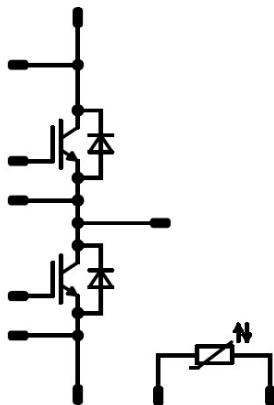




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A0-VS122PA600M7-L759F70
A0-VP122PA600M7-L759F70T
datasheet

VINcoDUAL E3		1200 V / 600 A
Features	VINco E3 	
• IGBT M7 technology with low V_{CEsat} and improved EMC behavior • New SoLid Cover Technology for higher reliability • Industry standard housing • Press-fit pin and pre-applied phase-change Thermal Interface Material available	Schematic 	
Target applications		
• Industrial Drives • Power Supply • UPS		
Types		
• A0-VS122PA600M7-L759F70 • A0-VP122PA600M7-L759F70T		

Maximum Ratings

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

Parameter	Symbol	Condition	Value	Unit
Half Bridge Switch				
Collector-emitter voltage	V_{CES}		1200	V
Collector current	I_C	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	535	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}	1200	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	946	W
Gate-emitter voltage	V_{GES}		±20	V
Maximum junction temperature	T_{jmax}		175	°C



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datasheet

Maximum Ratings

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

Parameter	Symbol	Condition	Value	Unit
Half Bridge Diode				
Peak repetitive reverse voltage	V_{RRM}		1200	V
Continuous (direct) forward current	I_F	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	437	A
Repetitive peak forward current	I_{FRM}		1200	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	713	W
Maximum junction temperature	T_{jmax}		175	°C

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 $t_p = 2\text{ s}$	4000	V
Creepage distance			18,1	mm
Clearance			16,2	mm
Comparative Tracking Index	CTI		> 200	



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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	

Half Bridge Switch

Static

Gate-emitter threshold voltage	$V_{GE(th)}$	$V_{GE} = V_{CE}$			0,06	25	5,4	6	6,6	V
Collector-emitter saturation voltage	V_{CEsat}		15		600	25 125 150		1,51 1,71 1,78	2,15	V
Collector-emitter cut-off current	I_{CES}		0	1200		25			600	μA
Gate-emitter leakage current	I_{GES}		20	0		25			1500	nA
Internal gate resistance	r_g							0,67		Ω
Input capacitance	C_{ies}		0	10	25			111000		pF
Output capacitance	C_{oes}							3300		
Reverse transfer capacitance	C_{res}							1260		
Gate charge	Q_g		±15	600	600	25		6700		nC

Thermal

Thermal resistance junction to sink	$R_{th(j-s)}$	phase-change material $\lambda = 3,4$ W/mK						0,10		K/W
-------------------------------------	---------------	---	--	--	--	--	--	------	--	-----

Dynamic

Turn-on delay time	$t_{d(on)}$	$R_{goff} = 2 \Omega$ $R_{gon} = 2 \Omega$	±15	600	626	25 125 150		639 639 641		ns
Rise time	t_r					25 125 150		109 128 133		
Turn-off delay time	$t_{d(off)}$					25 125 150		447 478 491		
Fall time	t_f					25 125 150		58 86 97		
Turn-on energy (per pulse)	E_{on}	$Q_{tFWD} = 37,5 \mu C$ $Q_{tFWD} = 77 \mu C$ $Q_{tFWD} = 92 \mu C$				25 125 150		76,680 104,706 119,766		mWs
Turn-off energy (per pulse)	E_{off}					25 125 150		44,920 57,152 66,317		



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 datasheet

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	

Half Bridge Diode

Static

Forward voltage	V_F				600	25 125 150		1,67 1,82 1,83	2,2	V
Reverse leakage current	I_R			1200		25			360	μA

Thermal

Thermal resistance junction to sink	$R_{th(j-s)}$	phase-change material $\lambda = 3,4$ W/mK						0,13		K/W
-------------------------------------	---------------	---	--	--	--	--	--	------	--	-----

Dynamic

Peak recovery current	I_{RRM}	$di/dt = 7225$ A/μs $di/dt = 4638$ A/μs $di/dt = 4219$ A/μs	± 15	600	626	25 125 150		273 309 313		A
Reverse recovery time	t_{rr}					25 125 150		342 536 598		ns
Recovered charge	Q_r					25 125 150		37,548 77,003 91,978		μC
Reverse recovered energy	E_{rec}					25 125 150		10,478 25,305 31,206		mWs
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 125 150		1408 845 762		A/μs



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Half Bridge Switch Characteristics

