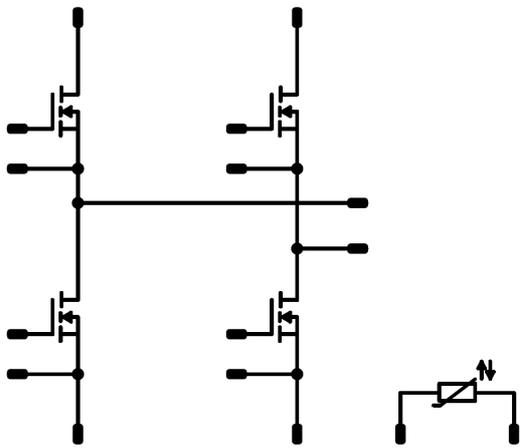




Vincotech

<i>fast</i> PACK 0 H	1200 V / 40 mΩ
<div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;"> <p style="text-align: center; background-color: #ccc; margin: 0;">Features</p> <ul style="list-style-type: none"> H-bridge or 2x half-bridge SiC MOS Thermistor </div> <div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;"> <p style="text-align: center; background-color: #ccc; margin: 0;">Target applications</p> <ul style="list-style-type: none"> Power Supply </div> <div style="border: 1px solid black; padding: 5px;"> <p style="text-align: center; background-color: #ccc; margin: 0;">Types</p> <ul style="list-style-type: none"> 10-PC124PA040MR-L638F18Y </div>	<div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;"> <p style="text-align: center; background-color: #ccc; margin: 0;"><i>flow</i> 0 12 mm housing</p>  </div> <div style="border: 1px solid black; padding: 5px;"> <p style="text-align: center; background-color: #ccc; margin: 0;">Schematic</p>  </div>

Maximum Ratings

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

Parameter	Symbol	Condition	Value	Unit
H-Bridge Switch				
Drain-source voltage	V_{DSS}		1200	V
Drain current	I_D	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	30	A
Peak drain current	I_{DM}	t_p limited by T_{jmax}	137	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	68	W
Gate-source voltage	V_{GSS}		-4/22	V
Maximum Junction Temperature	T_{jmax}		175	°C



Vincotech

Maximum Ratings

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

Parameter	Symbol	Condition	Value	Unit
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Module Properties

Thermal Properties

Storage temperature	T_{stg}		-40...+125	°C
Operation temperature under switching condition	T_{top}		-40...(T _{max} - 25)	°C

Isolation Properties

Isolation voltage	V_{isol}	DC Test Voltage* $t_p = 2\text{ s}$	6000	V
		AC Voltage $t_p = 1\text{ min}$	2500	V
Creepage distance			min. 12,7	mm
Clearance			9,57	mm
Comparative Tracking Index	CTI		> 200	

*100 % tested in production



Vincotech

Characteristic Values

Parameter	Symbol	Conditions					Value			Unit
		V_{GS} [V]	V_{CE} [V] V_{DS} [V]	I_C [A] I_D [A] I_F [A]	T_j [°C]	Min	Typ	Max		

H-Bridge Switch

Static

Parameter	Symbol	Conditions	V_{GS} [V]	V_{CE} [V] V_{DS} [V]	I_C [A] I_D [A] I_F [A]	T_j [°C]	Min	Typ	Max	Unit
Drain-source on-state resistance	$r_{DS(on)}$		18		20	25 125 150		35 57 65	50	mΩ
Gate-source threshold voltage	$V_{GS(th)}$	$V_{GS} = V_{DS}$			0,01	25	2,7		5,6	V
Gate to Source Leakage Current	I_{GSS}		22 -4	0		25			100 -100	nA
Zero Gate Voltage Drain Current	I_{DSS}		0	1200		25			10	μA
Internal gate resistance	r_g							7		Ω
Gate charge	Q_g							107		nC
Gate to source charge	Q_{GS}		18	600	20	25		22		
Gate to drain charge	Q_{GD}							41		
Short-circuit input capacitance	C_{ISS}							1337		pF
Short-circuit output capacitance	C_{OSS}	$f = 1$ MHz	0	800		25		76		
Reverse transfer capacitance	C_{RSS}							27		

Reverse Diode Static

Parameter	Symbol	Conditions	V_{GS} [V]	V_{CE} [V] V_{DS} [V]	I_C [A] I_D [A] I_F [A]	T_j [°C]	Min	Typ	Max	Unit
Forward voltage	V_{SD}		0		20	25		3,20		V

Dynamic

Parameter	Symbol	Conditions	V_{GS} [V]	V_{CE} [V] V_{DS} [V]	I_C [A] I_D [A] I_F [A]	T_j [°C]	Min	Typ	Max	Unit
Turn-on delay time	$t_{d(on)}$					25 125 150		18 18 17		ns
Rise time	t_r	$R_{goff} = 4 \Omega$ $R_{gon} = 4 \Omega$				25 125 150		7 8 7		
Turn-off delay time	$t_{d(off)}$		16/-6	700	32	25 125 150		57 65 66		
Fall time	t_f					25 125 150		9 10 9		
Turn-on energy (per pulse)	E_{on}	$Q_{tFWD} = 0,5 \mu C$ $Q_{tFWD} = 0,5 \mu C$ $Q_{tFWD} = 0,7 \mu C$				25 125 150		0,619 0,649 0,698		
Turn-off energy (per pulse)	E_{off}					25 125 150		0,197 0,219 0,222		



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

Dynamic

Parameter	Symbol	Conditions					Value			Unit
Peak recovery current	I_{RRM}	$di/dt = 4760$ A/ μ s $di/dt = 4654$ A/ μ s $di/dt = 5136$ A/ μ s	16/-6	700	32	25		38		A
						125		37		
						150		45		
Reverse recovery time	t_{rr}					25		19		
						125		21		
						150		23		
Recovered charge	Q_r					25		0,464		μ C
						125		0,546		
						150		0,655		
Reverse recovered energy	E_{rec}					25		0,096		mWs
						125		0,131		
						150		0,152		
Peak rate of fall of recovery current	$(di_{rr}/dt)_{max}$					25		4997		A/ μ s
						125		8656		
						150		8100		

Thermistor

Rated resistance	R					25		22		k Ω
Deviation of R_{100}	$\Delta_{R/R}$	$R_{100} = 1484 \Omega$				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	

