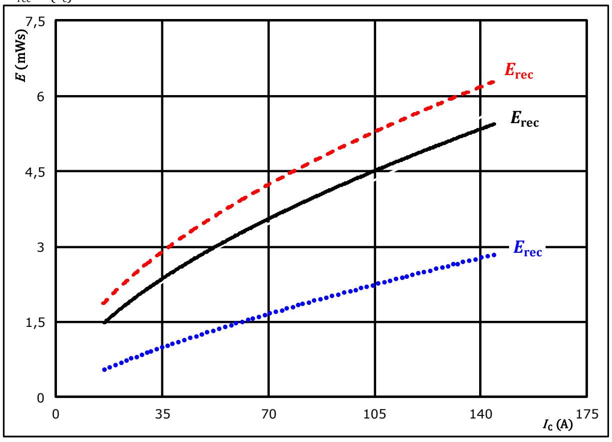
With an inductive load at

V_{CE} =	600	V	T_j:	25 °C	dotted blue
V_{GE} =	±15	V		125 °C	solid black
I_C =	80	A		150 °C	dashed red

figure 3. **FWD**

Typical reverse recovered energy loss as a function of collector current

$E_{rec} = f(I_c)$



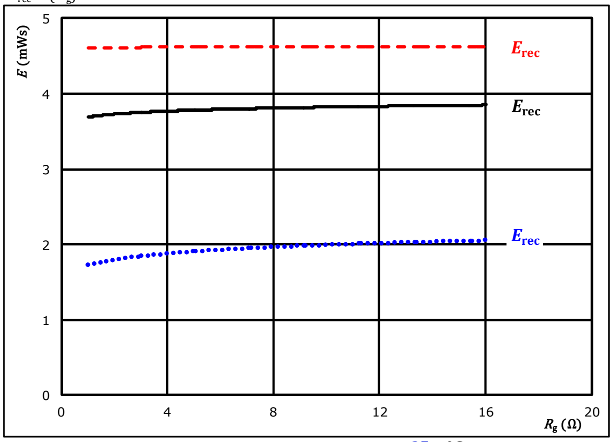
With an inductive load at

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

figure 4. **FWD**

Typical reverse recovered energy loss as a function of gate resistor

$E_{rec} = f(R_g)$



With an inductive load at

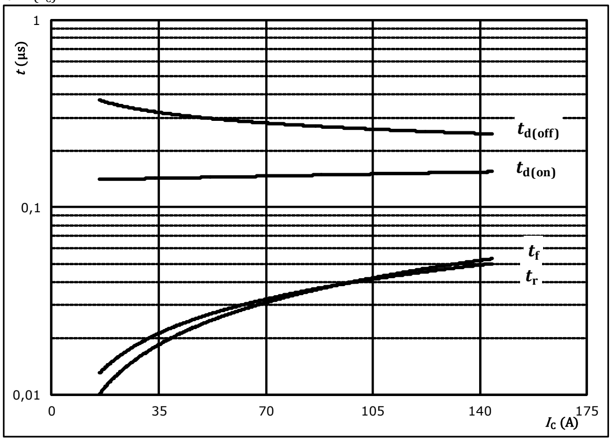
V_{CE} =	600	V	T_j:	25 °C	dotted blue
V_{GE} =	±15	V		125 °C	solid black
I_C =	80	A		150 °C	dashed red