figure 1. IGBT

Typical output characteristics

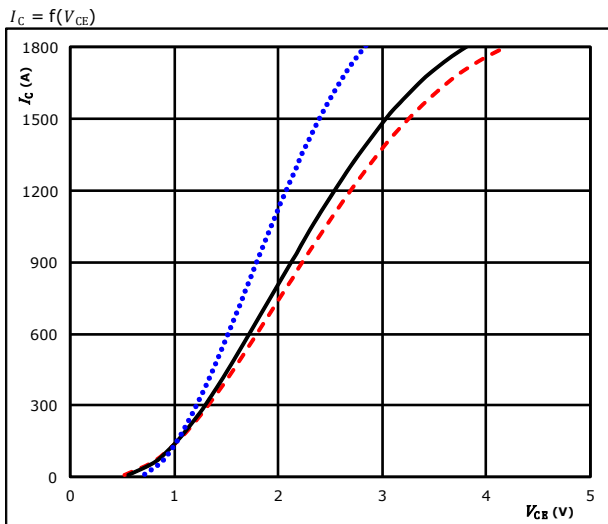


figure 2. IGBT

Typical output characteristics

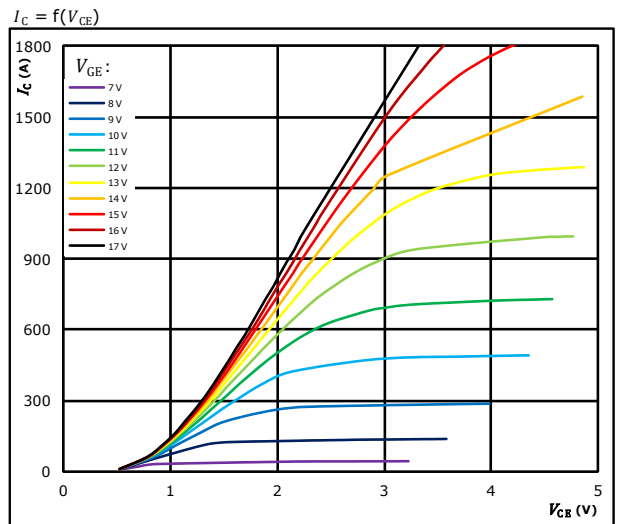


figure 3. IGBT

Typical transfer characteristics

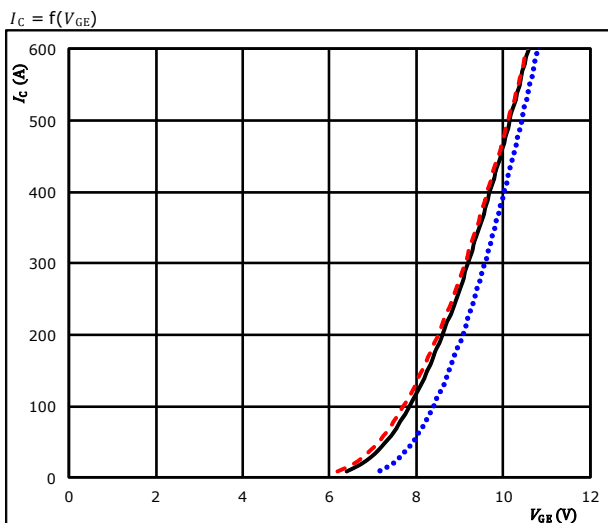
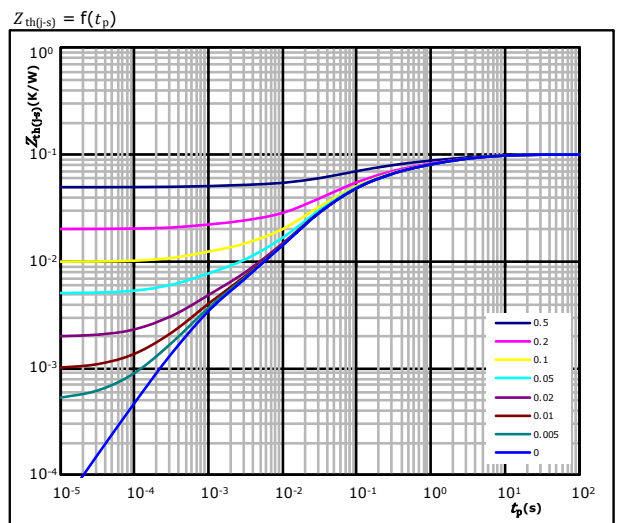


figure 4. IGBT

Transient thermal impedance as function of pulse duration



IGBT thermal model values

R (K/W)	τ (s)
1,28E-02	5,07E+00
2,01E-02	1,08E+00
2,47E-02	2,20E-01
2,82E-02	5,60E-02
1,16E-02	1,62E-02
3,16E-03	8,52E-04



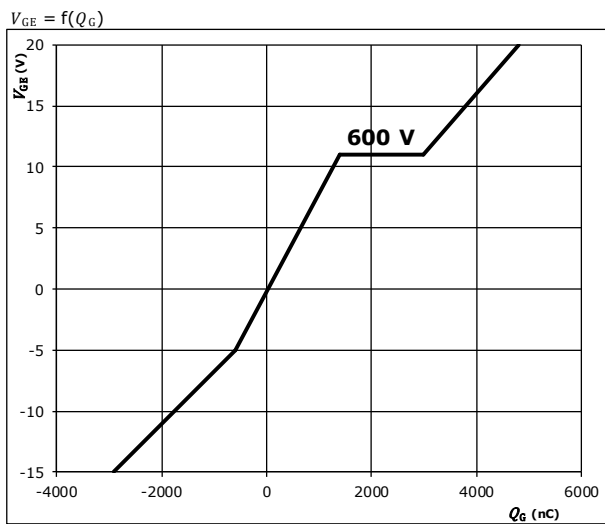
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datasheet

Half Bridge Switch Characteristics

figure 5. IGBT

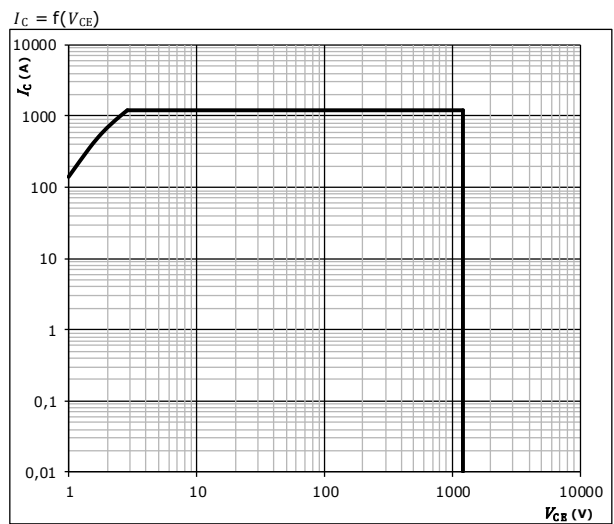
Gate voltage vs gate charge



$I_C = 600$ A
 $V_{GE} = \pm 15$ V
 $V_{CC} = 600$ V

figure 6. IGBT

Safe operating area



$D =$ single pulse
 $T_s = 80$ °C
 $V_{GE} = \pm 15$ V
 $T_j = T_{jmax}$ °C



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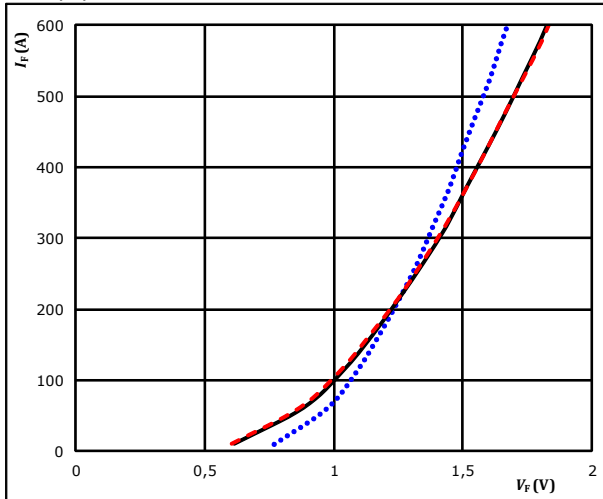
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A0-VP122PA600M7-L759F70T
 datasheet

