Vincotech

10-FY07NMA150S5-M824F58
10-PY07NMA150S5-M824F58Y
datasheet

flow **MNPC 1** **650 V / 150 A**

Features

- Special for 110V AC
- 4 quadrant operation

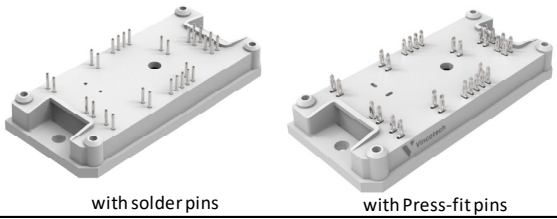
Target applications

- Solar Inverters

Types

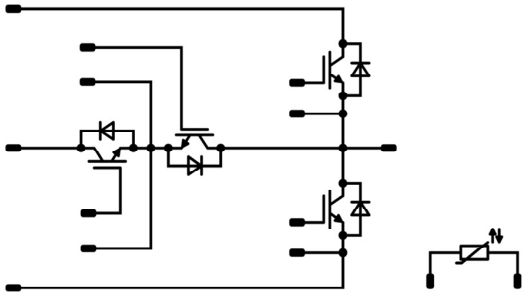
- 10-FY07NMA150S5-M824F58
- 10-PY07NMA150S5-M824F58Y

flow 1 12 mm housing



with solder pins | with Press-fit pins

Schematic



Maximum Ratings

T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Condition	Value	Unit
Buck/Boost Switch				
Collector-emitter voltage	V_{CES}		650	V
Collector current	I_C	$T_j = T_{jmax}$ T_s = 80 °C	104	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	145	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
Buck/Boost Diode				
Peak Repetitive Reverse Voltage	V_{RRM}		650	V
Continuous (direct) forward current	I_F	T_j = T_{jmax} T_s = 80 °C	101	A
Repetitive peak forward current	I_{FRM}		300	A
Total power dissipation	P_{tot}	T_j = T_{jmax} T_s = 80 °C	127	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	6000	V
		AC Voltage t_p = 1 min	2500	V
Creepage distance		with press-fit pins	min. 12,7	mm
		with solder pins	min. 12,7	mm
Clearance		with press-fit pins	7,2	mm
		with solder pins	7,48	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	
Buck/Boost Switch										
Static										
Gate-emitter threshold voltage	$V_{GE(th)}$	V_{GE} = V_{CE}			0,0015	25	3,2	4	4,8	V
Collector-emitter saturation voltage	V_{CEsat}		15		150	25 125 150		1,43 1,52 1,55	1,75	V
Collector-emitter cut-off current	I_{CES}		0	650		25			100	µA
Gate-emitter leakage current	I_{GES}		20	0		25			200	nA
Internal gate resistance	r_g							none		Ω
Input capacitance	C_{ies}	f= 1 MHz	0	25		25		9000		pF
Output capacitance	C_{oes}							260		
Reverse transfer capacitance	C_{res}							34		
Gate charge	Q_g		15	520	150	25		328		nC
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	phase-change material λ = 3,4 W/mK						0,65		K/W
Dynamic										
Turn-on delay time	$t_{d(on)}$	R_{goff} = 8 Ω R_{gon} = 8 Ω	±15	150	152	25 125 150		160 158 158		ns
Rise time	t_r					25 125 150		61 61 63		
Turn-off delay time	$t_{d(off)}$					25 125 150		132 137 145		
Fall time	t_f					25 125 150		29 30 37		
Turn-on energy (per pulse)	E_{on}	Q_{rFWD} = 3,8 µC Q_{rFWD} = 7,7 µC Q_{rFWD} = 9 µC				25 125 150		0,741 0,767 0,948		mWs
Turn-off energy (per pulse)	E_{off}					25 125 150		0,898 1,368 1,512		

Characteristic Values

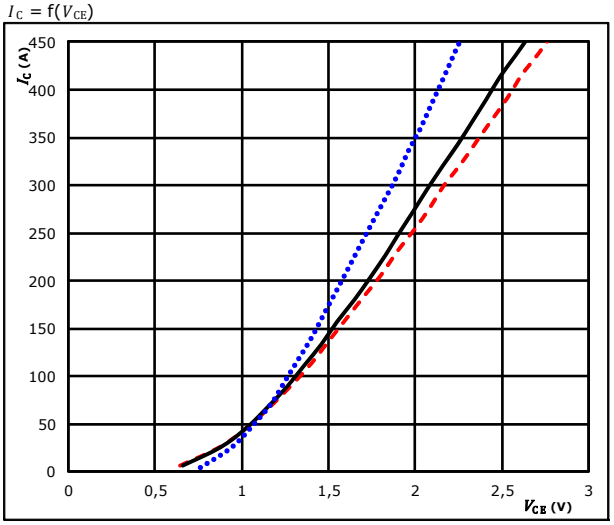
Parameter	Symbol	Conditions					Value			Unit
			V_{GE} [V] V_{GS} [V]	V_{CE} [V] V_{DS} [V] V_F [V]	I_C [A] I_D [A] I_F [A]	T_j [°C]	Min	Typ	Max	
Buck/Boost Diode										
Static										
Forward voltage	V_F				150	25 125 150		1,56 1,50 1,48	1,92	V
Reverse leakage current	I_r			650		25			7,6	µA
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	phase-change material λ = 3,4 W/mK						0,75		K/W
Dynamic										
Peak recovery current	I_{RRM}	di/dt = 1547 A/µs di/dt = 2604 A/µs di/dt = 2356 A/µs	±15	150	152	25 125 150		47 78 83		A
Reverse recovery time	t_{rr}					25 125 150		132 182 210		ns
Recovered charge	Q_r					25 125 150		3,768 7,658 9,015		µC
Reverse recovered energy	E_{rec}					25 125 150		0,390 0,833 0,992		mWs
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 125 150		439 710 724		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	

