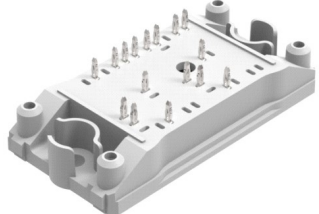
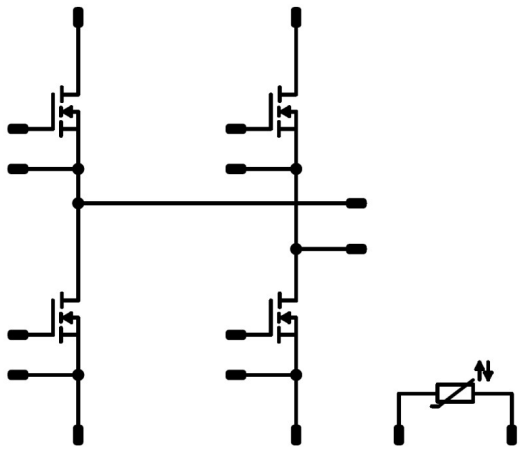




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fast PACK 0 H	1200 V / 40 mΩ
<div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;"> <p style="text-align: center; background-color: #ccc; margin: 0;"><b>Features</b></p> <ul style="list-style-type: none"> <li>H-bridge or 2x half-bridge</li> <li>SiC MOS</li> <li>Switching frequency up to 250kHz</li> <li>Thermistor</li> </ul> </div> <div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;"> <p style="text-align: center; background-color: #ccc; margin: 0;"><b>Target applications</b></p> <ul style="list-style-type: none"> <li>Power Supply</li> </ul> </div> <div style="border: 1px solid black; padding: 5px;"> <p style="text-align: center; background-color: #ccc; margin: 0;"><b>Types</b></p> <ul style="list-style-type: none"> <li>10-PC124PA040MR-L638F18Y</li> </ul> </div>	<div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;"> <p style="text-align: center; background-color: #ccc; margin: 0;"><i>flow 0 12 mm housing</i></p>  </div> <div style="border: 1px solid black; padding: 5px;"> <p style="text-align: center; background-color: #ccc; margin: 0;"><b>Schematic</b></p>  </div>

## Maximum Ratings

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

Parameter	Symbol	Condition	Value	Unit
<b>H-Bridge Switch</b>				
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



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## Maximum Ratings

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

Parameter	Symbol	Condition	Value	Unit
-----------	--------	-----------	-------	------

### Module Properties

#### Thermal Properties

Storage temperature	$T_{stg}$		-40...+125	°C
Operation temperature under switching condition	$T_{top}$		-40...(T <sub>max</sub> - 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



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## Characteristic Values

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

### H-Bridge Switch

#### Static

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

Forward voltage	$V_{sd}$		0		20	25		3,20		V
-----------------	----------	--	---	--	----	----	--	------	--	---

#### Dynamic

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)	$E_{on}$	$Q_{t-FWD} = 0,5 \mu C$ $Q_{t-FWD} = 0,5 \mu C$ $Q_{t-FWD} = 0,7 \mu C$				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		



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## Characteristic Values

Parameter	Symbol	Conditions					Value			Unit
		$V_{GE}$ [V] $V_{GS}$ [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

#### Dynamic

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

### Thermistor

Rated resistance	$R$					25		22		k $\Omega$
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. $\pm 1$ %				25		3962		K
B-value	$B_{(25/100)}$	Tol. $\pm 1$ %				25		4000		K
Vincotech NTC Reference									I	

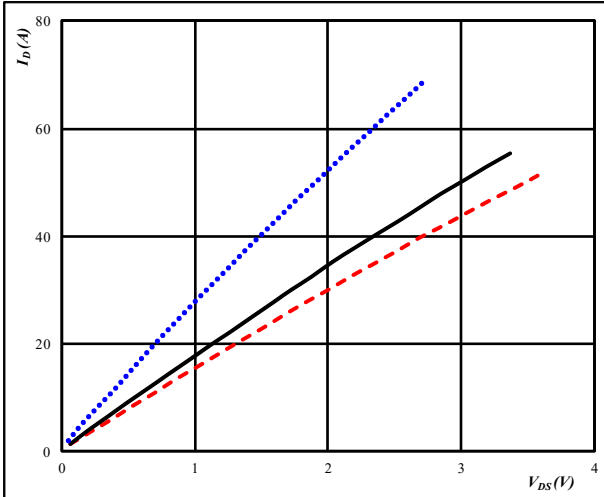


### H-Bridge Switch Characteristics

**figure 1.** MOSFET

Typical output characteristics

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

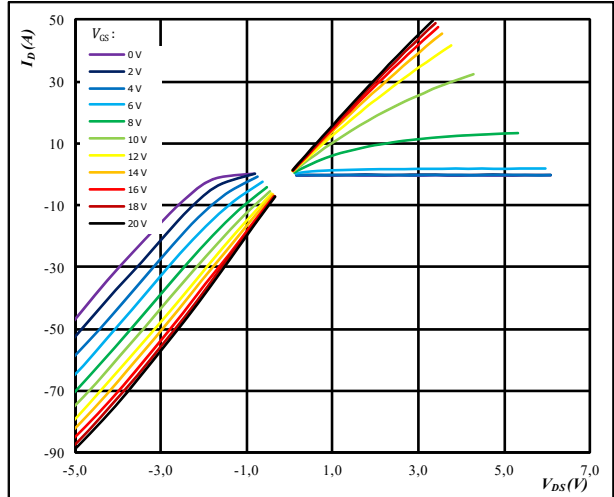


$t_p = 250 \mu s$   
 $V_{GS} = 18 V$   
 $T_j: 25 \text{ }^\circ C$  (dotted blue)  
 $125 \text{ }^\circ C$  (solid black)  
 $150 \text{ }^\circ C$  (dashed red)

