Vincotech

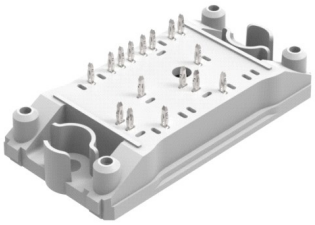
10-PC124PA040MR-L638F18Y
datasheet

fast PACK 0 H — **1200 V / 40 mΩ**

Features

- H-bridge or 2x half-bridge
- SiC MOS
- Switching frequency up to 250kHz
- Thermistor

flow 0 12 mm housing



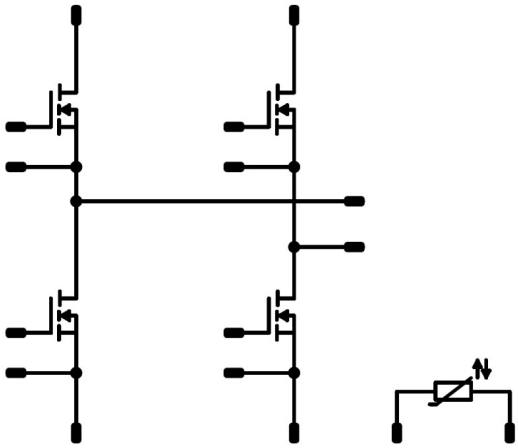
Target applications

- Power Supply

Types

- 10-PC124PA040MR-L638F18Y

Schematic



Maximum Ratings

T_j = 25 °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 °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 °C	68	W
Gate-source voltage	V_{GSS}		-4/22	V
Maximum Junction Temperature	T_{jmax}		175	°C

Maximum Ratings

T_j = 25 °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_{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			min. 12,7	mm
Clearance			9,57	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										
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		
Gate to source charge	Q_{GS}		18	600	20	25		22		nC
Gate to drain charge	Q_{GD}							41		
Short-circuit input capacitance	C_{iss}							1337		
Short-circuit output capacitance	C_{oss}	f= 1 MHz	0	800		25		76		pF
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		
Rise time	t_r	R_{goff} = 4 Ω R_{gon} = 4 Ω				25 125 150		7 8 7		
Turn-off delay time	$t_{d(off)}$					25 125 150		57 65 66		ns
Fall time	t_f		16/-6	700	32	25 125 150		9 10 9		
Turn-on energy (per pulse)	E_{on}	Q_{rFWD} = 0,5 µC Q_{rFWD} = 0,5 µC Q_{rFWD} = 0,7 µC				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		mWs

Characteristic Values

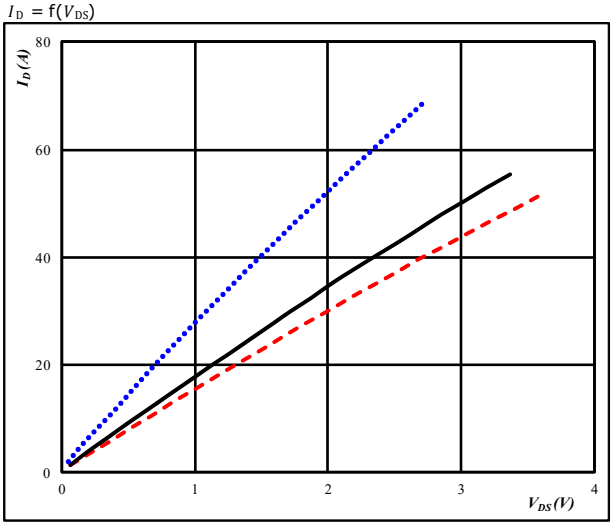
Parameter	Symbol	Conditions					Value			Unit
			V_{GE} [V] V_{GS} [V]	V_{CE} [V] V_{DS} [V] V_F [V]	I_C [A] I_D [A] I_F [A]	T_j [°C]	Min	Typ	Max	
H-Bridge Switch										
Dynamic										
Peak recovery current	I_{RRM}	di/dt = 4760 A/µs di/dt = 4654 A/µs di/dt = 5136 A/µs	16/-6	700	32	25 125 150		38 37 45		A
Reverse recovery time	t_{rr}					25 125 150		19 21 23		ns
Recovered charge	Q_r					25 125 150		0,464 0,546 0,655		µC
Reverse recovered energy	E_{rec}					25 125 150		0,096 0,131 0,152		mWs
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 125 150		4997 8656 8100		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 Characteristics