Half Bridge Diode Characteristics

figure 1. FWD

Typical forward characteristics

$$I_F = f(V_F)$$

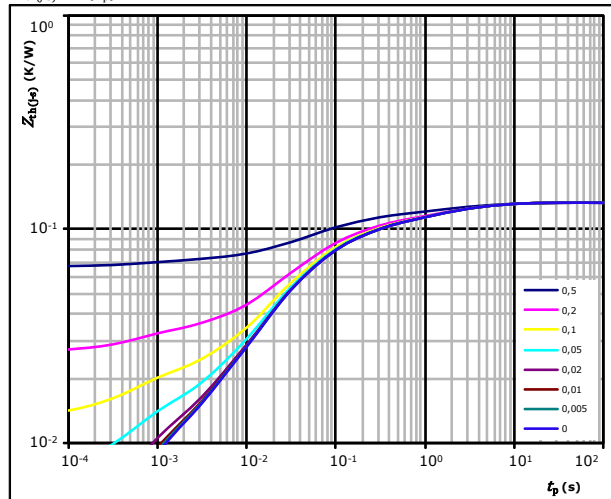


$t_p = 250 \mu s$
 T_J : 25 °C (blue dotted line), 125 °C (black solid line), 150 °C (red dashed line)

figure 2. FWD

Transient thermal impedance as a function of pulse width

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



$D = t_p / T$
 $R_{th(j-s)} = 0,13 \text{ K/W}$
 FWD thermal model values

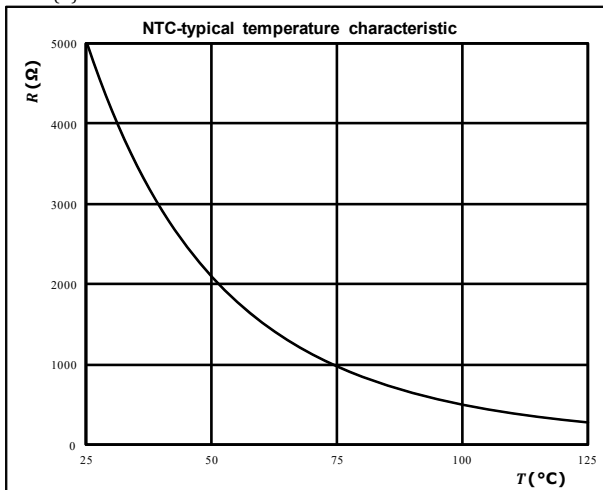
$R \text{ (K/W)}$	$\tau \text{ (s)}$
1,42E-02	4,56E+00
2,24E-02	9,51E-01
3,79E-02	1,30E-01
4,42E-02	3,01E-02
6,69E-03	8,14E-03
7,87E-03	6,10E-04

Thermistor Characteristics

figure 1. Thermistor

Typical NTC characteristic
 as a function of temperature

$$R = f(T)$$



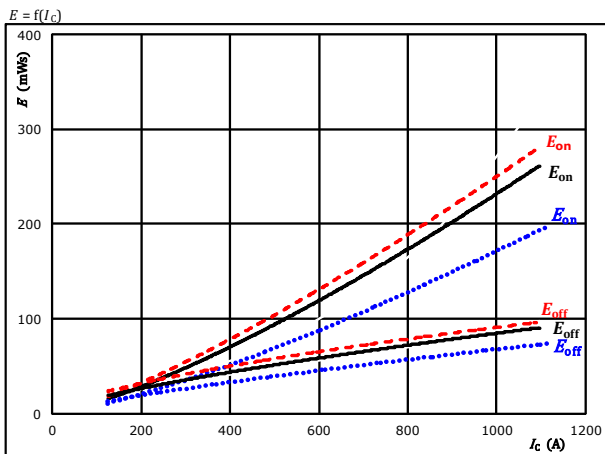


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Half Bridge Switching Characteristics

figure 1. IGBT

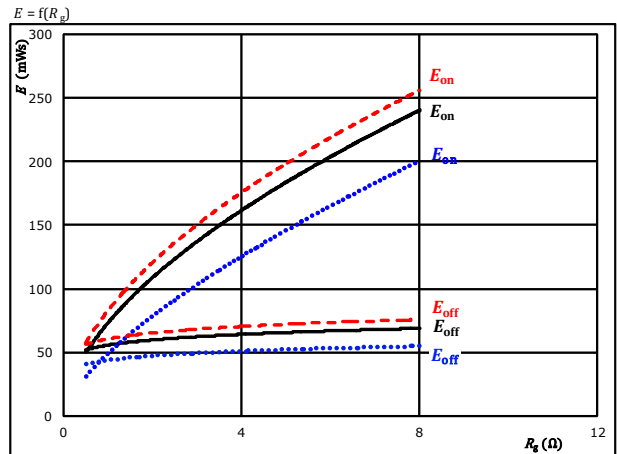
Typical switching energy losses as a function of collector current



With an inductive load at
 $V_{CE} = 600$ V
 $V_{GE} = \pm 15$ V
 $R_{g\text{on}} = 2$ Ω
 $R_{g\text{off}} = 2$ Ω
 T_j : 25 °C (blue dotted), 125 °C (black solid), 150 °C (red dashed)

figure 2. IGBT

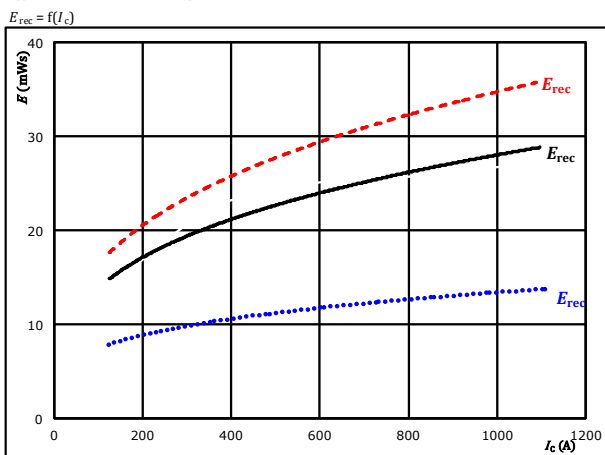
Typical switching energy losses as a function of gate resistor