H-Bridge Switch - Lo side / H-Bridge Switch - Hi side Characteristics

figure 5. IGBT

Typical switching times as a function of collector current

$t = f(I_C)$



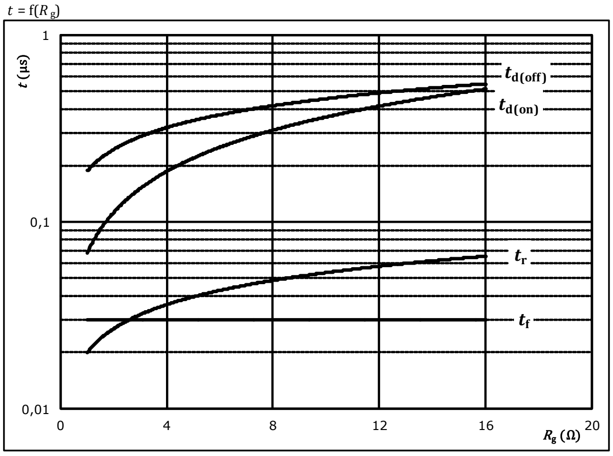
With an inductive load at

$T_j =$	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

$t = f(R_g)$



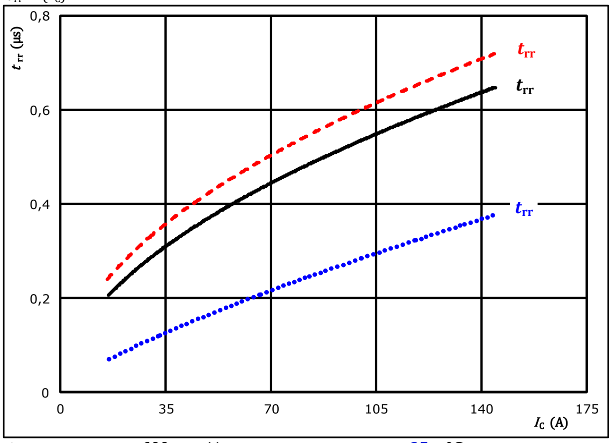
With an inductive load at

$T_j =$	150	°C
$V_{CE} =$	600	V
$V_{GE} =$	±15	V
$I_C =$	80	A

figure 7. FWD

Typical reverse recovery time as a function of collector current

$t_{rr} = f(I_C)$

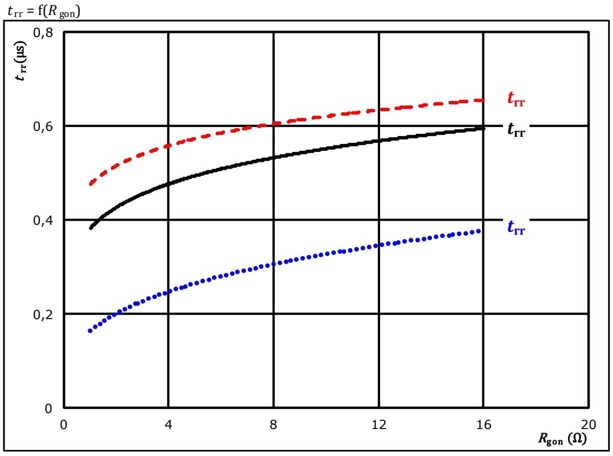


At					
$V_{CE} =$	600	V	T_j:	25 °C	dotted
$V_{GE} =$	±15	V		125 °C	solid
$R_{gon} =$	4	Ω		150 °C	dashed

figure 8. FWD

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

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



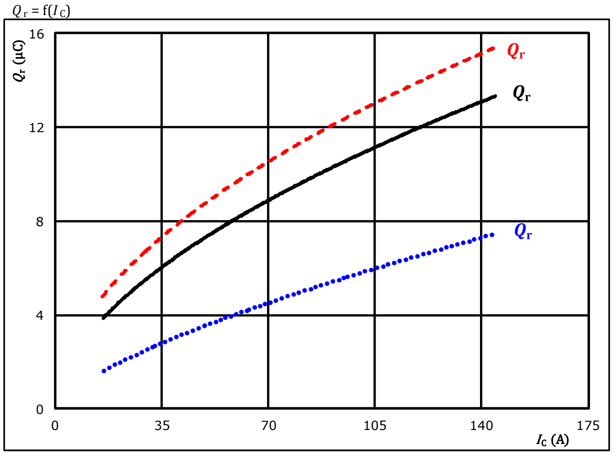
At					
$V_{CE} =$	600	V	T_j:	25 °C	dotted
$V_{GE} =$	±15	V		125 °C	solid
$I_C =$	80	A		150 °C	dashed

H-Bridge Switch - Lo side / H-Bridge Switch - Hi side Characteristics

figure 9. FWD

Typical recovered charge as a function of collector current

$Q_r = f(I_C)$

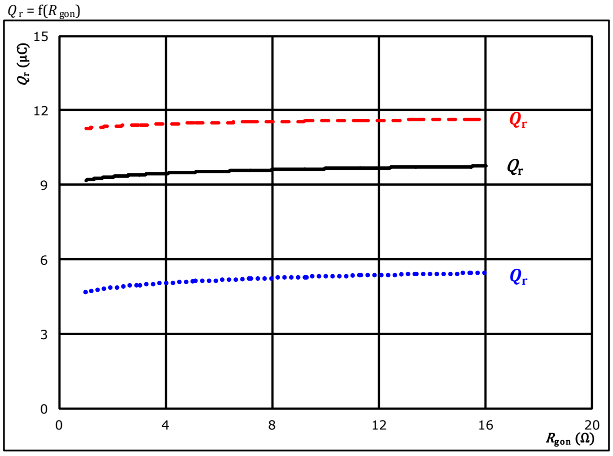


At					
V_{CE} =	600	V	T_j:	25 °C	dotted
V_{GE} =	±15	V		125 °C	solid
R_{gon} =	4	Ω		150 °C	dashed

