A0-VS122PA600M7-L759F70
A0-VP122PA600M7-L759F70T
datasheet

VINcoDUAL E3	1200 V / 600 A

Features

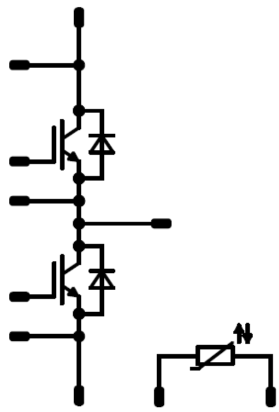
- IGBT Mitsubishi gen 7 technology with low V_{CEsat} and improved EMC behavior
- New SoLid Cover Technology for higher reliability
- Industry standard housing
- Press-fit pin and pre-applied phase-change Thermal Interface Material available

VINco E3

Target applications

- Industrial Drives
- Power Supply
- UPS

Schematic



Types

- A0-VS122PA600M7-L759F70
- A0-VP122PA600M7-L759F70T

Maximum Ratings

T_j = 25 °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 °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 °C	946	W
Gate-emitter voltage	V_{GES}			±20	V
Maximum junction temperature	T_{jmax}			175	°C

Maximum Ratings

T_j = 25 °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 °C	437	A
Repetitive peak forward current	I_{FRM}			1200	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °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 s	4000	V
Creepage distance				18,1	mm
Clearance				16,2	mm
Comparative Tracking Index	CTI			> 200	

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}		0	10		25		3300		pF
Reverse transfer capacitance	C_{res}		0	10		25		1260		pF
Gate charge	Q_g		15	600	600	25		3600		nC
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	phase-change material λ = 3,4 W/mK						0,10		K/W
Dynamic										
Turn-on delay time	$t_{d(on)}$	R_{goff} = 2 Ω R_{gon} = 2 Ω	±15	600	626	25 125 150		639 639 641		ns
Rise time	t_r	R_{goff} = 2 Ω R_{gon} = 2 Ω	±15	600	626	25 125 150		109 128 133		ns
Turn-off delay time	$t_{d(off)}$	R_{goff} = 2 Ω R_{gon} = 2 Ω	±15	600	626	25 125 150		447 478 491		ns
Fall time	t_f	R_{goff} = 2 Ω R_{gon} = 2 Ω	±15	600	626	25 125 150		58 86 97		ns
Turn-on energy (per pulse)	E_{on}	Q_{rFWD} = 37,5 µC Q_{rFWD} = 77 µC Q_{rFWD} = 92 µC	±15	600	626	25 125 150		76,680 104,706 119,766		mWs
Turn-off energy (per pulse)	E_{off}		±15	600	626	25 125 150		44,920 57,152 66,317		mWs

Characteristic Values

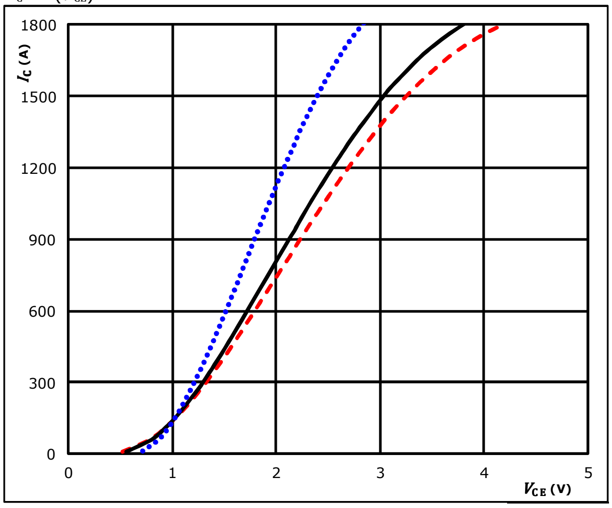
Parameter	Symbol	Conditions					Value			Unit
			V_{GE} [V] V_{GS} [V]	V_{CE} [V] V_{DS} [V] V_F [V]	I_C [A] I_D [A] I_F [A]	T_j [°C]	Min	Typ	Max	
Half Bridge Diode										
Static										
Forward voltage	V_F				600	25 125 150		1,67 1,82 1,83	2,2	V
Reverse leakage current	I_R			1200		25			360	µA
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	phase-change material λ = 3,4 W/mK						0,13		K/W
Dynamic										
Peak recovery current	I_{RRM}					25 125 150		273 309 313		A
Reverse recovery time	t_{rr}					25 125 150		342 536 598		ns
Recovered charge	Q_r	di/dt = 7225 A/µs di/dt = 4638 A/µs di/dt = 4219 A/µs	±15	600	626	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
Thermistor										
Rated resistance	R					25		5		kΩ
Deviation of R_{100}	$\Delta_{R/R}$	R_{100} = 493 Ω				100	-5		+5	%
Power dissipation	P					25		245		mW
Power dissipation constant						25		1,4		mW/K
B-value	$B_{(25/50)}$	Tol. ±2 %				25		3375		K
B-value	$B_{(25/100)}$	Tol. ±2 %				25		3437		K
Vincotech NTC Reference									K	

