



fastPACK 0

1200 V / 40 A

Topology features

- Kelvin Emitter for improved switching performance
- Temperature sensor

Component features

- Easy paralleling
- High speed switching
- Low switching losses

Housing features

- Base isolation: Al₂O₃
- Convex shaped substrate for superior thermal contact
- Thermo-mechanical push-and-pull force relief
- Press-fit pin
- Reliable cold welding connection

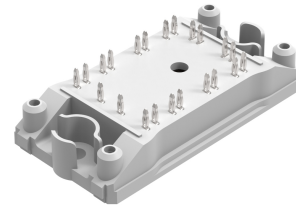
Target applications

- Charging Stations
- Energy Storage Systems
- Power Supply
- UPS
- Welding & Cutting

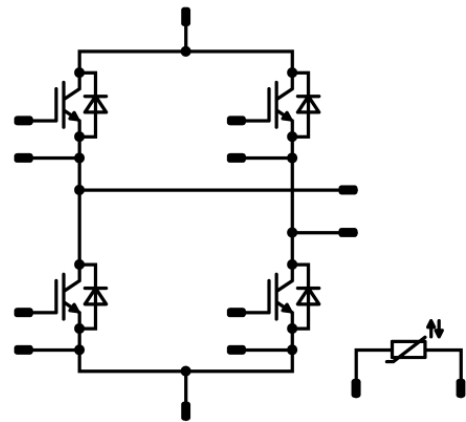
Types

- 10-PC124PA040SH-P629F41Y

flow 0 12 mm housing



Schematic





Vincotech

10-PC124PA040SH-P629F41Y
datasheet

Maximum Ratings

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

Parameter	Symbol	Conditions	Value	Unit
H-Bridge Switch				
Collector-emitter voltage	V_{CES}		1200	V
Collector current (DC current)	I_C	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	44	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}	120	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	113	W
Gate-emitter voltage	V_{GES}		± 20	V
Short circuit ratings	t_{SC}	$V_{GE} = 15\text{ V}$, $V_{CC} = 800\text{ V}$ $T_j = 150\text{ °C}$	10	μs
Maximum junction temperature	T_{jmax}		175	$^{\circ}\text{C}$

H-Bridge Diode

Peak repetitive reverse voltage	V_{RRM}		1200	V
Forward current (DC current)	I_F	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	24	A
Surge (non-repetitive) forward current	I_{FSM}	Single Half Sine Wave, $t_p = 10\text{ ms}$ $T_j = 150\text{ °C}$	100	A
Surge current capability	I^2t		50	A^2s
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	61	W
Maximum junction temperature	T_{jmax}		175	$^{\circ}\text{C}$

Module Properties

Thermal Properties

Storage temperature	T_{stg}		-40...+125	$^{\circ}\text{C}$
Operation temperature under switching condition	T_{jop}		-40...+($T_{jmax} - 25$)	$^{\circ}\text{C}$

Isolation Properties

Isolation voltage	V_{isol}	DC Test Voltage* $t_p = 2\text{ s}$	6000	V
Isolation voltage	V_{isol}	AC Voltage $t_p = 1\text{ min}$	2500	V
Creepage distance			>12,7	mm
Clearance			9,19	mm
Comparative Tracking Index	CTI		≥ 200	

*100 % tested in production



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10-PC124PA040SH-P629F41Y
datasheet

Characteristic Values

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

H-Bridge Switch

Static

Gate-emitter threshold voltage	$V_{GE(th)}$	$V_{CE} = V_{GE}$				0,0015	25	5,3	5,8	6,3	V
Collector-emitter saturation voltage	$V_{CE(sat)}$		15		40		25 125	1,78	1,96	2,42 ⁽¹⁾	V
Collector-emitter cut-off current	I_{CES}		0	1200			25			5	μA
Gate-emitter leakage current	I_{GES}		20	0			25			120	nA
Internal gate resistance	r_g								None		Ω
Input capacitance	C_{ies}								2330		pF
Output capacitance	C_{oes}	$f = 1$ Mhz	0	25			25		150		pF
Reverse transfer capacitance	C_{res}								130		pF
Gate charge	Q_g	$V_{CC} = 960$ V	15		40		25		185		nC

Thermal

Thermal resistance junction to sink ⁽²⁾	$R_{th(j-s)}$	$\lambda_{paste} = 3,4$ W/mK (PSX)							0,84		K/W
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Dynamic

Turn-on delay time	$t_{d(on)}$						25 125 150		63,6 65 66		ns
Rise time	t_r						25 125 150		15,4 18,6 18		ns
Turn-off delay time	$t_{d(off)}$						25 125 150		162,4 215,8 229,6		ns
Fall time	t_f						25 125 150		26,3 62,8 70,15		ns
Turn-on energy (per pulse)	E_{on}	$Q_{tFWD} = 2,7$ μC $Q_{tFWD} = 4,78$ μC $Q_{tFWD} = 5,82$ μC					25 125 150		1,54 2,19 2,41		mWs
Turn-off energy (per pulse)	E_{off}						25 125 150		1,32 2,29 2,53		mWs



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Characteristic Values

Parameter	Symbol	Conditions					Values			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 Diode

Static

Forward voltage	V_F				25	25 150		2,47 2,49	2,74 ⁽¹⁾ 2,79 ⁽¹⁾	V
Reverse leakage current	I_R	$V_i = 1200$ V				25 150			60 3300	μA

Thermal

Thermal resistance junction to sink ⁽²⁾	$R_{th(j-s)}$	$\lambda_{paste} = 3,4$ W/mK (PSX)						1,56		K/W
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Dynamic