With an inductive load at
 $V_{CE} = 600$ V
 $V_{GE} = \pm 15$ V
 $I_C = 626$ A
 T_j : 25 °C (blue dotted), 125 °C (black solid), 150 °C (red dashed)

figure 3. FWD

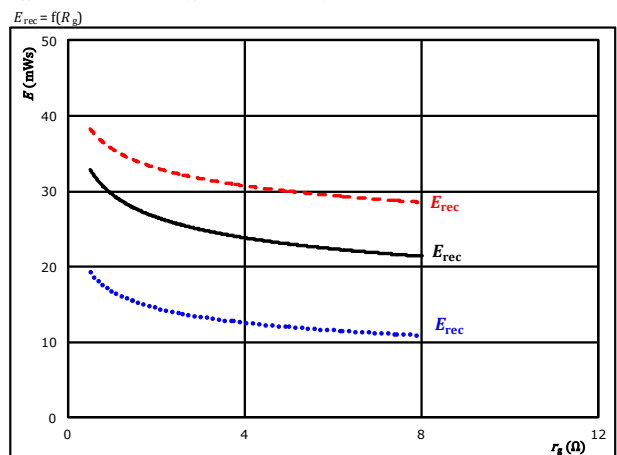
Typical reverse recovered energy loss as a function of collector current



With an inductive load at
 $V_{CE} = 600$ V
 $V_{GE} = \pm 15$ V
 $R_{g\text{on}} = 2$ Ω
 T_j : 25 °C (blue dotted), 125 °C (black solid), 150 °C (red dashed)

figure 4. FWD

Typical reverse recovered energy loss as a function of gate resistor



With an inductive load at
 $V_{CE} = 600$ V
 $V_{GE} = \pm 15$ V
 $I_C = 626$ A
 T_j : 25 °C (blue dotted), 125 °C (black solid), 150 °C (red dashed)



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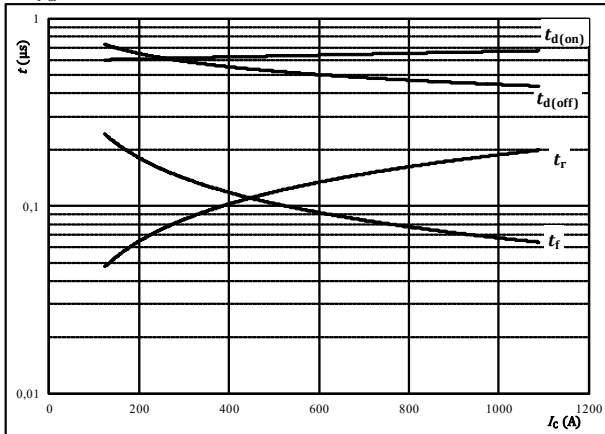
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datasheet

Half Bridge Switching Characteristics

figure 5. IGBT

Typical switching times as a function of collector current

$$t = f(I_C)$$



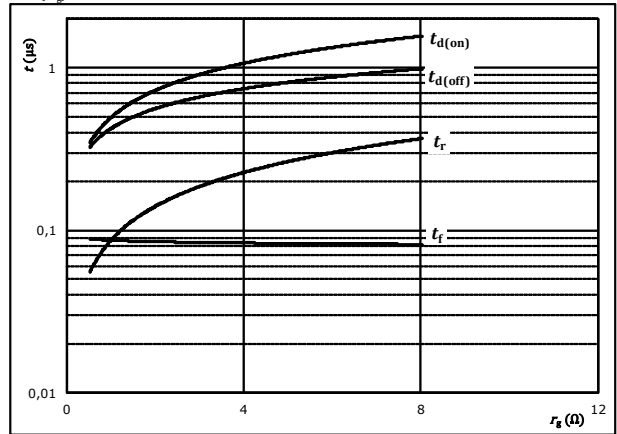
With an inductive load at

$T_j =$	150	°C
$V_{CE} =$	600	V
$V_{GE} =$	±15	V
$R_{gon} =$	2	Ω
$R_{goff} =$	2	Ω

figure 6. IGBT

Typical switching times as a function of gate resistor

$$t = f(R_g)$$



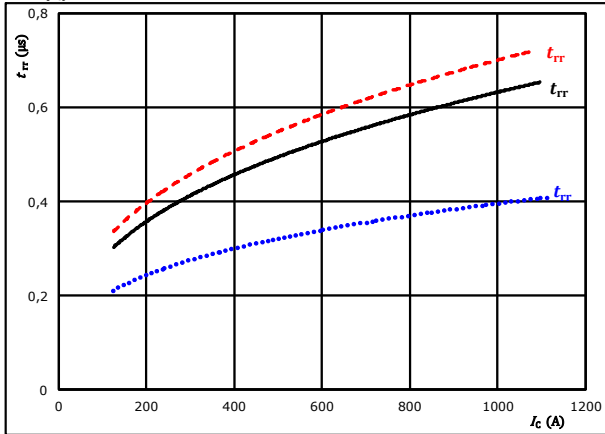
With an inductive load at

$T_j =$	150	°C
$V_{CE} =$	600	V
$V_{GE} =$	±15	V
$I_C =$	626	A

figure 7. FWD

Typical reverse recovery time as a function of collector current

$$t_{rr} = f(I_C)$$

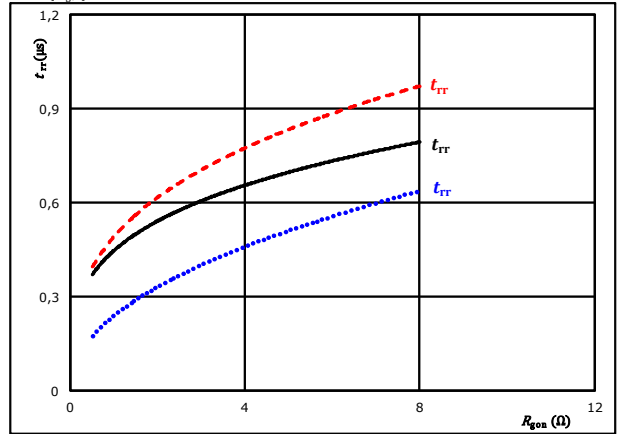


At	$V_{CE} =$	600	V	$T_j =$	25 °C	
	$V_{GE} =$	±15	V		125 °C	————
	$R_{gon} =$	2	Ω		150 °C	-----

