



Vincotech

10-PD074PA075SM-L625F07Y

datasheet

fastPACK 0 H C

650 V / 75 A

Features

- High speed H-Bridge
- High efficiency IGBT H5
- Full current fast FWD
- Integrated capacitors
- Thermistor

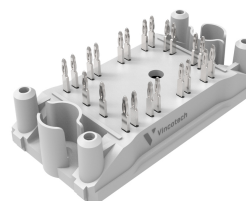
Target applications

- Power Supply
- Welding & Cutting

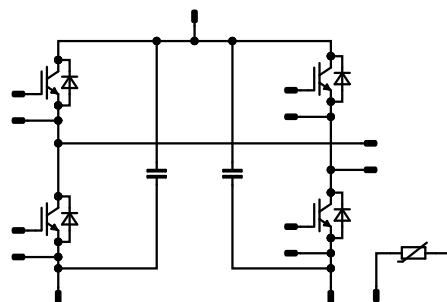
Types

- 10-PD074PA075SM-L625F07Y

flow 0 17 mm housing



Schematic





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Maximum Ratings

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

Parameter	Symbol	Conditions	Value	Unit
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H-Bridge Switch

Collector-emitter voltage	V_{CES}		650	V
Collector current	I_C	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	53	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}	225	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	90	W
Gate-emitter voltage	V_{GES}		± 20	V
Maximum junction temperature	T_{jmax}		175	°C

H-Bridge Diode

Peak repetitive reverse voltage	V_{RRM}		650	V
Continuous (direct) forward current	I_F	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	55	A
Repetitive peak forward current	I_{FRM}	t_p limited by T_{jmax}	150	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	71	W
Maximum junction temperature	T_{jmax}		175	°C

Capacitor (DC)

Maximum DC voltage	V_{MAX}		630	V
Operation Temperature	T_{op}		0 ... 125	°C



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Maximum Ratings

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

Parameter	Symbol	Conditions	Value	Unit
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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* $t_p = 2\text{ s}$	6000	V
Isolation voltage	V_{isol}	AC Voltage $t_p = 1\text{ min}$	2500	V
Creepage distance			min. 12,7	mm
Clearance			min. 12,7	mm
Comparative Tracking Index	CTI		≥ 600	

*100 % tested in production



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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 Switch

Static

Gate-emitter threshold voltage	$V_{GE(th)}$	$V_{CE} = V_{GE}$			0,00075	25	3,3	4	4,7	V
Collector-emitter saturation voltage	$V_{CE(sat)}$		15		75	25 125 150		1,67 1,84 1,89	2,22 ⁽¹⁾	V
Collector-emitter cut-off current	I_{CES}		0	650		25			40	µA
Gate-emitter leakage current	I_{GES}		20	0		25			120	nA
Internal gate resistance	r_g							None		Ω
Input capacitance	C_{ies}	$f = 1 \text{ Mhz}$	0	25		25		4300		pF
Output capacitance	C_{oes}							75		pF
Reverse transfer capacitance	C_{res}							16		pF
Gate charge	Q_g	$V_{CC} = 520 \text{ V}$	15		75	25		166		nC

Thermal

Thermal resistance junction to sink ⁽²⁾	$R_{th(j-s)}$	$\lambda_{paste} = 3,4 \text{ W/mK}$ (PSX)						1,06		K/W
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Dynamic

Turn-on delay time	$t_{d(on)}$	$R_{gon} = 2 \Omega$ $R_{goff} = 2 \Omega$	± 15	350	75	25 125 150		49 49,2 49,2		ns
Rise time	t_r					25 125 150		9,8 12,4 13,4		ns
Turn-off delay time	$t_{d(off)}$					25 125 150		66,6 78,6 82		ns
Fall time	t_f					25 125 150		4,97 7,23 8,48		ns
Turn-on energy (per pulse)	E_{on}	$Q_{tFWD}=2,53 \mu\text{C}$ $Q_{tFWD}=4,54 \mu\text{C}$ $Q_{tFWD}=5,21 \mu\text{C}$				25 125 150		0,644 0,982 1,08		mWs
Turn-off energy (per pulse)	E_{off}					25 125 150		0,269 0,524 0,596		mWs



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10-PD074PA075SM-L625F07Y

datasheet

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				75	25 125 150		1,53 1,49 1,46	1,92 ⁽¹⁾	V
Reverse leakage current	I_R	$V_i = 650$ V				25			3,8	µA

Thermal

Thermal resistance junction to sink ⁽²⁾	$R_{th(j-s)}$	$\lambda_{paste} = 3,4$ W/mK (PSX)						1,34		K/W
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Dynamic

Peak recovery current	I_{RRM}	$di/dt=7979$ A/µs $di/dt=6480$ A/µs $di/dt=6720$ A/µs	± 15	350	75	25 125 150		90,26 110,59 117,11		A
Reverse recovery time	t_{rr}					25 125 150		51,24 82,54 93,03		ns
Recovered charge	Q_r					25 125 150		2,53 4,54 5,21		µC
Reverse recovered energy	E_{rec}					25 125 150		0,578 1,07 1,24		mWs
Peak rate of fall of recovery current	$(di_{rr}/dt)_{max}$					25 125 150		3574 2005 2114		A/µs



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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	

Capacitor (DC)

Static

Capacitance	C							150		nF
Tolerance							-10		10	%

Thermistor

Static

Rated resistance	R					25		22		kΩ
Deviation of R_{100}	$\Delta_{R/R}$	$R_{100} = 1484 \Omega$				100	-5		5	%
Power dissipation	P							5		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.