figure 10. FWD

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

$Q_r = f(R_{gon})$

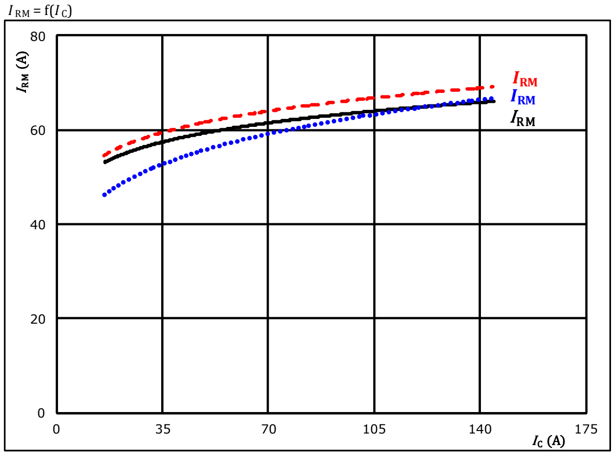


At					
V_{CE} =	600	V	T_j:	25 °C	dotted
V_{GE} =	±15	V		125 °C	solid
I_C =	80	A		150 °C	dashed

figure 11. FWD

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

$I_{RM} = f(I_C)$

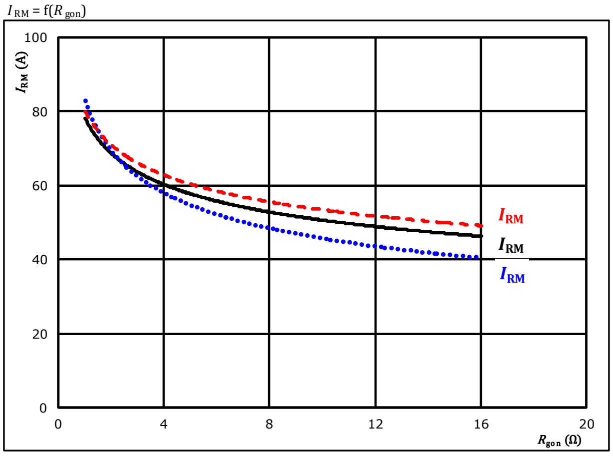


At					
V_{CE} =	600	V	T_j:	25 °C	dotted
V_{GE} =	±15	V		125 °C	solid
R_{gon} =	4	Ω		150 °C	dashed

figure 12. FWD

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

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



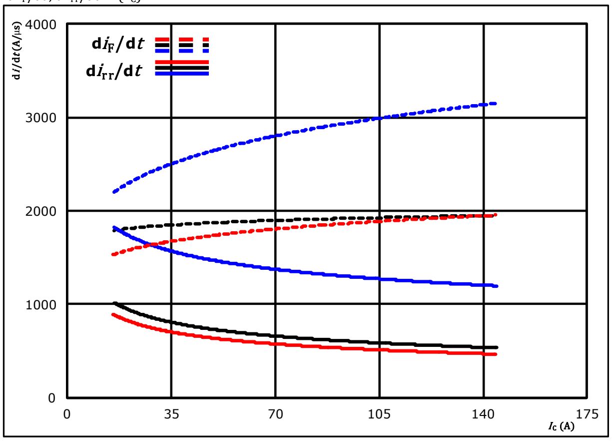
At					
V_{CE} =	600	V	T_j:	25 °C	dotted
V_{GE} =	±15	V		125 °C	solid
I_C =	80	A		150 °C	dashed

