Vincotech

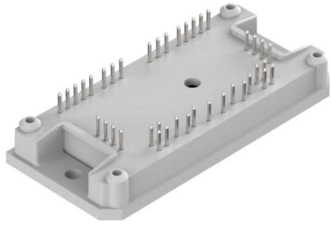
10-FY074PA100SM-L583F08
datasheet

fast PACK 1 H C — 650 V / 100 A

Features

- High-efficient H-Bridge
- Open emitter topology
- Fast IGBT H5 + Fast Rapid 1 Diode
- Integrated capacitors
- Integrated thermistor
- Low inductive 12mm housing

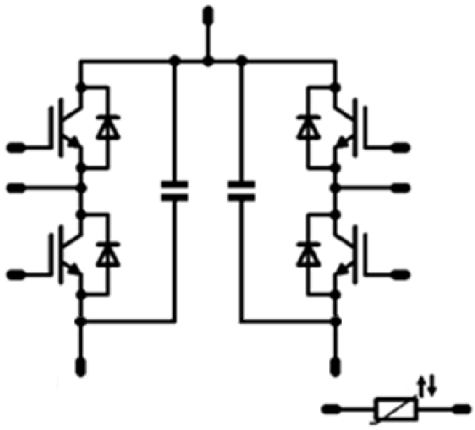
flow 1 12mm housing



Target applications

- SMPS
- Solar
- Welding

Schematic



Types

- 10-FY074PA100SM-L583F08

Maximum Ratings

T_j=25°C, unless otherwise specified

Parameter	Symbol	Condition	Value	Unit
Inverter Switch				
Collector-emitter voltage	V_{CES}		650	V
Collector current	I_C	$T_j = T_{jmax}$ T_s =80 °C	79	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}	300	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ T_s =80 °C	133	W
Gate-emitter voltage	V_{GES}		±20	V
Maximum Junction Temperature	T_{jmax}		175	°C

Parameter	Symbol	Conditions		Value	Unit
Inverter Diode					
Peak Repetitive Reverse Voltage	V_{RRM}			650	V
Continuous (direct) forward current	I_F	$T_j = T_{jmax}$	T_s = 80°C	59	A
Repetitive peak forward current	I_{FRM}			120	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80°C	83	W
Maximum Junction Temperature	T_{jmax}			175	°C

Parameter	Symbol	Conditions	Value	Unit
DC Link Capacitance				
Maximum DC voltage	V_{MAX}		630	V
Operation Temperature	T_{op}		-55…+125	°C

Parameter	Symbol	Conditions	Value	Unit
Module Properties				
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				8,1	mm
Comparative Tracking Index	CTI			>200	

Characteristic Values

Inverter Switch

Parameter	Symbol	Conditions					Value			Unit
			V_{GE} [V]	V_{CE} [V]	I_C [A]	T_j[°C]	Min	Typ	Max	
Static										
Gate-emitter threshold voltage	$V_{GE(th)}$	$V_{GE}=V_{CE}$			0,001	25 125	3,3	4	4,7	V
Collector-emitter saturation voltage	V_{CEsat}		15		100	25 125	1	1,63 1,78	2,22	V
Collector-emitter cut-off current	I_{CES}		0	650		25 125			80	µA
Gate-emitter leakage current	I_{GES}		20	0		25 125			240	nA
Internal gate resistance	r_g							none		Ω
Input capacitance	C_{ies}	f=1 MHz	0	25		25		6000		pF
Output capacitance	C_{oes}							100		
Reverse transfer capacitance	C_{res}							22		
Gate charge	Q_g		15	520	100	25		240		nC
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	phase-change material λ=3,4W/mK						0,72		K/W
IGBT Switching										
Turn-on delay time	$t_{d(on)}$	R_{goff} = 4 Ω R_{gon} = 4 Ω	±15	350	100	25 125 150		41 41 41		ns
Rise time	t_r					25 125 150		13 15 16		
Turn-off delay time	$t_{d(off)}$					25 125 150		102 113 117		
Fall time	t_f					25 125 150		5 8 11		
Turn-on energy (per pulse)	E_{on}	Q_{rFWD} = 2,6 µC Q_{rFWD} = 4,7 µC Q_{rFWD} = 5,4 µC				25 125 150		0,886 1,186 1,286		mWs
Turn-off energy (per pulse)	E_{off}					25 125 150		0,387 0,642 0,706		

Inverter Diode

Parameter	Symbol	Conditions					Value			Unit
				V_r [V]	I_F [A]	T_j [°C]	Min	Typ	Max	
Static										
Forward voltage	V_F				60	25 125 150		1,52 1,45 1,43	1,77	V
Reverse leakage current	I_r			650		25 150			3,2	µA
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	phase-change material λ=3,4W/mK						1,15		K/W
FWD Switching										
Peak recovery current	I_{RRM}	di/dt = 3535 A/µs di/dt = 4800 A/µs di/dt = 5060 A/µs	±15	350	100	25 125 150		65 87 91		A
Reverse recovery time	t_{rr}					25 125 150		78 105 117		ns
Recovered charge	Q_r					25 125 150		2,565 4,690 5,388		µC
Reverse recovered energy	E_{rec}					25 125 150		0,511 0,980 1,135		mWs
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 125 150		884 994 989		A/µs

DC Link Capacitance

Parameter	Symbol	Conditions					Value			Unit
						T_j[°C]	Min	Typ	Max	
Capacitance	C							200		nF
Tolerance							-10		+10	%

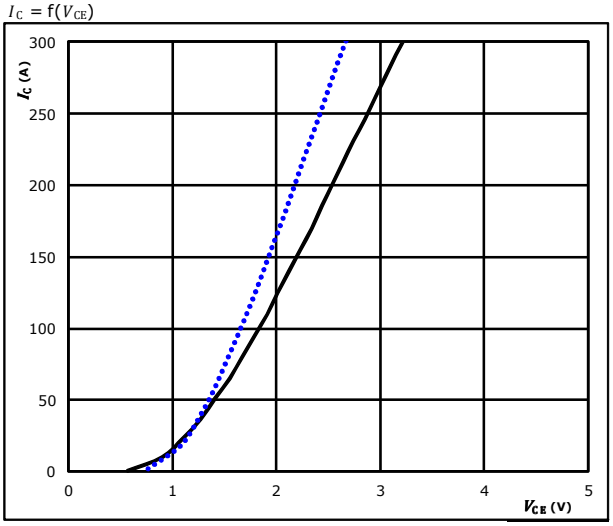
Thermistor

Parameter	Symbol	Conditions					Value			Unit
			V_{GE}[V]	V_{CE}[V]	I_C[A]	T_j[°C]	Min	Typ	Max	
Rated resistance	R					25		21,5		kΩ
Deviation of R100	$\Delta_{R/R}$	R100=1486 Ω				100	-4,5		+4,5	%
Power dissipation	P					25		210		mW
Power dissipation constant						25		3,5		mW/K
B-value	$B_{(25/50)}$					25		3884		K
B-value	$B_{(25/100)}$					25		3964		K
Vincotech NTC Reference									F	