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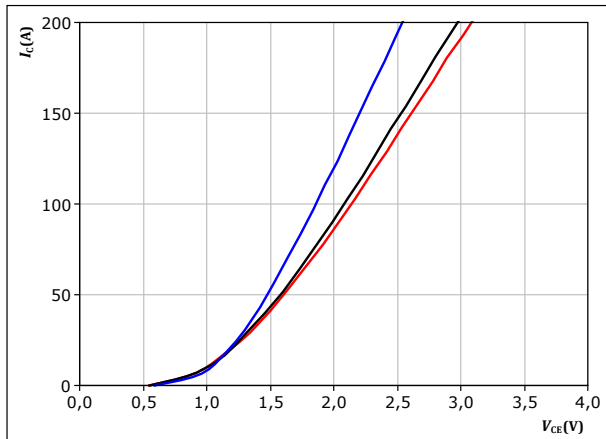
datasheet

H-Bridge Switch Characteristics

figure 1. IGBT

Typical output characteristics

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

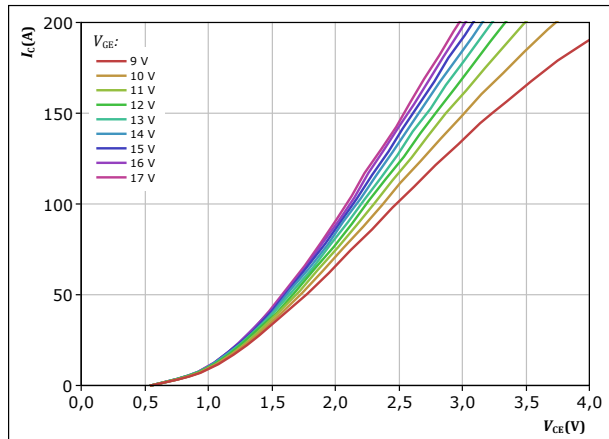


$t_p = 250 \mu s$
 $V_{GE} = 15 V$
 $T_j:$ 25 °C, 125 °C, 150 °C

figure 2. IGBT

Typical output characteristics

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

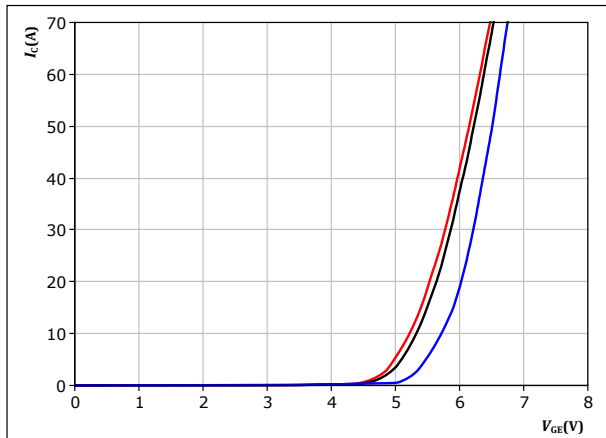


$t_p = 250 \mu s$
 $T_j = 150 ^\circ C$
 V_{GE} from 9 V to 17 V in steps of 1 V

figure 3. IGBT

Typical transfer characteristics

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

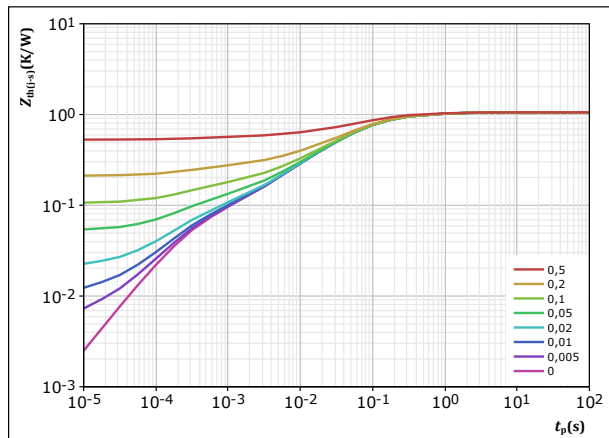


$t_p = 250 \mu s$
 $V_{CE} = 10 V$
 $T_j:$ 25 °C, 125 °C, 150 °C

figure 4. IGBT

Transient thermal impedance as a function of pulse width

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



$D = t_p / T$
 $R_{th(j-s)} = 1,057 K/W$
 IGBT thermal model values

$R (K/W)$	$\tau (s)$
1,05E-01	8,62E-01
2,95E-01	1,39E-01
4,07E-01	4,84E-02
1,50E-01	1,04E-02
3,75E-02	2,37E-03
6,12E-02	2,88E-04



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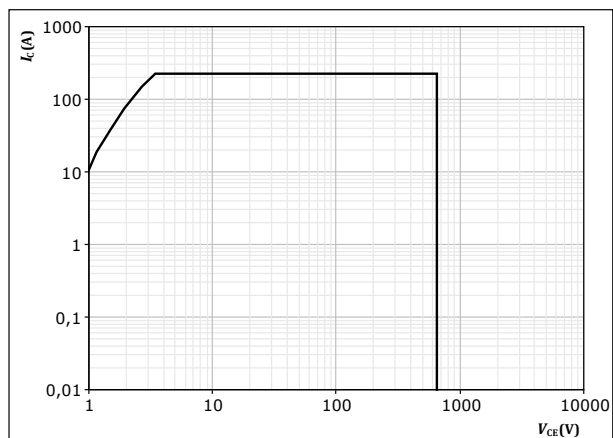
H-Bridge Switch Characteristics

figure 5.