H-Bridge Switch - Lo side / H-Bridge Switch - Hi side Characteristics

figure 13. FWD

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

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

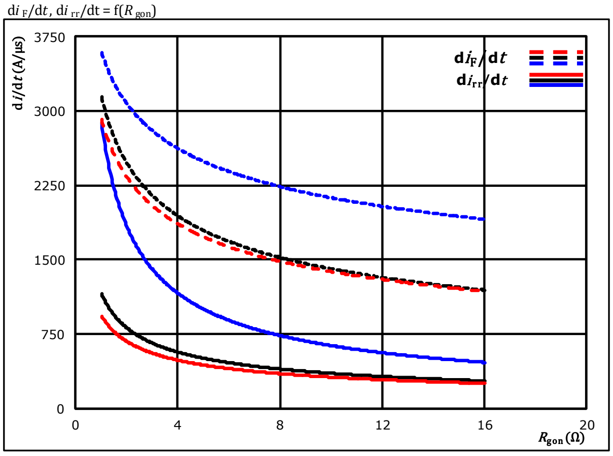


At					
V_{CE} =	600	V	T_j:	25 °C	dotted
V_{GE} =	±15	V		125 °C	solid
R_{gon} =	4	Ω		150 °C	dashed

figure 14. FWD

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

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

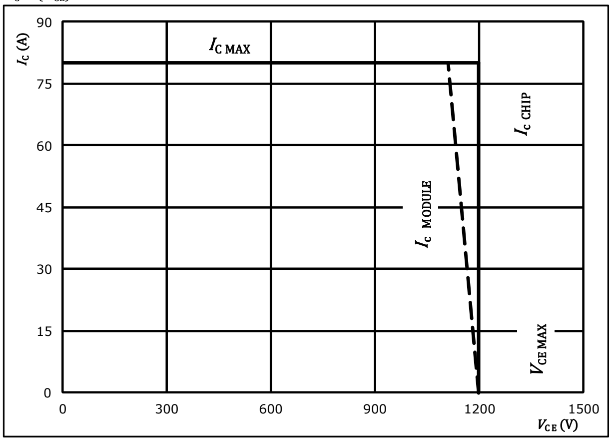


At					
V_{CE} =	600	V	T_j:	25 °C	dotted
V_{GE} =	±15	V		125 °C	solid
I_C =	80	A		150 °C	dashed

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

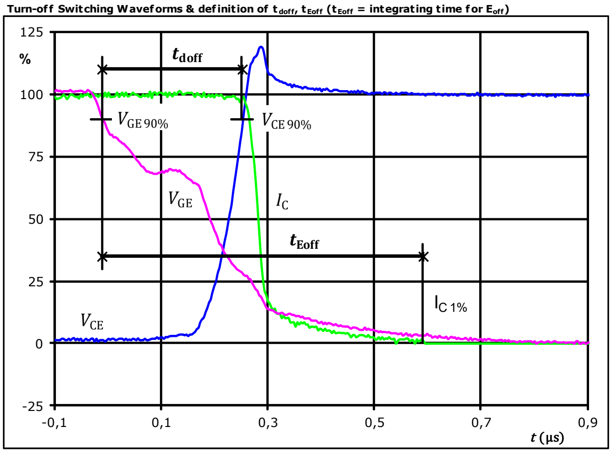
H-Bridge Switch - Lo side / H-Bridge Switch - Hi side Characteristics

General conditions

T_j	=	125 °C
R_{gon}	=	4 Ω
R_{goff}	=	4 Ω

figure 1. IGBT

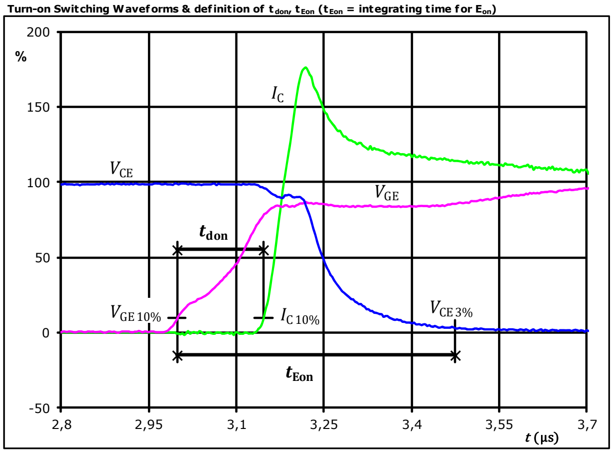
Turn-off Switching Waveforms & definition of t_{doff}, t_{Eoff} (t_{Eoff} = integrating time for E_{off})