figure 1. **MOSFET**

Typical output characteristics

$I_D = f(V_{DS})$

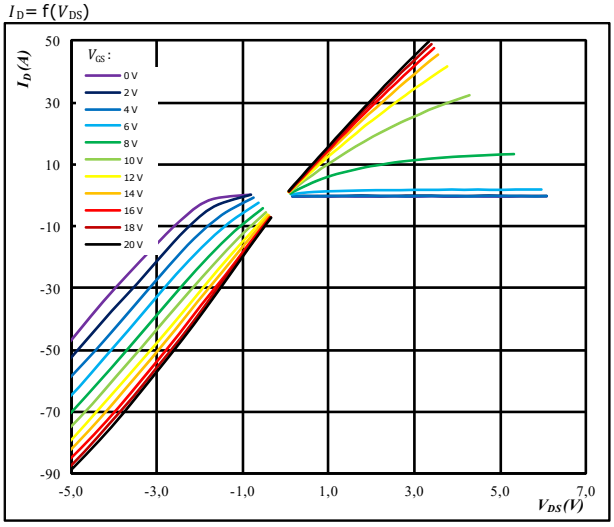


t_p =	250	µs		25 °C
V_{GS}=	18	V	T_j:	125 °C
				150 °C

figure 2. **MOSFET**

Typical output characteristics

$I_D = f(V_{DS})$

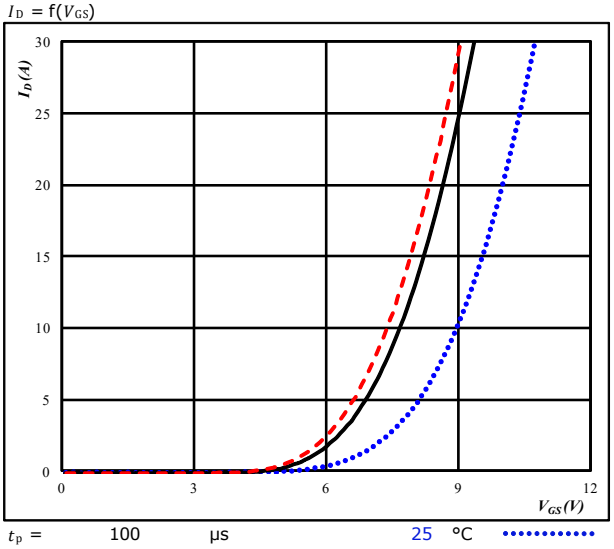


t_p =	250	µs
T_j =	150	°C
V_{GS} from	0 V to 20 V in steps of 2 V	

figure 3. **MOSFET**

Typical transfer characteristics

$I_D = f(V_{GS})$

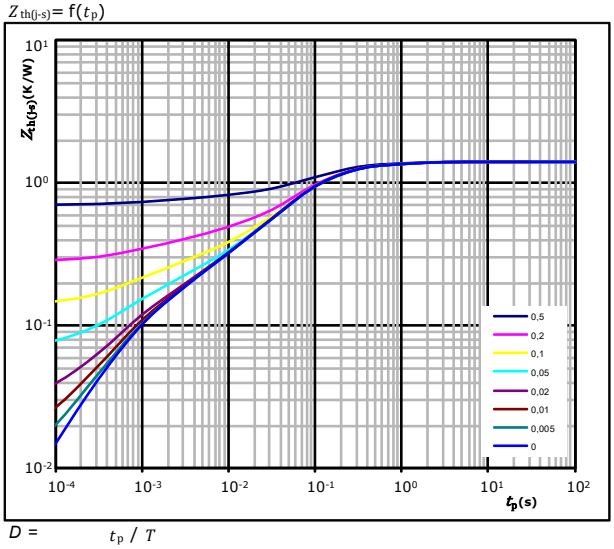


t_p =	100	µs		25 °C
V_{DS} =	10	V	T_j:	125 °C
				150 °C

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	K/W

MOSFET thermal model values

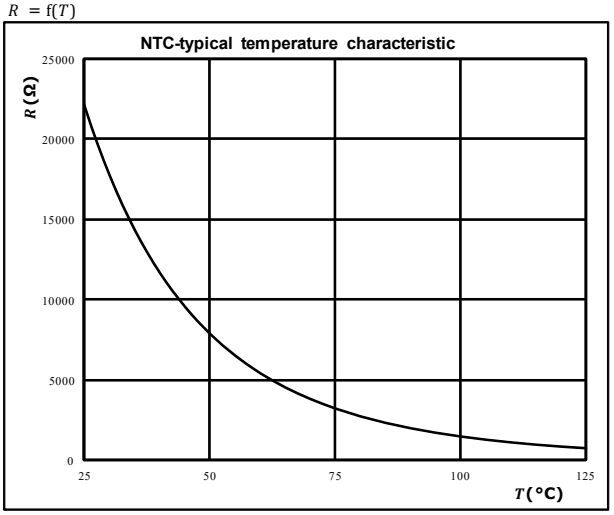
R (K/W)	τ (s)
1,24E-01	1,00E+00
3,91E-01	1,66E-01
6,76E-01	6,11E-02
1,21E-01	5,50E-03
9,55E-02	8,02E-04