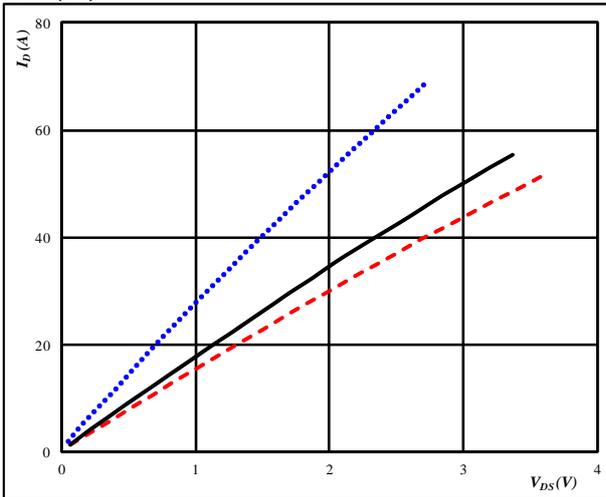


H-Bridge Switch Characteristics

figure 1. MOSFET

Typical output characteristics

$$I_D = f(V_{DS})$$

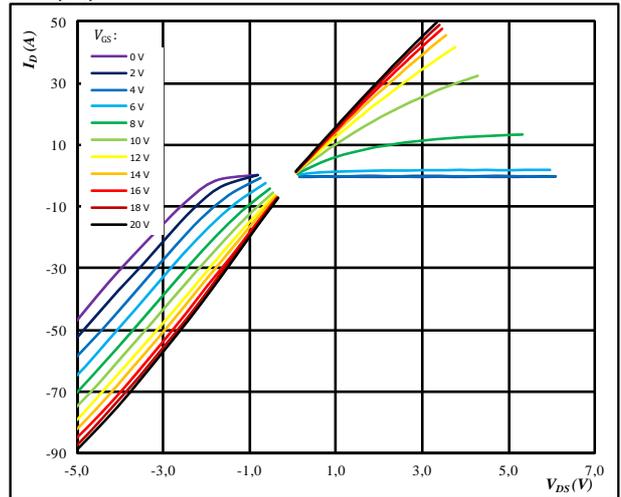


$t_p = 250 \mu s$
 $V_{GS} = 18 V$
 $T_j: 25 \text{ } ^\circ C$ (blue dotted line)
 $125 \text{ } ^\circ C$ (black solid line)
 $150 \text{ } ^\circ C$ (red dashed line)

figure 2. MOSFET

Typical output characteristics

$$I_D = f(V_{DS})$$

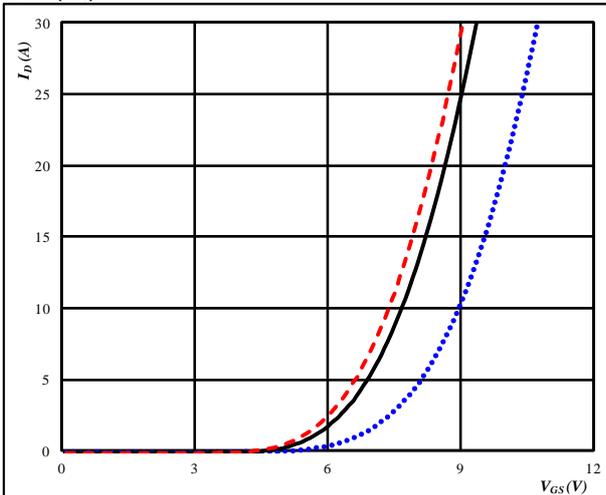


$t_p = 250 \mu s$
 $T_j = 150 \text{ } ^\circ C$
 V_{GS} from 0 V to 20 V in steps of 2 V

figure 3. MOSFET

Typical transfer characteristics

$$I_D = f(V_{GS})$$

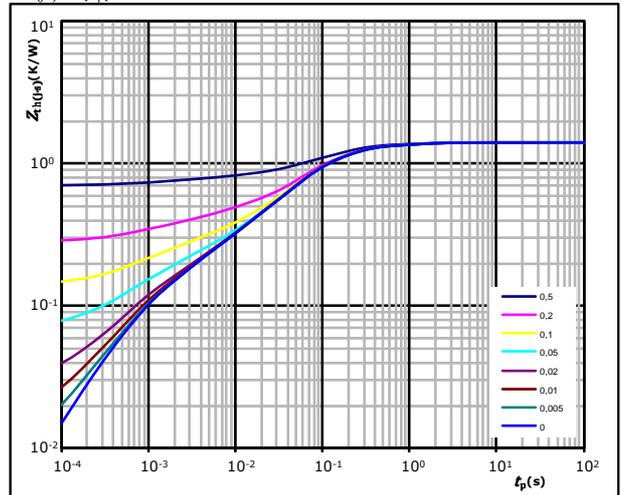


$t_p = 100 \mu s$
 $V_{DS} = 10 V$
 $T_j: 25 \text{ } ^\circ C$ (blue dotted line)
 $125 \text{ } ^\circ C$ (black solid line)
 $150 \text{ } ^\circ C$ (red dashed line)