Inverter Switch Characteristics

Typical output characteristics **IGBT**

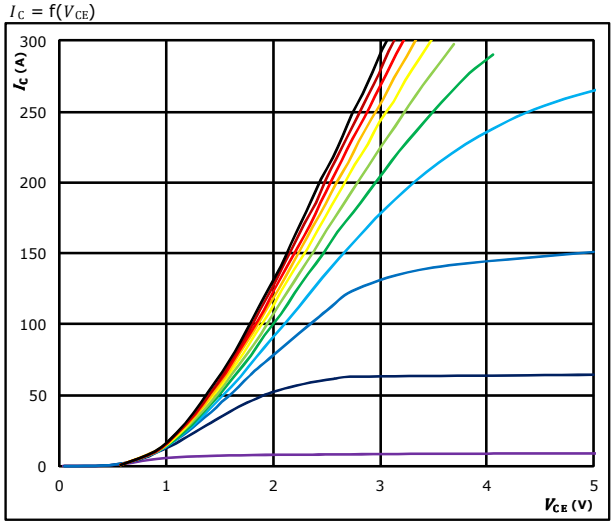
$I_C = f(V_{CE})$



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

Typical output characteristics **IGBT**

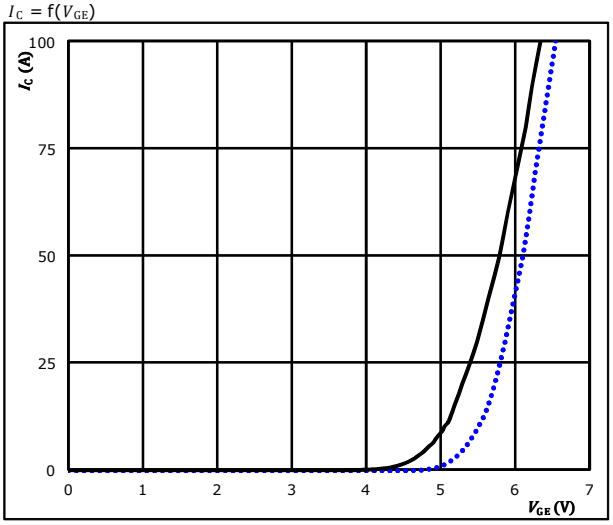
$I_C = f(V_{CE})$



t_p =	250	µs
T_j =	125	°C
V_{GE} from	5 V to 19 V in steps of 1 V	

Typical transfer characteristics **IGBT**

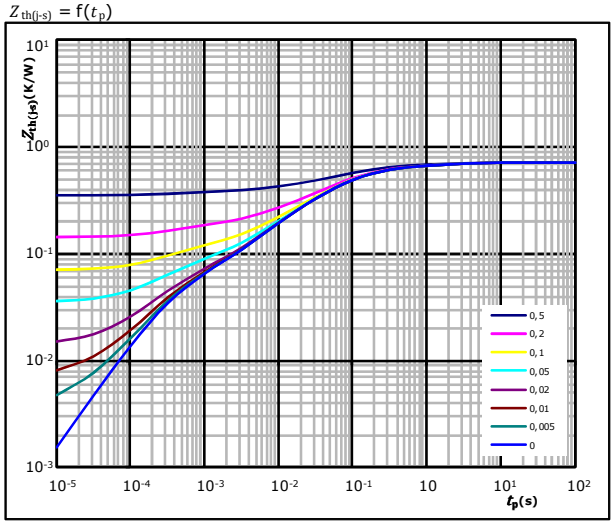
$I_C = f(V_{GE})$



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

Transient Thermal Impedance as function of Pulse duration **IGBT**

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



D =	t_p / T	
$R_{th(j-s)}$ =	0,72	K/W

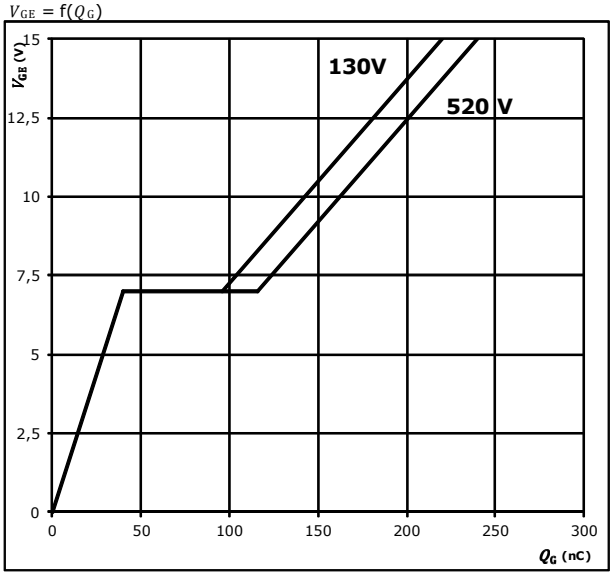
IGBT thermal model values

R_{th} (K/W)	τ (s)
7,52E-02	1,73E+00
1,31E-01	2,44E-01
3,01E-01	6,32E-02
1,21E-01	1,39E-02
4,30E-02	3,50E-03
4,35E-02	3,33E-04