Peak recovery current	I_{RM}	$di/dt=3019$ A/μs $di/dt=3104$ A/μs $di/dt=2972$ A/μs	±15	600	40	25		48,06		A
Reverse recovery time	t_{rr}					125		54,99		
						150		60,27		
						25		101,42		
Recovered charge	Q_r					125		221,81		
						150		250,67		
		25		2,7						
Reverse recovered energy	E_{rec}	125		4,78						
		150		5,82						
		25		1,13						
Peak rate of fall of recovery current	$(di_{rr}/dt)_{max}$	125		2,11						
		150		2,6						
		25		3780						
						25		2583		A/μs
						150		2658		



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Characteristic Values

Parameter	Symbol	Conditions					Values			Unit
		V_{GS} [V]	V_{GE} [V]	V_{DS} [V]	V_{CE} [V]	T_j [°C]	Min	Typ	Max	

Thermistor

Static

Rated resistance	R					25		22		kΩ
Deviation of R100	$A_{R/R}$	$R_{100} = 1484 \Omega$				100	-5		5	%
Power dissipation	P					25		130		mW
Power dissipation constant	d					25		1,5		mW/K
B-value	$B_{(25/50)}$	Tol. $\pm 1 \%$						3962		K
B-value	$B_{(25/100)}$	Tol. $\pm 1 \%$						4000		K
Vincotech Thermistor Reference									I	

⁽¹⁾ Value at chip level

⁽²⁾ Only valid with pre-applied Vincotech thermal interface material.

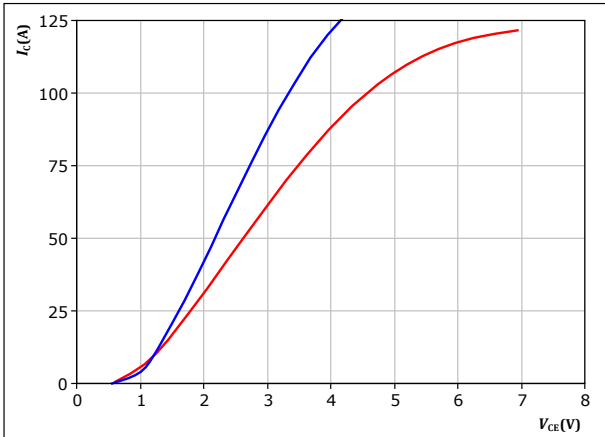


H-Bridge Switch Characteristics

figure 1. IGBT

Typical output characteristics

$$I_C = f(V_{CE})$$

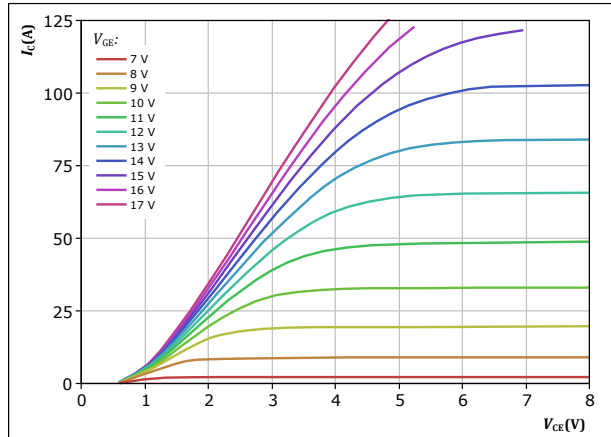


$t_p = 250 \mu s$
 $V_{GE} = 15 V$
 $T_j:$ — 25 °C
— 125 °C

figure 2. IGBT

Typical output characteristics

$$I_C = f(V_{CE})$$

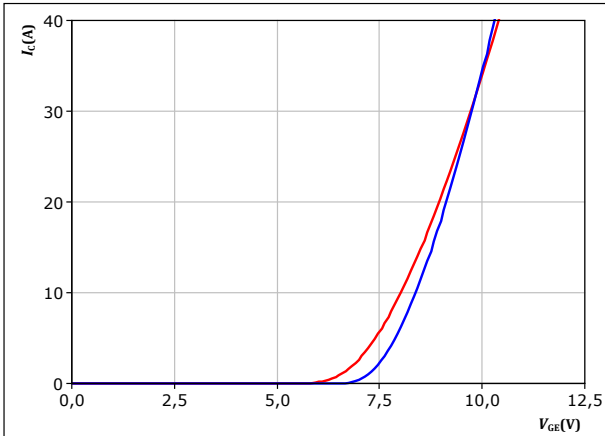


$t_p = 250 \mu s$
 $T_j = 125 \text{ °C}$
 V_{GE} from 7 V to 17 V in steps of 1 V