**figure 2.** MOSFET

Typical output characteristics

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

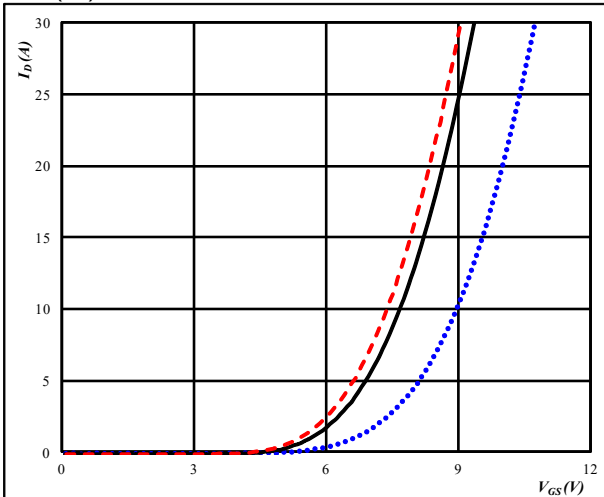


$t_p = 250 \mu s$   
 $T_j = 150 \text{ }^\circ C$   
 $V_{GS}$  from 0 V to 20 V in steps of 2 V

**figure 3.** MOSFET

Typical transfer characteristics

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

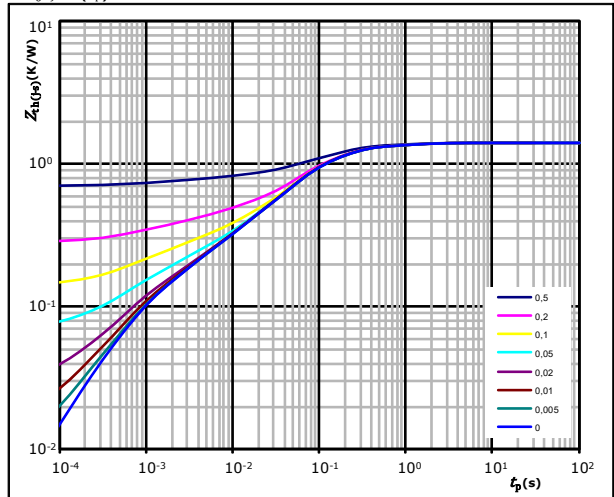


$t_p = 100 \mu s$   
 $V_{DS} = 10 V$   
 $T_j: 25 \text{ }^\circ C$  (dotted blue)  
 $125 \text{ }^\circ C$  (solid black)  
 $150 \text{ }^\circ C$  (dashed red)