Half Bridge Switch Characteristics

figure 1. **IGBT**

Typical output characteristics

$I_C = f(V_{CE})$

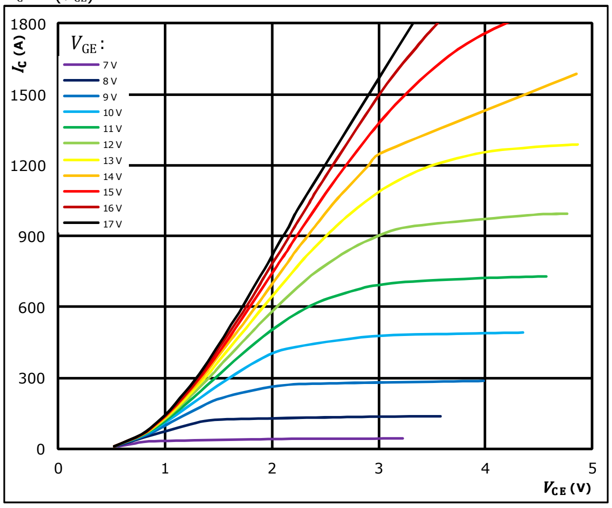


t_p =	250	µs		25 °C	dotted (blue)
V_{GE} =	15	V	T_j:	125 °C	solid (black)
				150 °C	dashed (red)

figure 2. **IGBT**

Typical output characteristics

$I_C = f(V_{CE})$



t_p = 250 µs

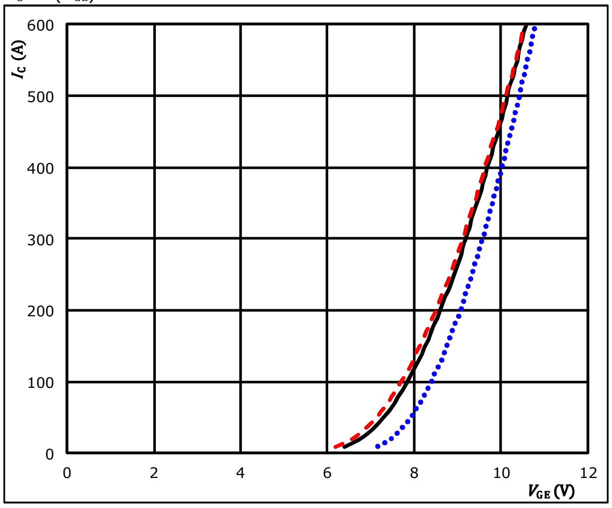
T_j = 125 °C

V_{GE} from 7 V to 17 V in steps of 1 V

figure 3. **IGBT**

Typical transfer characteristics

$I_C = f(V_{GE})$

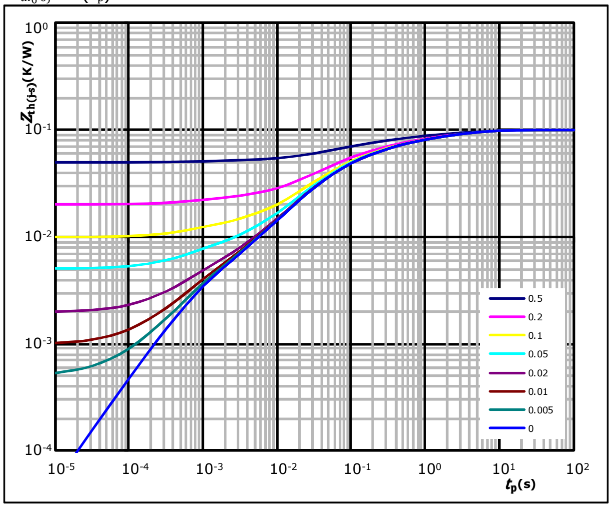


t_p =	100	µs		25 °C	dotted (blue)
V_{CE} =	0	V	T_j:	125 °C	solid (black)
				150 °C	dashed (red)