Inverter Switch Characteristics

Gate voltage vs Gate charge **IGBT**

$V_{GE} = f(Q_G)$

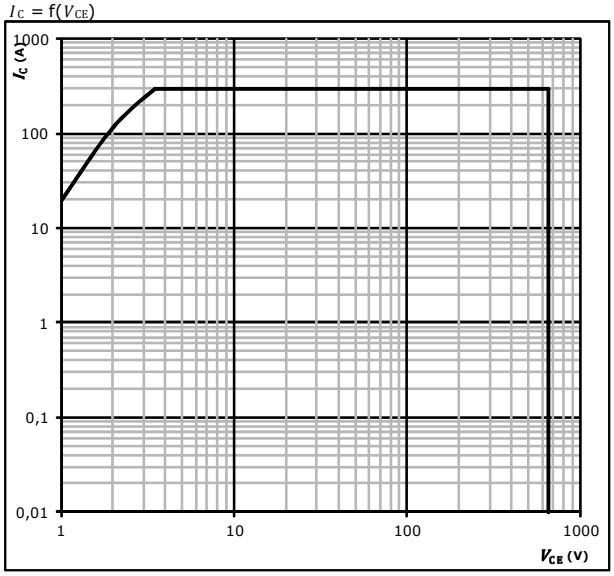


At

I_C= 100 A

Safe operating area **IGBT**

$I_C = f(V_{CE})$



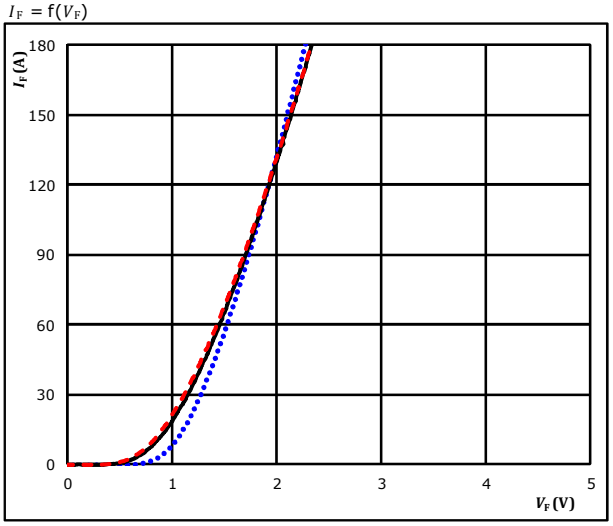
At

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

Inverter Diode Characteristics

Typical forward characteristics **FWD**

$I_F = f(V_F)$

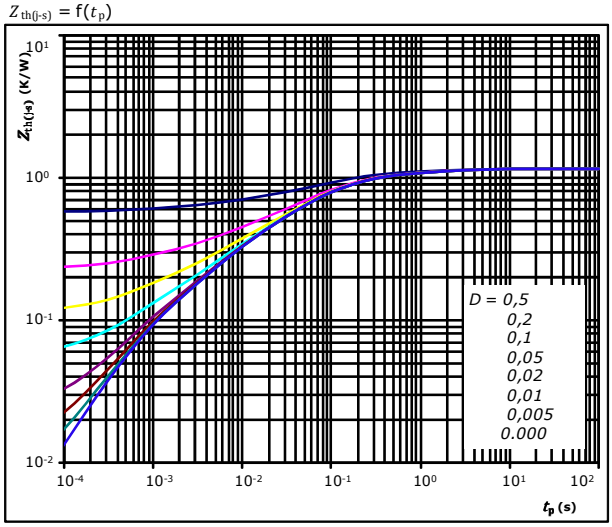


t_p = 250 µs

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

$R_{th(j-s)}$ = 1,15 K/W

FWD thermal model values

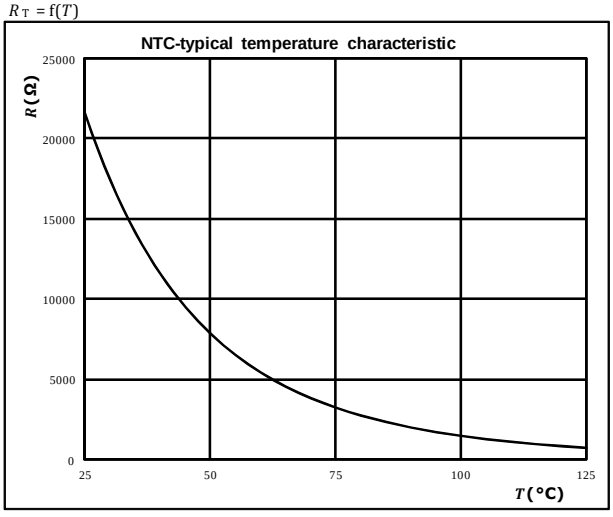
R (K/W)	τ (s)
7,9580E-02	2,7140E+00
1,5790E-01	4,4770E-01
4,6040E-01	9,1060E-02
2,2560E-01	2,4420E-02
1,5160E-01	5,4170E-03
6,9580E-02	7,3100E-04

Thermistor Characteristics

Thermistor typical temperature characteristic

Typical NTC characteristic as a function of temperature

$R_T = f(T)$

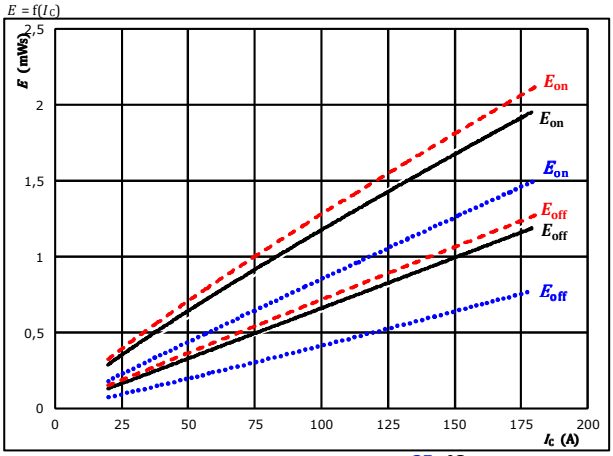


Inverter Switching Characteristics

Figure 1. **IGBT**

Typical switching energy losses as a function of collector current

$E = f(I_C)$



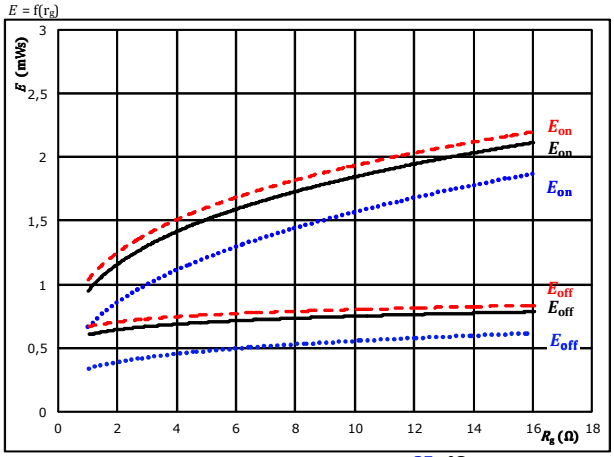
With an inductive load at

V_{CE} =	350	V	T_j:	25 °C
V_{GE} =	+15/-5	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