IGBT

Safe operating area

$I_C = f(V_{CE})$



$D = \text{single pulse}$

$T_s = 80 \text{ } ^\circ\text{C}$
 $V_{GE} = 15 \text{ V}$
 $T_j = T_{jmax}$



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H-Bridge Diode Characteristics

figure 6. FWD

Typical forward characteristics

$$I_F = f(V_F)$$

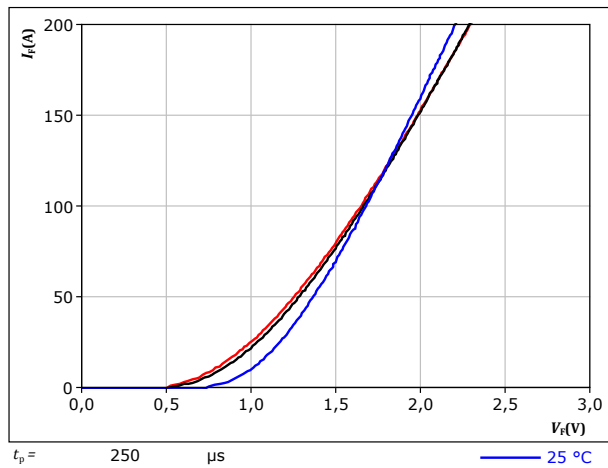
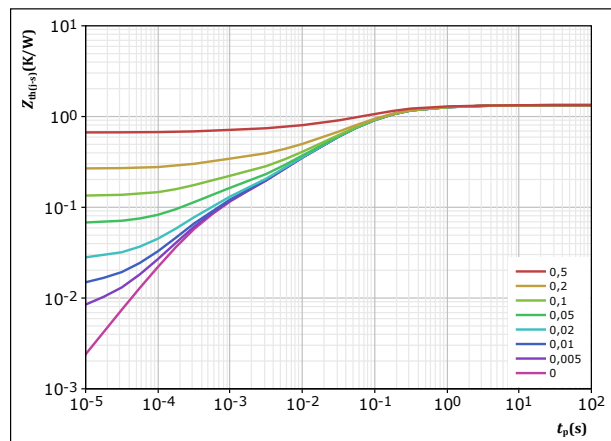


figure 7. FWD

Transient thermal impedance as a function of pulse width

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



$D =$	t_p / T
$R_{th(j-s)} =$	1,336 K/W
FWD thermal model values	
R (K/W)	τ (s)
5,84E-02	3,64E+00
1,57E-01	5,25E-01
5,86E-01	1,06E-01
3,27E-01	2,57E-02
1,27E-01	4,84E-03
8,12E-02	4,11E-04



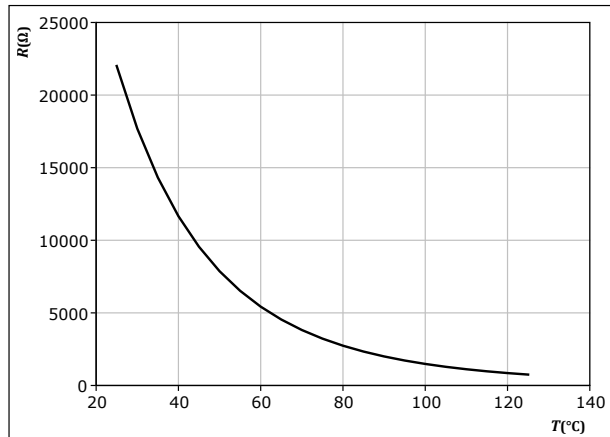
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Thermistor Characteristics

figure 15. Thermistor

Typical NTC characteristic as function of temperature

$$R_T = f(T)$$





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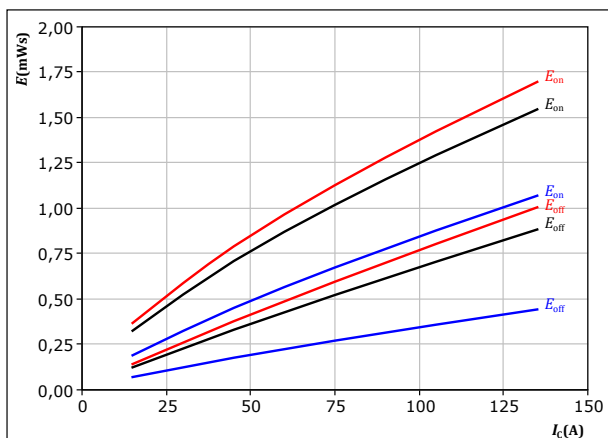
H-Bridge Switching Characteristics

figure 16.