Buck/Boost Switch Characteristics

figure 1. **IGBT**

Typical output characteristics

$I_C = f(V_{CE})$

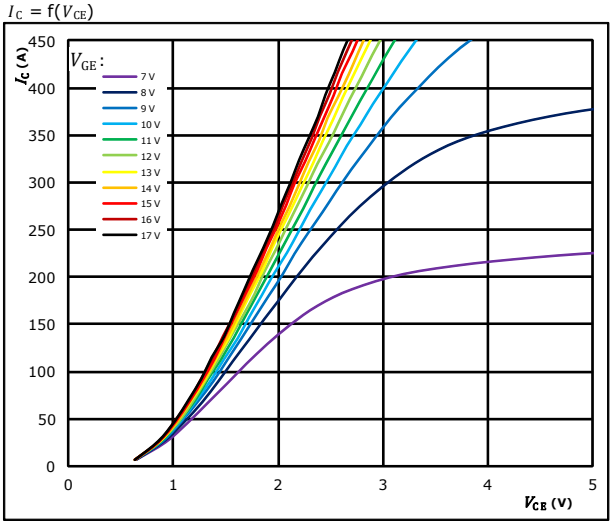


t_p =	250	µs		25 °C
V_{GE} =	15	V	T_j:	125 °C
				150 °C

figure 2. **IGBT**

Typical output characteristics

$I_C = f(V_{CE})$

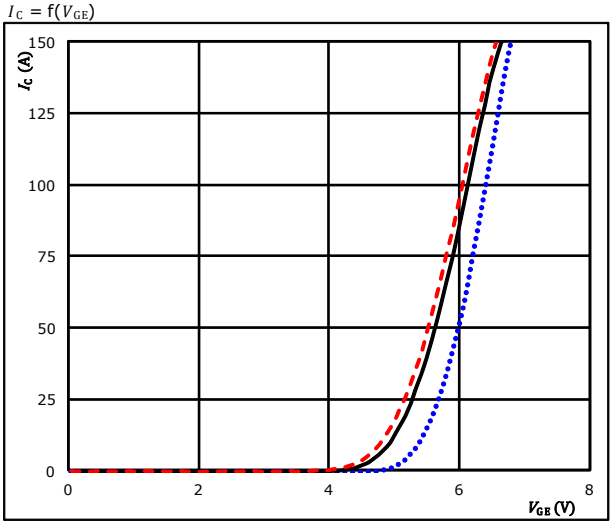


t_p =	250	µs
T_j =	150	°C
V_{GE} from	7 V to 17 V in steps of 1 V	

figure 3. **IGBT**

Typical transfer characteristics

$I_C = f(V_{GE})$

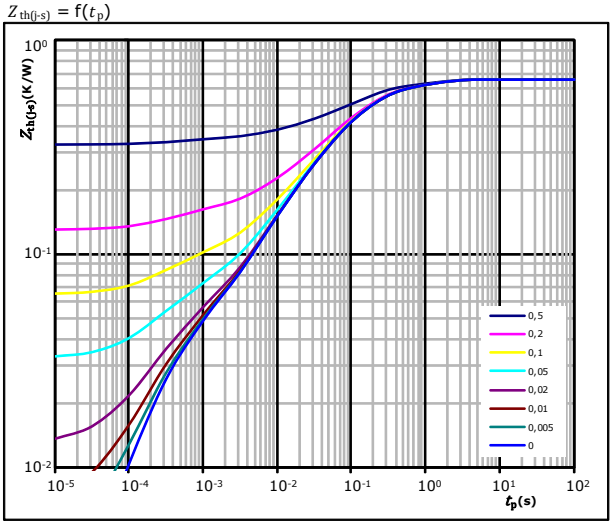


t_p =	100	µs		25 °C
V_{CE} =	10	V	T_j:	125 °C
				150 °C

figure 4. **IGBT**

Transient thermal impedance as function of pulse duration

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



D =	t_p / T	
$R_{th(j-s)}$ =	0,65	K/W

IGBT thermal model values

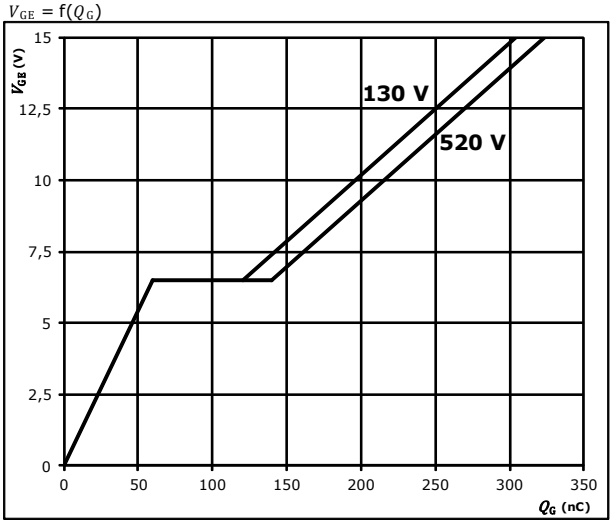
R (K/W)	τ (s)
1,13E-01	8,46E-01
2,91E-01	1,23E-01
1,38E-01	3,33E-02
6,68E-02	8,32E-03
1,32E-02	2,63E-03
3,21E-02	3,23E-04