figure 3. IGBT

Typical transfer characteristics

$$I_C = f(V_{GE})$$

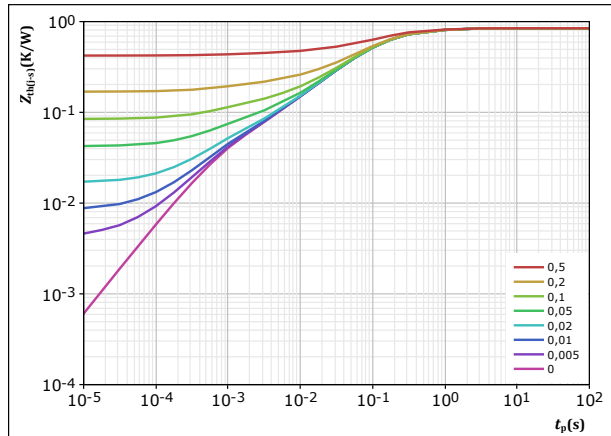


$t_p = 250 \mu s$
 $V_{CE} = 10 V$
 $T_j:$ — 25 °C
— 125 °C

figure 4. IGBT

Transient thermal impedance as a function of pulse width

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



$D = t_p / T$
 $R_{th(j-s)} = 0,844 \text{ K/W}$

IGBT thermal model values

R (K/W)	τ (s)
1,18E-01	8,20E-01
4,24E-01	1,32E-01
2,01E-01	4,79E-02
6,46E-02	9,26E-03
3,72E-02	8,03E-04



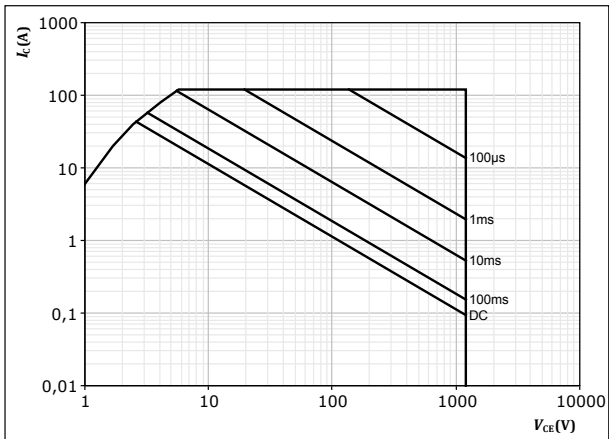
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H-Bridge Switch Characteristics

figure 5. IGBT

Safe operating area

$$I_C = f(V_{CE})$$



$D =$ single pulse

$T_s = 80$ °C

$V_{GE} = 15$ V

$T_j = T_{jmax}$



H-Bridge Diode Characteristics

figure 6. FWD

Typical forward characteristics

$$I_F = f(V_F)$$

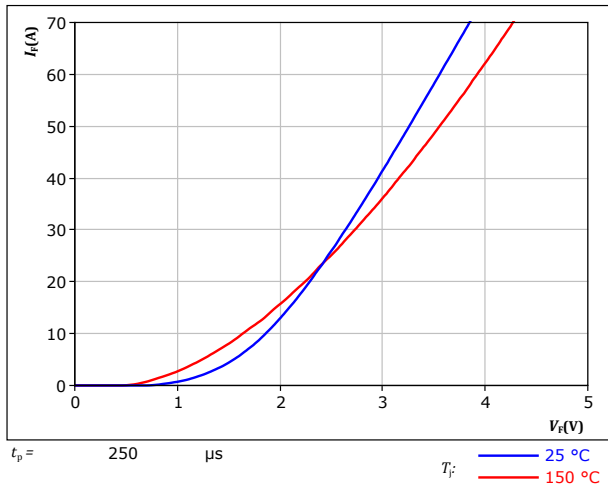
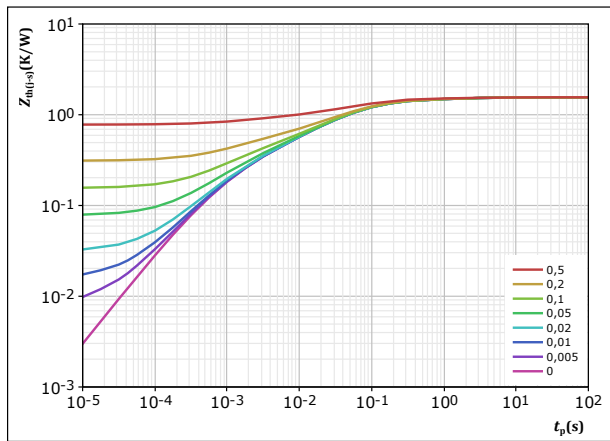


figure 7. FWD

Transient thermal impedance as a function of pulse width

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



$D = t_p / T$
 $R_{th(j-s)} = 1,556\text{ K/W}$
 FWD thermal model values

R (K/W)	τ (s)
4,65E-02	4,86E+00
1,06E-01	8,11E-01
4,71E-01	1,09E-01
4,83E-01	3,07E-02
2,34E-01	7,03E-03
1,81E-01	1,25E-03
3,38E-02	3,28E-04