Thermistor Characteristics

figure 1. **Thermistor**

Typical NTC characteristic as a function of temperature

$R = f(T)$

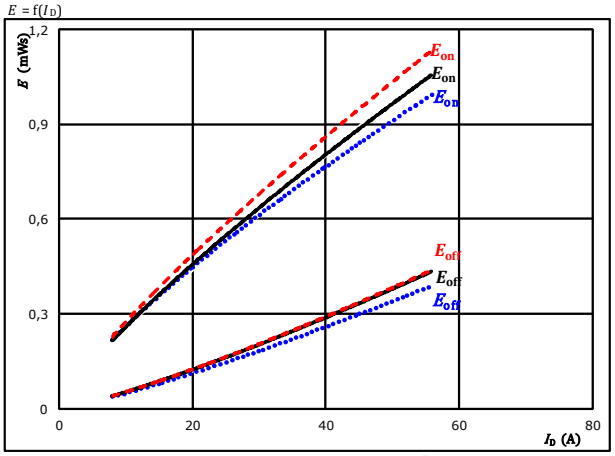


H-bridge Switching Characteristics

figure 1. **MOSFET**

Typical switching energy losses as a function of drain current

$E = f(I_D)$



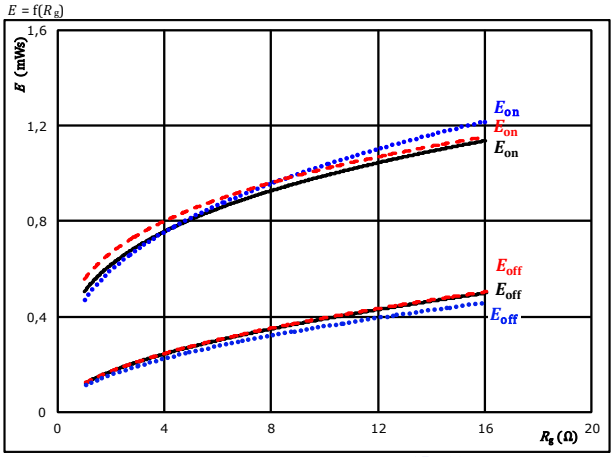
With an inductive load at

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

$E = f(R_g)$



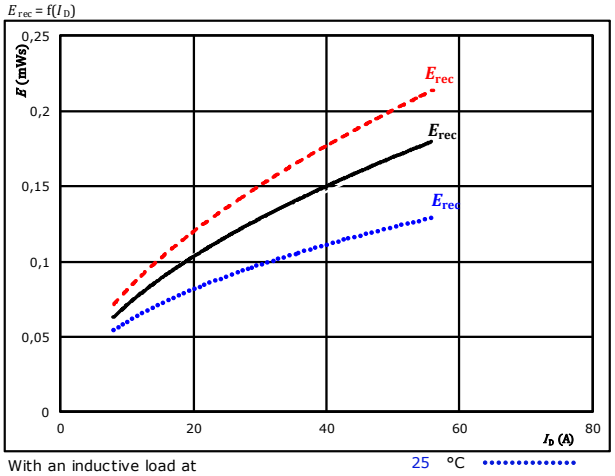
With an inductive load at

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

$E_{rec} = f(I_D)$



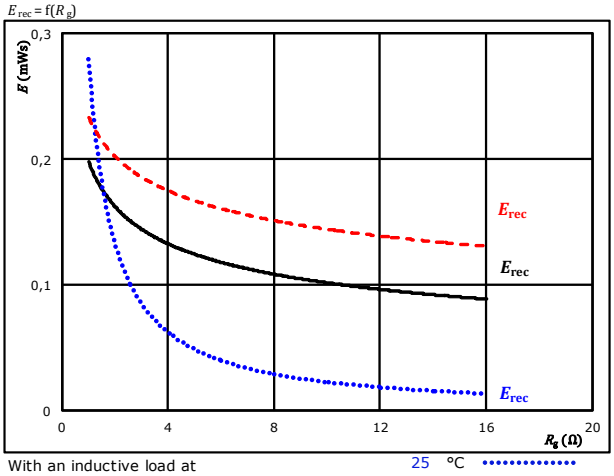
With an inductive load at

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

$E_{rec} = f(R_g)$



With an inductive load at

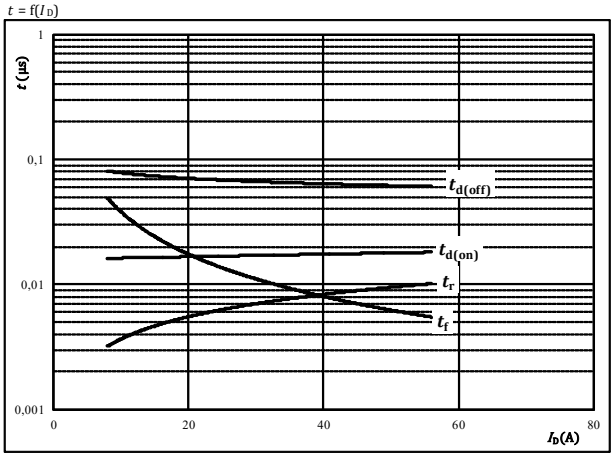
V_{DS} =	700	V	T_j:	25 °C	·····
V_{GS} =	16/-6	V		125 °C	———
I_D =	32	A		150 °C	– – –