figure 4. **IGBT**

Transient thermal impedance as function of pulse duration

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



D = t_p / T

$R_{th(j-s)}$ = 0,10 K/W

IGBT thermal model values

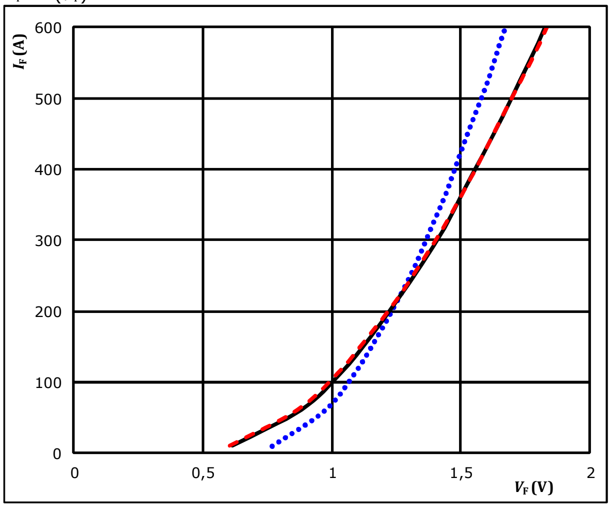
R (K/W)	τ (s)
1,28E-02	5,07E+00
2,01E-02	1,08E+00
2,47E-02	2,20E-01
2,82E-02	5,60E-02
1,16E-02	1,62E-02
3,16E-03	8,52E-04

Half Bridge Diode Characteristics

figure 1. **FWD**

Typical forward characteristics

$I_F = f(V_F)$



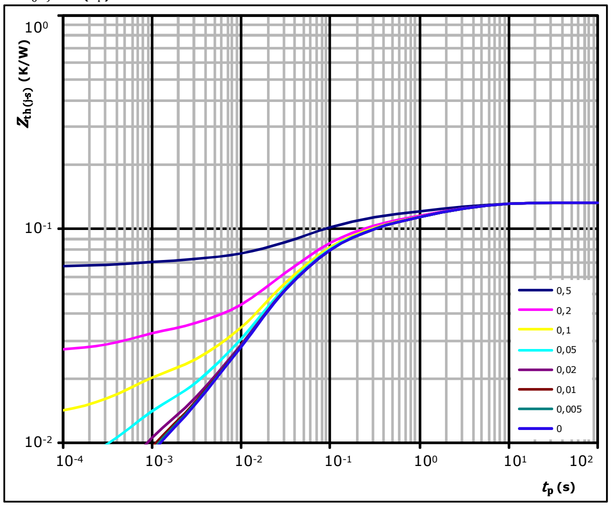
t_p = 250 µs

T_j: 25 °C; 125 °C; 150 °C

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 K/W

FWD thermal model values

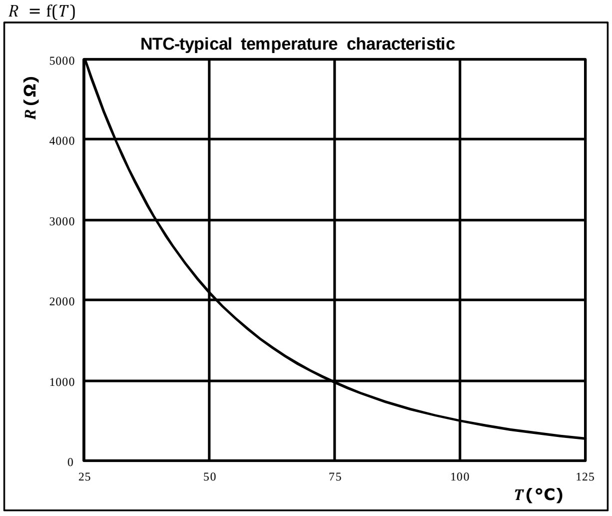
R (K/W)	τ (s)
1,42E-02	4,56E+00
2,24E-02	9,51E-01
3,79E-02	1,30E-01
4,42E-02	3,01E-02
6,69E-03	8,14E-03
7,87E-03	6,10E-04