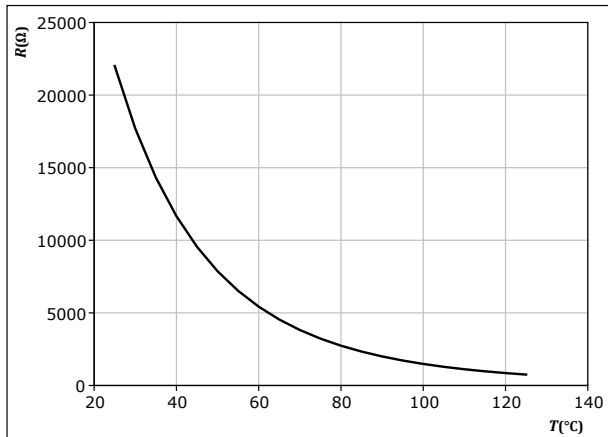


Thermistor Characteristics

figure 8. Thermistor

Typical NTC characteristic as function of temperature

$$R_T = f(T)$$

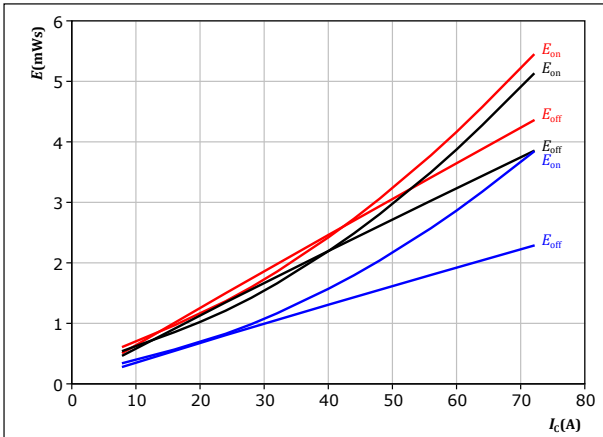




H-Bridge Switching Characteristics

figure 9. IGBT

Typical switching energy losses as a function of collector current
 $E = f(I_c)$

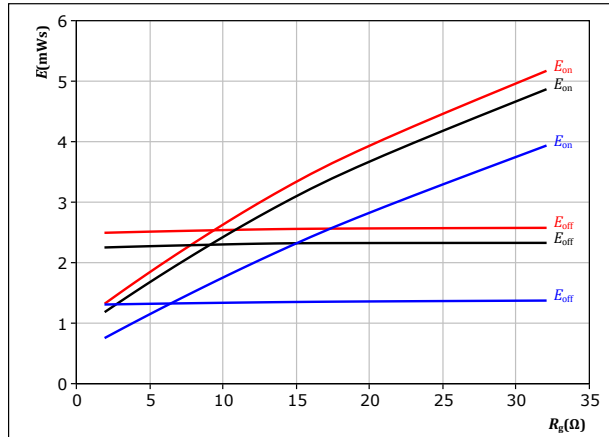


With an inductive load at

$V_{CE} =$	600	V	$T_j:$	—	25 °C
$V_{GE} =$	±15	V		—	125 °C
$R_{g(on)} =$	8	Ω		—	150 °C
$R_{g(off)} =$	8	Ω			

figure 10. IGBT

Typical switching energy losses as a function of IGBT turn on gate resistor
 $E = f(R_g)$

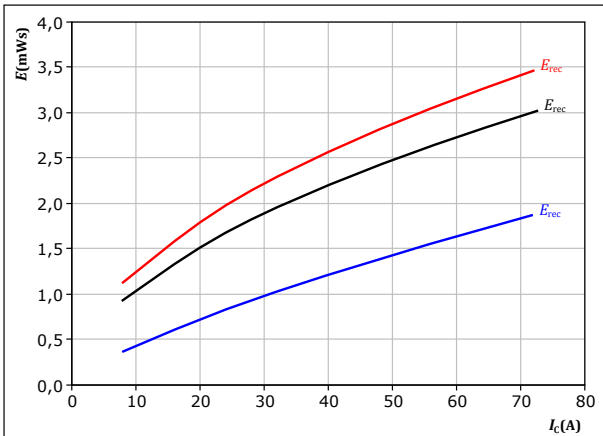


With an inductive load at

$V_{CE} =$	600	V	$T_j:$	—	25 °C
$V_{GE} =$	±15	V		—	125 °C
$I_c =$	40	A		—	150 °C

figure 11. FWD

Typical reverse recovered energy loss as a function of collector current
 $E_{rec} = f(I_c)$

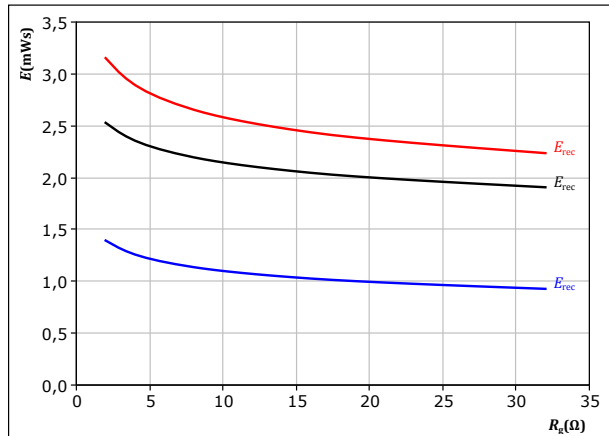


With an inductive load at

$V_{CE} =$	600	V	$T_j:$	—	25 °C
$V_{GE} =$	±15	V		—	125 °C
$R_{g(on)} =$	8	Ω		—	150 °C

figure 12. FWD

Typical reverse recovered energy loss as a function of IGBT turn on gate resistor
 $E_{rec} = f(R_g)$



With an inductive load at

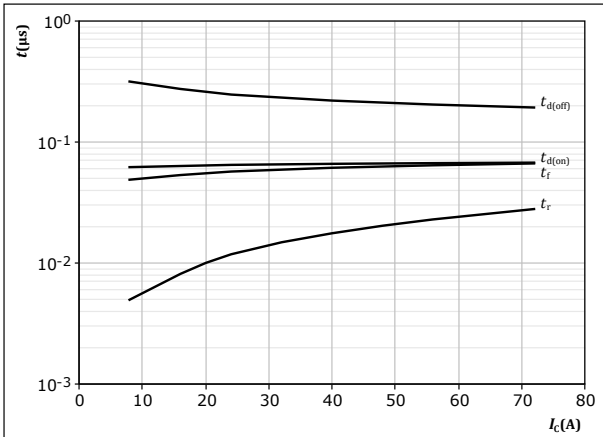
$V_{CE} =$	600	V	$T_j:$	—	25 °C
$V_{GE} =$	±15	V		—	125 °C
$I_c =$	40	A		—	150 °C