**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)	$\tau$ (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

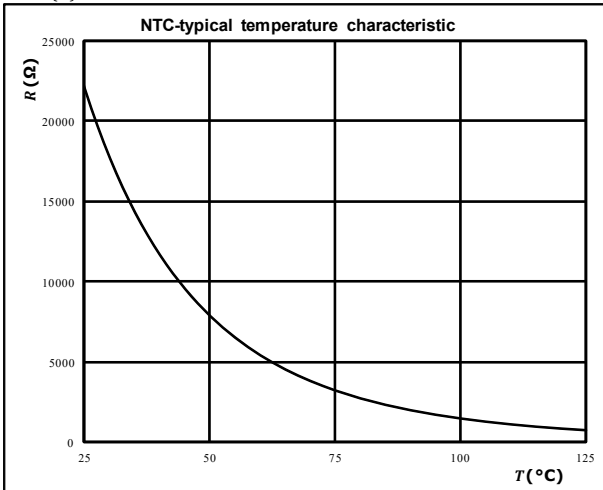


### Thermistor Characteristics

figure 1. Thermistor

Typical NTC characteristic  
as a function of temperature

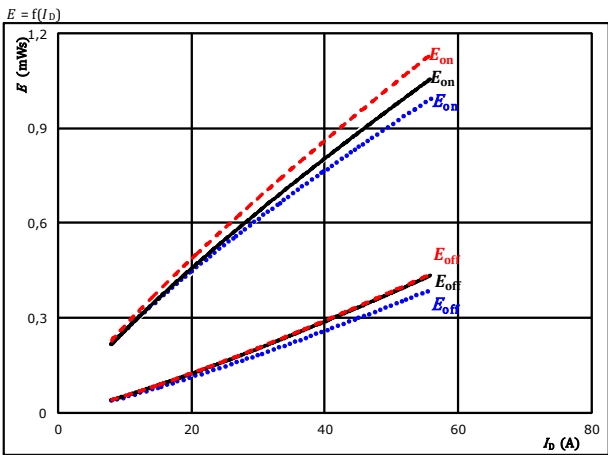
$$R = f(T)$$





## H-bridge Switching Characteristics

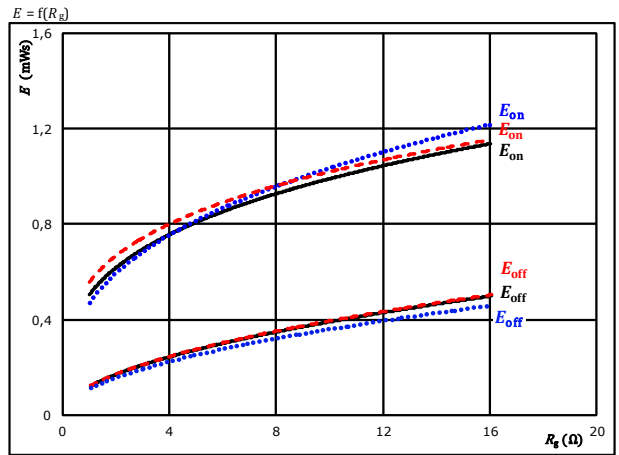
**figure 1.** MOSFET  
Typical switching energy losses as a function of drain current



With an inductive load at

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

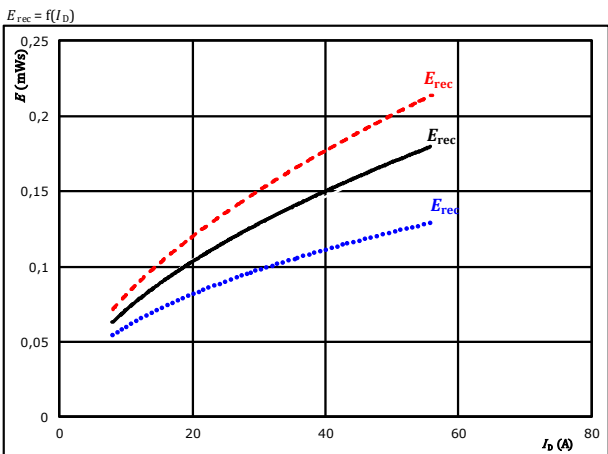
**figure 2.** MOSFET  
Typical switching energy losses as a function of gate resistor



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	-----

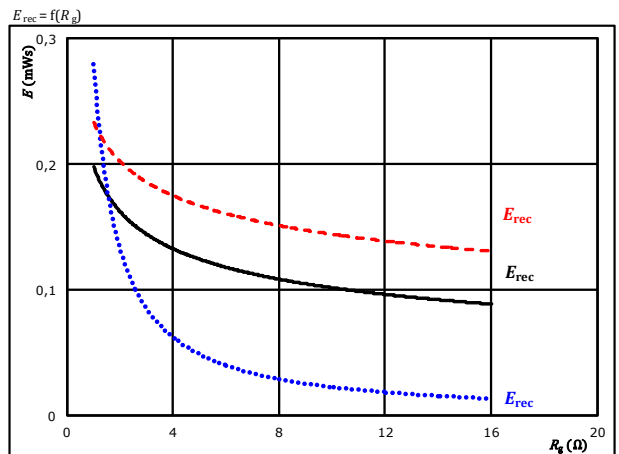
**figure 3.** FWD  
Typical reverse recovered energy loss as a function of drain current



With an inductive load at

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

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



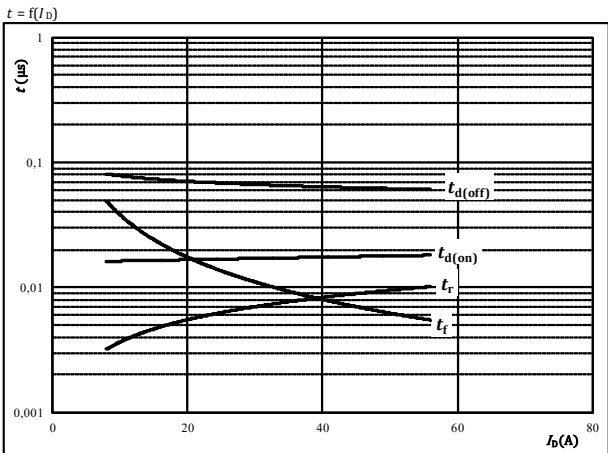
With an inductive load at

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



## H-bridge Switching Characteristics

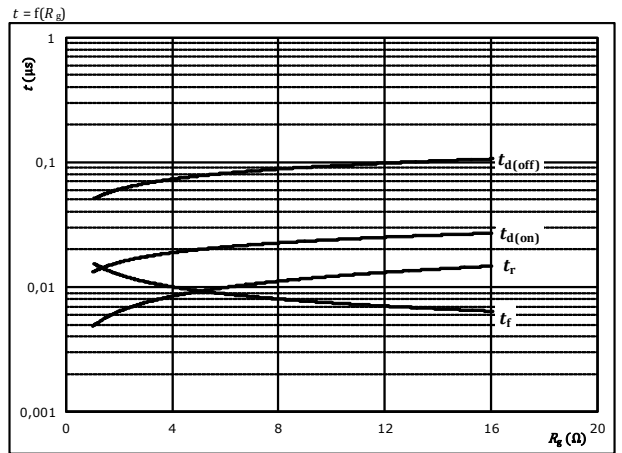
**figure 5.** MOSFET  
Typical switching times as a function of drain current