V_{GE} (0%) =	-15	V
V_{GE} (100%) =	15	V
V_C (100%) =	600	V
I_C (100%) =	80	A
t_{doff} =	0,264	µs
t_{Eoff} =	0,603	µs

figure 2. IGBT

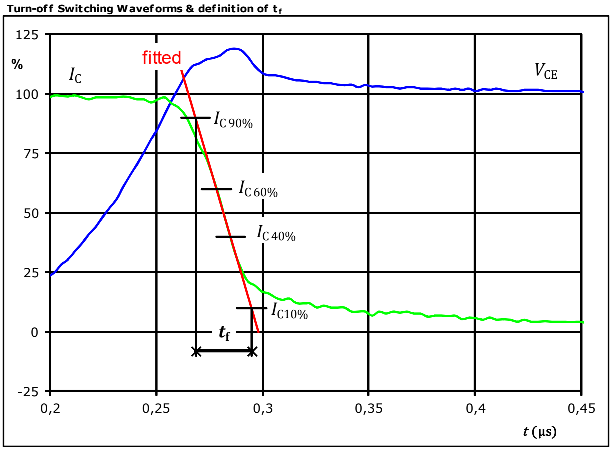
Turn-on Switching Waveforms & definition of t_{don}, t_{Eon} (t_{Eon} = integrating time for E_{on})



V_{GE} (0%) =	-15	V
V_{GE} (100%) =	15	V
V_C (100%) =	600	V
I_C (100%) =	80	A
t_{don} =	0,149	µs
t_{Eon} =	0,476	µs

figure 3. IGBT

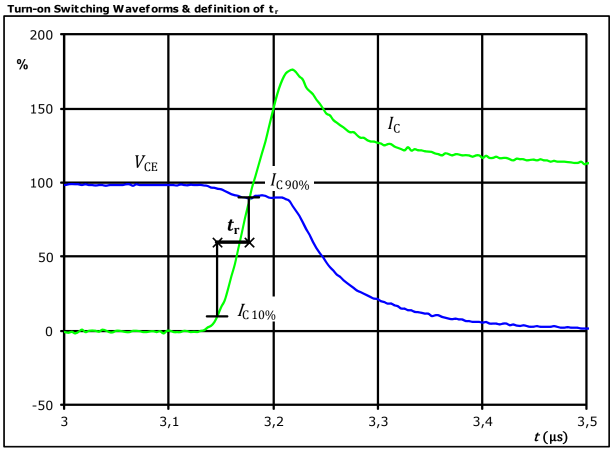
Turn-off Switching Waveforms & definition of t_f



V_C (100%) =	600	V
I_C (100%) =	80	A
t_f =	0,027	µs

figure 4. IGBT

Turn-on Switching Waveforms & definition of t_r

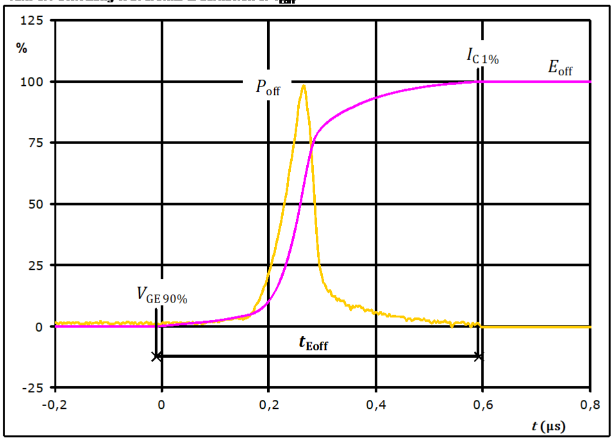


V_C (100%) =	600	V
I_C (100%) =	80	A
t_r =	0,030	µs

H-Bridge Switch - Lo side / H-Bridge Switch - Hi side Characteristics

figure 5. IGBT

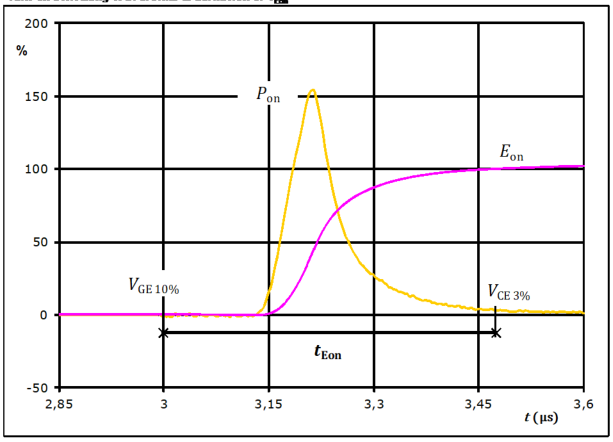
Turn-off Switching Waveforms & definition of t_{Eoff}