Buck/Boost Switch Characteristics

figure 5. **IGBT**

Gate voltage vs gate charge

$V_{GE} = f(Q_G)$

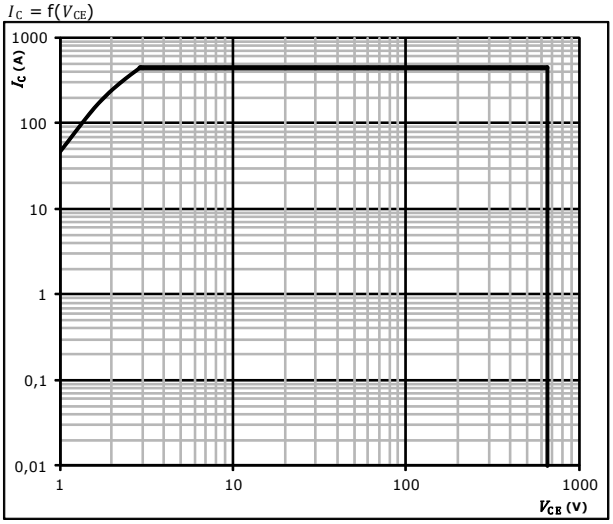


I_C= 150 A

figure 6. **IGBT**

Safe operating area

$I_C = f(V_{CE})$

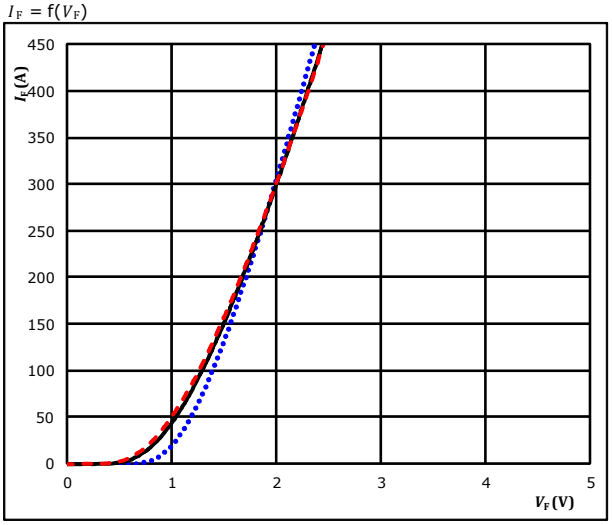


D = single pulse
T_s = 80 °C
V_{GE} = ±15 V
T_j = T_{jmax}

Buck/Boost Diode Characteristics

Typical forward characteristics

$I_F = f(V_F)$

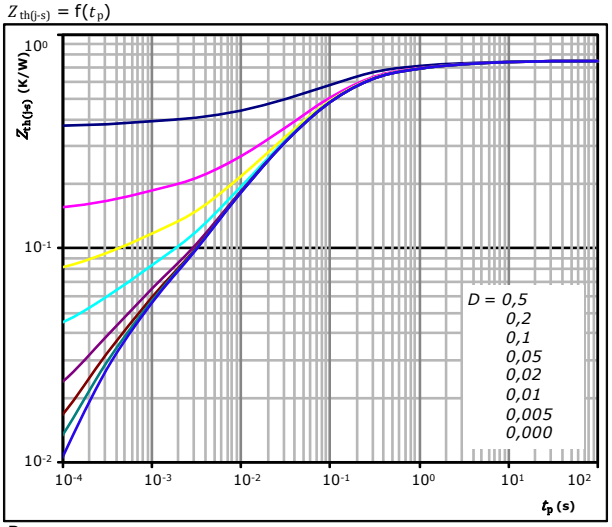


t_p = 250 µs

T_j: 25 °C, 125 °C, 150 °C

Transient thermal impedance as a function of pulse width

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



D = t_p / T

$R_{th(j-s)}$ = 0,75 K/W

FWD thermal model values

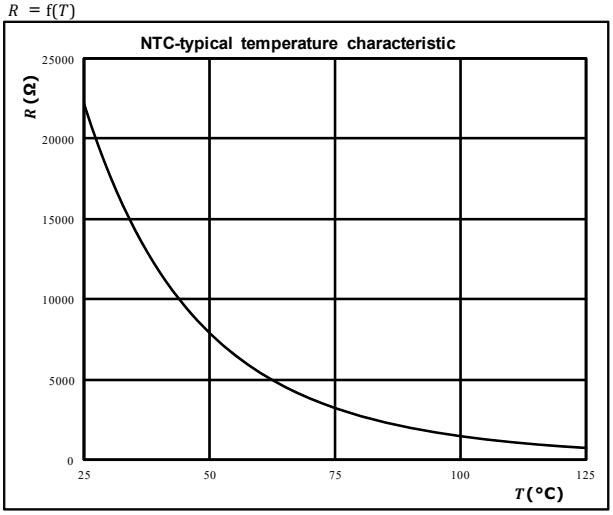
R (K/W)	τ (s)
2,88E-02	7,46E+00
7,02E-02	1,27E+00
1,95E-01	2,04E-01
2,65E-01	6,33E-02
1,21E-01	1,27E-02
3,39E-02	3,05E-03

Thermistor Characteristics

figure 1. **Thermistor**

Typical NTC characteristic as a function of temperature

$R = f(T)$

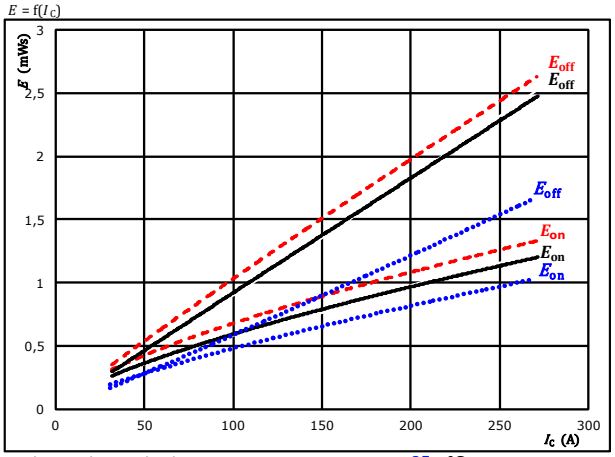


Boost/Buck Switching Characteristics

figure 1. IGBT

Typical switching energy losses as a function of collector current

$E = f(I_C)$



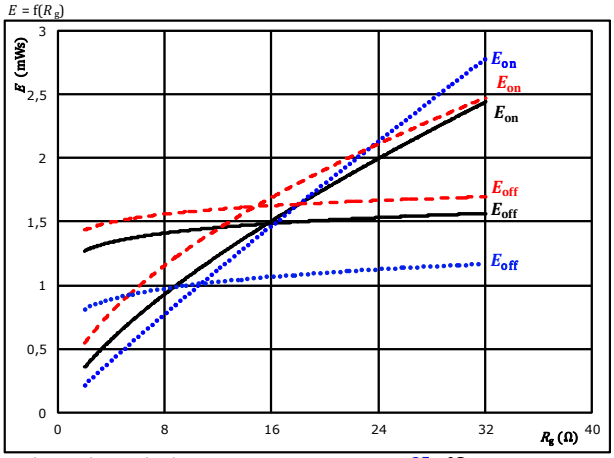
With an inductive load at

V_{CE} =	150	V	T_j:	25 °C	·····
V_{GE} =	±15	V		125 °C	———
R_{gon} =	8	Ω		150 °C	– – –
R_{goff} =	8	Ω			