IGBT

Typical switching energy losses as a function of collector current

$$E = f(I_c)$$



With an inductive load at

$V_{CE} = 350 \text{ V}$
 $V_{GE} = \pm 15 \text{ V}$
 $R_{gon} = 2 \text{ } \Omega$
 $R_{goff} = 2 \text{ } \Omega$

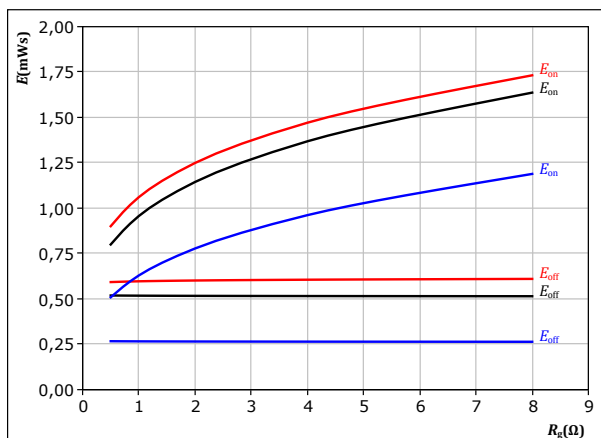
T_j :
— 25 °C
— 125 °C
— 150 °C

figure 17.

IGBT

Typical switching energy losses as a function of gate resistor

$$E = f(R_g)$$



With an inductive load at

$V_{CE} = 350 \text{ V}$
 $V_{GE} = \pm 15 \text{ V}$
 $I_c = 75 \text{ A}$

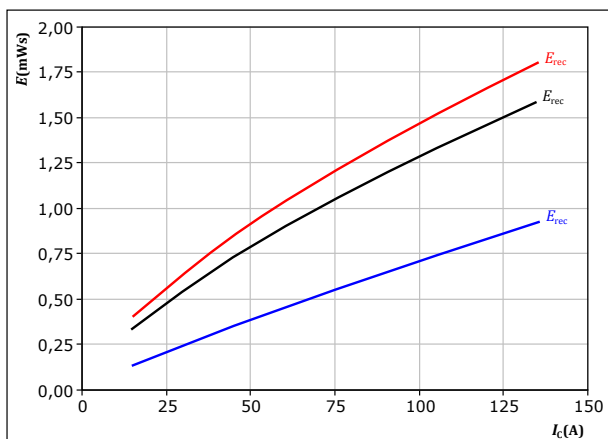
T_j :
— 25 °C
— 125 °C
— 150 °C

figure 18.

FWD

Typical reverse recovered energy loss as a function of collector current

$$E_{rec} = f(I_c)$$



With an inductive load at

$V_{CE} = 350 \text{ V}$
 $V_{GE} = \pm 15 \text{ V}$
 $R_{gon} = 2 \text{ } \Omega$

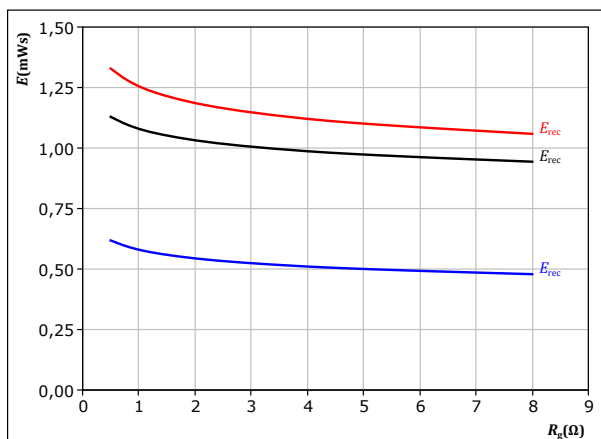
T_j :
— 25 °C
— 125 °C
— 150 °C

figure 19.

FWD

Typical reverse recovered energy loss as a function of gate resistor

$$E_{rec} = f(R_g)$$



With an inductive load at

$V_{CE} = 350 \text{ V}$
 $V_{GE} = \pm 15 \text{ V}$
 $I_c = 75 \text{ A}$

T_j :
— 25 °C
— 125 °C
— 150 °C



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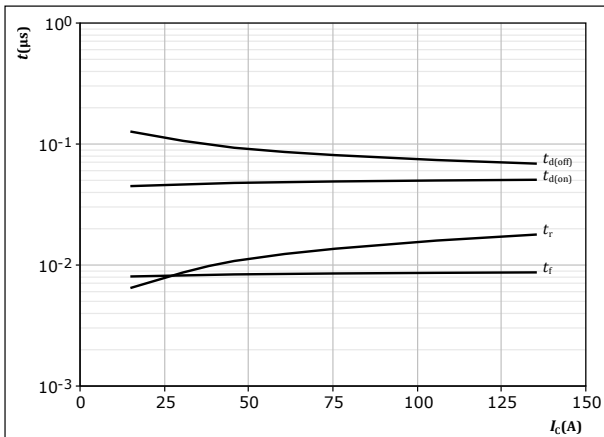
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H-Bridge Switching Characteristics

figure 20.

IGBT

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



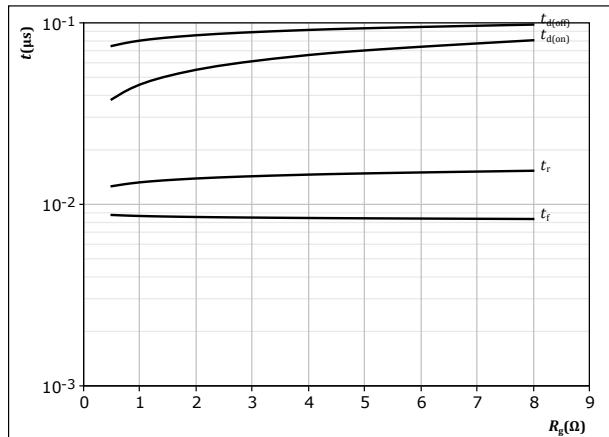
With an inductive load at

$T_j = 150$ °C
 $V_{CE} = 350$ V
 $V_{GE} = \pm 15$ V
 $R_{gon} = 2$ Ω
 $R_{goff} = 2$ Ω

figure 21.