figure 4. MOSFET

Transient thermal impedance as a function of pulse width

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



$D = t_p / T$
 $R_{th(j-s)} = 1,41 \text{ K/W}$
MOSFET thermal model values

R (K/W)	τ (s)
1,24E-01	1,00E+00
3,91E-01	1,66E-01
6,76E-01	6,11E-02
1,21E-01	5,50E-03
9,55E-02	8,02E-04

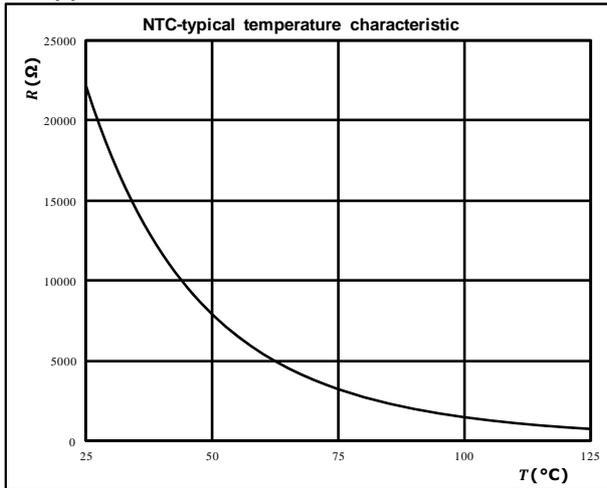


Thermistor Characteristics

figure 1. Thermistor

Typical NTC characteristic
as a function of temperature

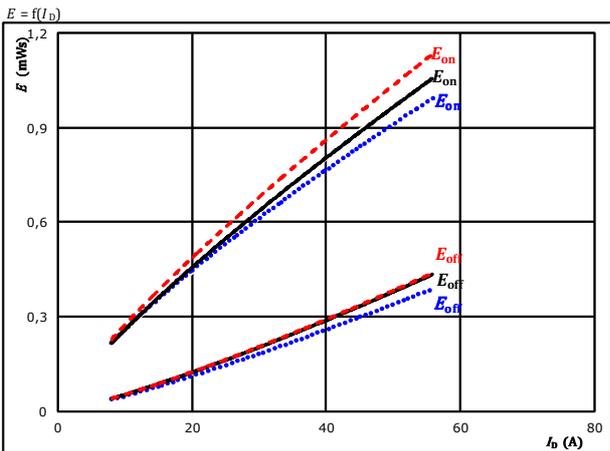
$$R = f(T)$$





H-bridge Switching Characteristics

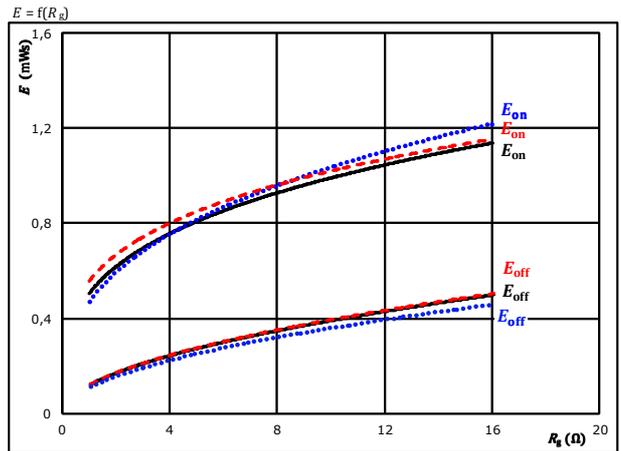
figure 1. MOSFET
Typical switching energy losses as a function of drain current



With an inductive load at

$V_{DS} = 700$ V	$T_j:$ 25 °C
$V_{GS} = 16/-6$ V	125 °C	————
$R_{gon} = 4$ Ω	150 °C	-----
$R_{goff} = 4$ Ω		

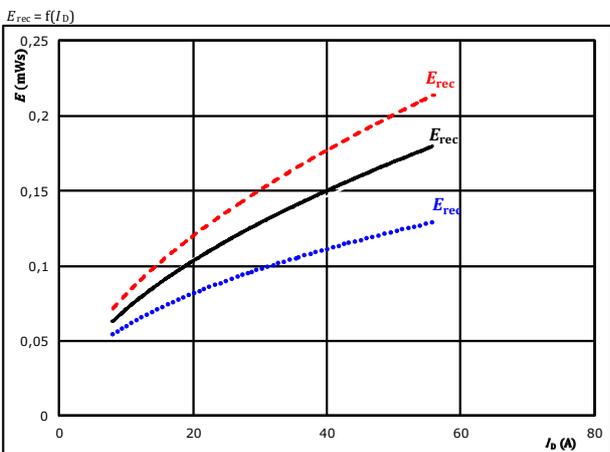
figure 2. MOSFET
Typical switching energy losses as a function of gate resistor



With an inductive load at

$V_{DS} = 700$ V	$T_j:$ 25 °C
$V_{GS} = 16/-6$ V	125 °C	————
$I_D = 32$ A	150 °C	-----

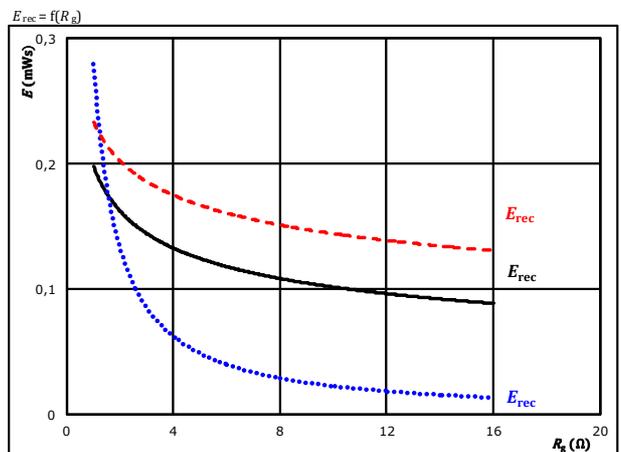
figure 3. FWD
Typical reverse recovered energy loss as a function of drain current



With an inductive load at

$V_{DS} = 700$ V	$T_j:$ 25 °C
$V_{GS} = 16/-6$ V	125 °C	————
$R_{gon} = 4$ Ω	150 °C	-----

figure 4. FWD
Typical reverse recovered energy loss as a function of gate resistor