With an inductive load at

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

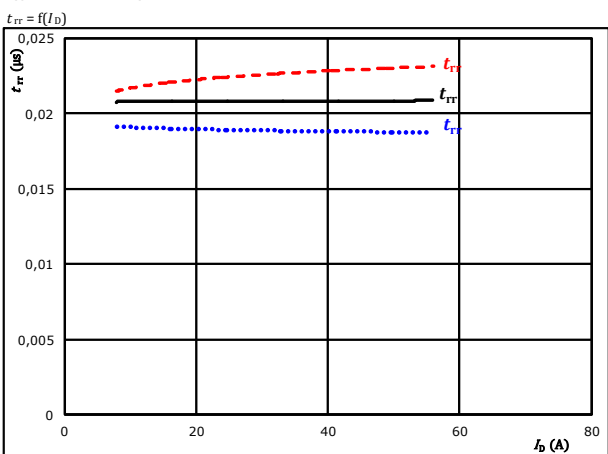
**figure 6.** MOSFET  
Typical switching times as a function of gate resistor



With an inductive load at

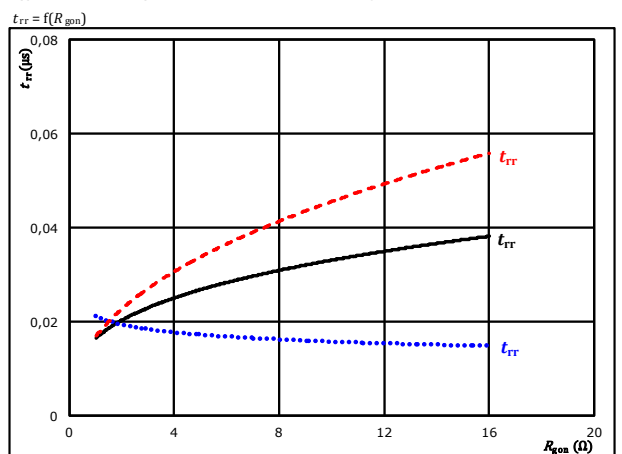
$T_j = 150 \text{ } ^\circ\text{C}$   
 $V_{DS} = 700 \text{ V}$   
 $V_{GS} = 16/-6 \text{ V}$   
 $I_D = 32 \text{ A}$

**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 blue line)  
 $125 \text{ } ^\circ\text{C}$  (solid black line)  
 $150 \text{ } ^\circ\text{C}$  (dashed red line)

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



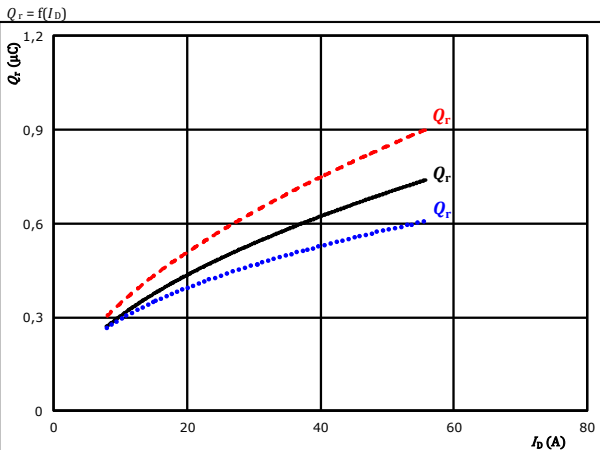
At  $V_{DS} = 700 \text{ V}$   
 $V_{GS} = 16/-6 \text{ V}$   
 $I_D = 32 \text{ A}$   
 $T_j: 25 \text{ } ^\circ\text{C}$  (dotted blue line)  
 $125 \text{ } ^\circ\text{C}$  (solid black line)  
 $150 \text{ } ^\circ\text{C}$  (dashed red line)