$E = f(r_G)$



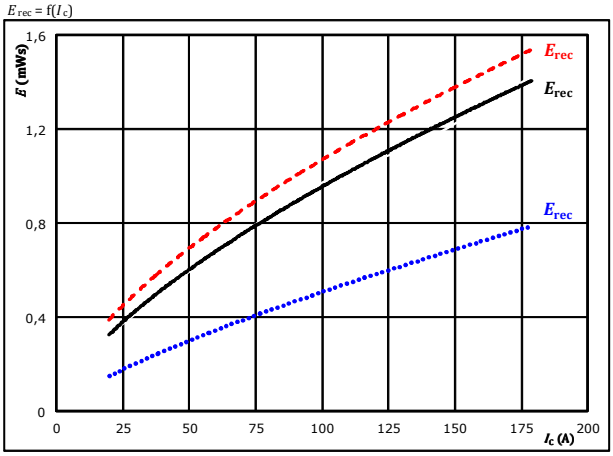
With an inductive load at

V_{CE} =	350	V	T_j:	25 °C
V_{GE} =	+15/-5	V		125 °C
I_C =	100	A		150 °C

Figure 3. **FWD**

Typical reverse recovered energy loss as a function of collector current

$E_{rec} = f(I_C)$



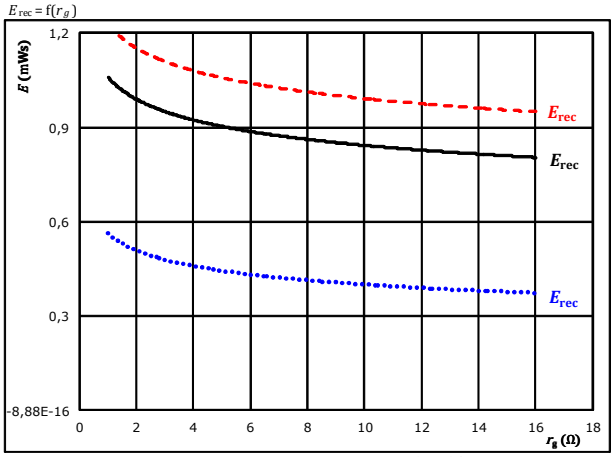
With an inductive load at

V_{CE} =	350	V	T_j:	25 °C
V_{GE} =	+15/-5	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

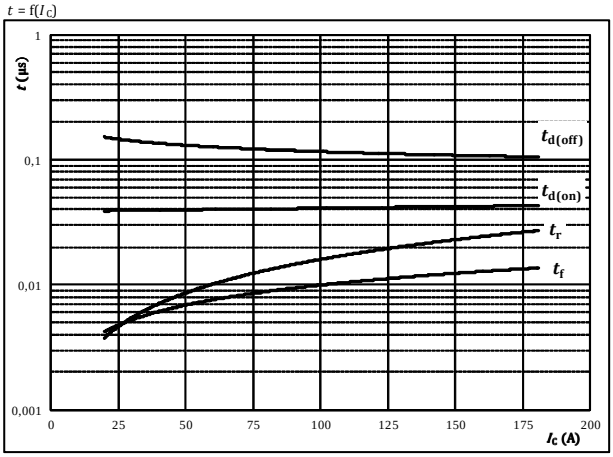
V_{CE} =	350	V	T_j:	25 °C
V_{GE} =	+15/-5	V		125 °C
I_C =	100	A		150 °C