figure 2. IGBT

Typical switching energy losses as a function of gate resistor

$E = f(R_g)$



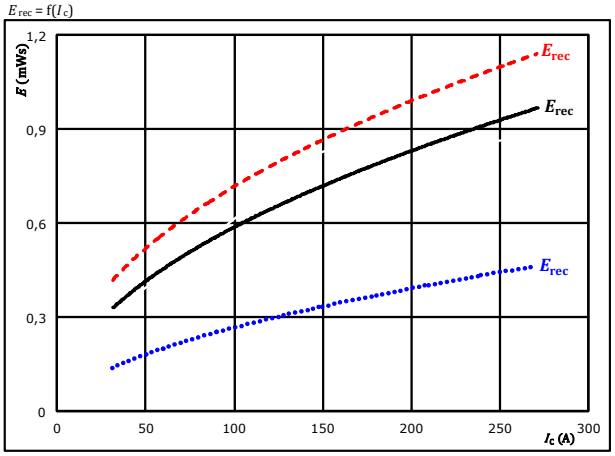
With an inductive load at

V_{CE} =	150	V	T_j:	25 °C	·····
V_{GE} =	±15	V		125 °C	———
I_C =	152	A		150 °C	– – –

figure 3. FWD

Typical reverse recovered energy loss as a function of collector current

$E_{rec} = f(I_C)$



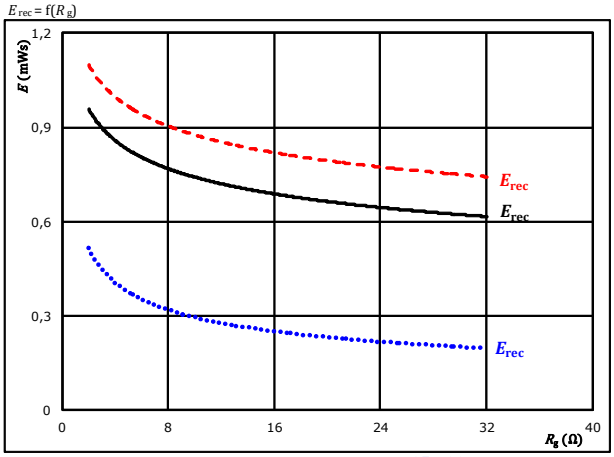
With an inductive load at

V_{CE} =	150	V	T_j:	25 °C	·····
V_{GE} =	±15	V		125 °C	———
R_{gon} =	8	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

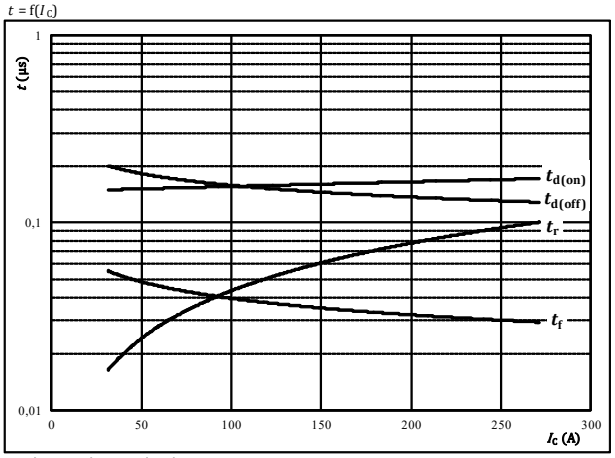
V_{CE} =	150	V	T_j:	25 °C	·····
V_{GE} =	±15	V		125 °C	———
I_C =	152	A		150 °C	– – –