IGBT

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



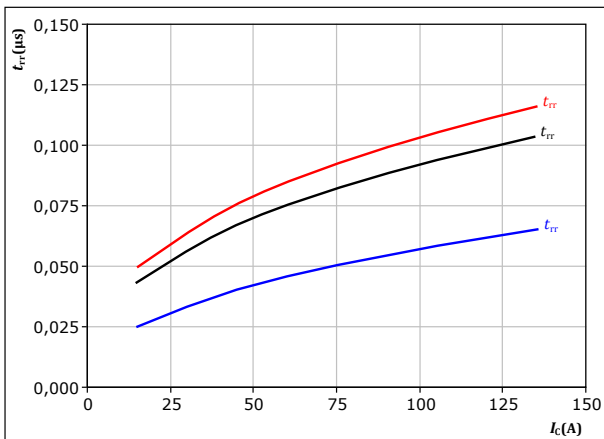
With an inductive load at

$T_j = 150$ °C
 $V_{CE} = 350$ V
 $V_{GE} = \pm 15$ V
 $I_c = 75$ A

figure 22.

FWD

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



With an inductive load at

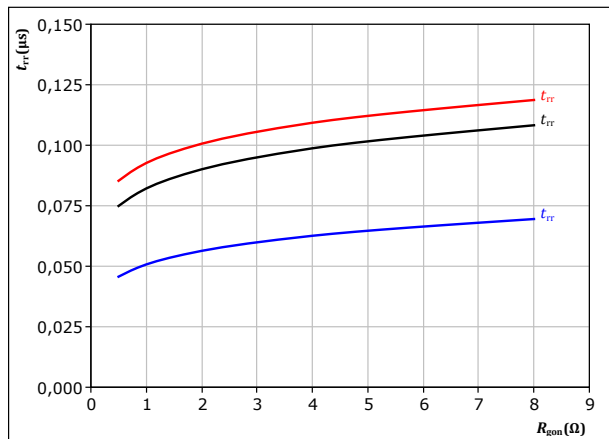
$V_{CE} = 350$ V
 $V_{GE} = \pm 15$ V
 $R_{gon} = 2$ Ω

T_j : 25 °C
125 °C
150 °C

figure 23.

FWD

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



With an inductive load at

$V_{CE} = 350$ V
 $V_{GE} = \pm 15$ V
 $I_c = 75$ A

T_j : 25 °C
125 °C
150 °C



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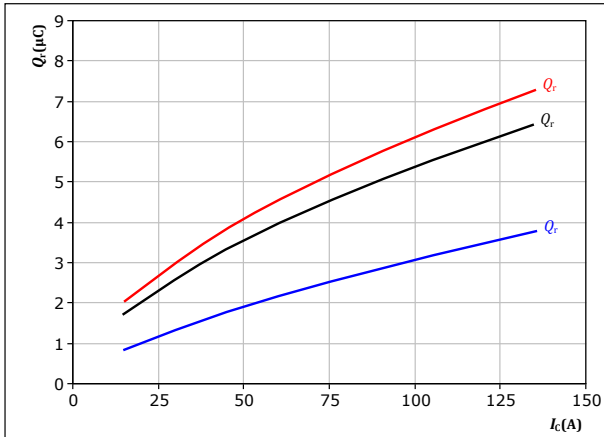
H-Bridge Switching Characteristics

figure 24.

FWD

Typical recovered charge as a function of collector current

$$Q_r = f(I_c)$$



With an inductive load at

$V_{CE} = 350$ V
 $V_{GE} = \pm 15$ V
 $R_{gon} = 2$ Ω

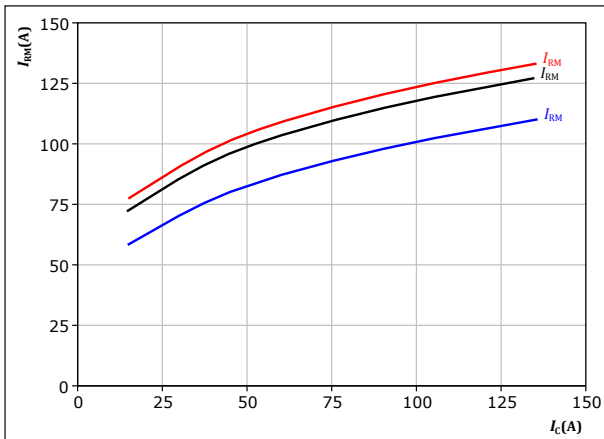
T_j :
— 25 °C
— 125 °C
— 150 °C

figure 26.

FWD

Typical peak reverse recovery current as a function of collector current

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



With an inductive load at

$V_{CE} = 350$ V
 $V_{GE} = \pm 15$ V
 $R_{gon} = 2$ Ω

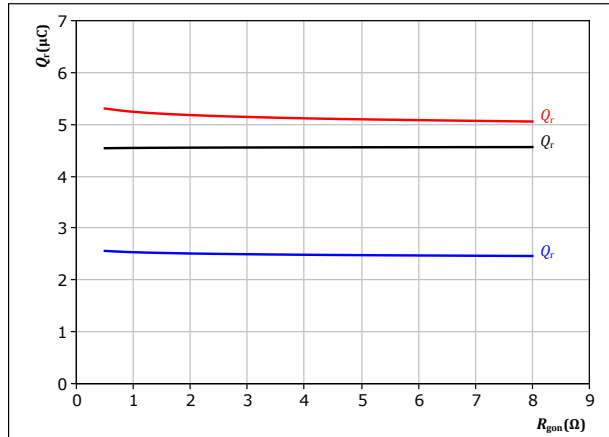
T_j :
— 25 °C
— 125 °C
— 150 °C

figure 25.