Inverter Switching Characteristics

Figure 5. **IGBT**

Typical switching times as a function of collector current

$t = f(I_C)$



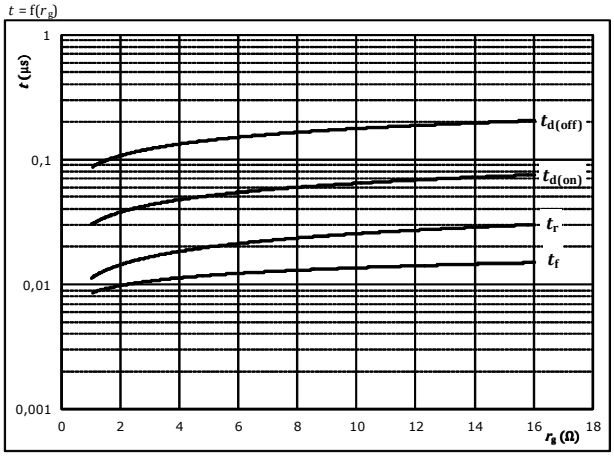
With an inductive load at

T_j =	150	°C
V_{CE} =	350	V
V_{GE} =	+15/-5	V
R_{gon} =	4	Ω
R_{goff} =	4	Ω

Figure 6. **IGBT**

Typical switching times as a function of gate resistor

$t = f(r_g)$



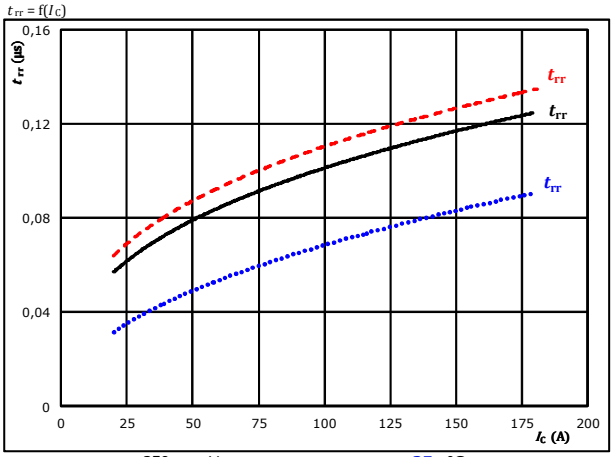
With an inductive load at

T_j =	150	°C
V_{CE} =	350	V
V_{GE} =	+15/-5	V
I_C =	100	A

Figure 7. **FWD**

Typical reverse recovery time as a function of collector current

$t_{rr} = f(I_C)$

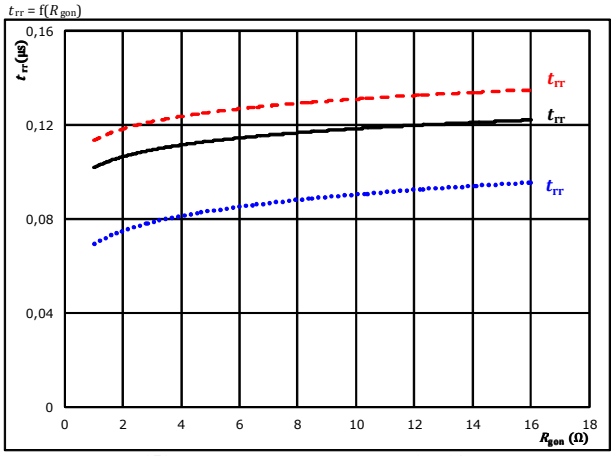


At	V_{CE}=	350	V	T_j:	25 °C
	V_{GE} =	+15/-5	V		125 °C
	R_{gon} =	4	Ω		150 °C

Figure 8. **FWD**

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

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



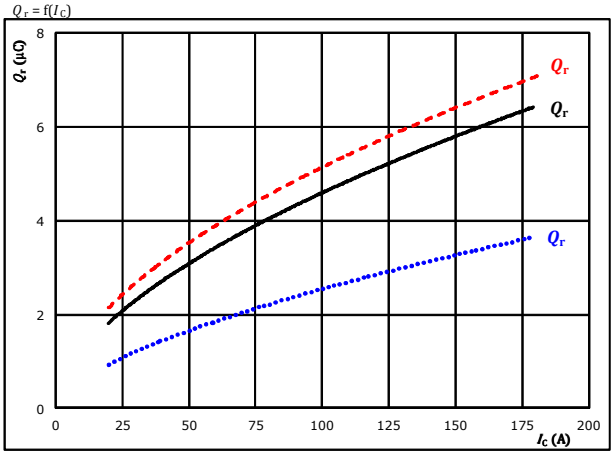
At	V_{CE} =	350	V	T_j:	25 °C
	V_{GE} =	+15/-5	V		125 °C
	I_C =	100	A		150 °C

Inverter Switching Characteristics

Figure 9. **FWD**

Typical recovered charge as a function of collector current

$Q_r = f(I_C)$

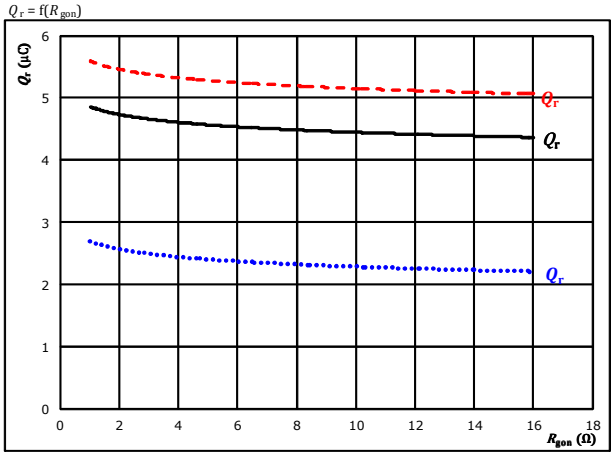


At					
	V_{CE} =	350	V		25 °C
	V_{GE} =	+15/-5	V	T_j:	125 °C
	R_{gon} =	4	Ω		150 °C

Figure 10. **FWD**

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

$Q_r = f(R_{gon})$

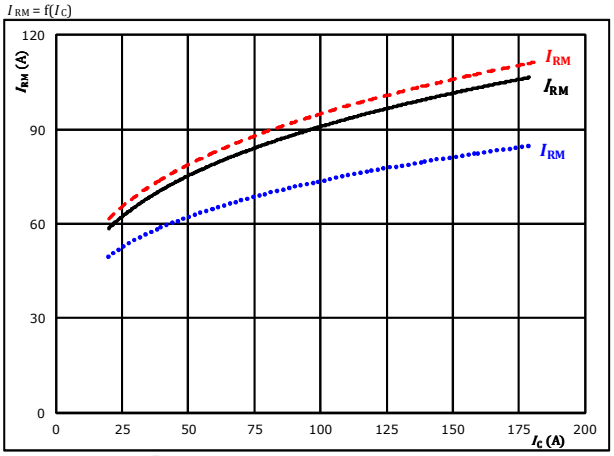


At					
	V_{CE}=	350	V		25 °C
	V_{GE} =	+15/-5	V	T_j:	125 °C
	I_C=	100	A		150 °C

Figure 11. **FWD**

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

$I_{RM} = f(I_C)$

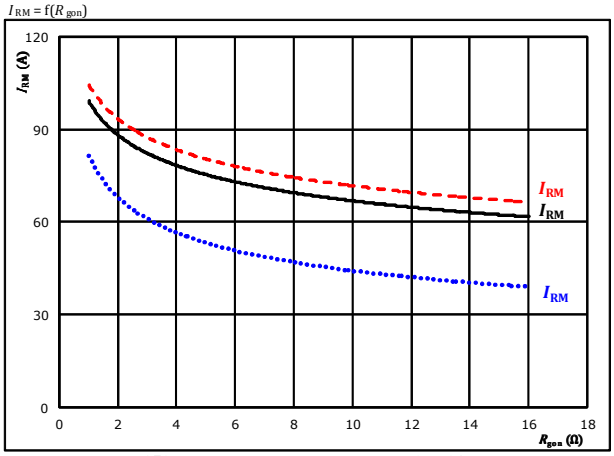


At					
	V_{CE} =	350	V		25 °C
	V_{GE} =	+15/-5	V	T_j:	125 °C
	R_{gon} =	4	Ω		150 °C

Figure 12. **FWD**

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

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



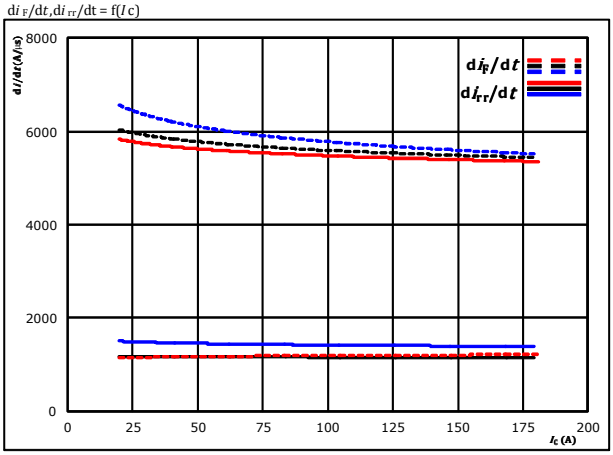
At					
	V_{CE} =	350	V		25 °C
	V_{GE} =	+15/-5	V	T_j:	125 °C
	I_C =	100	A		150 °C