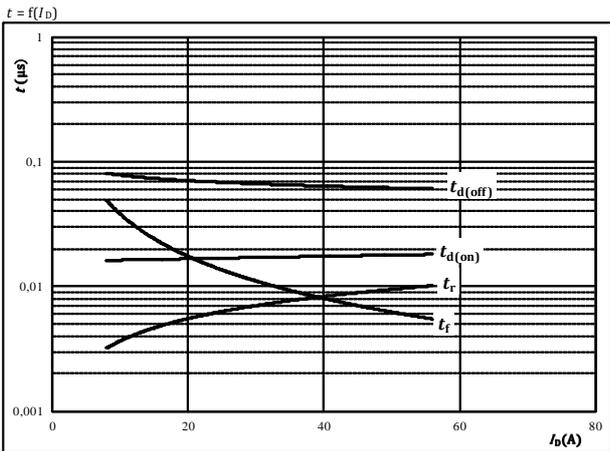
With an inductive load at

$V_{DS} = 700$ V	$T_j:$ 25 °C
$V_{GS} = 16/-6$ V	125 °C	————
$I_D = 32$ A	150 °C	-----



H-bridge Switching Characteristics

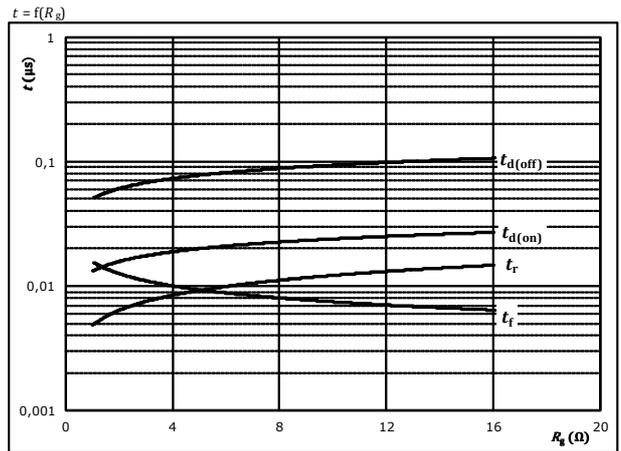
figure 5. MOSFET
Typical switching times as a function of drain current



With an inductive load at

$T_j = 150 \text{ } ^\circ\text{C}$
 $V_{DS} = 700 \text{ V}$
 $V_{GS} = 16/-6 \text{ V}$
 $R_{g\text{on}} = 4 \text{ } \Omega$
 $R_{g\text{off}} = 4 \text{ } \Omega$

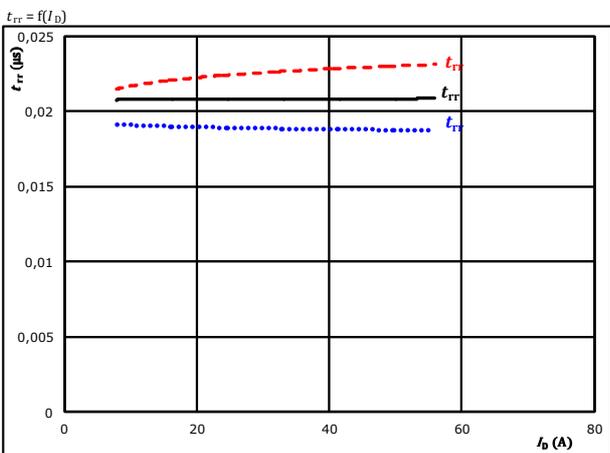
figure 6. MOSFET
Typical switching times as a function of gate resistor



With an inductive load at

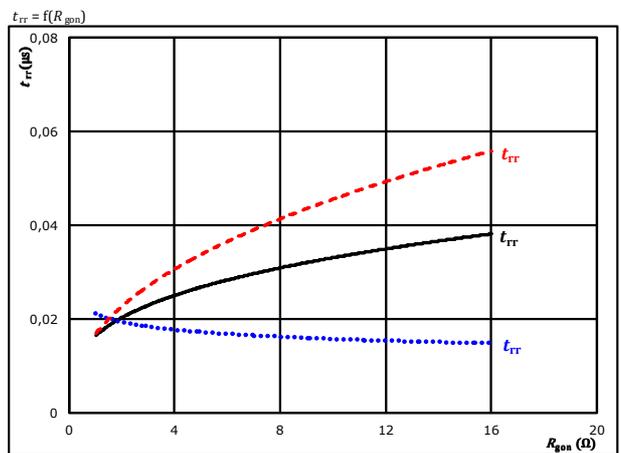
$T_j = 150 \text{ } ^\circ\text{C}$
 $V_{DS} = 700 \text{ V}$
 $V_{GS} = 16/-6 \text{ V}$
 $I_D = 32 \text{ A}$

figure 7. FWD
Typical reverse recovery time as a function of drain current



At $V_{DS} = 700 \text{ V}$
 $V_{GS} = 16/-6 \text{ V}$
 $R_{g\text{on}} = 4 \text{ } \Omega$
 $T_j: 25 \text{ } ^\circ\text{C}$ (dotted line)
 $125 \text{ } ^\circ\text{C}$ (solid line)
 $150 \text{ } ^\circ\text{C}$ (dashed line)

figure 8. FWD
Typical reverse recovery time as a function of MOSFET turn on gate resistor



At $V_{DS} = 700 \text{ V}$
 $V_{GS} = 16/-6 \text{ V}$
 $I_D = 32 \text{ A}$
 $T_j: 25 \text{ } ^\circ\text{C}$ (dotted line)
 $125 \text{ } ^\circ\text{C}$ (solid line)
 $150 \text{ } ^\circ\text{C}$ (dashed line)

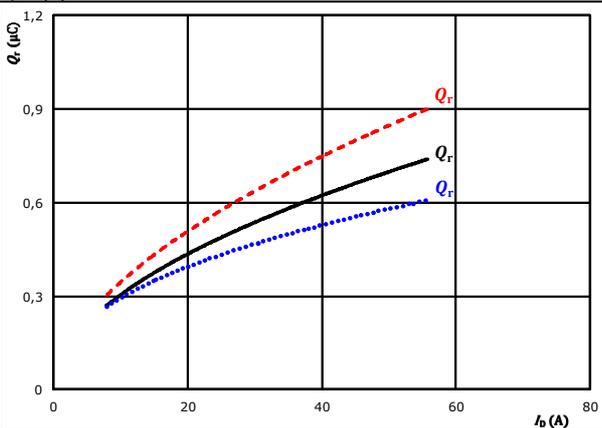


H-bridge Switching Characteristics

figure 9. FWD

Typical recovered charge as a function of drain current

$$Q_r = f(I_D)$$

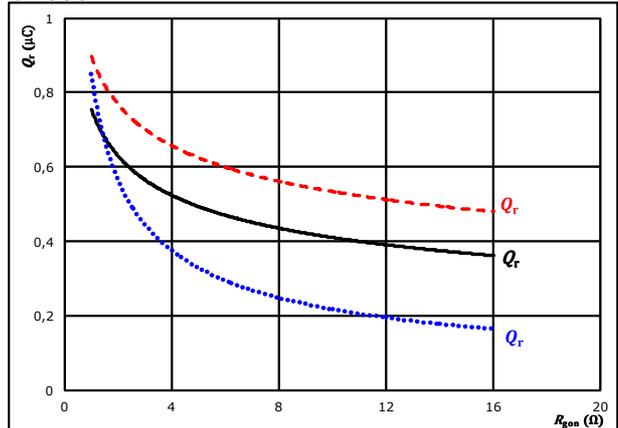


At $V_{DS} = 700$ V $T_j: 25$ °C
 $V_{GS} = 16/-6$ V $T_j: 125$ °C ———
 $R_{gpn} = 4$ Ω $T_j: 150$ °C - - - - -