H-Bridge Switching Characteristics

figure 13. IGBT

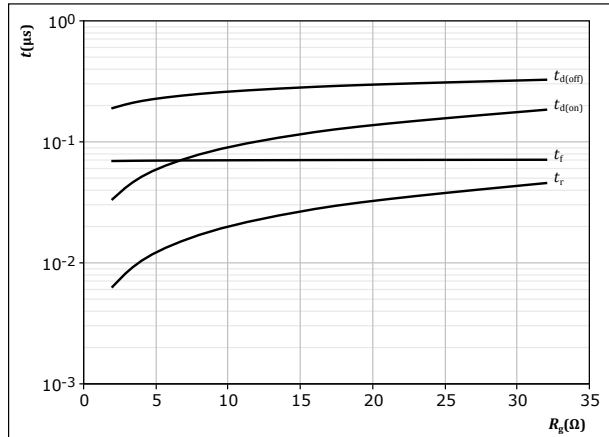
Typical switching times as a function of collector current
 $t = f(I_c)$



With an inductive load at
 $T_j = 150 \text{ }^\circ\text{C}$
 $V_{CE} = 600 \text{ V}$
 $V_{GE} = \pm 15 \text{ V}$
 $R_{gon} = 8 \text{ } \Omega$
 $R_{goff} = 8 \text{ } \Omega$

figure 14. IGBT

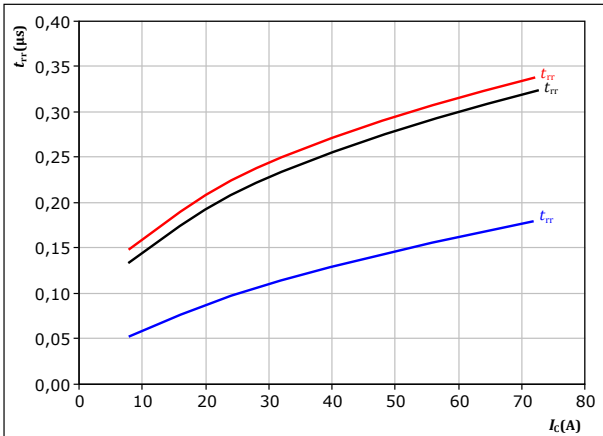
Typical switching times as a function of IGBT turn on gate resistor
 $t = f(R_g)$



With an inductive load at
 $T_j = 150 \text{ }^\circ\text{C}$
 $V_{CE} = 600 \text{ V}$
 $V_{GE} = \pm 15 \text{ V}$
 $I_c = 40 \text{ A}$

figure 15. FWD

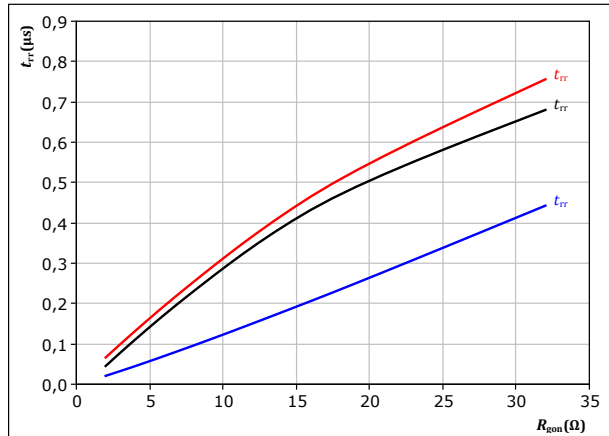
Typical reverse recovery time as a function of collector current
 $t_{rr} = f(I_c)$



With an inductive load at
 $V_{CE} = 600 \text{ V}$
 $V_{GE} = \pm 15 \text{ V}$
 $R_{gon} = 8 \text{ } \Omega$
 $T_j:$ — 25 °C
— 125 °C
— 150 °C

figure 16. FWD

Typical reverse recovery time as a function of IGBT turn on gate resistor
 $t_{rr} = f(R_{gon})$



With an inductive load at
 $V_{CE} = 600 \text{ V}$
 $V_{GE} = \pm 15 \text{ V}$
 $I_c = 40 \text{ A}$
 $T_j:$ — 25 °C
— 125 °C
— 150 °C

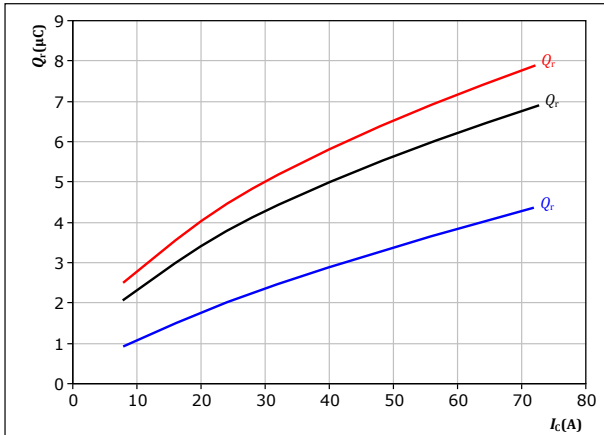


H-Bridge Switching Characteristics

figure 17. FWD

Typical recovered charge as a function of collector current

$$Q_r = f(I_c)$$



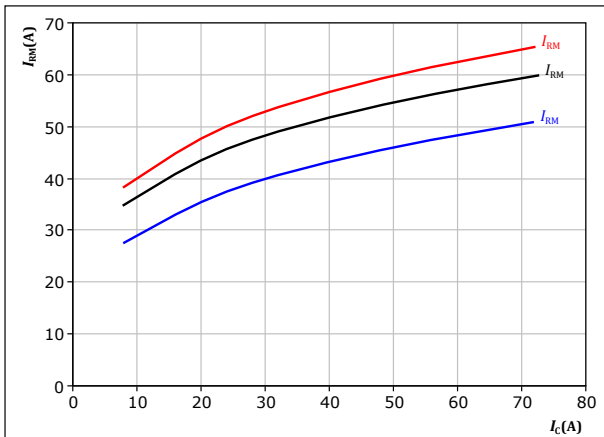
With an inductive load at

$V_{CE} = 600$ V
 $V_{GE} = \pm 15$ V
 $R_{gon} = 8$ Ω
 T_j : 25 °C (blue), 125 °C (black), 150 °C (red)