P_{off}(100%) =	48,24	kW
E_{off}(100%) =	3,97	mJ
t_{Eoff} =	0,60	µs

figure 6. IGBT

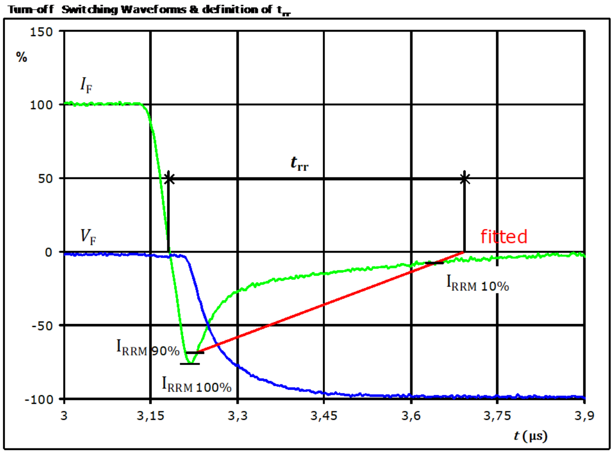
Turn-on Switching Waveforms & definition of t_{Eon}



P_{on}(100%) =	48,24	kW
E_{on}(100%) =	6,67	mJ
t_{Eon} =	0,48	µs

figure 7. FWD

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

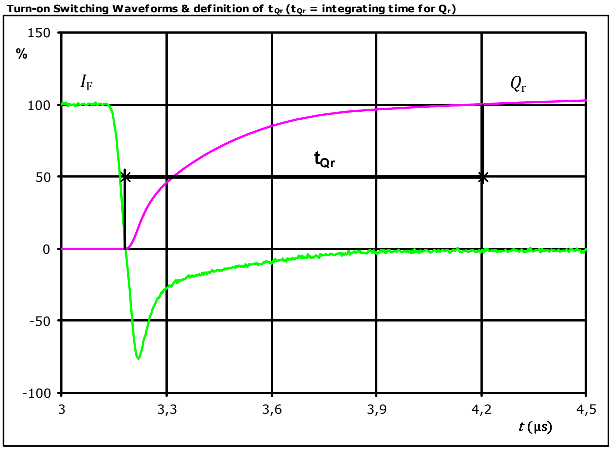


V_F(100%) =	600	V
I_F(100%) =	80	A
I_{RRM}(100%) =	-61	A
t_{rr} =	0,474	µs

H-Bridge Switch - Lo side / H-Bridge Switch - Hi side Characteristics

figure 8. **FWD**

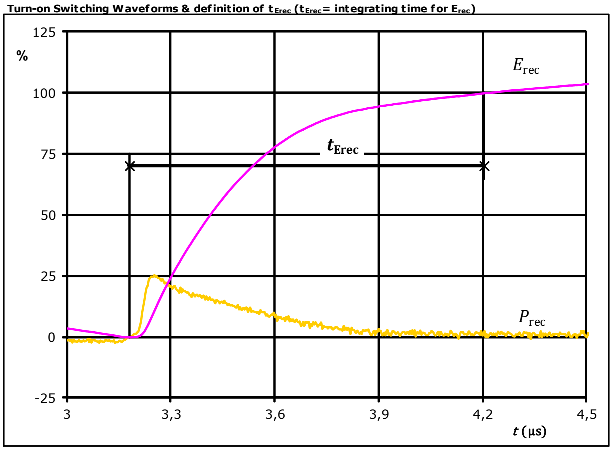
Turn-on Switching Waveforms & definition of t_{Qr} (t_{Qr} = integrating time for Q_r)