H-bridge Switching Characteristics

figure 5. **MOSFET**

Typical switching times as a function of drain current

$t = f(I_D)$



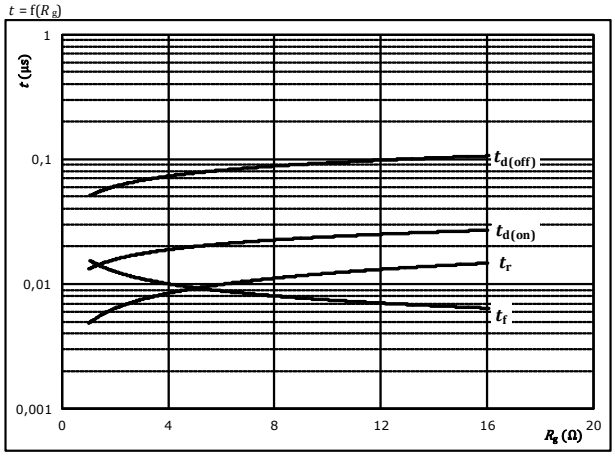
With an inductive load at

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

figure 6. **MOSFET**

Typical switching times as a function of gate resistor

$t = f(R_g)$



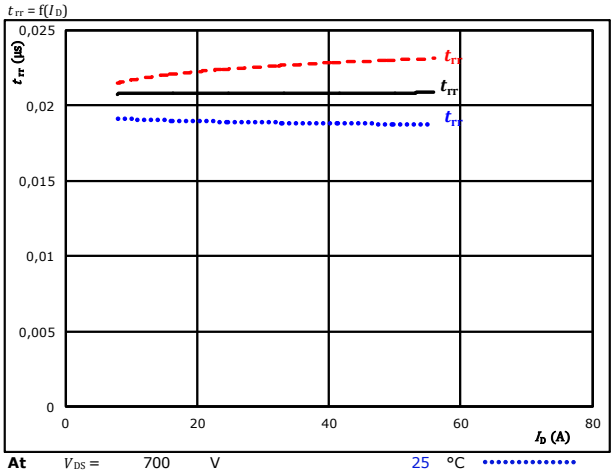
With an inductive load at

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

figure 7. **FWD**

Typical reverse recovery time as a function of drain current

$t_{rr} = f(I_D)$

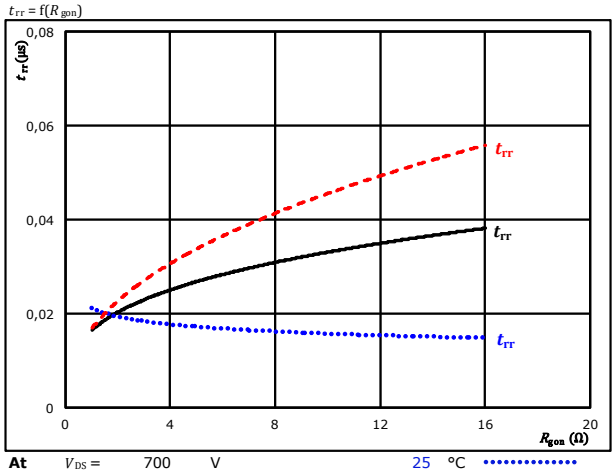


At	V_{DS} =	700	V		
	V_{GS} =	16/-6	V	T_j:	25 °C
	R_{gon} =	4	Ω		125 °C
					150 °C

figure 8. **FWD**

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

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



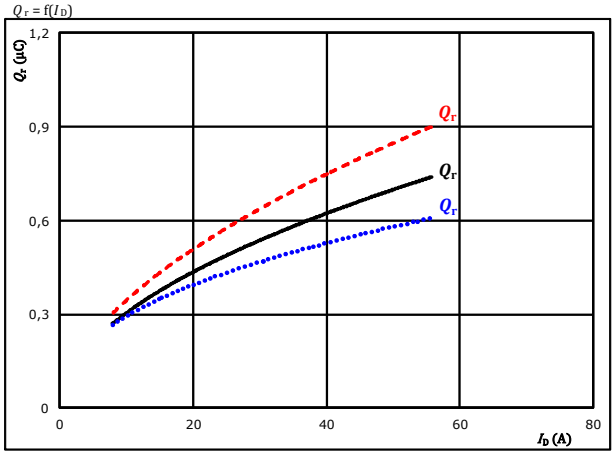
At	V_{DS} =	700	V		
	V_{GS} =	16/-6	V	T_j:	25 °C
	I_D =	32	A		125 °C
					150 °C

H-bridge Switching Characteristics

figure 9. **FWD**

Typical recovered charge as a function of drain current

$Q_r = f(I_D)$

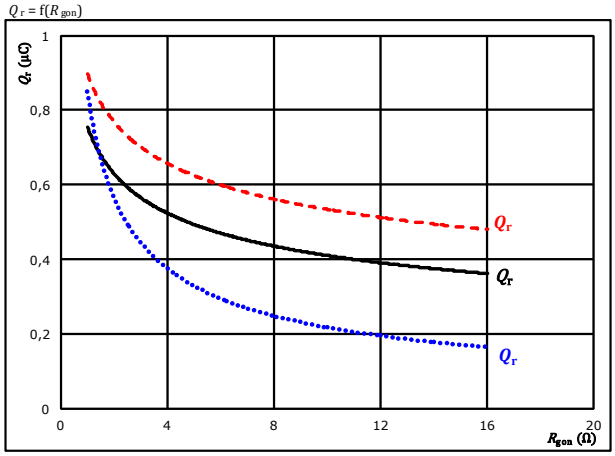


At						
	V_{DS} =	700	V		25 °C	
	V_{GS} =	16/-6	V	T_j:	125 °C	
	R_{gon} =	4	Ω		150 °C	