figure 10. FWD

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

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

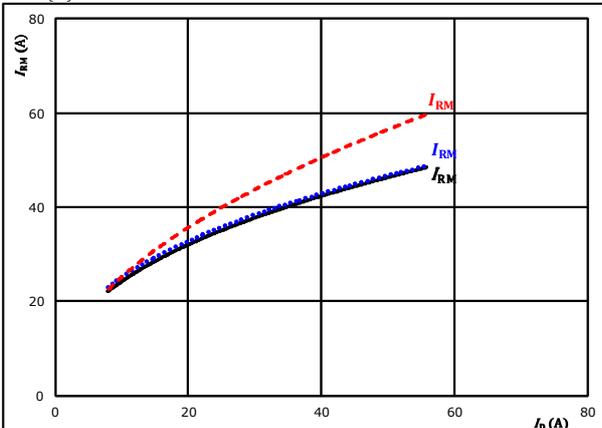


At $V_{DS} = 700$ V $T_j: 25$ °C
 $V_{GS} = 16/-6$ V $T_j: 125$ °C ———
 $I_D = 32$ A $T_j: 150$ °C - - - - -

figure 11. FWD

Typical peak reverse recovery current as a function of drain current

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

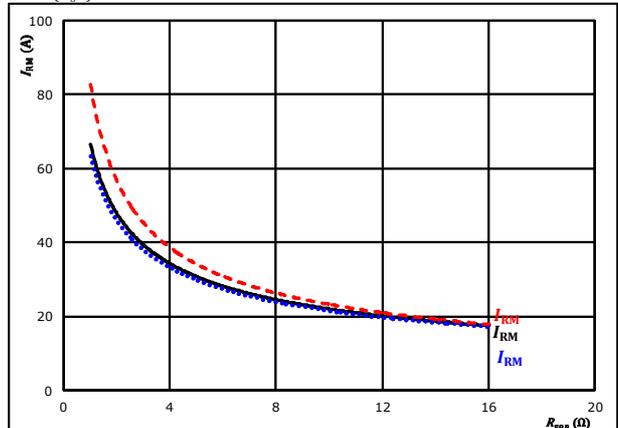


At $V_{DS} = 700$ V $T_j: 25$ °C
 $V_{GS} = 16/-6$ V $T_j: 125$ °C ———
 $R_{gpn} = 4$ Ω $T_j: 150$ °C - - - - -

figure 12. FWD

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

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



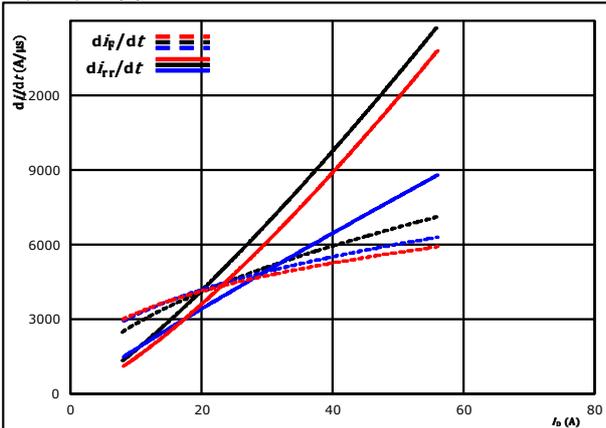
At $V_{DS} = 700$ V $T_j: 25$ °C
 $V_{GS} = 16/-6$ V $T_j: 125$ °C ———
 $I_D = 32$ A $T_j: 150$ °C - - - - -



H-bridge Switching Characteristics

figure 13. FWD

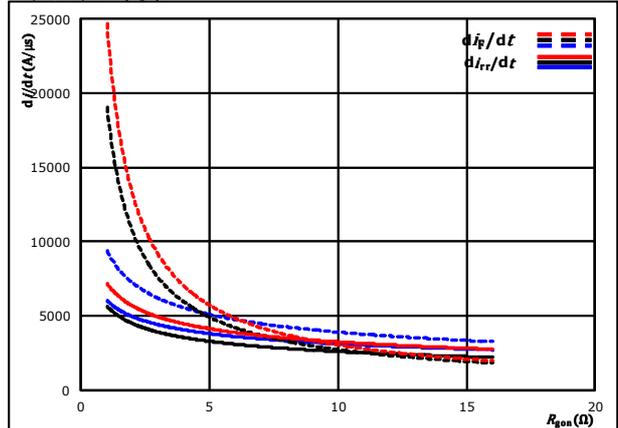
Typical rate of fall of forward and reverse recovery current as a function of drain current
 $di_F/dt, di_{rr}/dt = f(I_D)$



At $V_{DS} = 700$ V
 $V_{GS} = 16/-6$ V
 $R_{gon} = 4$ Ω
 $T_j = 25$ °C
 125 °C
 150 °C

figure 14. FWD

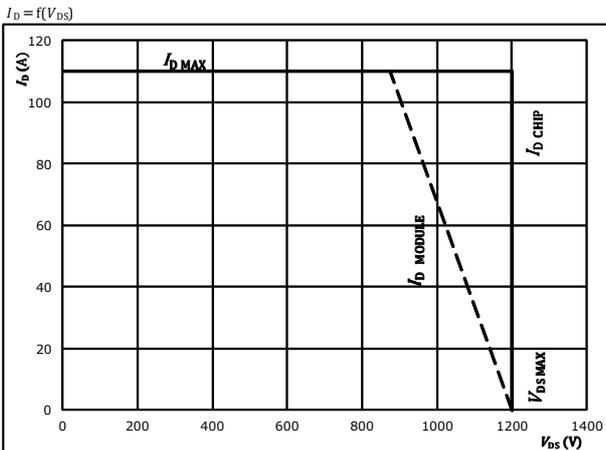
Typical rate of fall of forward and reverse recovery current as a function of MOSFET turn on gate resistor
 $di_F/dt, di_{rr}/dt = f(R_{gon})$