I_F (100%) =	80	A
Q_r (100%) =	9,37	µC
t_{Qr} =	1,02	µs

figure 9. **FWD**

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

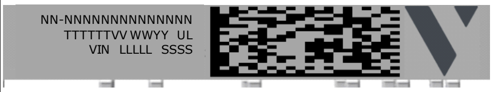


P_{rec} (100%) =	48,24	kW
E_{rec} (100%) =	3,75	mJ
t_{Erec} =	1,02	µs

10-FY124PA080FV-L589F88
10-PY124PA080FV-L589F88Y
datasheet

Ordering Code & Marking

Version	Ordering Code
without thermal paste 12 mm housing with solder pins	10-FY124PA080FV-L589F88
without thermal paste 12 mm housing with solder pins and Press-fit pins	10-PY124PA080FV-L589F88Y
with thermal paste 12 mm housing with solder pins	10-FY124PA080FV-L589F88-/3/
with thermal paste 12 mm housing with Press-fit pins	10-PY124PA080FV-L589F88Y-/3/

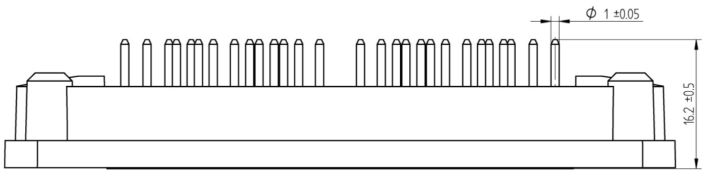


Text	Name		Date code	UL & VIN	Lot	Serial
	NN-NNNNNNNNNNNNNN-TTTTTTVV		WWYY	UL VIN	LLLLL	SSSS
Datamatrix	Type&Ver	Lot number	Serial	Date code		
	TTTTTTTVV	LLLLL	SSSS	WWYY		

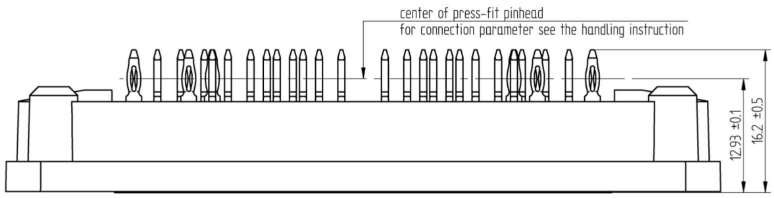
Outline

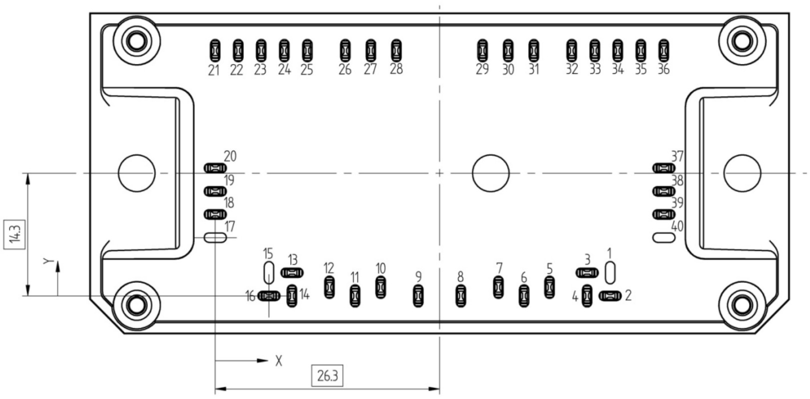
Pin table			
Pin	X	Y	Function
1	Not assembled		
2	46,3	0	DC-2
3	43,6	2,7	DC-2
4	43,6	0	DC-2
5	39,2	1	G13-a
6	36,2	0	S13
7	33,2	1	G13-b
8	28,8	0	Therm2
9	23,8	0	Therm1
10	19,4	1	G11-b
11	16,4	0	S11
12	13,4	1	G11-a
13	9	2,7	DC-1
14	9	0	DC-1
15	Not assembled		
16	6,3	0	DC-1
17	Not assembled		
18	0	9,5	DC+
19	0	12,2	DC+
20	0	14,9	DC+
21	0	28,6	Ph1
22	2,7	28,6	Ph1
23	5,4	28,6	Ph1
24	8,1	28,6	Ph1
25	10,8	28,6	Ph1
26	15,25	28,6	G12-a
27	18,25	28,6	S12
28	21,25	28,6	G12-b
29	31,35	28,6	G14-b
30	34,35	28,6	S14
31	37,35	28,6	G14-a
32	41,8	28,6	Ph2
33	44,5	28,6	Ph2
34	47,2	28,6	Ph2
35	49,9	28,6	Ph2
36	52,6	28,6	Ph2
37	52,6	14,9	DC+
38	52,6	12,2	DC+
39	52,6	9,5	DC+
40	Not assembled		