figure 8. FWD

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

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



At	$V_{CE} =$	600	V	$T_j =$	25 °C	
	$V_{GE} =$	±15	V		125 °C	————
	$I_C =$	626	A		150 °C	-----



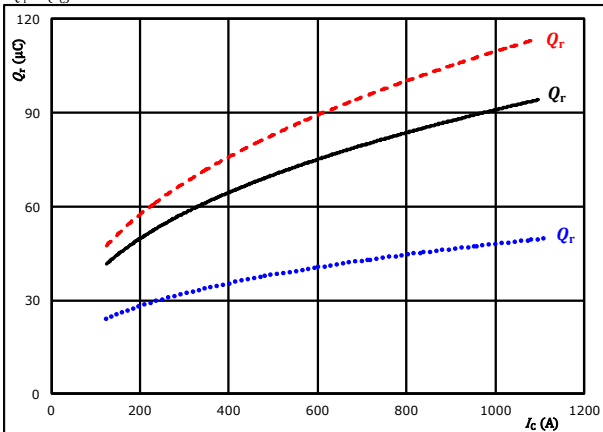
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Half Bridge Switching Characteristics

figure 9. FWD

Typical recovered charge as a function of collector current

$$Q_r = f(I_c)$$

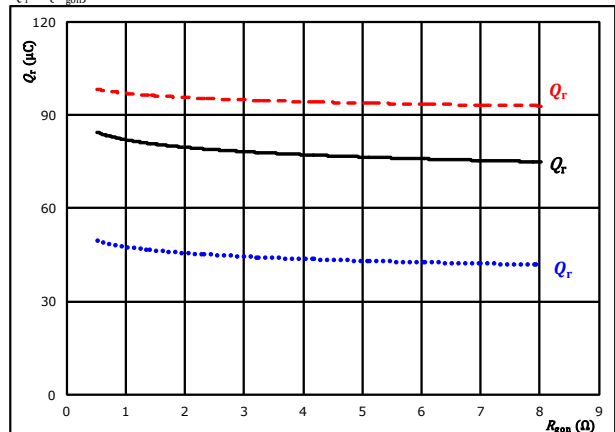


At $V_{CE} = 600$ V
 $V_{GE} = \pm 15$ V
 $R_{g(on)} = 2$ Ω
 $T_j = 25$ °C
125 °C ———
150 °C - - - - -

figure 10. FWD

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

$$Q_r = f(R_{g(on)})$$

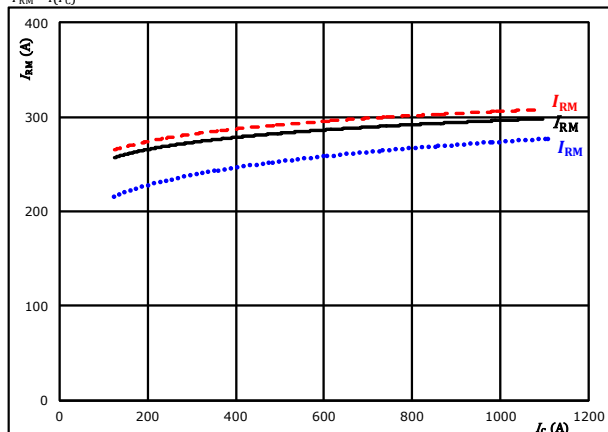


At $V_{CE} = 600$ V
 $V_{GE} = \pm 15$ V
 $I_c = 626$ A
 $T_j = 25$ °C
125 °C ———
150 °C - - - - -

figure 11. FWD

Typical peak reverse recovery current as a function of collector current

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

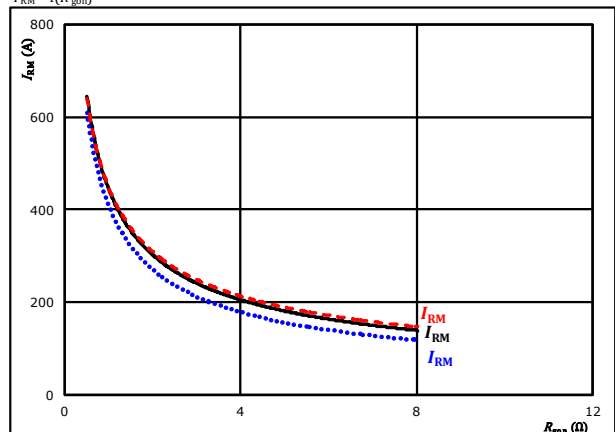


At $V_{CE} = 600$ V
 $V_{GE} = \pm 15$ V
 $R_{g(on)} = 2$ Ω
 $T_j = 25$ °C
125 °C ———
150 °C - - - - -

figure 12. FWD

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

$$I_{RM} = f(R_{g(on)})$$



At $V_{CE} = 600$ V
 $V_{GE} = \pm 15$ V
 $I_c = 626$ A
 $T_j = 25$ °C
125 °C ———
150 °C - - - - -



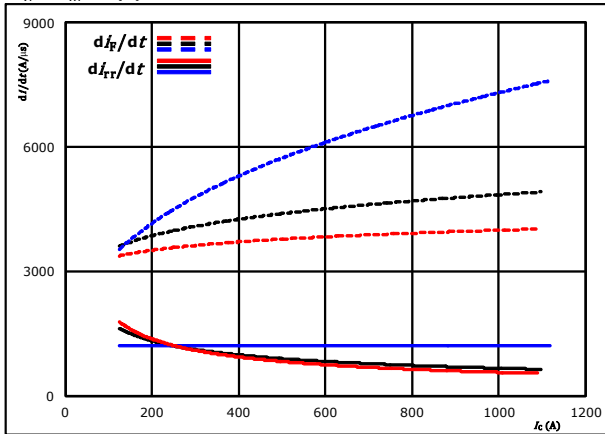
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 datasheet