Boost/Buck Switching Characteristics

figure 5. **IGBT**

Typical switching times as a function of collector current

$t = f(I_C)$



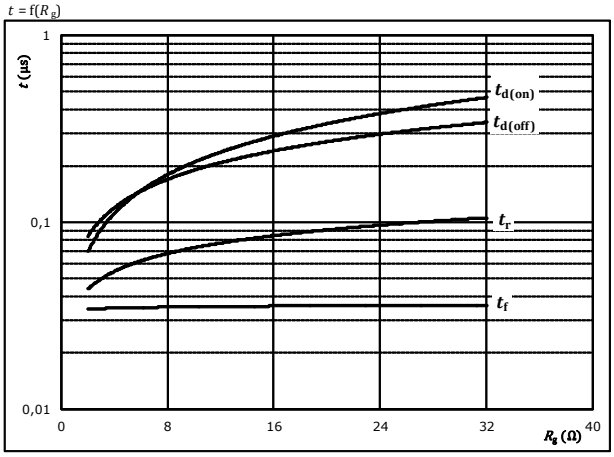
With an inductive load at

T_j =	150	°C
V_{CE} =	150	V
V_{GE} =	±15	V
R_{gon} =	8	Ω
R_{goff} =	8	Ω

figure 6. **IGBT**

Typical switching times as a function of gate resistor

$t = f(R_g)$



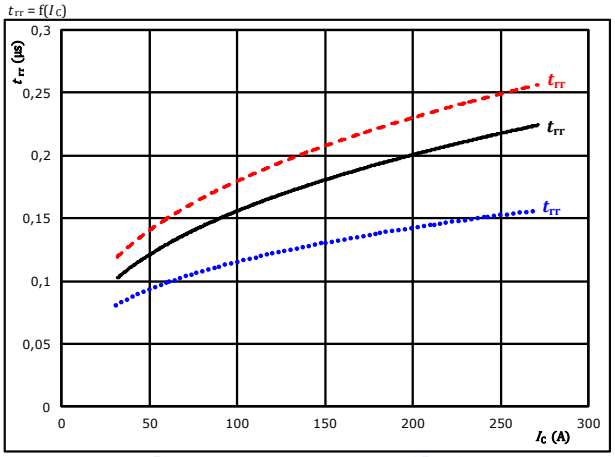
With an inductive load at

T_j =	150	°C
V_{CE} =	150	V
V_{GE} =	±15	V
I_C =	152	A

figure 7. **FWD**

Typical reverse recovery time as a function of collector current

$t_{rr} = f(I_C)$

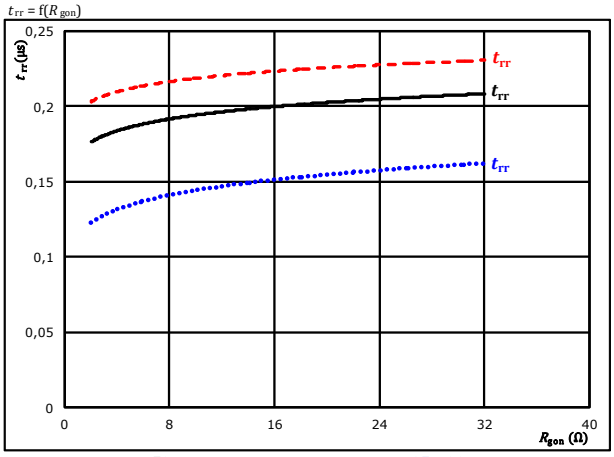


At	V_{CE} =	150	V		25 °C
	V_{GE} =	±15	V	T_j:	125 °C
	R_{gon} =	8	Ω		150 °C

figure 8. **FWD**

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

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



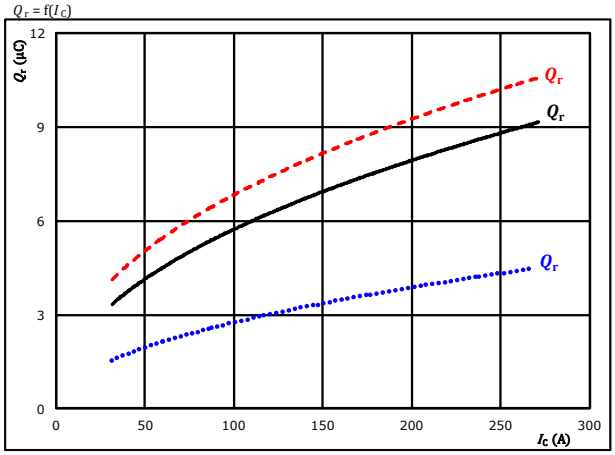
At	V_{CE} =	150	V		25 °C
	V_{GE} =	±15	V	T_j:	125 °C
	I_C =	152	A		150 °C

Boost/Buck Switching Characteristics

figure 9. FWD

Typical recovered charge as a function of collector current

$Q_r = f(I_C)$

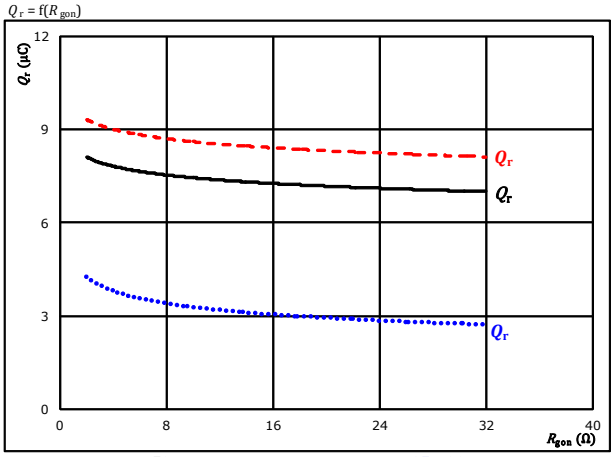


At						
V_{CE} =	150	V		25 °C	·····
V_{GE} =	±15	V	T_j:	125 °C	———
R_{gon} =	8	Ω		150 °C	– – –

figure 10. FWD

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

$Q_r = f(R_{gon})$

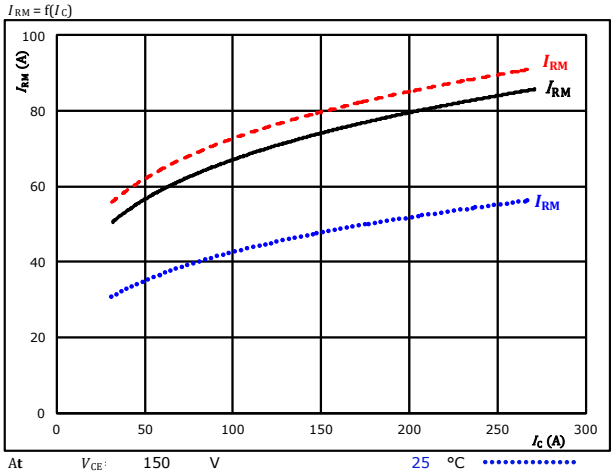


At						
V_{CE}=	150	V		25 °C	·····
V_{GE} =	±15	V	T_j:	125 °C	———
I_C=	152	A		150 °C	– – –

figure 11. FWD

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

$I_{RM} = f(I_C)$

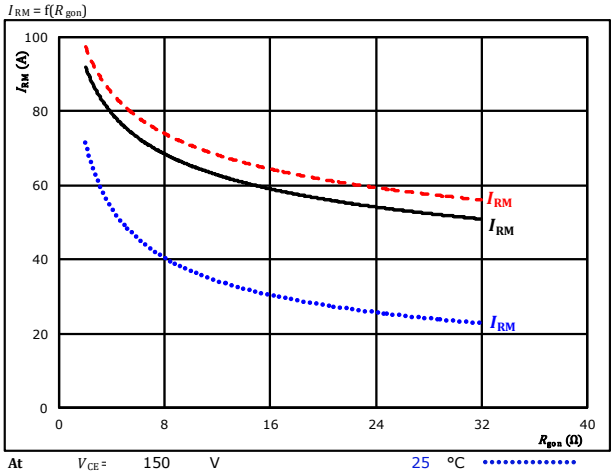


At						
V_{CE}:	150	V		25 °C	·····
V_{GE} =	±15	V	T_j:	125 °C	———
R_{gon} =	8	Ω		150 °C	– – –

figure 12. FWD

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

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



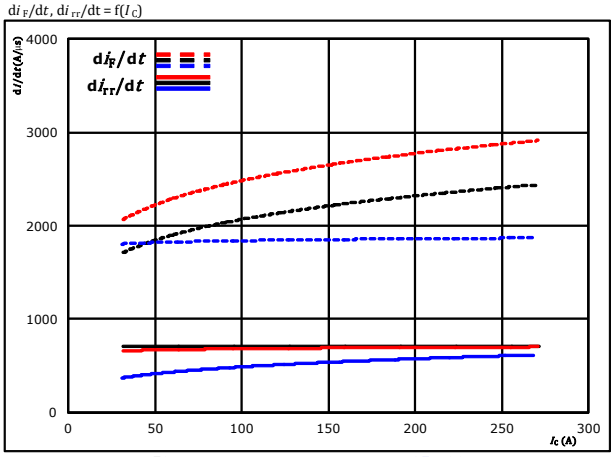
At						
V_{CE} =	150	V		25 °C	·····
V_{GE} =	±15	V	T_j:	125 °C	———
I_C =	152	A		150 °C	– – –