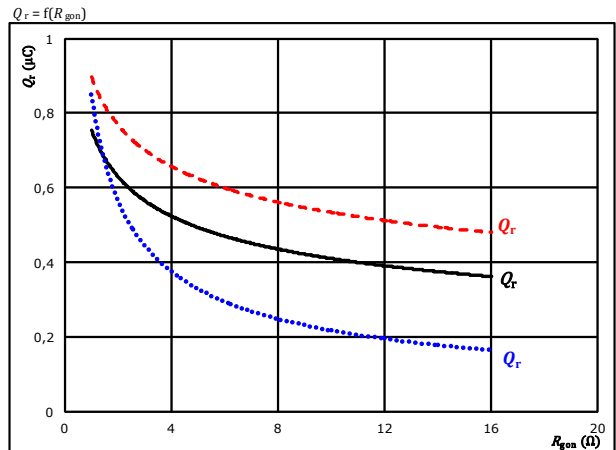
## H-bridge Switching Characteristics

**figure 9.** FWD  
Typical recovered charge as a function of drain current



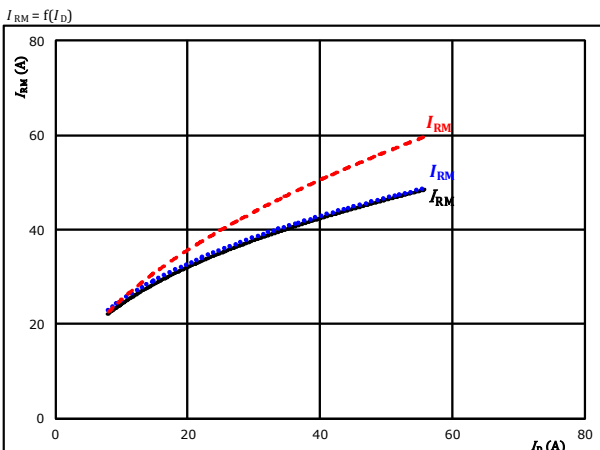
At  $V_{DS} = 700$  V  $T_j: 25$  °C .....  
 $V_{GS} = 16/-6$  V  $T_j: 125$  °C ———  
 $R_{g\text{on}} = 4$  Ω  $T_j: 150$  °C - - - - -

**figure 10.** FWD  
Typical recovered charge as a function of MOSFET turn on gate resistor



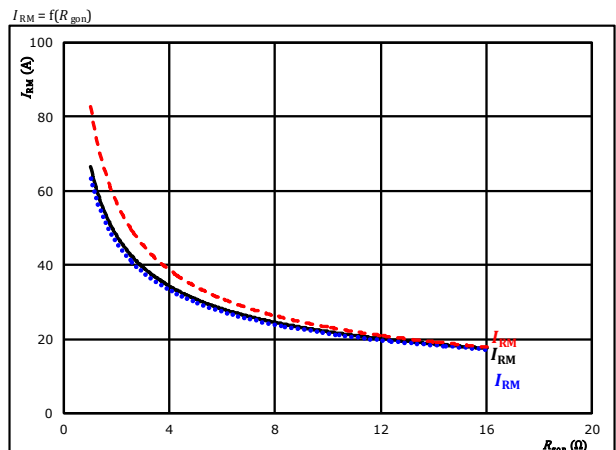
At  $V_{DS} = 700$  V  $T_j: 25$  °C .....  
 $V_{GS} = 16/-6$  V  $T_j: 125$  °C ———  
 $I_D = 32$  A  $T_j: 150$  °C - - - - -

**figure 11.** FWD  
Typical peak reverse recovery current current as a function of drain current



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

**figure 12.** FWD  
Typical peak reverse recovery current current as a function of MOSFET turn on gate resistor



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 - - - - -

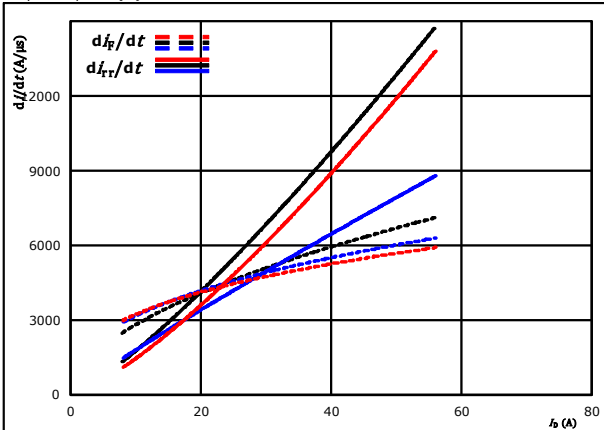


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## H-bridge Switching Characteristics

**figure 13.** FWD

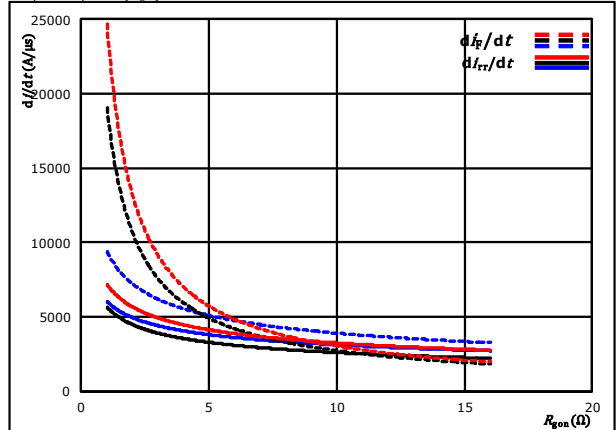
Typical rate of fall of forward and reverse recovery current as a function of drain current  
 $di_F/dt, di_{rr}/dt = f(I_D)$



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

**figure 14.** FWD

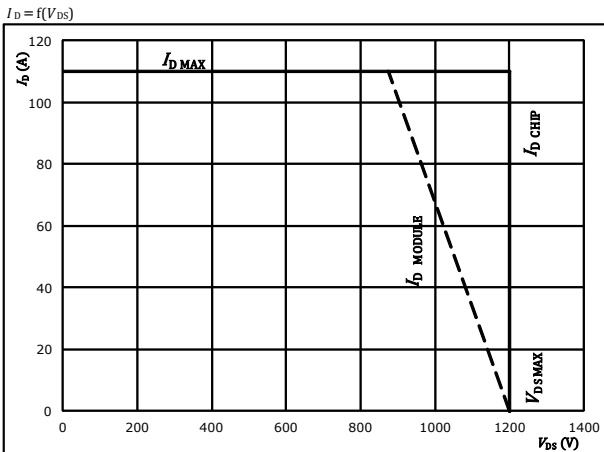
Typical rate of fall of forward and reverse recovery current as a function of MOSFET turn on gate resistor  
 $di_F/dt, di_{rr}/dt = f(R_{gon})$