At $V_{DS} = 700$ V
 $V_{GS} = 16/-6$ V
 $I_D = 32$ A
 $T_j = 25$ °C
 125 °C
 150 °C

figure 15. MOSFET

Reverse bias safe operating area



At $T_j = 175$ °C
 $R_{gon} = 4$ Ω
 $R_{goff} = 4$ Ω



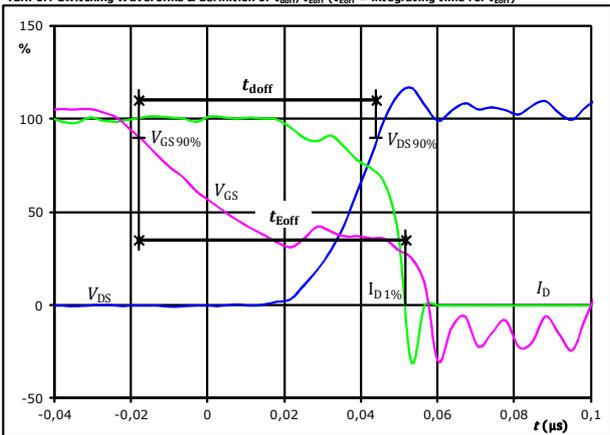
H-bridge Switching Characteristics

General conditions

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

figure 1. MOSFET

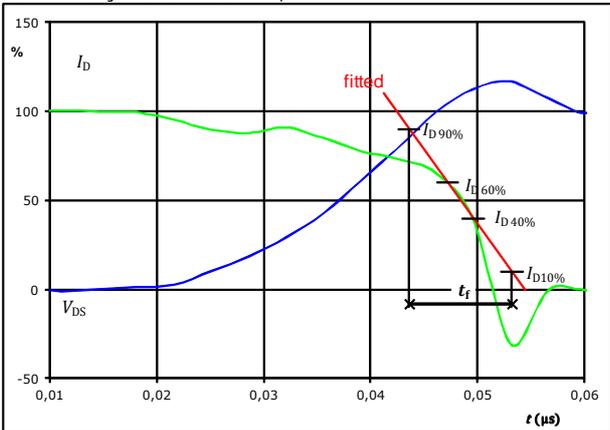
Turn-off Switching Waveforms & definition of t_{doff} , t_{Eoff} (t_{Eoff} = integrating time for t_{Eoff})



$V_{GS}(0\%) =$	-6	V
$V_{GS}(100\%) =$	16	V
$V_{DS}(100\%) =$	700	V
$I_D(100\%) =$	32	A
$t_{doff} =$	0,065	μ S
$t_{Eoff} =$	0,070	μ S

figure 3. MOSFET

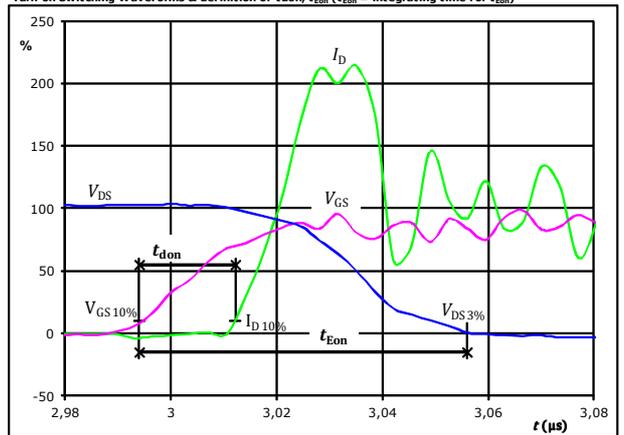
Turn-off Switching Waveforms & definition of t_f



$V_{DS}(100\%) =$	700	V
$I_D(100\%) =$	32	A
$t_f =$	0,010	μ S

figure 2. MOSFET

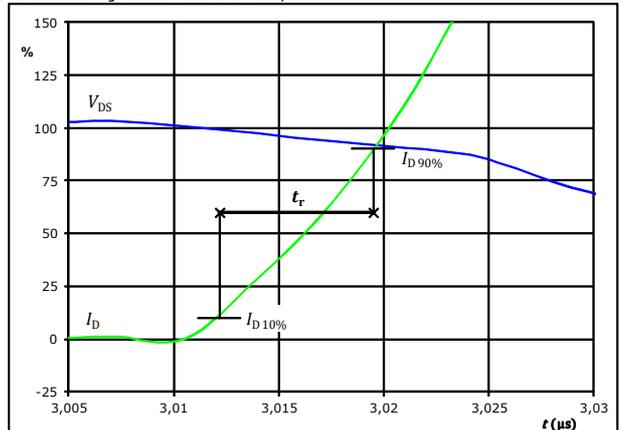
Turn-on Switching Waveforms & definition of t_{don} , t_{Eon} (t_{Eon} = integrating time for t_{Eon})



$V_{GS}(0\%) =$	-6	V
$V_{GS}(100\%) =$	16	V
$V_{DS}(100\%) =$	700	V
$I_D(100\%) =$	32	A
$t_{don} =$	0,018	μ S
$t_{Eon} =$	0,062	μ S

figure 4. MOSFET

Turn-on Switching Waveforms & definition of t_r



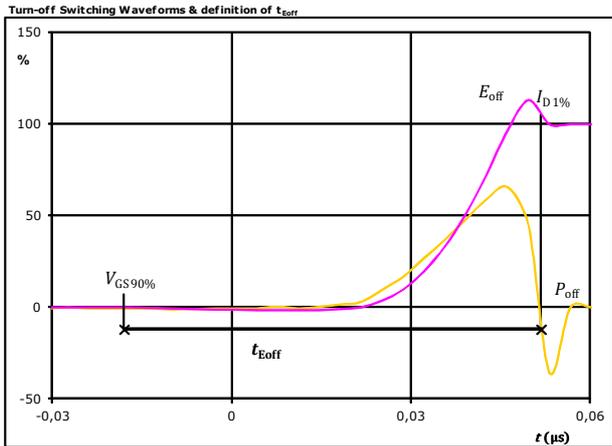
$V_{DS}(100\%) =$	700	V
$I_D(100\%) =$	32	A
$t_r =$	0,008	μ S