figure 10. **FWD**

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

$Q_r = f(R_{gon})$

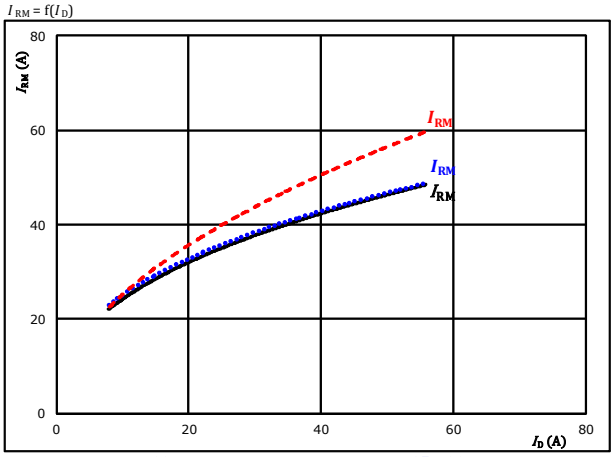


At						
	V_{DS} =	700	V		25 °C	
	V_{GS} =	16/-6	V	T_j:	125 °C	
	I_D =	32	A		150 °C	

figure 11. **FWD**

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

$I_{RM} = f(I_D)$

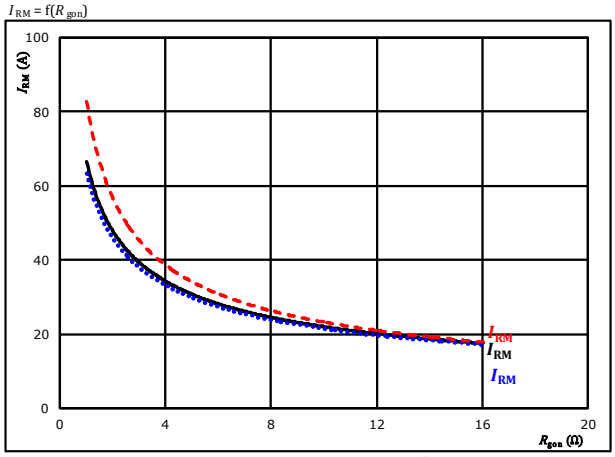


At						
	V_{DS} =	700	V		25 °C	
	V_{GS} =	16/-6	V	T_j:	125 °C	
	R_{gon} =	4	Ω		150 °C	

figure 12. **FWD**

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

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



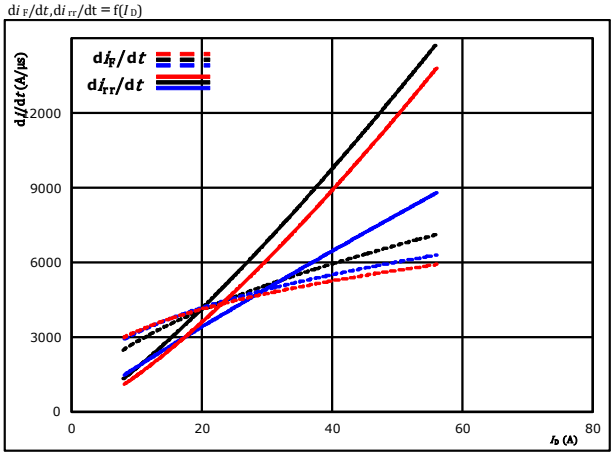
At						
	V_{DS} =	700	V		25 °C	
	V_{GS} =	16/-6	V	T_j:	125 °C	
	I_D =	32	A		150 °C	

H-bridge Switching Characteristics

figure 13. **FWD**

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

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

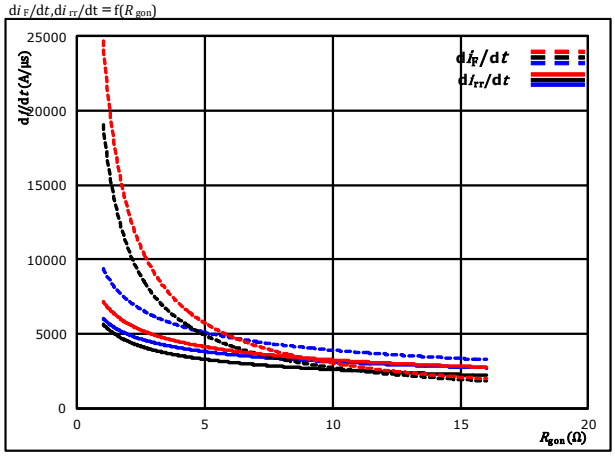


At						
V_{DS} =	700	V		25 °C	·····
V_{GS} =	16/-6	V	T_j:	125 °C	———
R_{gon} =	4	Ω		150 °C	- - -