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

**figure 15.** MOSFET

Reverse bias safe operating area



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



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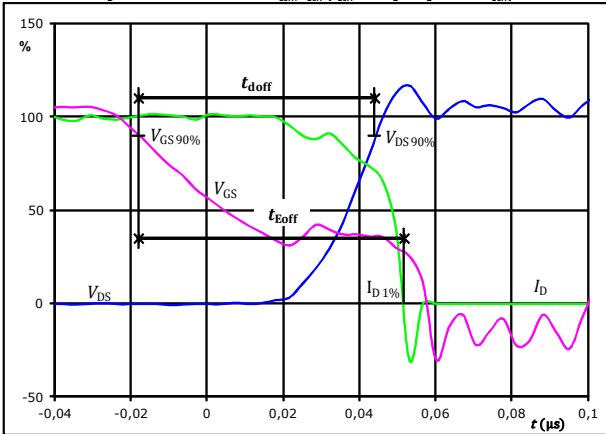
## H-bridge Switching Characteristics

**General conditions**

$T_j$	=	125 °C
$R_{gon}$	=	4 $\Omega$
$R_{goff}$	=	4 $\Omega$

**figure 1. MOSFET**

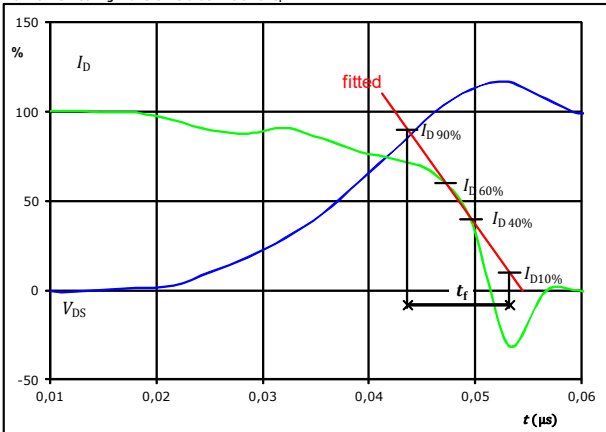
Turn-off Switching Waveforms & definition of  $t_{doff}$ ,  $t_{Eoff}$  ( $t_{Eoff}$  = integrating time for  $t_{Eoff}$ )



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

**figure 3. MOSFET**

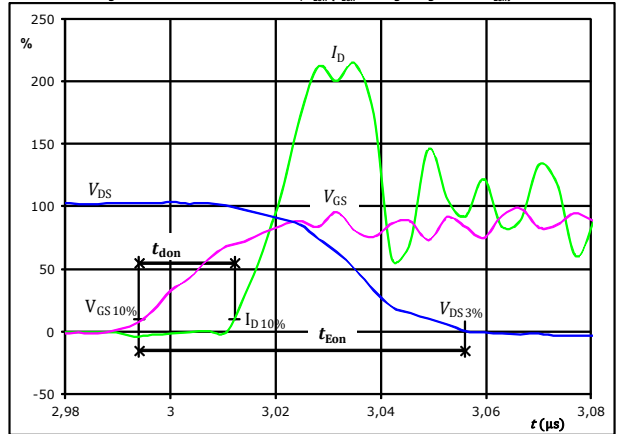
Turn-off Switching Waveforms & definition of  $t_f$



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

**figure 2. MOSFET**

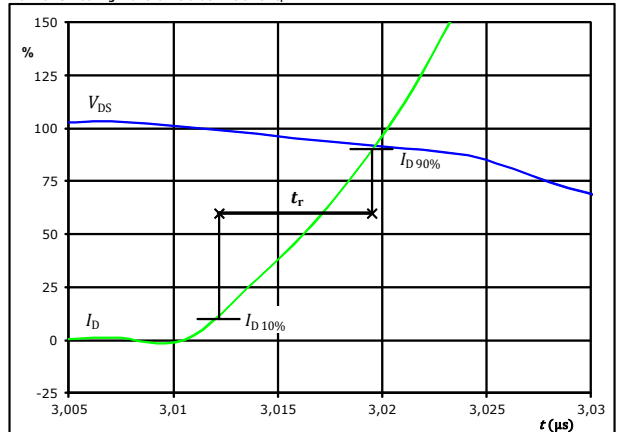
Turn-on Switching Waveforms & definition of  $t_{don}$ ,  $t_{Eon}$  ( $t_{Eon}$  = integrating time for  $t_{Eon}$ )