Inverter Switching Characteristics

Figure 13. **FWD**

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

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

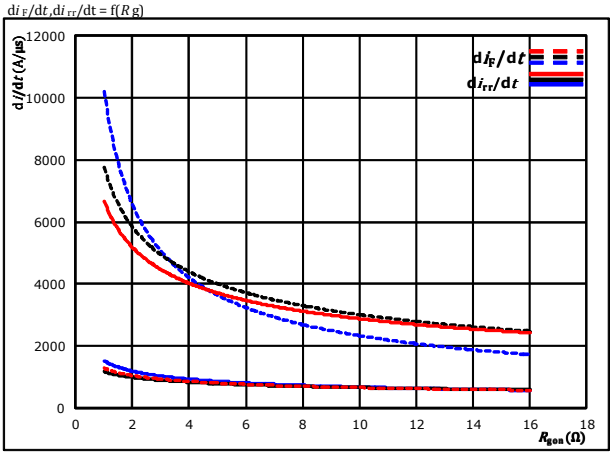


At					
V_{CE}:	350	V		25 °C	
V_{GE} =	+15/-5	V	T_j:	125 °C	
R_{gon} =	4	Ω		150 °C	

Figure 14. **FWD**

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

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

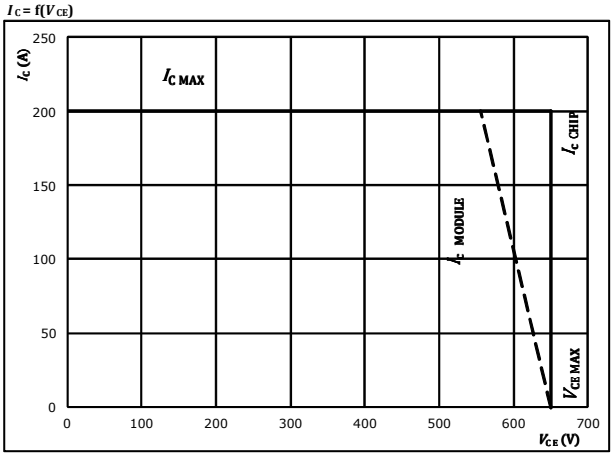


At					
V_{CE} =	350	V		25 °C	
V_{GE} =	+15/-5	V	T_j:	125 °C	
I_C=	100	A		150 °C	

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

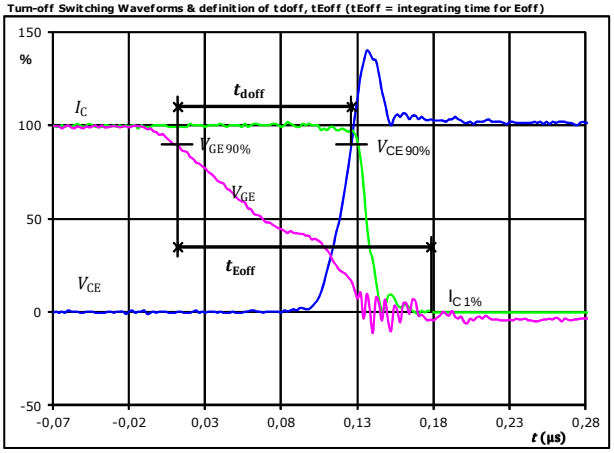
Inverter Switching Definitions

General conditions

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

Figure 1. IGBT

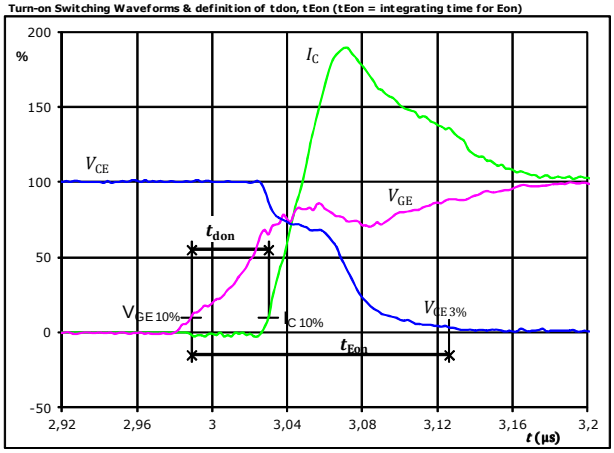
Turn-off Switching Waveforms & definition of tdoff, tEoff (tEoff = integrating time for Eoff)



$V_{GE}(0\%)$ =	-5	V
$V_{GE}(100\%)$ =	15	V
$V_C(100\%)$ =	300	V
$I_C(100\%)$ =	101	A
t_{doff} =	0,117	µs
t_{Eoff} =	0,166	µs

Figure 2. IGBT

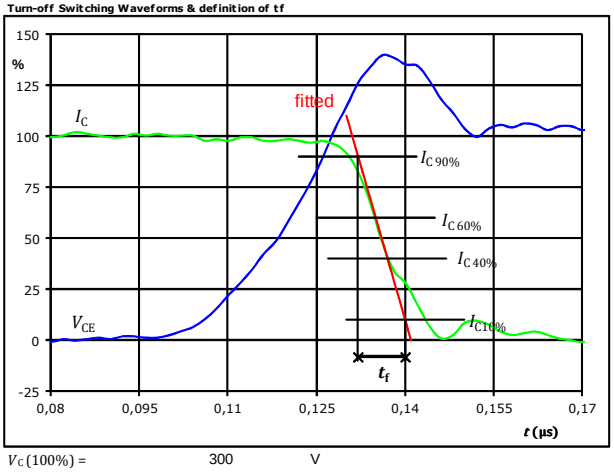
Turn-on Switching Waveforms & definition of tdon, tEon (tEon = integrating time for Eon)



$V_{GE}(0\%)$ =	-5	V
$V_{GE}(100\%)$ =	15	V
$V_C(100\%)$ =	300	V
$I_C(100\%)$ =	101	A
t_{don} =	0,041	µs
t_{Eon} =	0,137	µs

Figure 3. IGBT

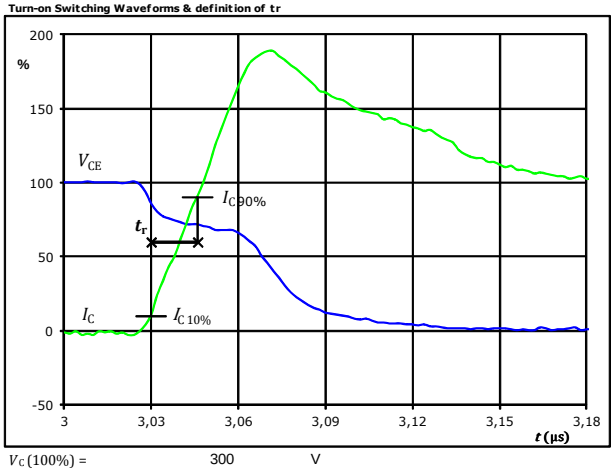
Turn-off Switching Waveforms & definition of tf