figure 14. **FWD**

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

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

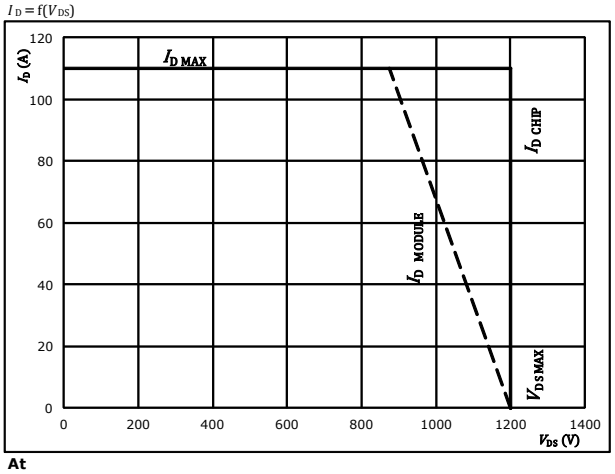


At						
V_{DS} =	700	V		25 °C	·····
V_{GS} =	16/-6	V	T_j:	125 °C	———
I_D =	32	A		150 °C	- - -

figure 15. **MOSFET**

Reverse bias safe operating area

$I_D = f(V_{DS})$



At

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

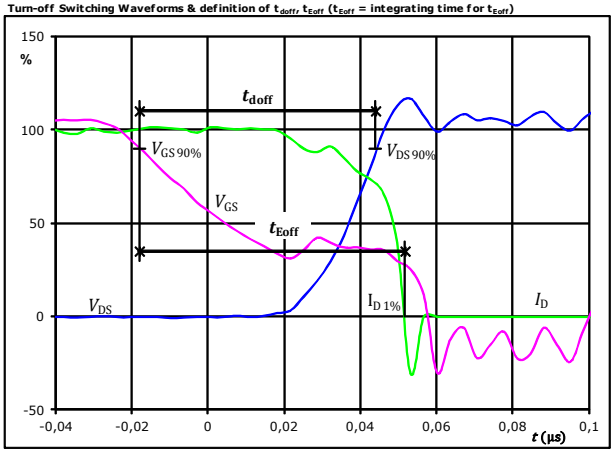
H-bridge Switching Characteristics

General conditions

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

figure 1. MOSFET

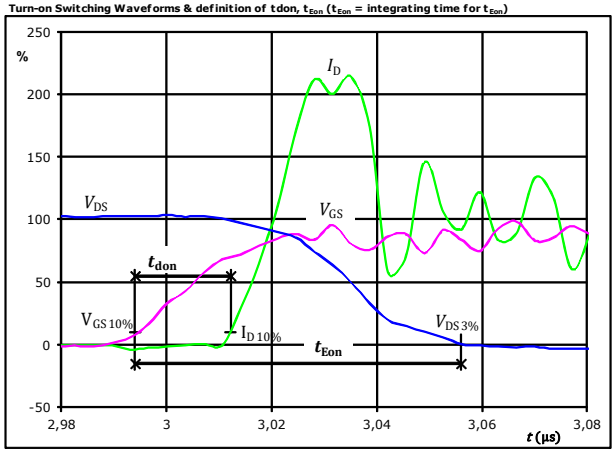
Turn-off Switching Waveforms & definition of t_{doff}, t_{Eoff} (t_{Eoff} = integrating time for t_{Eoff})



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

figure 2. MOSFET

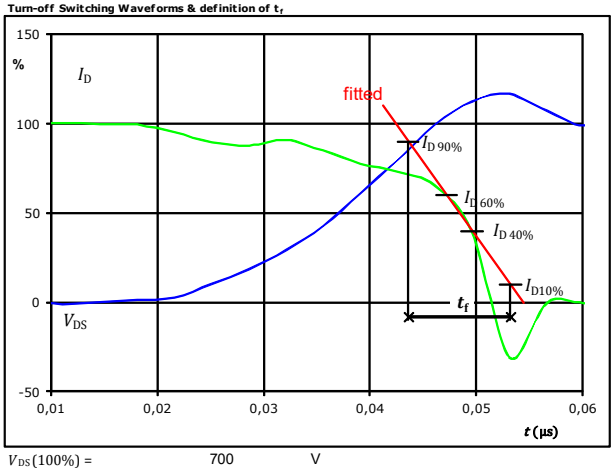
Turn-on Switching Waveforms & definition of tdon, t_{Eon} (t_{Eon} = integrating time for t_{Eon})



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

figure 3. MOSFET

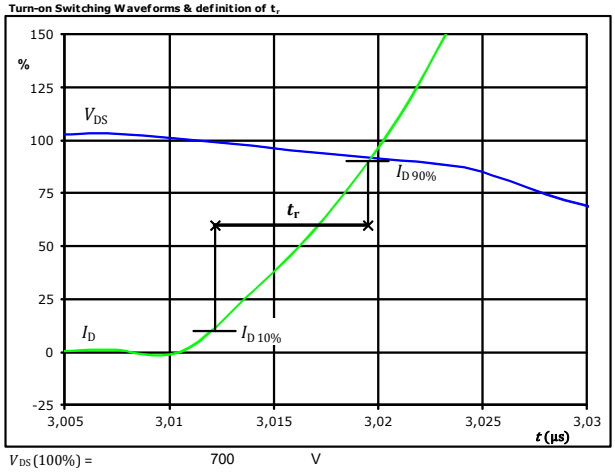
Turn-off Switching Waveforms & definition of t_f