FWD

Typical recovered charge as a function of turn on gate resistor

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



With an inductive load at

$V_{CE} = 350$ V
 $V_{GE} = \pm 15$ V
 $I_c = 75$ A

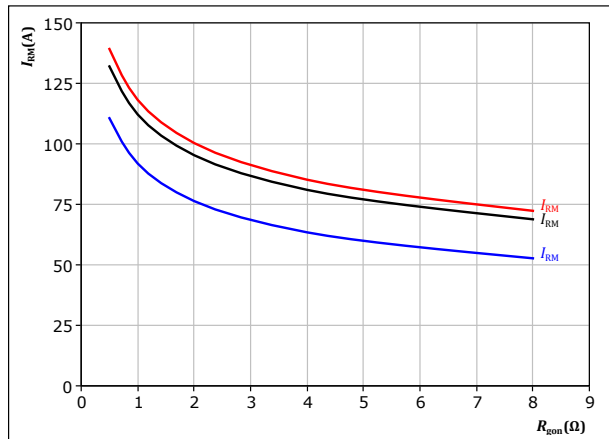
T_j :
— 25 °C
— 125 °C
— 150 °C

figure 27.

FWD

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

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



With an inductive load at

$V_{CE} = 350$ V
 $V_{GE} = \pm 15$ V
 $I_c = 75$ A

T_j :
— 25 °C
— 125 °C
— 150 °C



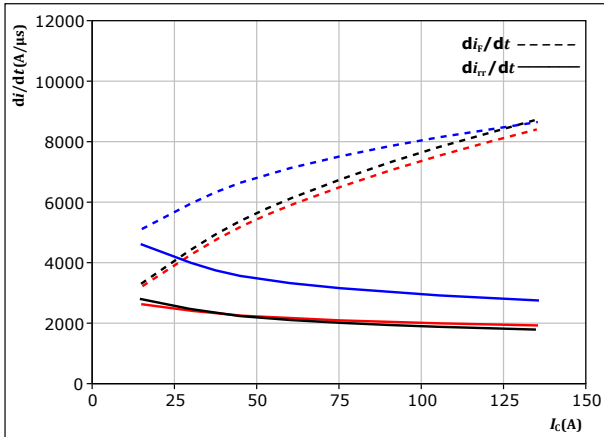
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H-Bridge Switching Characteristics

figure 28. 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

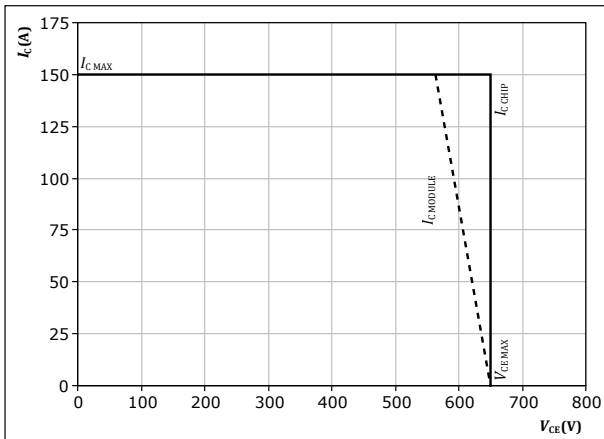
$V_{CE} = 350$ V
 $V_{GE} = \pm 15$ V
 $R_{gon} = 2$ Ω

T_j : 25 °C
125 °C
150 °C

figure 30. IGBT

Reverse bias safe operating area

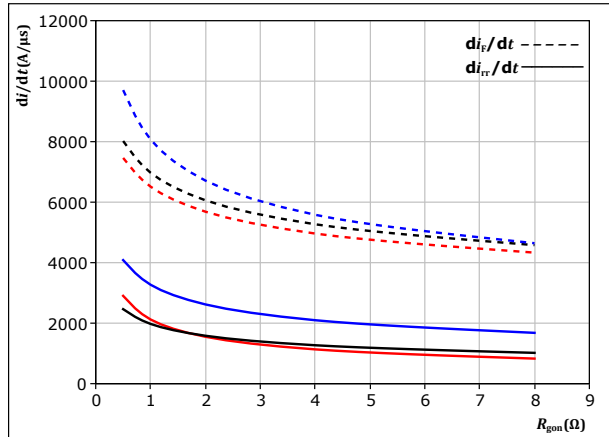
$I_C = f(V_{CE})$



At $T_j = 150$ °C
 $R_{gon} = 2$ Ω
 $R_{goff} = 2$ Ω

figure 29. 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

$V_{CE} = 350$ V
 $V_{GE} = \pm 15$ V
 $I_C = 75$ A

T_j : 25 °C
125 °C
150 °C



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10-PD074PA075SM-L625F07Y datasheet