Vincotech

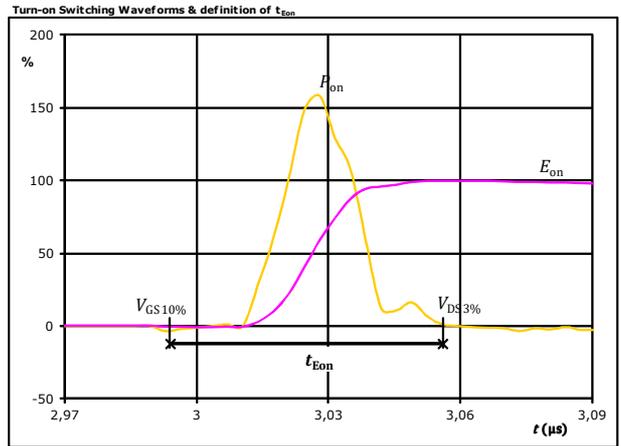
H-bridge Switching Characteristics

figure 5. MOSFET



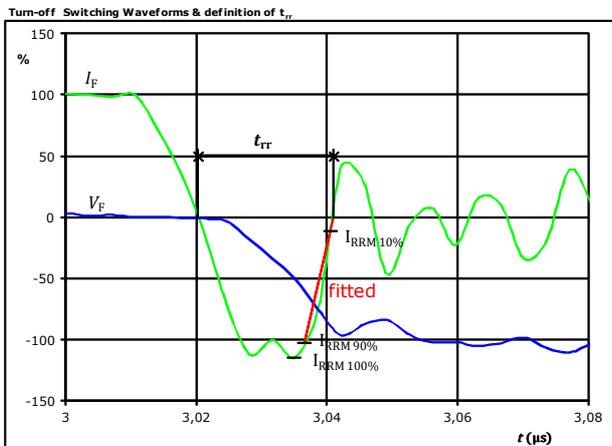
$P_{off}(100\%) =$	22,52	kW
$E_{off}(100\%) =$	0,22	mJ
$t_{Eoff} =$	0,07	μ s

figure 6. MOSFET



$P_{on}(100\%) =$	22,52	kW
$E_{on}(100\%) =$	0,65	mJ
$t_{Eon} =$	0,06	μ s

figure 7. FWD

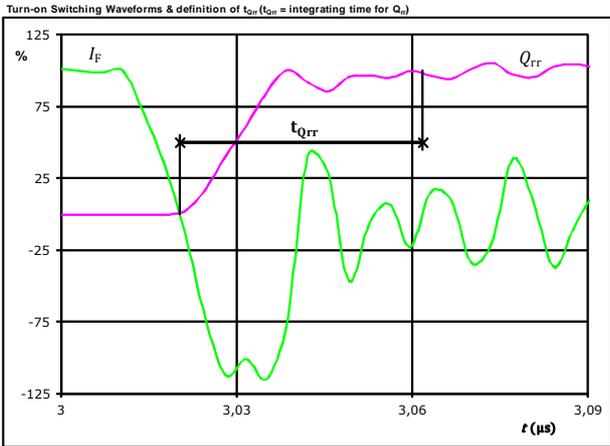


$V_F(100\%) =$	700	V
$I_F(100\%) =$	32	A
$I_{RRM}(100\%) =$	-37	A
$t_{rr} =$	0,021	μ s



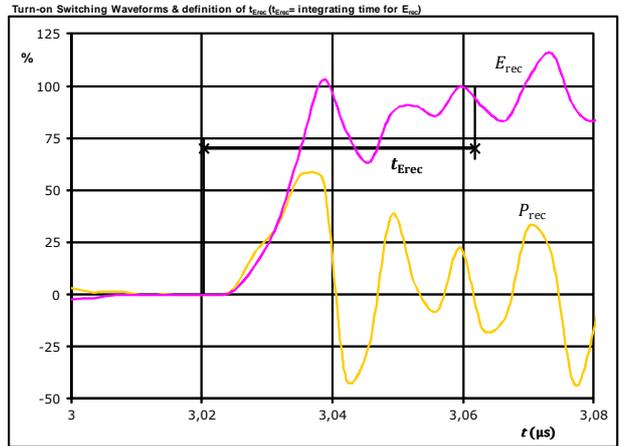
H-bridge Switching Characteristics

figure 8. FWD



I_F (100%) =	32	A
Q_{rr} (100%) =	0,55	μC
t_{Qrr} =	0,04	μs

figure 9. FWD



P_{rec} (100%) =	22,52	kW
E_{rec} (100%) =	0,13	mJ
t_{Erec} =	0,04	μs

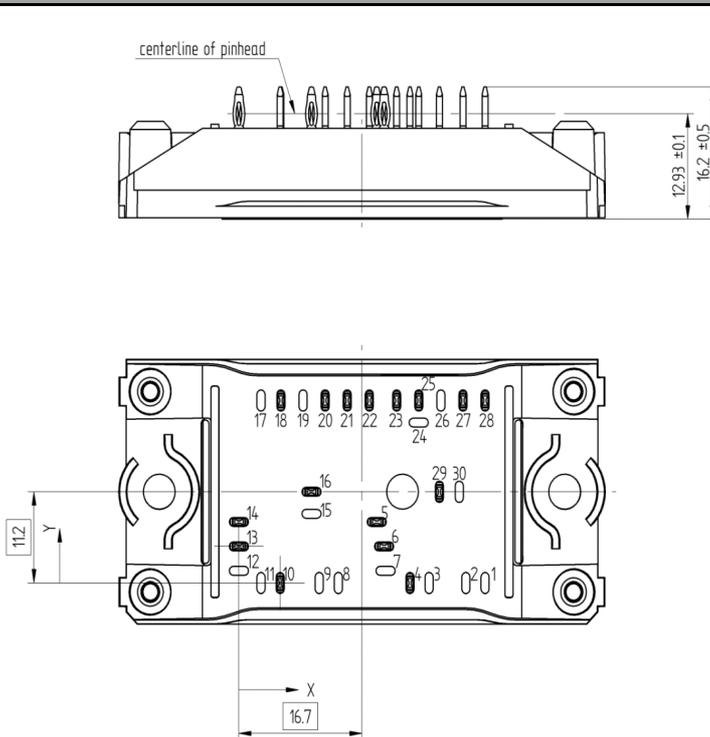


Vincotech

Ordering Code & Marking								
Version			Ordering Code					
without thermal paste 12 mm housing with press-fit pins			10-PC124PA040MR-L638F18Y					
with thermal paste 12 mm housing with press-fit pins			10-PC124PA040MR-L638F18Y-/3/					
NN-NNNNNNNNNNNN TTTTIVVWYY UL VIN LLLL SSSS			Text	Name	Date code	UL & VIN	Lot	Serial
			Datamatrix	Type&Ver	Lot number	Serial	Date code	
			NN-NNNNNNNNNNNN-TTTTIVV	WWYY	UL VIN	LLLLL	SSSS	
			TTTTIVV	LLLLL	SSSS	WWYY		