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

figure 4. MOSFET

Turn-on Switching Waveforms & definition of t_r

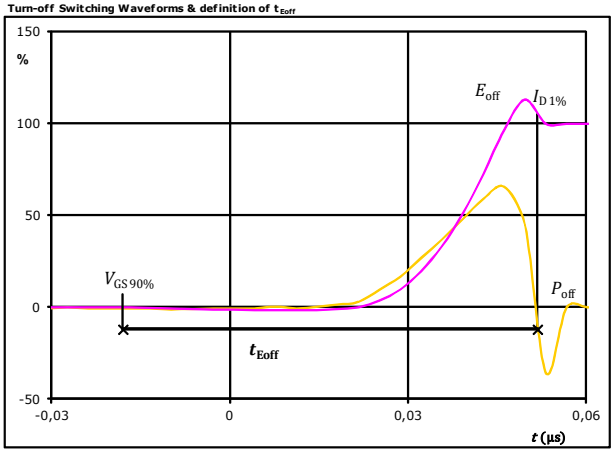


$V_{DS}(100\%)$ =	700	V
$I_D(100\%)$ =	32	A
t_r =	0,008	µs

H-bridge Switching Characteristics

figure 5. **MOSFET**

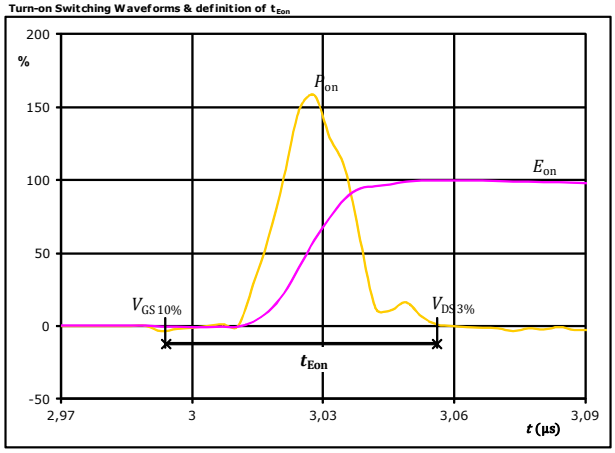
Turn-off Switching Waveforms & definition of t_{Eoff}



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

figure 6. **MOSFET**

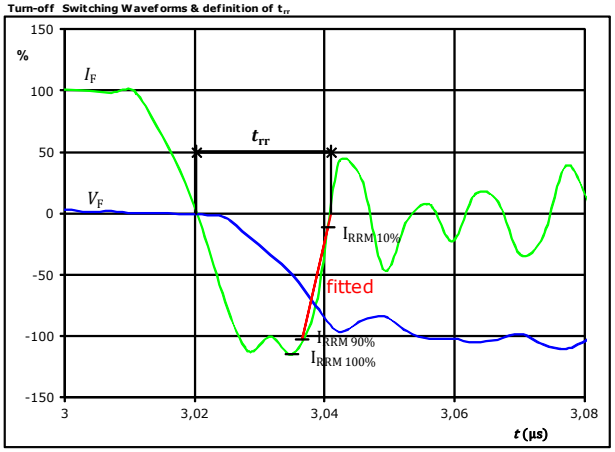
Turn-on Switching Waveforms & definition of t_{Eon}



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

figure 7. **FWD**

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

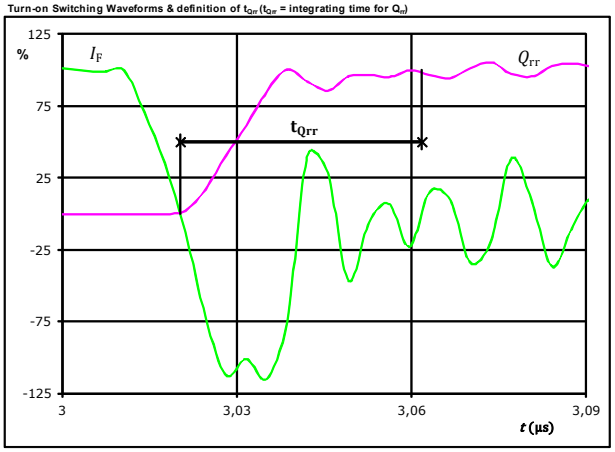


$V_F(100\%)$ =	700	V
$I_F(100\%)$ =	32	A
$I_{RRM}(100\%)$ =	-37	A
t_{rr} =	0,021	µs

H-bridge Switching Characteristics

figure 8. **FWD**

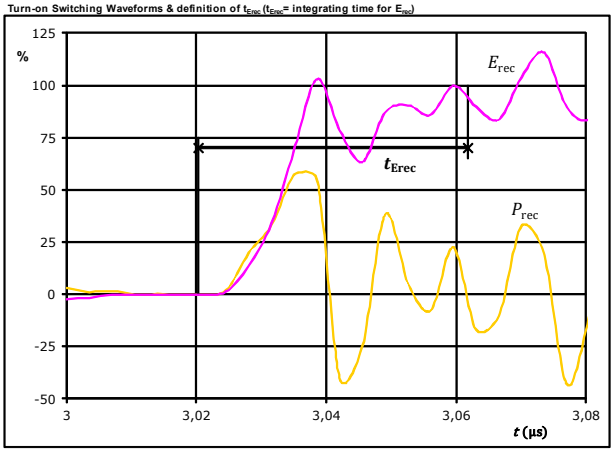
Turn-on Switching Waveforms & definition of t_{Qrr} (t_{Qrr} = integrating time for Q_{rr})