figure 19. FWD

Typical peak reverse recovery current as a function of collector current

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



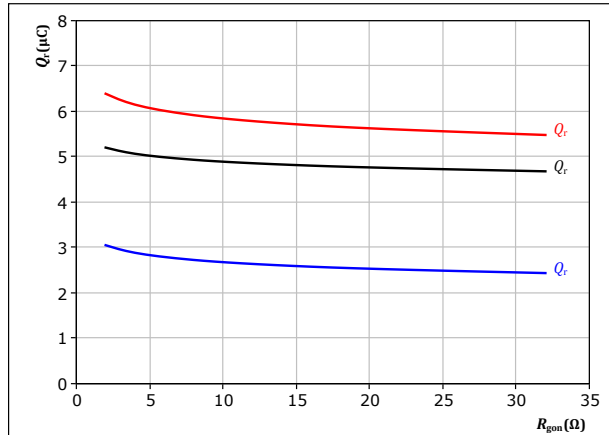
With an inductive load at

$V_{CE} = 600$ V
 $V_{GE} = \pm 15$ V
 $R_{gon} = 8$ Ω
 T_j : 25 °C (blue), 125 °C (black), 150 °C (red)

figure 18. FWD

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

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



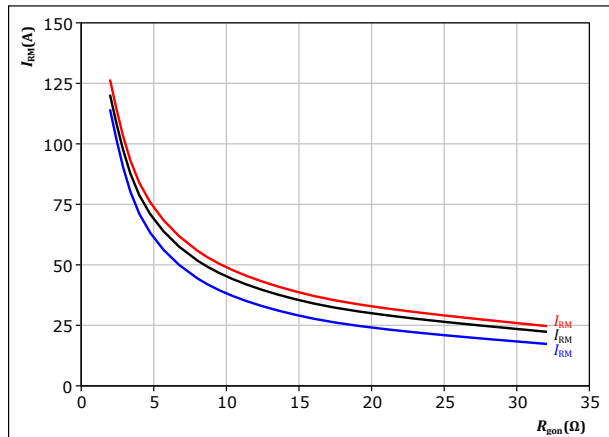
With an inductive load at

$V_{CE} = 600$ V
 $V_{GE} = \pm 15$ V
 $I_c = 40$ A
 T_j : 25 °C (blue), 125 °C (black), 150 °C (red)

figure 20. FWD

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

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



With an inductive load at

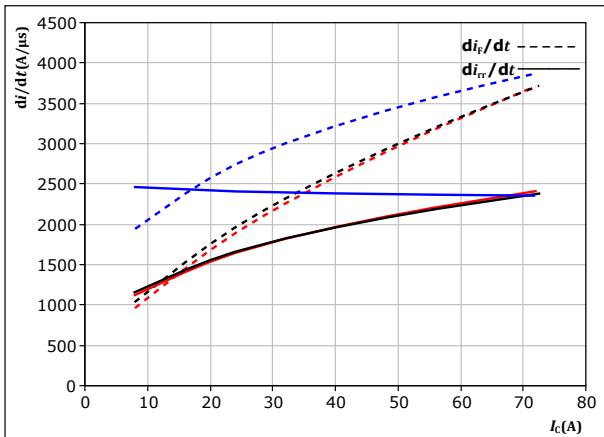
$V_{CE} = 600$ V
 $V_{GE} = \pm 15$ V
 $I_c = 40$ A
 T_j : 25 °C (blue), 125 °C (black), 150 °C (red)



H-Bridge Switching Characteristics

figure 21. FWD

Typical rate of fall of forward and reverse recovery current as a function of collector current
 $di_f/dt, di_r/dt = f(I_c)$