$V_C(100\%)$ =	300	V
$I_C(100\%)$ =	101	A
t_f =	0,010	µs

Figure 4. IGBT

Turn-on Switching Waveforms & definition of tr

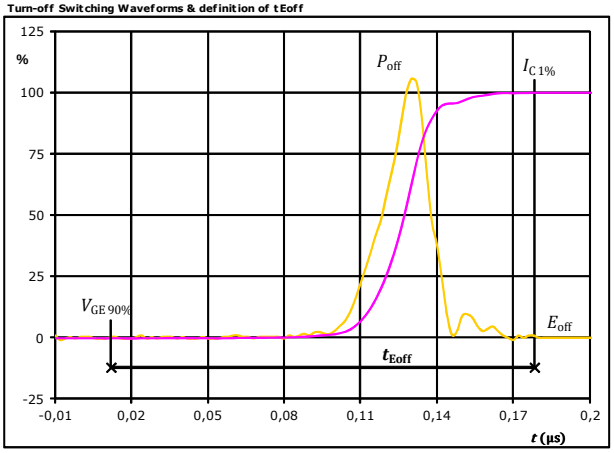


$V_C(100\%)$ =	300	V
$I_C(100\%)$ =	101	A
t_r =	0,016	µs

Inverter Switching Definitions

Figure 5. **IGBT**

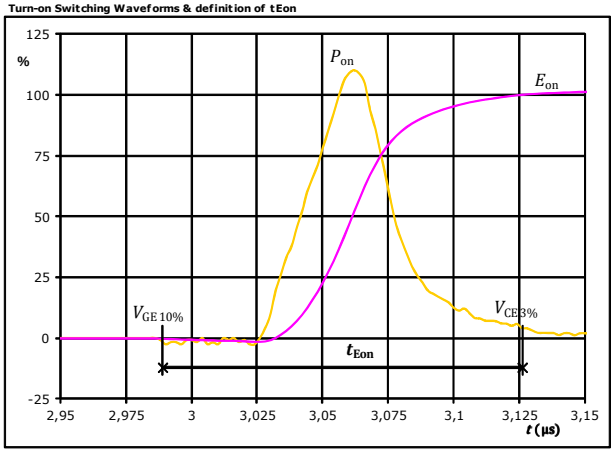
Turn-off Switching Waveforms & definition of tEoff



$P_{off}(100\%)$ =	30,29	kW
$E_{off}(100\%)$ =	0,71	mJ
t_{Eoff} =	0,17	µs

Figure 6. **IGBT**

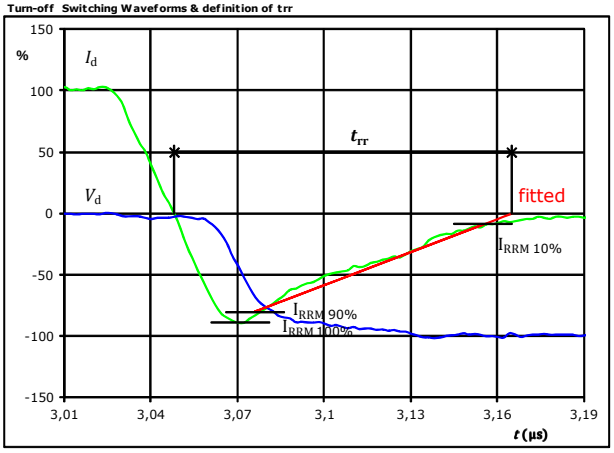
Turn-on Switching Waveforms & definition of tEon



$P_{on}(100\%)$ =	30,29	kW
$E_{on}(100\%)$ =	1,29	mJ
t_{Eon} =	0,14	µs

Figure 7. **FWD**

Turn-off Switching Waveforms & definition of trr

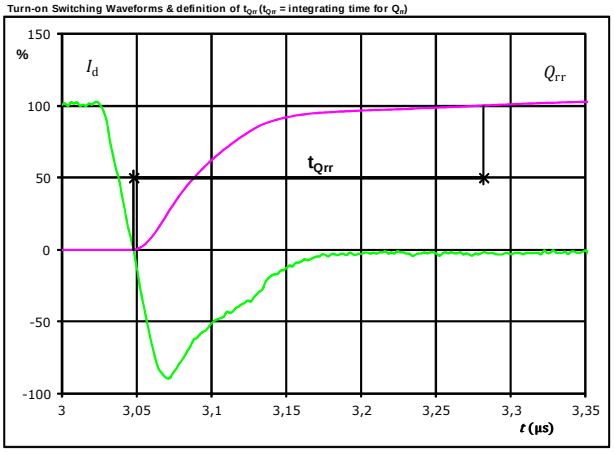


$V_d(100\%)$ =	300	V
$I_d(100\%)$ =	101	A
$I_{RRM}(100\%)$ =	-91	A
t_{rr} =	0,117	µs

Inverter Switching Definitions

Figure 8. **FWD**

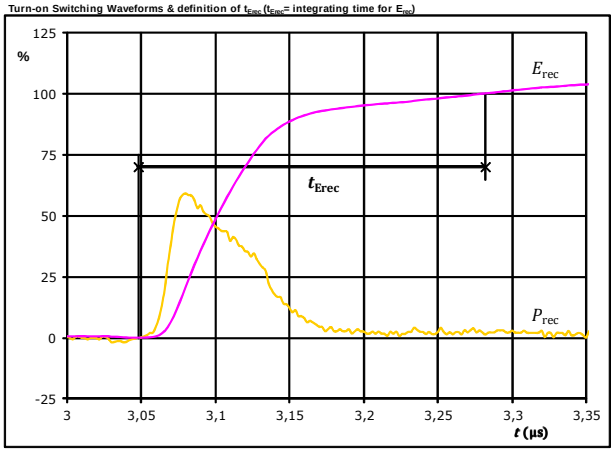
Turn-on Switching Waveforms & definition of t_{Qrr} (t_{Qrr} = integrating time for Q_{rr})