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

figure 9. **FWD**

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



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

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Ordering Code & Marking

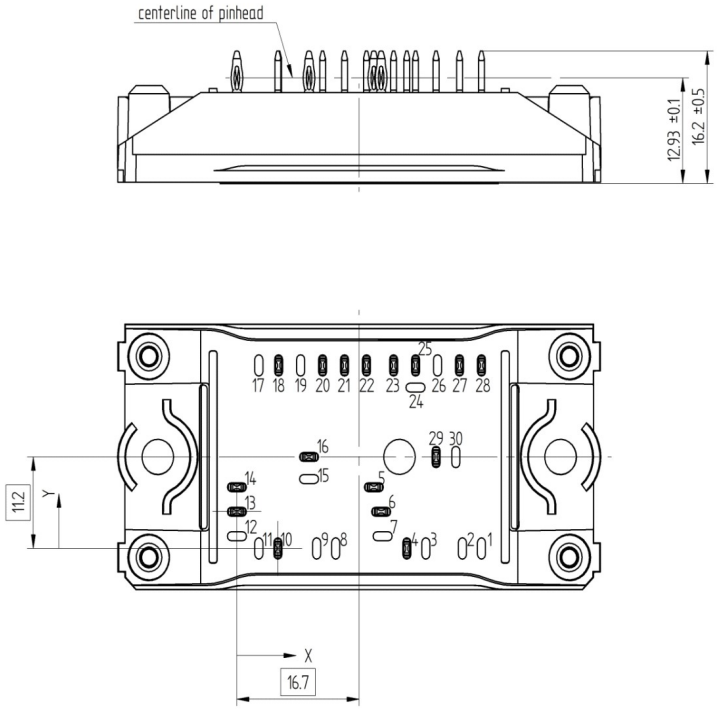
Version	Ordering Code
without thermal paste 12 mm housing with press-fit pins	10-PC124PA040MR-L638F18Y
with thermal paste 12 mm housing with press-fit pins	10-PC124PA040MR-L638F18Y-/3/

NN-NNNNNNNNNNNNN
TTTTTTVV WWYY UL
VIN LLLLL SSSS

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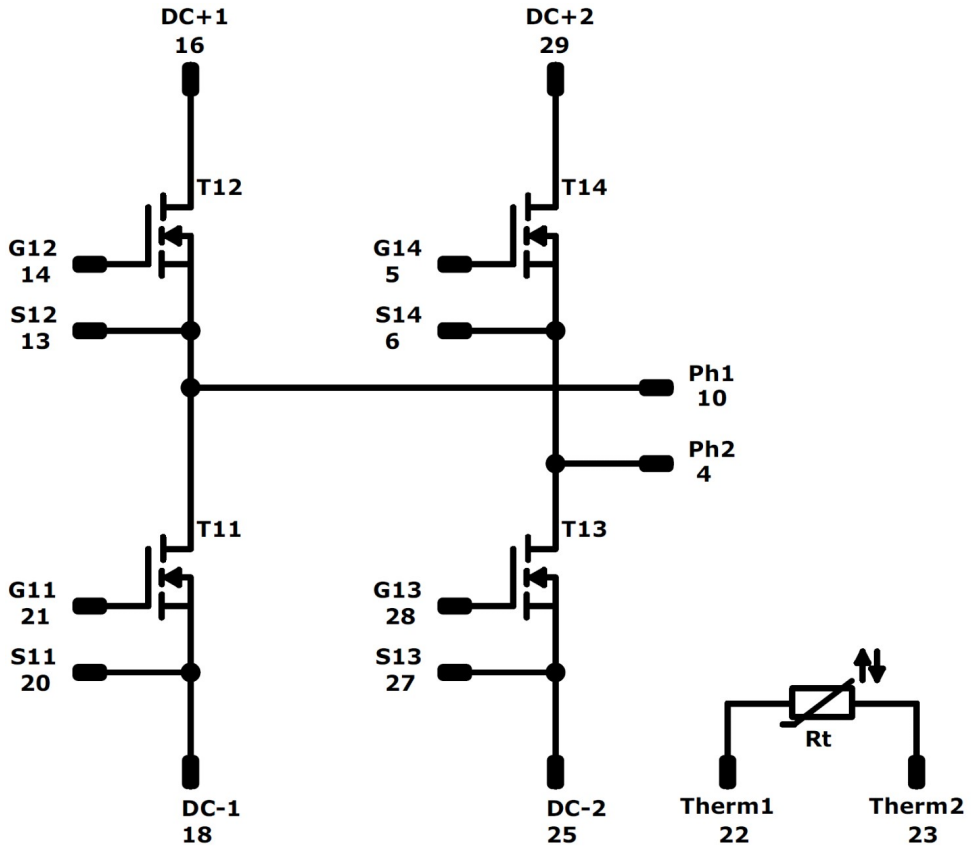
Pinout



Identification

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

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

Handling instruction
Handling instructions for *flow* 0 packages see vincotech.com website.

Package data
Package data for *flow* 0 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		