Boost/Buck Switching Characteristics

figure 13. **FWD**

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

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

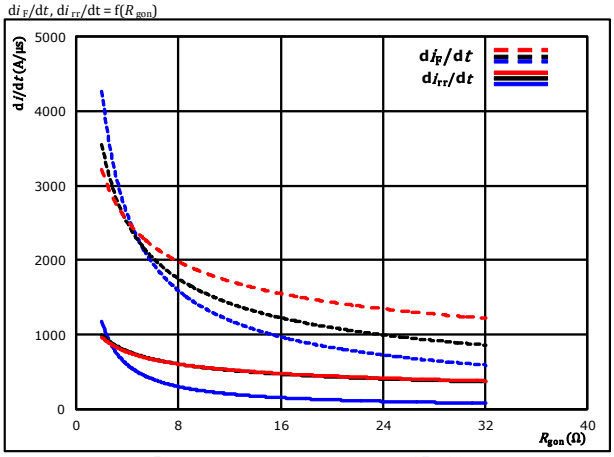


At						
V_{CE} =	150	V		25	°C	
V_{GE} =	±15	V	T_j:	125	°C	
R_{gon} =	8	Ω		150	°C	

figure 14. **FWD**

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

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

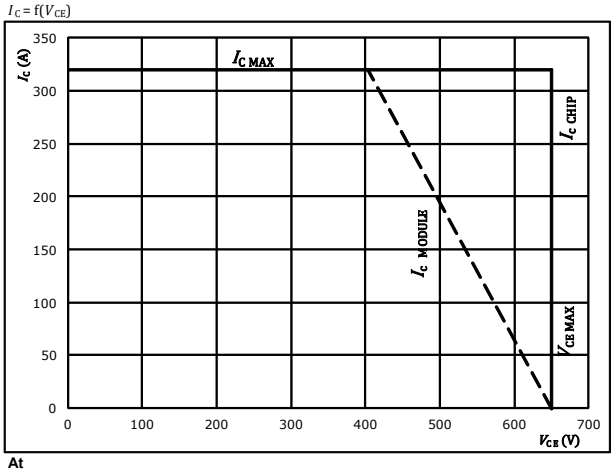


At						
V_{CE} =	150	V		25	°C	
V_{GE} =	±15	V	T_j:	125	°C	
I_C =	152	A		150	°C	

figure 15. **IGBT**

Reverse bias safe operating area

$I_C = f(V_{CE})$



At		
T_j =	175	°C
R_{gon} =	8	Ω
R_{goff} =	8	Ω

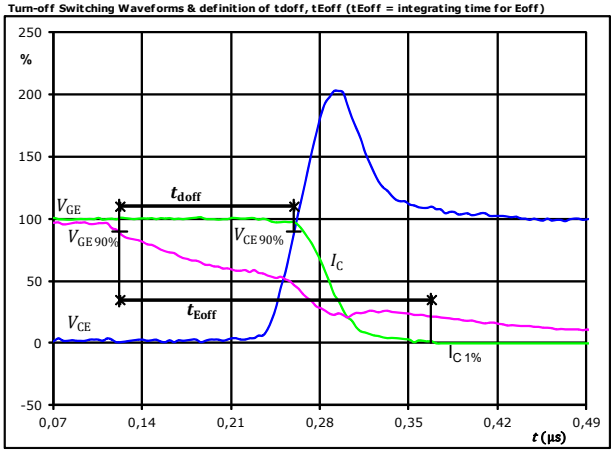
Boost/Buck Switching Definitions

General conditions

T_j	=	125 °C
R_{gon}	=	8 Ω
R_{goff}	=	8 Ω

figure 1. IGBT

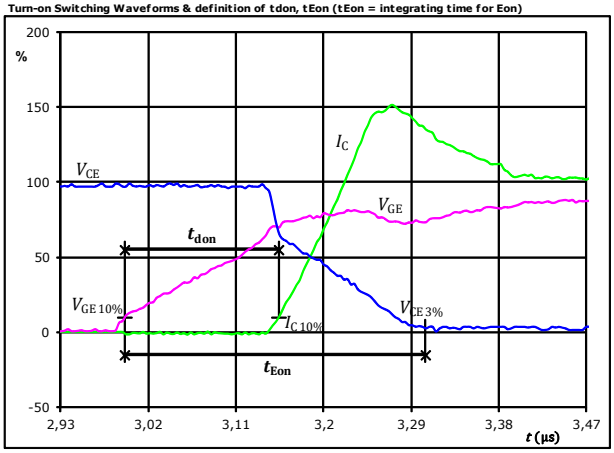
Turn-off Switching Waveforms & definition of tdoff, tEoff (tEoff = integrating time for Eoff)



$V_{GE}(0\%)$ =	-15	V
$V_{GE}(100\%)$ =	15	V
$V_C(100\%)$ =	150	V
$I_C(100\%)$ =	152	A
t_{doff} =	0,137	µs
t_{Eoff} =	0,245	µs

figure 2. IGBT

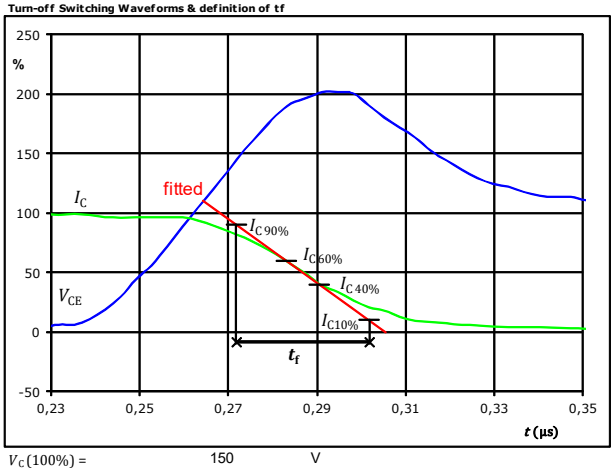
Turn-on Switching Waveforms & definition of tdon, tEon (tEon = integrating time for Eon)



$V_{GE}(0\%)$ =	-15	V
$V_{GE}(100\%)$ =	15	V
$V_C(100\%)$ =	150	V
$I_C(100\%)$ =	152	A
t_{don} =	0,158	µs
t_{Eon} =	0,309	µs

figure 3. IGBT

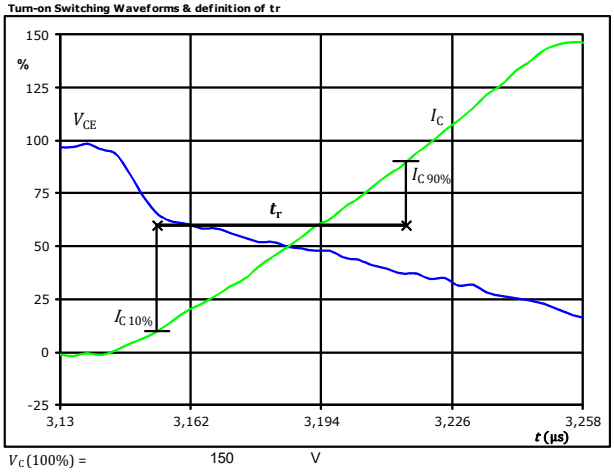
Turn-off Switching Waveforms & definition of tf