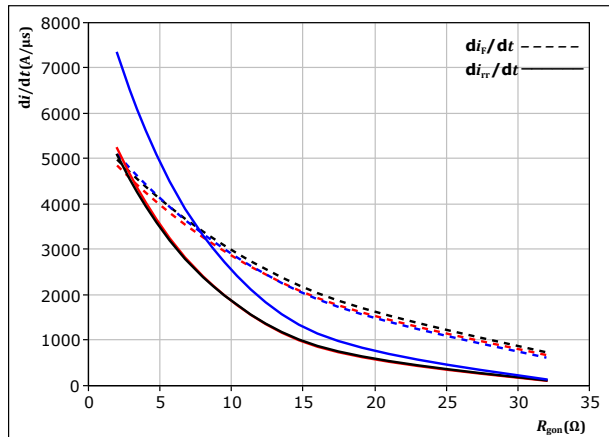


With an inductive load at

$V_{CE} =$	600	V	$T_j =$	25 °C
$V_{GE} =$	±15	V		125 °C
$R_{gon} =$	8	Ω		150 °C

figure 22. FWD

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

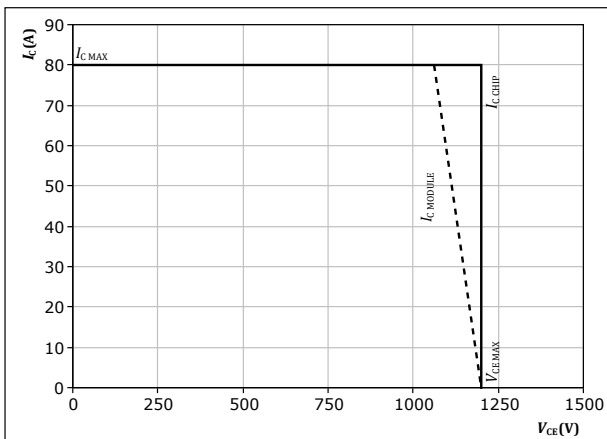


With an inductive load at

$V_{CE} =$	600	V	$T_j =$	25 °C
$V_{GE} =$	±15	V		125 °C
$I_c =$	40	A		150 °C

figure 23. IGBT

Reverse bias safe operating area
 $I_c = f(V_{CE})$



At $T_j = 150$ °C
 $R_{gon} = 8$ Ω
 $R_{goff} = 8$ Ω



H-Bridge Switching Definitions

figure 24. IGBT

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

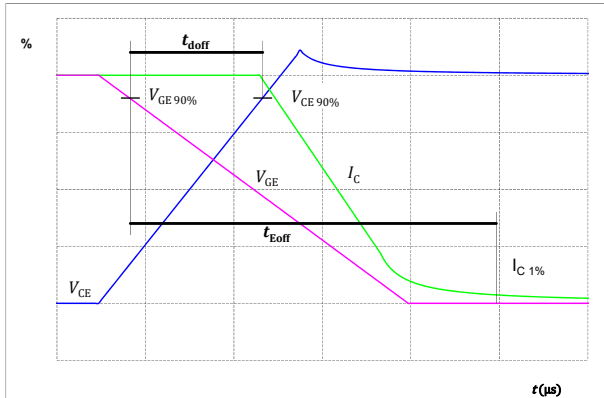


figure 25. IGBT

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

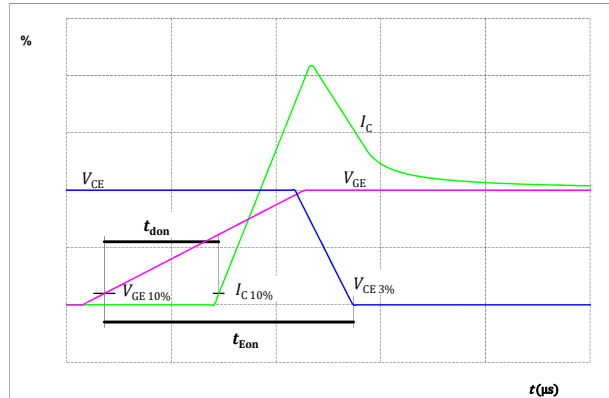


figure 26. IGBT

Turn-off Switching Waveforms & definition of t_f

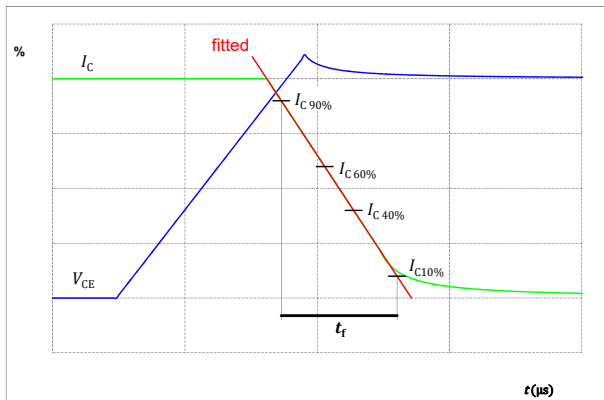
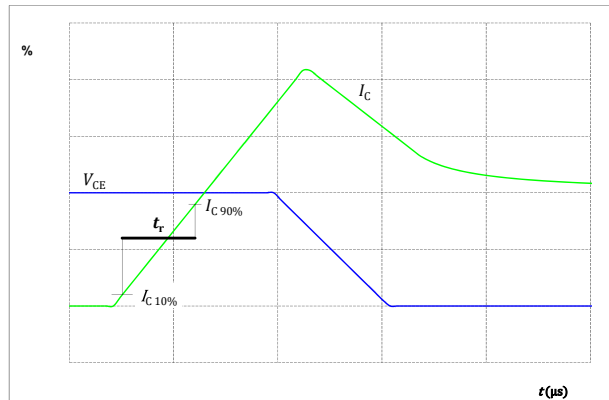


figure 27. IGBT

Turn-on Switching Waveforms & definition of t_r





H-Bridge Switching Definitions

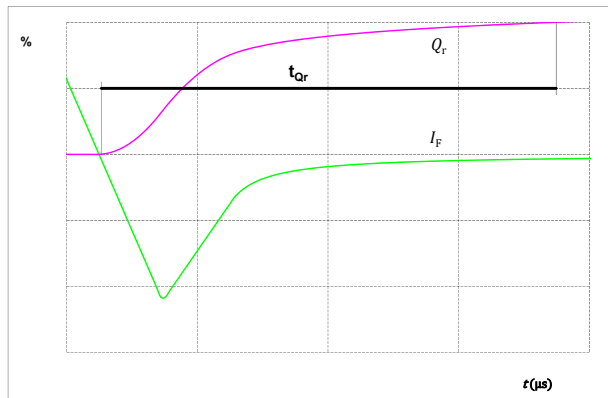
figure 28. FWD

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



figure 29. FWD

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





Ordering Code	
Version	Ordering Code
Without thermal paste	10-PC124PA040SH-P629F41Y
With thermal paste (5,2 W/mK, PTM6000HV)	10-PC124PA040SH-P629F41Y-/7/
With thermal paste (3,4 W/mK, PSX-P7)	10-PC124PA040SH-P629F41Y-/3/