Outline

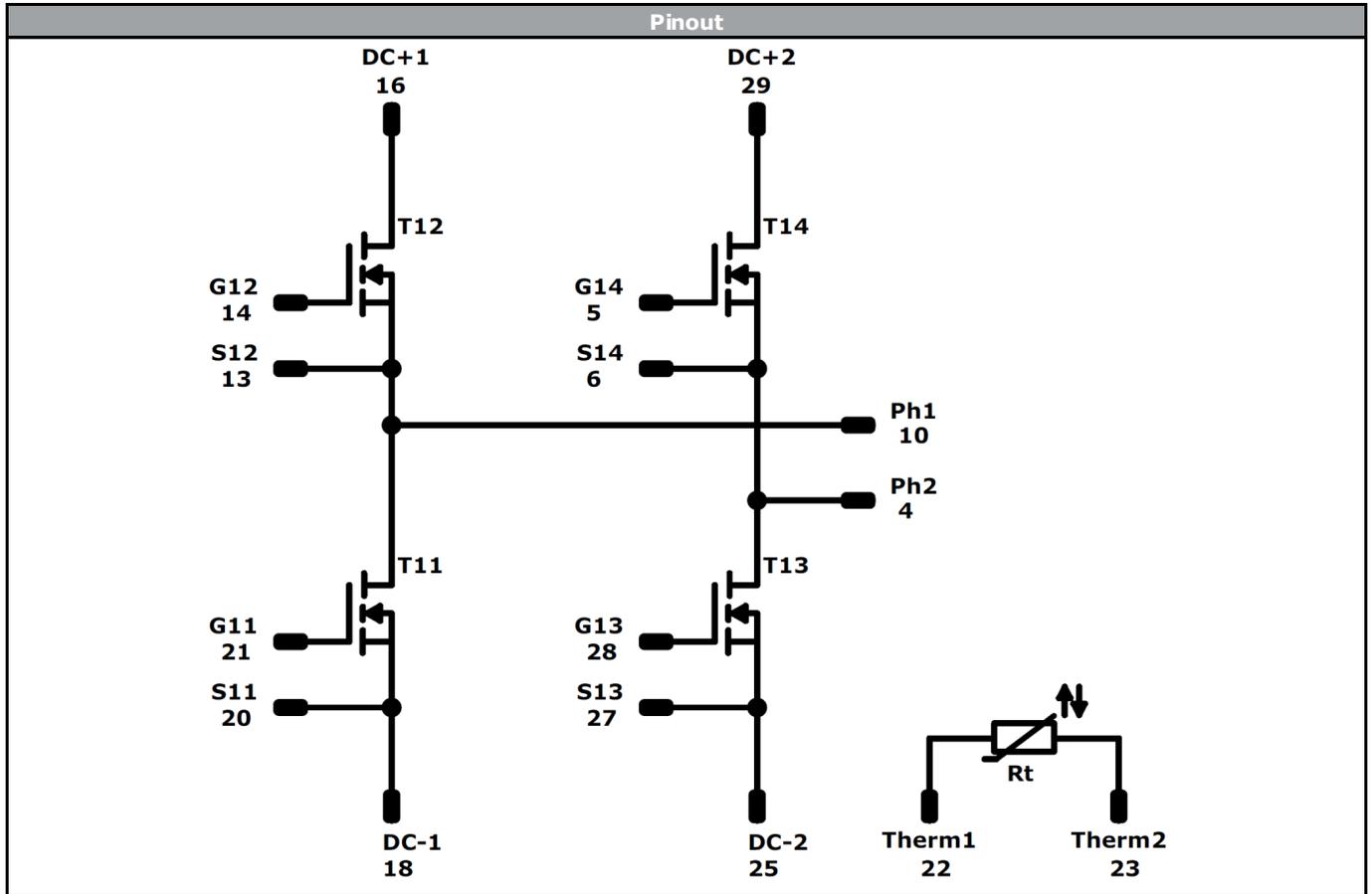
Pin table			
Pin	X	Y	Function
1			not assembled
2			not assembled
3			not assembled
4	23,2	0	Ph2
5	18,7	7,5	G14
6	19,7	4,5	S14
7			not assembled
8			not assembled
9			not assembled
10	5,6	0	Ph1
11			not assembled
12			not assembled
13	0	4,5	S12
14	0	7,5	G12
15			not assembled
16	9,85	11,2	DC+1
17			not assembled
18	5,7	22,4	DC-1
19			not assembled
20	11,7	22,4	S11
21	14,7	22,4	G11
22	17,7	22,4	Therm1
23	21,4	22,4	Therm2
24			not assembled
25	24,4	22,4	DC-2
26			not assembled
27	30,4	22,4	S13
28	33,4	22,4	G13
29	27,2	11,2	DC+2
30			not assembled



Tolerance of pinpositions ±0.5mm at the end of pins
Dimension of coordinate axis is only offset without tolerance



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Identification					
ID	Component	Voltage	Current	Function	Comment
T11 , T12 , T13 , T14	MOSFET	1200 V	40 mΩ	H-Bridge Switch	
Rt	NTC			Thermistor	



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Packaging instruction			
Standard packaging quantity (SPQ) 135	>SPQ	Standard	<SPQ Sample

Handling instruction
Handling instructions for <i>flow 0</i> packages see vincotech.com website.

Package data
Package data for <i>flow 0</i> 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-PC124PA040MR-L638F18Y-D2-14	08 Aug. 2018	Product features has been updated	1

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As used herein:

1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, or (c) whose failure to perform when properly used in accordance with instructions for use provided in labelling can be reasonably expected to result in significant injury to the user.
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.