I_d (100%) =	101	A
Q_{rr} (100%) =	5,39	µC
t_{Qrr} =	0,23	µs

Figure 9. **FWD**

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



P_{rec} (100%) =	30,29	kW
E_{rec} (100%) =	1,14	mJ
t_{Erec} =	0,23	µs

Vincotech

Ordering Code & Marking

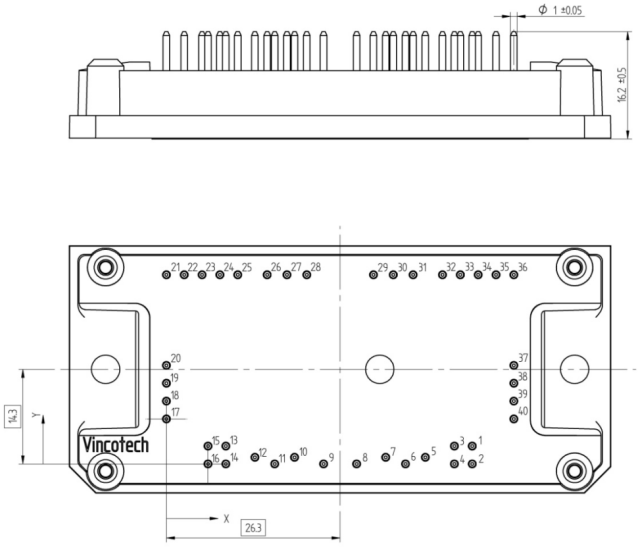
Version	Ordering Code	in DataMatrix as	in packaging barcode as
without thermal paste 12mm housing	10-FY074PA100SM-L583F08	L583F08	L583F08

NN-NNNNNNNNNNNNNN
NNNNNNNN WWYY UL
Vinco LLLLL SSSS

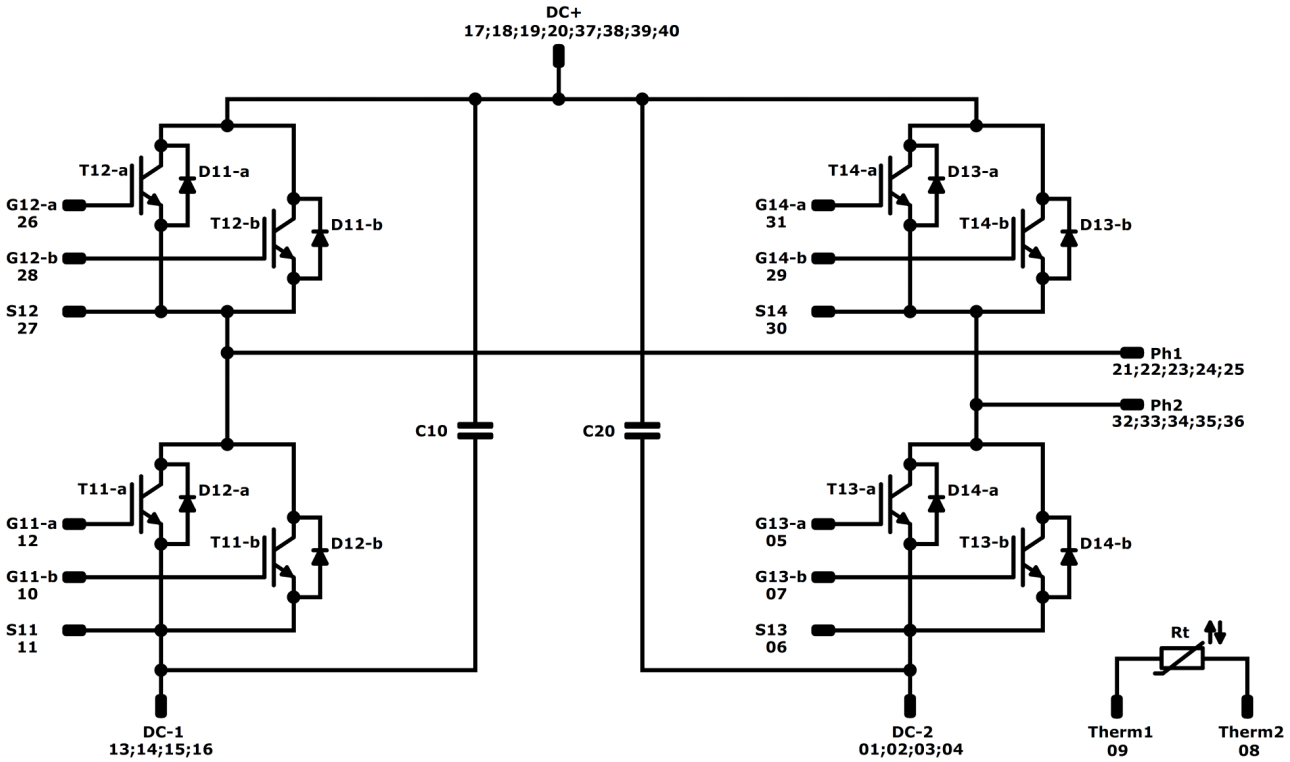
Text	**Name**		**Date code**	**UL & Vinco**	**Lot**	**Serial**
	NN-NNNNNNNNNNNNNN-NNNNNNNN		WWYY	UL Vinco	LLLLL	SSSS
Datamatrix	**Type&Ver**	**Lot number**	**Serial**	**Date code**		
	TTTTTTTVV	LLLLL	SSSS	WWYY		

Outline

Pin table [mm]				Pin table [mm]			
Pin	X	Y	Function	Pin	X	Y	Function
1	46,3	2,7	DC-2	30	34,35	28,6	S14
2	46,3	0	DC-2	31	37,35	28,6	G14-a
3	43,6	2,7	DC-2	32	41,8	28,6	Ph2
4	43,6	0	DC-2	33	44,5	28,6	Ph2
5	39,2	1	G13-a	34	47,2	28,6	Ph2
6	36,2	0	S13	35	49,9	28,6	Ph2
7	33,2	1	G13-b	36	52,6	28,6	Ph2
8	28,8	0	Therm2	37	52,6	14,9	DC+
9	23,8	0	Therm1	38	52,6	12,2	DC+
10	19,4	1	G11-b	39	52,6	9,5	DC+
11	16,4	0	S11	40	52,6	6,8	DC+
12	13,4	1	G11-a				
13	9	2,7	DC-1				
14	9	0	DC-1				
15	6,3	2,7	DC-1				
16	6,3	0	DC-1				
17	0	6,8	DC+				
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				



Pinout



Identification

ID	Component	Voltage	Current	Function	Comment
T11-a,T11-b,T12-a, T12-b,T13-a,T13-b, T14-a,T14-b	IGBT	650V	100A	Iverter Switch	
D11-a,D11-b,D12-a, D12-b,D13-a,D13-b, D14-a,D14-b	FWD	650V	60A	Inverter Diode	
C10, C20	Capacitor	630V	-	DC Link Capacitance	
NTC	NTC	-	-	Thermistor	

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.

Document No.:	Date:	Modification:	Pages
10-FY074PA100SM-L583F08 -D1-14	29 Oct. 2015		