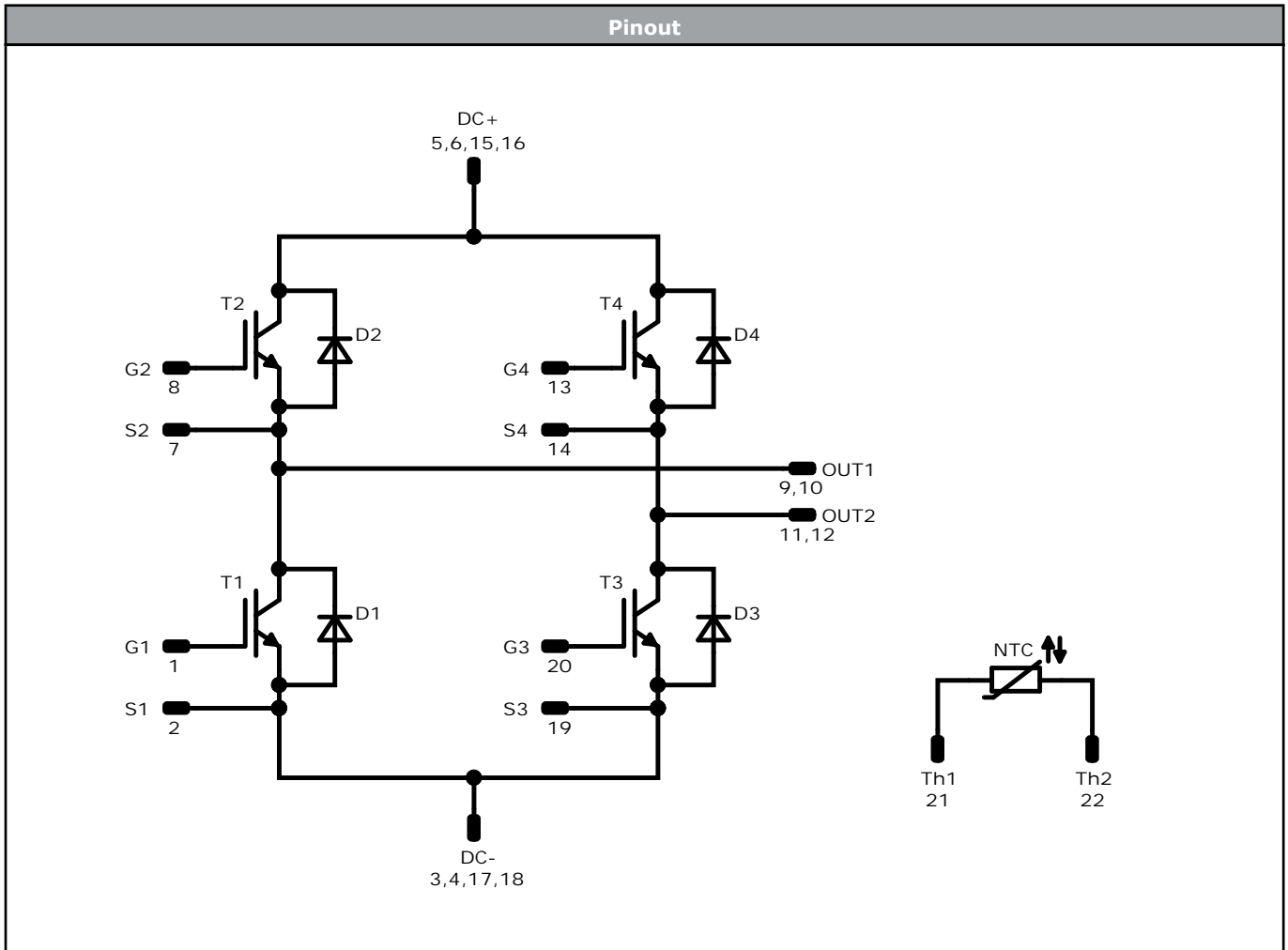
Marking						
	Text	Name NN-NNNNNNNNNNNNNN- TTTTTVV	Date code WWYY	UL & VIN UL VIN	Lot LLLLL	Serial SSSS
	Datamatrix	Type&Ver TTTTTVV	Lot number LLLLL	Serial SSSS	Date code WWYY	

Pin table [mm]			
Pin	X	Y	Function
1	0	22,5	G1
2	2,9	22,5	S1
3	8,3	22,5	DC-
4	10,8	22,5	DC-
5	19,6	22,5	DC+
6	22,1	22,5	DC+
7	29,1	22,5	S2
8	32	22,5	G2
9	33,5	17,8	OUT1
10	33,5	15,3	OUT1
11	33,5	7,2	OUT2
12	33,5	4,7	OUT2
13	32	0	G4
14	29,1	0	S4
15	22,1	0	DC+
16	19,6	0	DC+
17	10,8	0	DC-
18	8,3	0	DC-
19	2,9	0	S3
20	0	0	G3
21	0	8	Th1
22	0	14,5	Th2

Tolerance of positions: ±0,5mm at the end of pins
Dimension of coordinate axis is only offset without tolerance



Vincotech



Identification					
ID	Component	Voltage	Current	Function	Comment
T1, T2, T3, T4	IGBT	1200 V	40 A	H-Bridge Switch	
D1, D2, D3, D4	FWD	1200 V	25 A	H-Bridge Diode	
NTC	Thermistor			Thermistor	




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.

Vincotech thermistor reference
See Vincotech thermistor reference table at 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-PC124PA040SH-P629F41Y-D1-14	27 Mar. 2023		

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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.