Solder pins



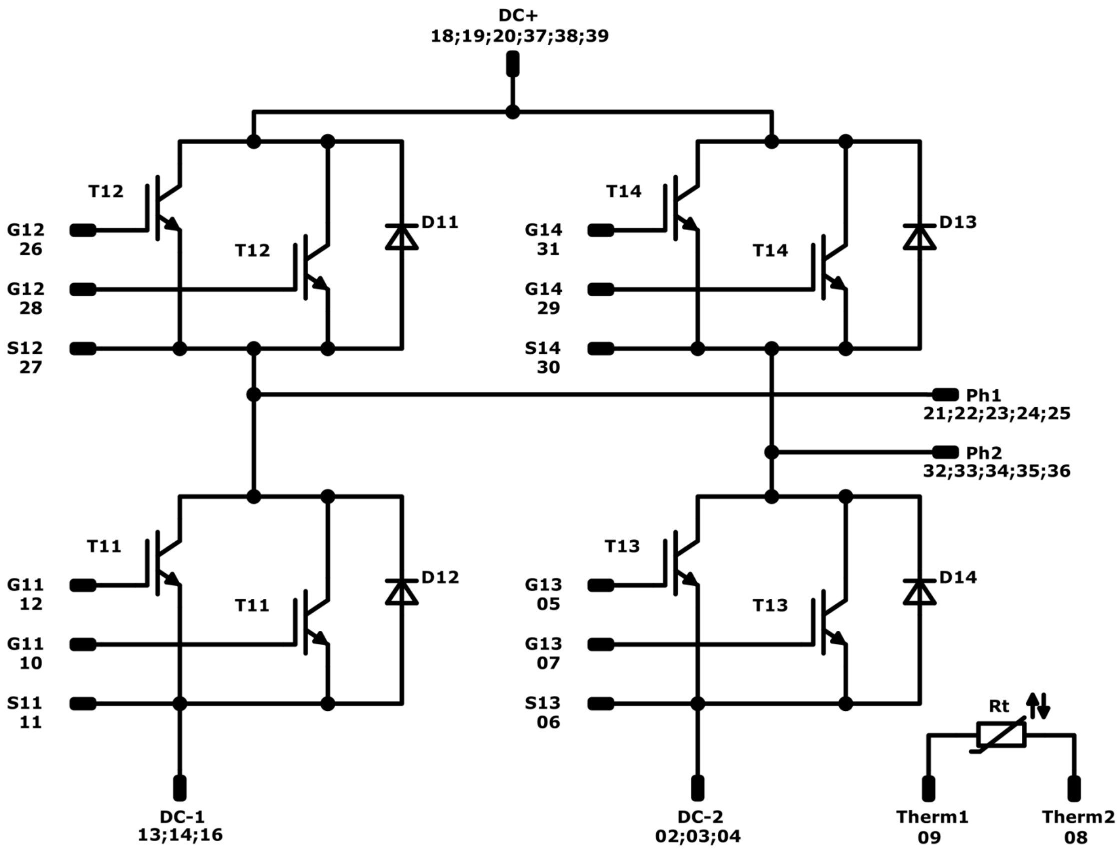
Press-fit pins





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, T13	IGBT	1200 V	80 A	H-Bridge Switch - Lo side	Parallel devices with separate control. Values apply to complete device.
D12, D14	FWD	1200 V	50 A	H-Bridge Diode - Lo side	
T12, T14	IGBT	1200 V	80 A	H-Bridge Switch - Hi side	Parallel devices with separate control. Values apply to complete device.
D11, D13	FWD	1200 V	50 A	H-Bridge Diode - Hi side	
Rt	NTC			Thermistor	

10-FY124PA080FV-L589F88
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datasheet

Vincotech

Packaging instruction				
Standard packaging quantity (SPQ) 100	>SPQ	Standard	<SPQ	Sample

Handling instruction
Handling instructions for *flow* 1 packages see vincotech.com website.

Package data
Package data for *flow* 1 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-xY124PA080FV-L589F88x-D2-14	07 Jan. 2019	Added thermal paste option to ordering code	15