Half Bridge Switching Characteristics

figure 13. FWD

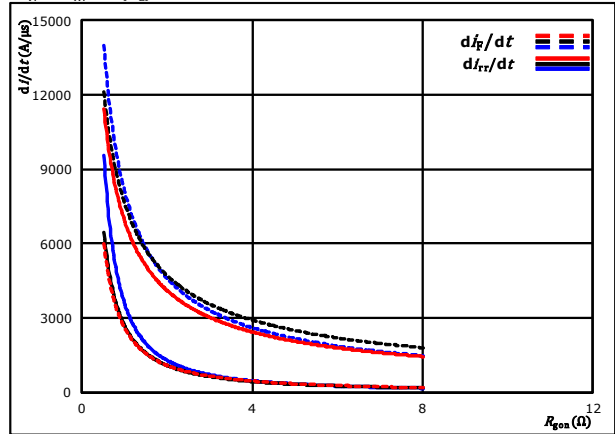
Typical rate of fall of forward and reverse recovery current as a function of collector current
 $di_F/dt, di_{rr}/dt = f(I_C)$



At $V_{CE} = 600$ V
 $V_{GE} = \pm 15$ V
 $R_{gon} = 2$ Ω
 $T_J = 25$ °C
 125 °C
 150 °C

figure 14. FWD

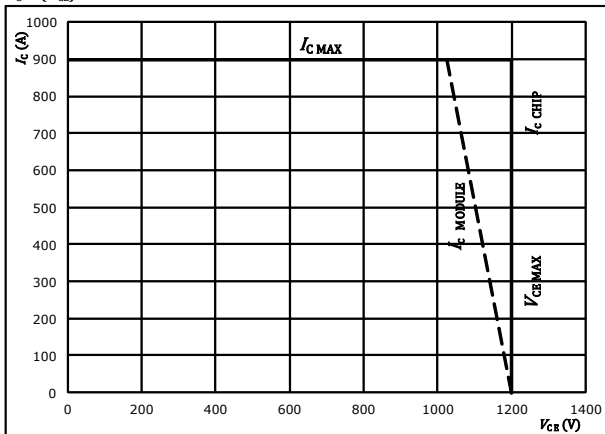
Typical rate of fall of forward and reverse recovery current as a function of IGBT turn on gate resistor
 $di_F/dt, di_{rr}/dt = f(R_{gon})$



At $V_{CE} = 600$ V
 $V_{GE} = \pm 15$ V
 $I_C = 626$ A
 $T_J = 25$ °C
 125 °C
 150 °C

figure 15. IGBT

Reverse bias safe operating area
 $I_C = f(V_{CR})$



At $T_J = 175$ °C
 $R_{gon} = 2$ Ω
 $R_{goff} = 2$ Ω



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 datasheet

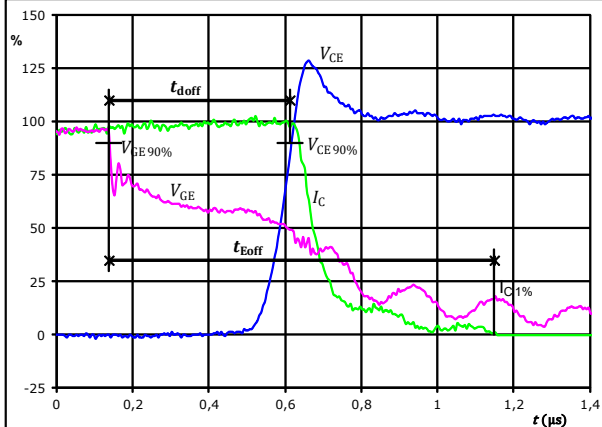
Half Bridge Switching Characteristics

General conditions

T_j	=	125 °C
R_{gon}	=	2 Ω
R_{goff}	=	2 Ω

figure 1. IGBT

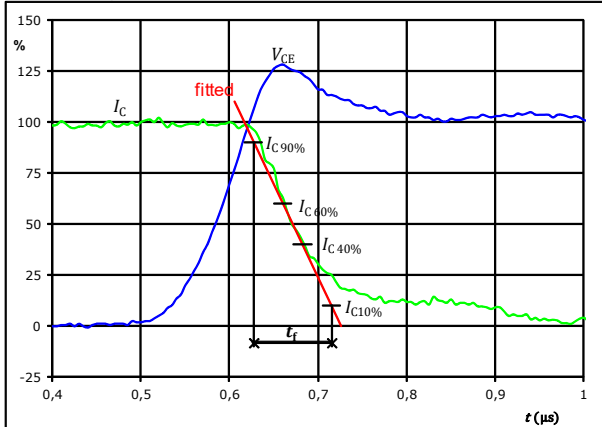
Turn-off Switching Waveforms & definition of t_{doff} , t_{Eoff} (t_{Eoff} = integrating time for E_{off})



$V_{GE}(0\%) =$	-15	V
$V_{GE}(100\%) =$	15	V
$V_C(100\%) =$	600	V
$I_C(100\%) =$	616	A
$t_{doff} =$	0,478	μs
$t_{Eoff} =$	1,012	μs

figure 3. IGBT

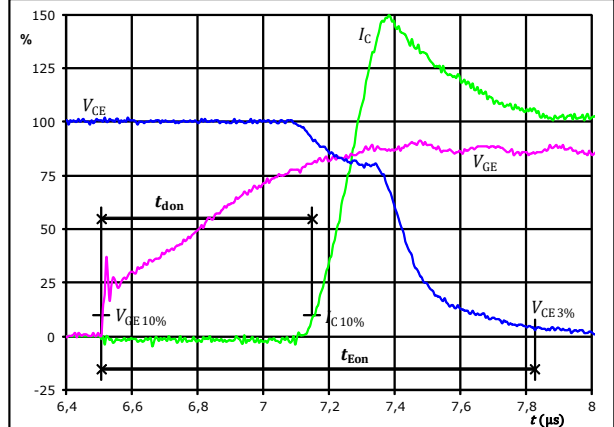
Turn-off Switching Waveforms & definition of t_f