Switching Definitions

figure 46. IGBT

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

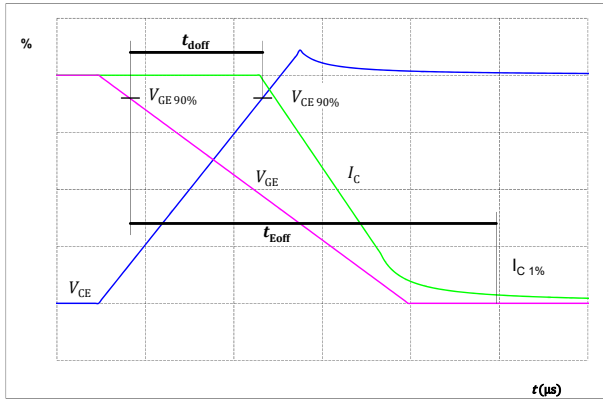


figure 47. IGBT

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

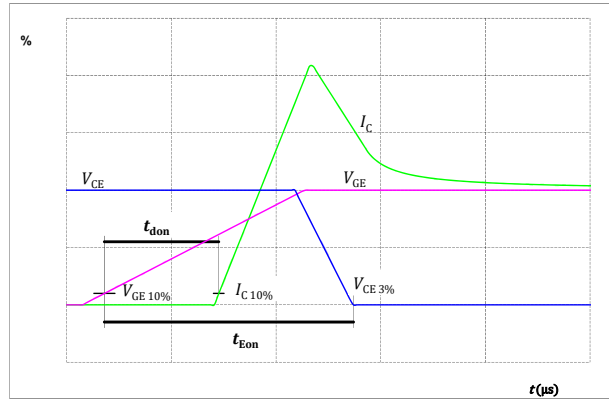


figure 48. IGBT

Turn-off Switching Waveforms & definition of t_f

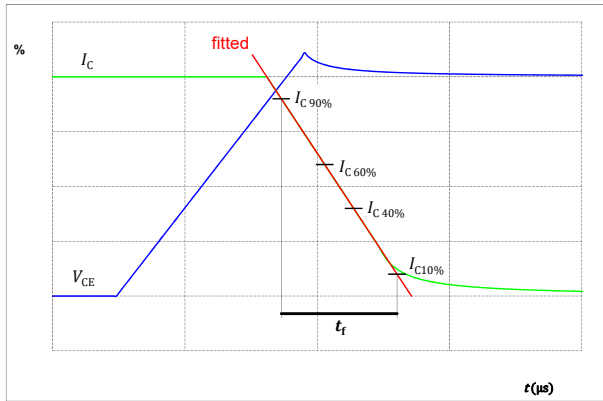
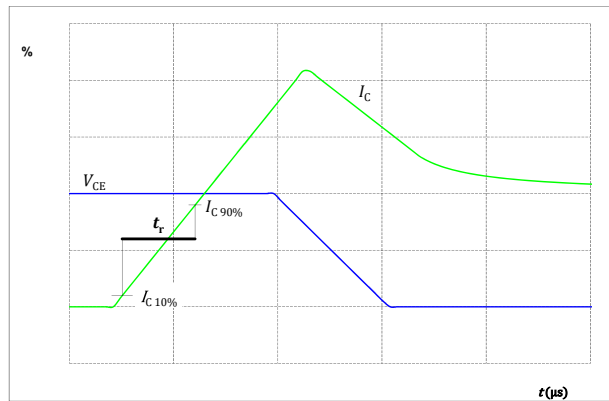


figure 49. IGBT

Turn-on Switching Waveforms & definition of t_r





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Switching Definitions

figure 50.

FWD

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

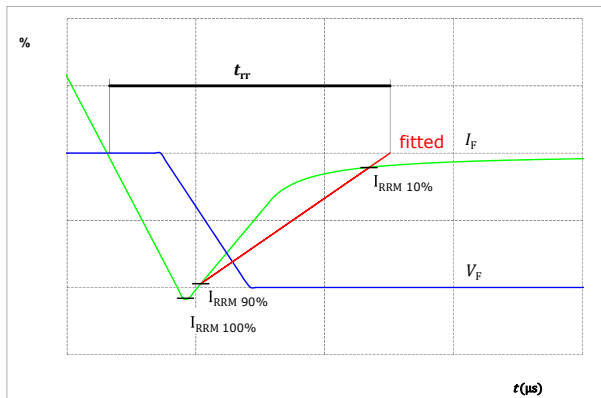
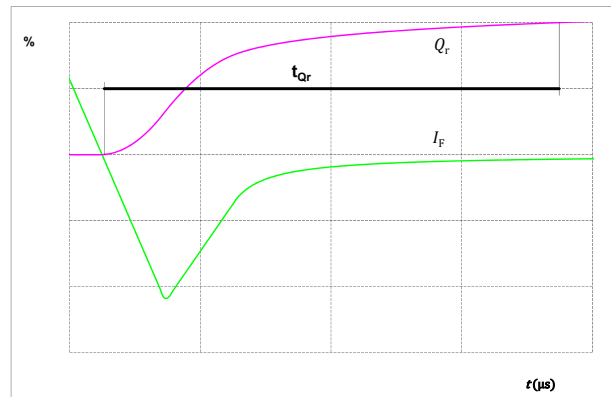


figure 51.