$V_C(100\%)$ =	150	V
$I_C(100\%)$ =	152	A
t_f =	0,030	µs

figure 4. IGBT

Turn-on Switching Waveforms & definition of tr

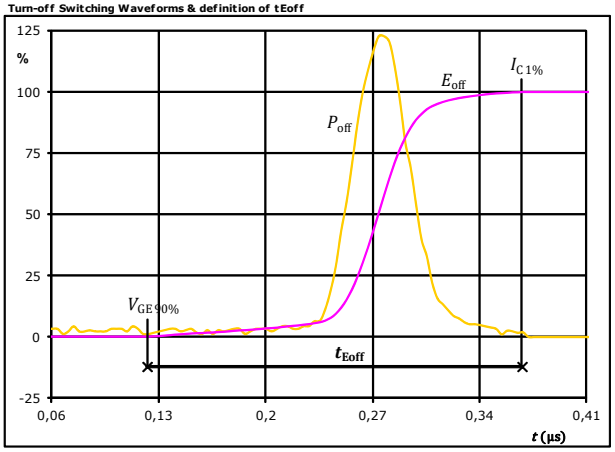


$V_C(100\%)$ =	150	V
$I_C(100\%)$ =	152	A
t_r =	0,061	µs

Boost/Buck Switching Characteristics

figure 5. **IGBT**

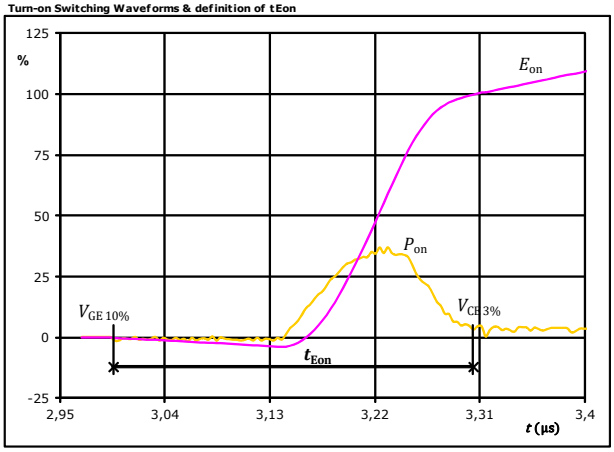
Turn-off Switching Waveforms & definition of tEoff



$P_{off}(100\%)$ =	22,76	kW
$E_{off}(100\%)$ =	1,37	mJ
t_{Eoff} =	0,25	µs

figure 6. **IGBT**

Turn-on Switching Waveforms & definition of tEon



$P_{on}(100\%)$ =	22,76	kW
$E_{on}(100\%)$ =	0,77	mJ
t_{Eon} =	0,31	µs

figure 7. **FWD**

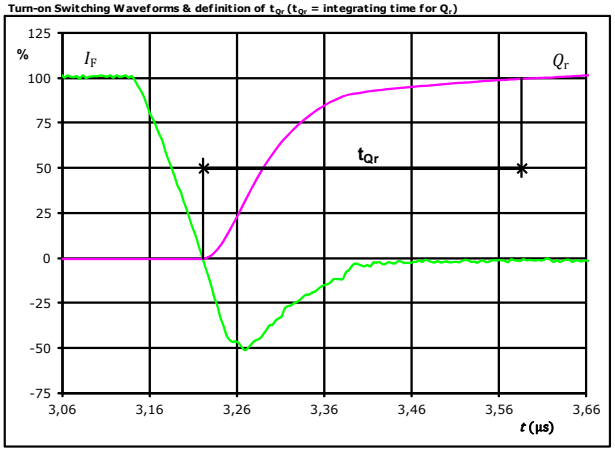
Turn-off Switching Waveforms & definition of trr

$V_F(100\%)$ =	150	V
$I_F(100\%)$ =	152	A
$I_{RRM}(100\%)$ =	-78	A
t_{rr} =	0,182	µs

Boost/Buck Switching Characteristics

figure 8. **FWD**

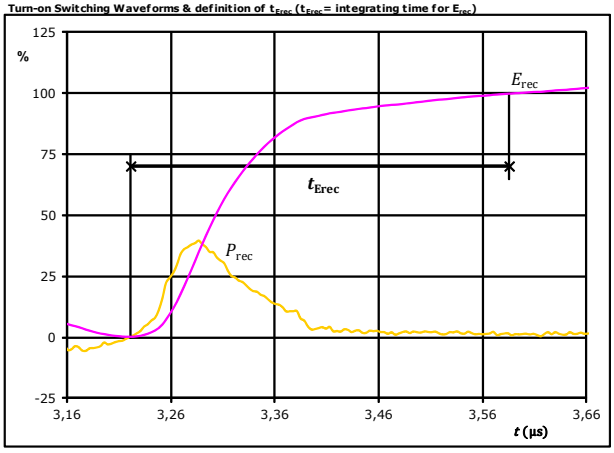
Turn-on Switching Waveforms & definition of t_{Qr} (t_{Qr} = integrating time for Q_r)