$V_C(100\%) =$	600	V
$I_C(100\%) =$	616	A
$t_f =$	0,086	μs

figure 2. IGBT

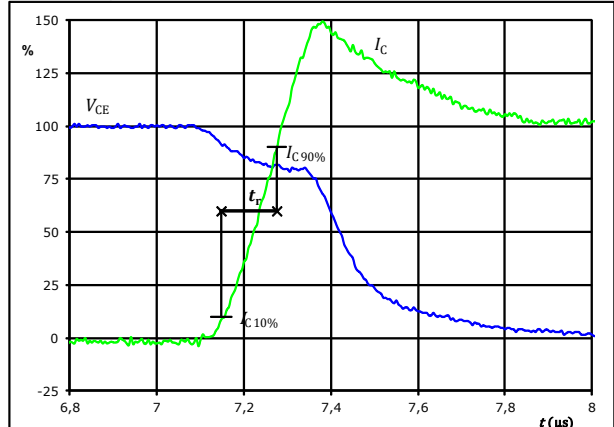
Turn-on Switching Waveforms & definition of t_{don} , t_{Eon} (t_{Eon} = integrating time for E_{on})



$V_{GE}(0\%) =$	-15	V
$V_{GE}(100\%) =$	15	V
$V_C(100\%) =$	600	V
$I_C(100\%) =$	616	A
$t_{don} =$	0,639	μs
$t_{Eon} =$	1,319	μs

figure 4. IGBT

Turn-on Switching Waveforms & definition of t_r



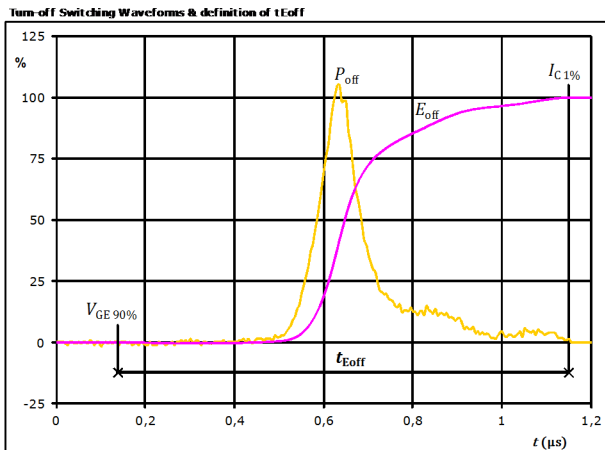
$V_C(100\%) =$	600	V
$I_C(100\%) =$	616	A
$t_r =$	0,128	μs



Vincotech

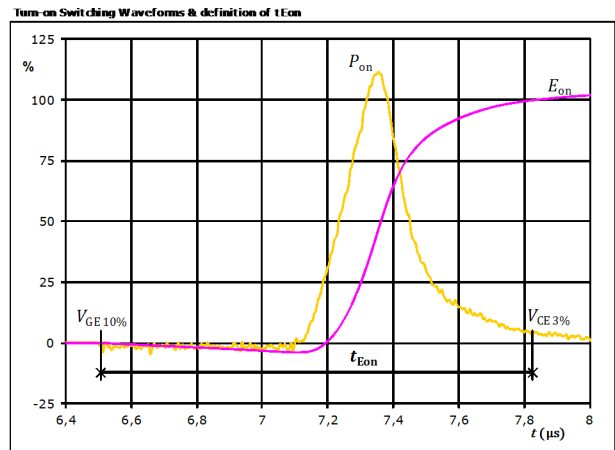
Half Bridge Switching Characteristics

figure 5. IGBT



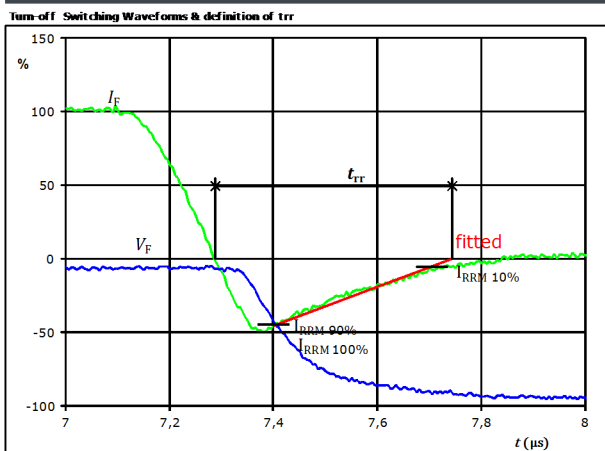
$P_{off}(100\%) = 369,63$ kW
 $E_{off}(100\%) = 57,15$ mJ
 $t_{Eoff} = 1,01$ μs

figure 6. IGBT



$P_{on}(100\%) = 369,63$ kW
 $E_{on}(100\%) = 104,71$ mJ
 $t_{Eon} = 1,32$ μs

figure 7. FWD



$V_F(100\%) = 600$ V
 $I_F(100\%) = 616$ A
 $I_{RRM}(100\%) = -309$ A
 $t_{rr} = 0,536$ μs