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

**figure 4. MOSFET**

Turn-on Switching Waveforms & definition of  $t_r$



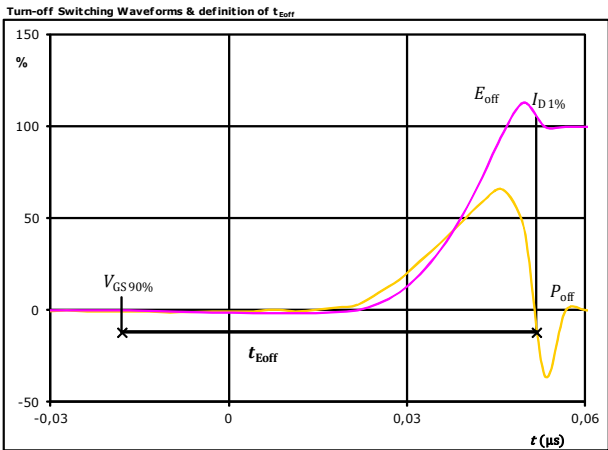
$V_{DS}(100\%) =$	700	V
$I_D(100\%) =$	32	A
$t_r =$	0,008	$\mu s$



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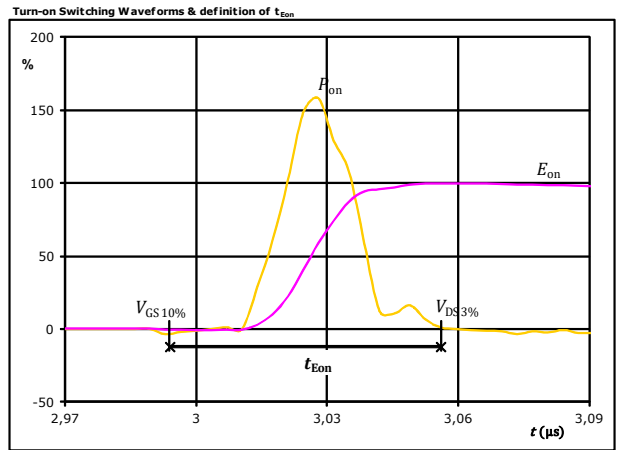
## H-bridge Switching Characteristics

**figure 5.** MOSFET



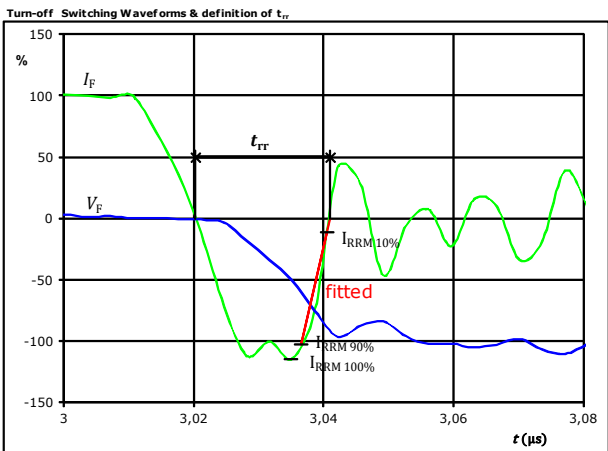
$P_{\text{off}}(100\%) =$	22,52	kW
$E_{\text{off}}(100\%) =$	0,22	mJ
$t_{\text{Eoff}} =$	0,07	$\mu\text{s}$

**figure 6.** MOSFET



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

**figure 7.** FWD



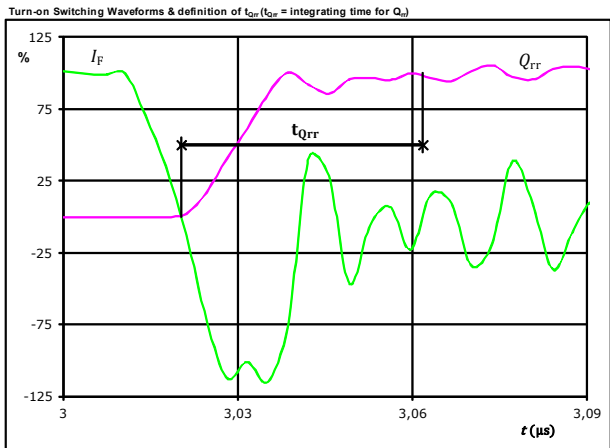
$V_F(100\%) =$	700	V
$I_F(100\%) =$	32	A
$I_{\text{RRM}}(100\%) =$	-37	A
$t_{\text{rr}} =$	0,021	$\mu\text{s}$



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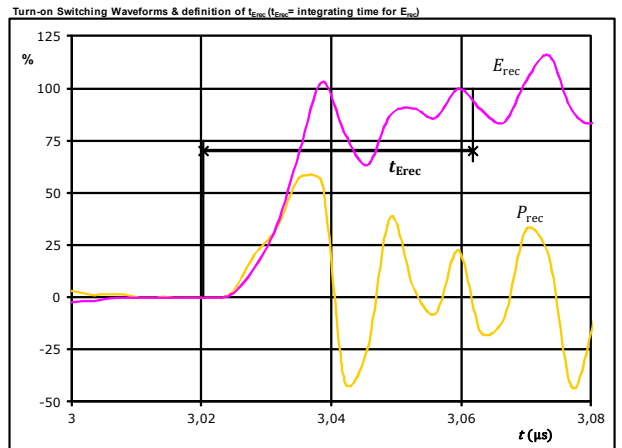
## H-bridge Switching Characteristics

**figure 8.** FWD



$I_F$ (100%) =	32	A
$Q_{rr}$ (100%) =	0,55	$\mu\text{C}$
$t_{Qrr}$ =	0,04	$\mu\text{s}$