I_F (100%) =	152	A
Q_r (100%) =	7,66	µC
t_{Qr} =	0,36	µs

figure 9. **FWD**

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



P_{rec} (100%) =	22,76	kW
E_{rec} (100%) =	0,83	mJ
t_{Erec} =	0,36	µs

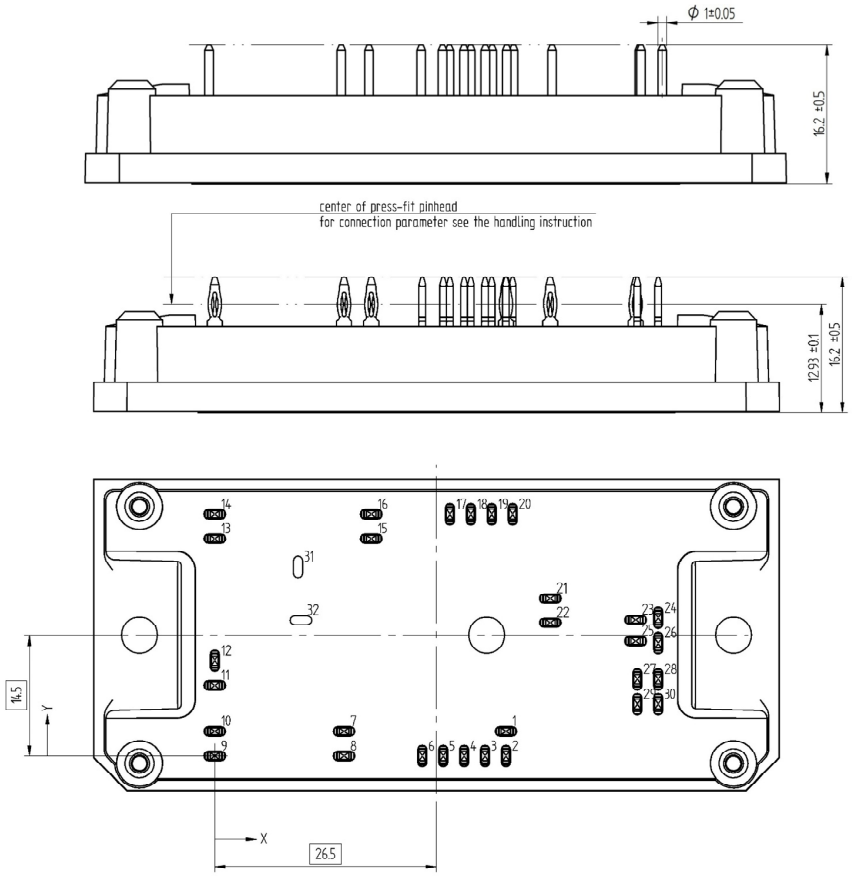
Ordering Code & Marking

Version	Ordering Code
without thermal paste 12 mm housing with solder pins	10-FY07NMA150S5-M824F58
with thermal paste 12 mm housing with solder pins	10-FY07NMA150S5-M824F58-/3/
without thermal paste 12 mm housing with Press-fit pins	10-PY07NMA150S5-M824F58Y
with thermal paste 12 mm housing with Press-fit pins	10-PY07NMA150S5-M824F58Y-/3/

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

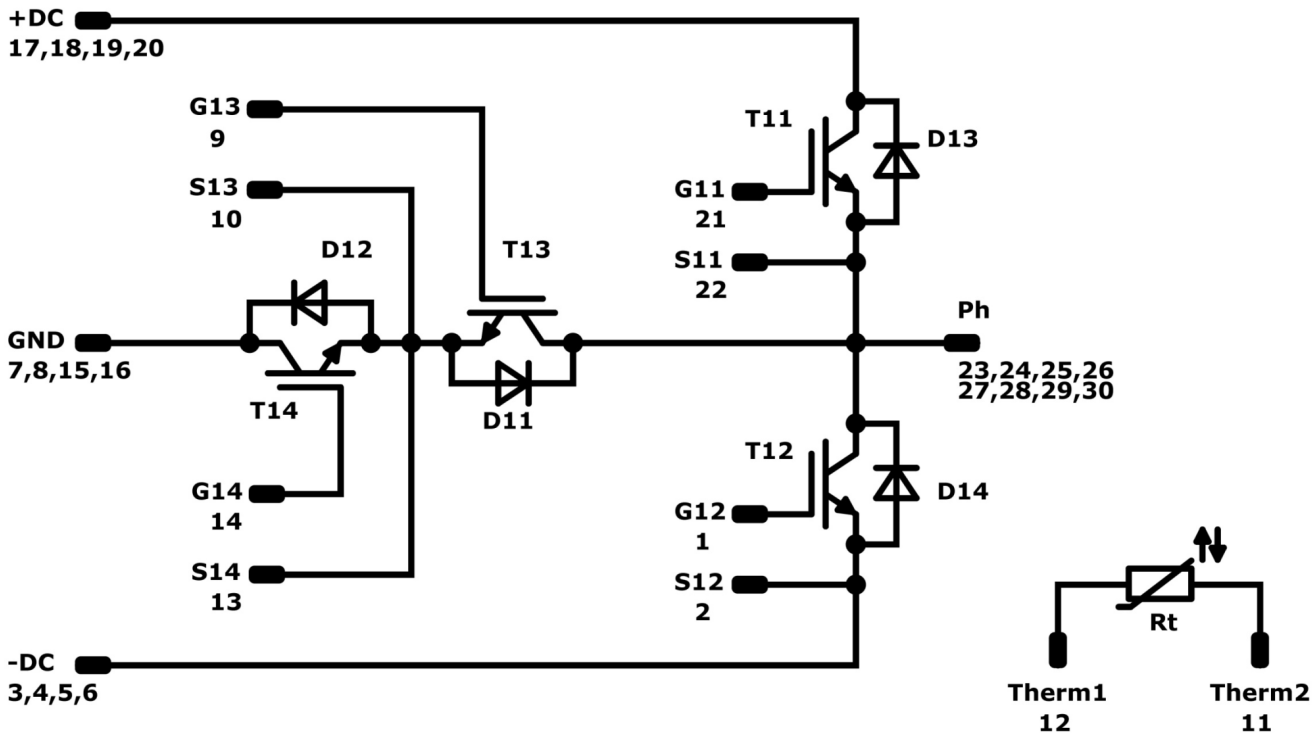
Outline

Pin table			
Pin	X	Y	Function
1	34,8	2,95	G12
2	34,8	0	S12
3	32,3	0	DC-
4	29,8	0	DC-
5	27,3	0	DC-
6	24,8	0	DC-
7	15,45	2,95	GND
8	15,45	0	GND
9	0	0	G13
10	0	2,95	S13
11	0	8,45	Therm2
12	0	11,45	Therm1
13	0	26,05	S14
14	0	29	G14
15	18,7	26,05	GND
16	18,7	29	GND
17	28,1	29	DC+
18	30,6	29	DC+
19	33,1	29	DC+
20	35,6	29	DC+
21	40,1	18,9	G11
22	40,1	15,95	S11
23	50,3	16,3	Ph
24	53	16,55	Ph
25	50,3	13,8	Ph
26	53	13,55	Ph
27	50,5	9,2	Ph
28	53	9,2	Ph
29	50,5	6,2	Ph
30	53	6,2	Ph
31	Not assembled		
32	Not assembled		



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 , T12	IGBT	650 V	150 A	Buck Switch	
D11 , D12	FWD	650 V	150 A	Buck Diode	
T13 , T14	IGBT	650 V	150 A	Boost Switch	
D13 , D14	FWD	650 V	150 A	Boost Diode	
Rt	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.

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-xY07NMA150S5-M824F58x-D2-14	24 Sept. 2018	Press-fit version added	