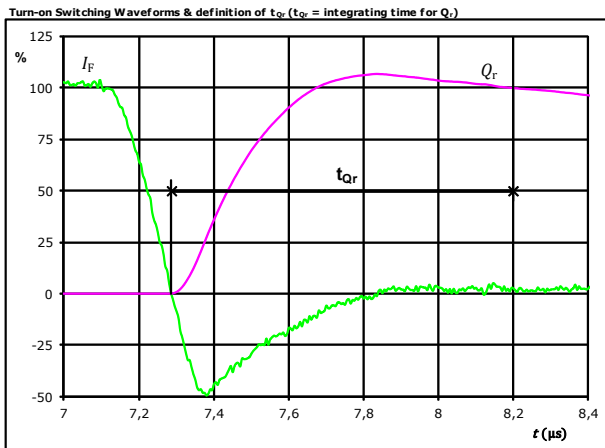


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 datasheet

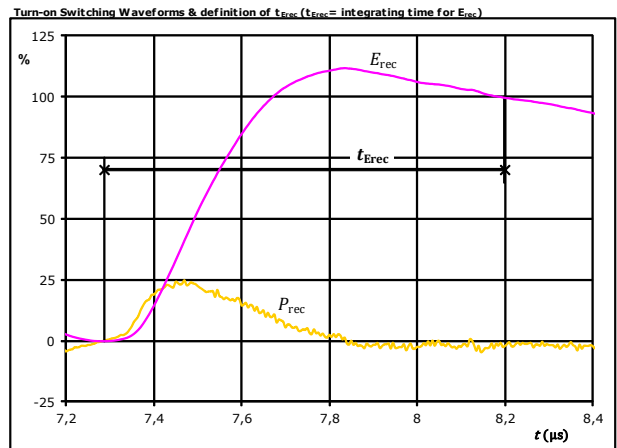
Half Bridge Switching Characteristics

figure 8. FWD



I_F (100%) = 616 A
 Q_r (100%) = 77,00 μC
 t_{Qr} = 0,91 μs

figure 9. FWD



P_{rec} (100%) = 369,63 kW
 E_{rec} (100%) = 25,31 mJ
 t_{Erec} = 0,91 μs



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A0-VS122PA600M7-L759F70
A0-VP122PA600M7-L759F70T
datasheet

Ordering Code & Marking							
Version			Ordering Code				
without thermal paste with solder pins			A0-VS122PA600M7-L759F70				
with thermal paste with solder pins			A0-VS122PA600M7-L759F70-/3/				
without thermal paste with Press-fit pins			A0-VP122PA600M7-L759F70T				
with thermal paste with Press-fit pins			A0-VP122PA600M7-L759F70T-/3/				
NN-NNNNNNNNNNNN TTTTTVV WWYY UL VIN LLLLL SSSS 	Text	Name		Date code	UL & VIN	Lot	Serial
		NN-NNNNNNNNNNNN-TTTTTW		WWYY	UL VIN	LLLLL	SSSS
	Datamatrix	Type&Ver	Lot number	Serial	Date code		
	TTTTTTVV	LLLLL	SSSS	WWYY			

Outline

Pin table [mm]			
Pin	X	Y	Function
1	7,24	-0,45	Therm1
2	11,06	-0,45	Therm2
3	60,58	-0,45	G12
4	64,4	-0,45	S12
5	87,26	-0,45	C12
6	-	-	Ph
7	-	-	Ph
8	37,72	57,95	G11
9	33,92	57,95	S11
10	-	-	DC-
11	-	-	DC+

Technical drawing of a rectangular component outline. The drawing shows the component with dimensions and pin locations. The dimensions are as follows:

- Overall width: 110.6 mm
- Overall height: 57.95 mm
- Pin 1 location: 7.24 mm from the left edge, 0.45 mm from the bottom edge.
- Pin 2 location: 11.06 mm from the left edge, 0.45 mm from the bottom edge.
- Pin 3 location: 60.58 mm from the left edge, 0.45 mm from the bottom edge.
- Pin 4 location: 64.4 mm from the left edge, 0.45 mm from the bottom edge.
- Pin 5 location: 87.26 mm from the left edge, 0.45 mm from the bottom edge.
- Pin 6 location: 37.72 mm from the left edge, 57.95 mm from the bottom edge.
- Pin 7 location: 33.92 mm from the left edge, 57.95 mm from the bottom edge.
- Pin 8 location: 7.24 mm from the left edge, 57.95 mm from the bottom edge.
- Pin 9 location: 11.06 mm from the left edge, 57.95 mm from the bottom edge.
- Pin 10 location: 60.58 mm from the left edge, 57.95 mm from the bottom edge.
- Pin 11 location: 64.4 mm from the left edge, 57.95 mm from the bottom edge.

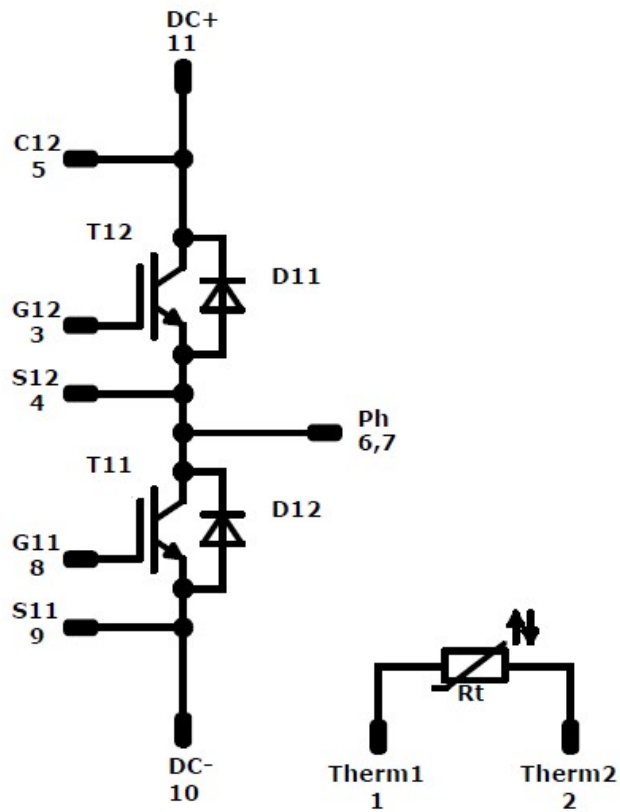
The drawing also shows the component's internal structure, including a central rectangular area and four corner mounting points. The pins are labeled 1 through 11, corresponding to the pin table.



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A0-VS122PA600M7-L759F70
A0-VP122PA600M7-L759F70T
datasheet

Pinout



Identification

ID	Component	Voltage	Current	Function	Comment
T11,T12	IGBT	1200 V	600 A	Half Bridge Switch	
D11,D12	FWD	1200 V	600 A	Half Bridge Diode	
Rt	Thermistor			Thermistor	



Vincotech

A0-VS122PA600M7-L759F70
A0-VP122PA600M7-L759F70T
datasheet

Packaging instruction			
Standard packaging quantity (SPQ) 24	>SPQ	Standard	<SPQ Sample

Document No.:	Date:	Modification:	Pages
A0-Vx122PA600M7-L759F70x-D3-14	05 May. 2017	Gate charge value correction and add function	3, 6

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