FWD


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

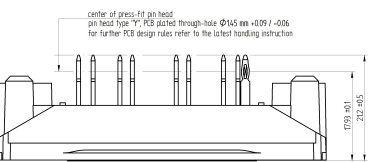
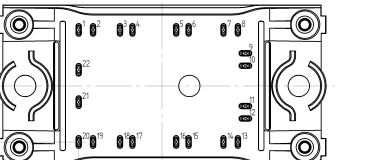
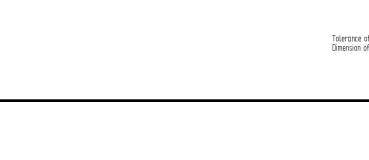








datasheet

Ordering Code	
Version	Ordering Code
Without thermal paste	10-PD074PA075SM-L625F07Y
With thermal paste	10-PD074PA075SM-L625F07Y-/3/

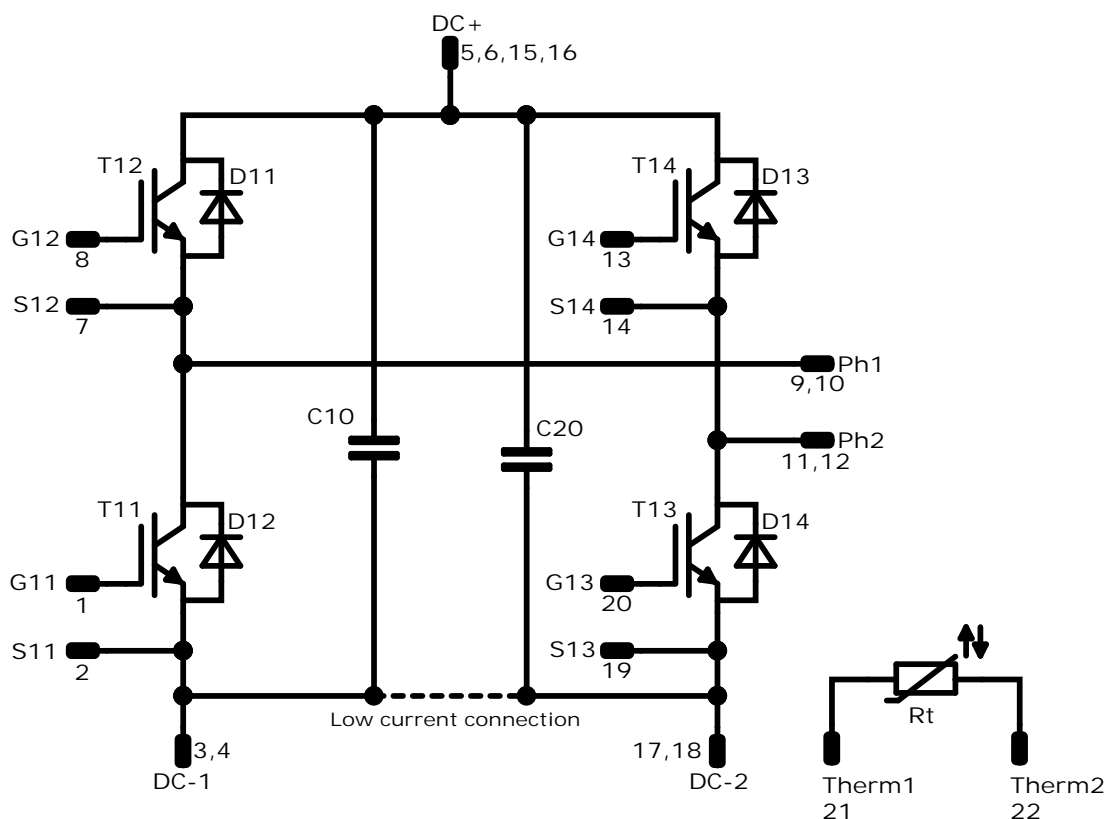
Marking							
	Text	Name		Date code	UL & VIN	Lot	Serial
		NN-NNNNNNNNNNNNNN- TTTTTIVV		WWYY	UL VIN	LLLLL	SSSS
	Datamatrix	Type&Ver	Lot number	Serial	Date code		
	TTTTTIVV	LLLLL	SSSS	WWYY			

Pin table [mm]				Outline	
Pin	X	Y	Function		
1	0	22,5	G11		
2	2,9	22,5	S11	center of press-fit pin head pin head base "Y" PCB drilled through-hole $\Phi 145 \text{ mm} \pm 0,09 / -0,06$ for further PCB design rules refer to the latest handling instruction	
3	8,3	22,5	DC-1		
4	10,8	22,5	DC-1		
5	19,6	22,5	DC+		
6	22,1	22,5	DC+		
7	29,1	22,5	S12		
8	32	22,5	G12		
9	33,5	17,8	Ph1		
10	33,5	15,3	Ph1		
11	33,5	7,2	Ph2		
12	33,5	4,7	Ph2		
13	32	0	G14		
14	29,1	0	S14		
15	22,1	0	DC+		
16	19,6	0	DC+		
17	10,8	0	DC-2		
18	8,3	0	DC-2		
19	2,9	0	S13		
20	0	0	G13		
21	0	8	Therm1		
22	0	14,5	Therm2		



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Pinout



Identification

ID	Component	Voltage	Current	Function	Comment
T11, T13	IGBT	650 V	75 A	H-Bridge Switch - Lo side	
D12, D14	FWD	650 V	75 A	H-Bridge Diode - Lo side	
T12, T14	IGBT	650 V	75 A	H-Bridge Switch - Hi side	
D11, D13	FWD	650 V	75 A	H-Bridge Diode - Hi side	
C10, C20	Capacitor	630 V		Capacitor (DC)	
Rt	Thermistor			Thermistor	



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10-PD074PA075SM-L625F07Y
datasheet

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-PD074PA075SM-L625F07Y-D1-14	26 Jun. 2020		

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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.