**figure 9.** FWD



$P_{rec}$ (100%) =	22,52	kW
$E_{rec}$ (100%) =	0,13	mJ
$t_{Erec}$ =	0,04	$\mu\text{s}$



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Ordering Code & Marking								
<b>Version</b>			<b>Ordering Code</b>					
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 TTTTITVV WWYY UL VIN LLLL SSSS			<b>Text</b>	<b>Name</b>	<b>Date code</b>	<b>UL &amp; VIN</b>	<b>Lot</b>	<b>Serial</b>
			<b>Datamatrix</b>	<b>Type&amp;Ver</b>	<b>Lot number</b>	<b>Serial</b>	<b>Date code</b>	
				NN-NNNNNNNNNNNNNN-TTTTITVV	WWYY	UL VIN	LLLLL	SSSS
				TTTTITVV	LLLLL	SSSS	WWYY	

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

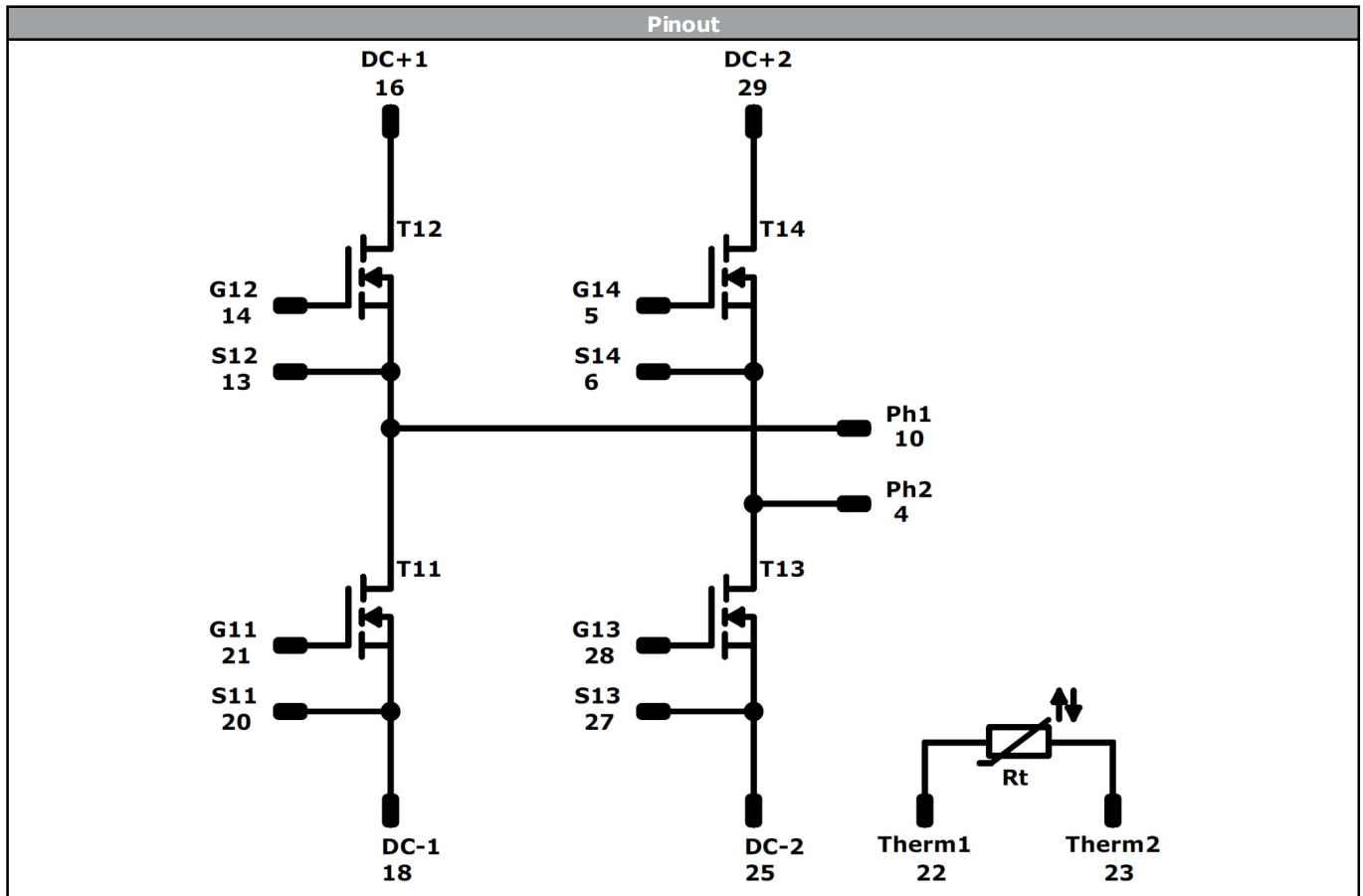
**Outline**

The side view shows a component with a width of 16.2 ±0.5 mm and a height of 12.93 ±0.1 mm. A label 'centerline of pinhead' points to the top edge. The top view shows a rectangular component with a width of 16.7 mm and a height of 11.2 mm. It features 30 pins numbered 1 through 30, with some pins grouped together. The pin locations are marked with their respective X and Y coordinates.

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



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<b>Identification</b>					
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-D1-14	13 Jul. 2017		

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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.