Thermistor Characteristics

figure 1. **Thermistor**

Typical NTC characteristic
as a function of temperature

$R = f(T)$

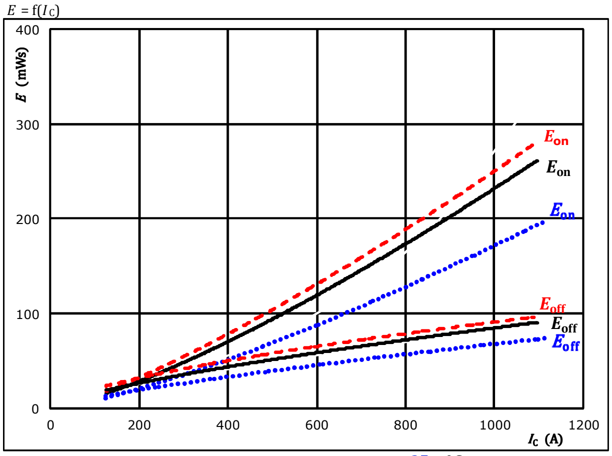


Half Bridge Switching Characteristics

figure 1. **IGBT**

Typical switching energy losses as a function of collector current

$E = f(I_C)$



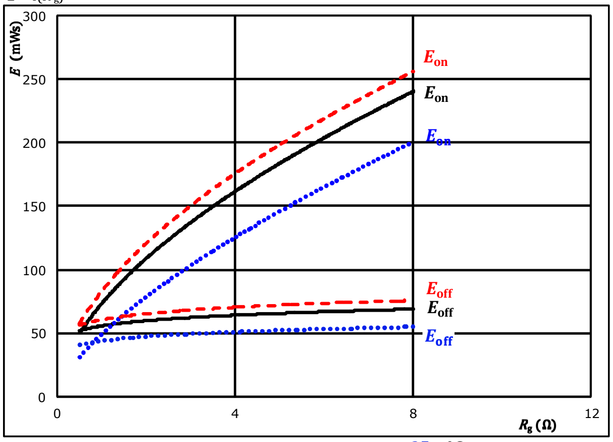
With an inductive load at

V_{CE} =	600	V	T_j:	25 °C	dotted
V_{GE} =	±15	V		125 °C	solid
R_{gon} =	2	Ω		150 °C	dashed
R_{goff} =	2	Ω			

figure 2. **IGBT**

Typical switching energy losses as a function of gate resistor

$E = f(R_g)$



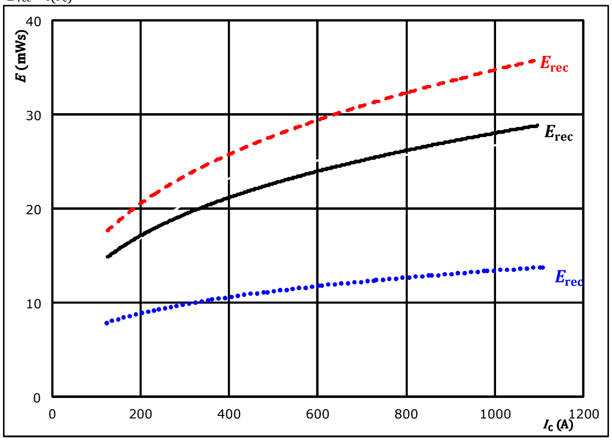
With an inductive load at

V_{CE} =	600	V	T_j:	25 °C	dotted
V_{GE} =	±15	V		125 °C	solid
I_C =	626	A		150 °C	dashed

figure 3. **FWD**

Typical reverse recovered energy loss as a function of collector current

$E_{rec} = f(I_C)$



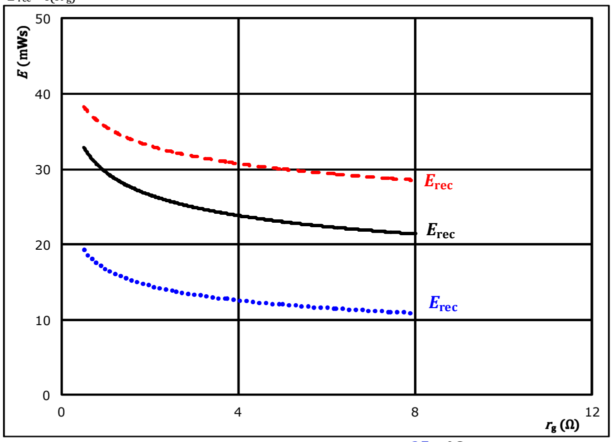
With an inductive load at

V_{CE} =	600	V	T_j:	25 °C	dotted
V_{GE} =	±15	V		125 °C	solid
R_{gon} =	2	Ω		150 °C	dashed

figure 4. **FWD**

Typical reverse recovered energy loss as a function of gate resistor

$E_{rec} = f(R_g)$



With an inductive load at

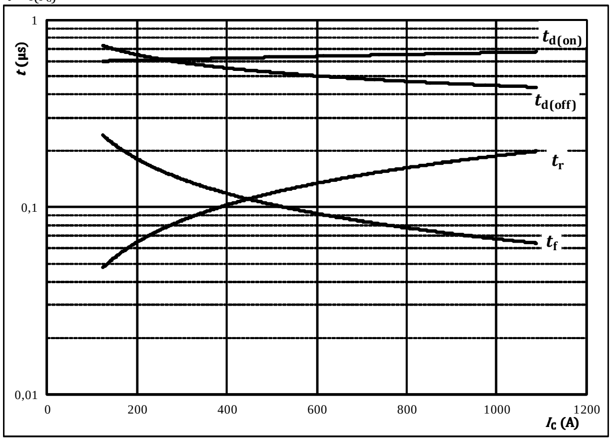
V_{CE} =	600	V	T_j:	25 °C	dotted
V_{GE} =	±15	V		125 °C	solid
I_C =	626	A		150 °C	dashed

Half Bridge Switching Characteristics

figure 5. **IGBT**

Typical switching times as a function of collector current

$t = f(I_C)$



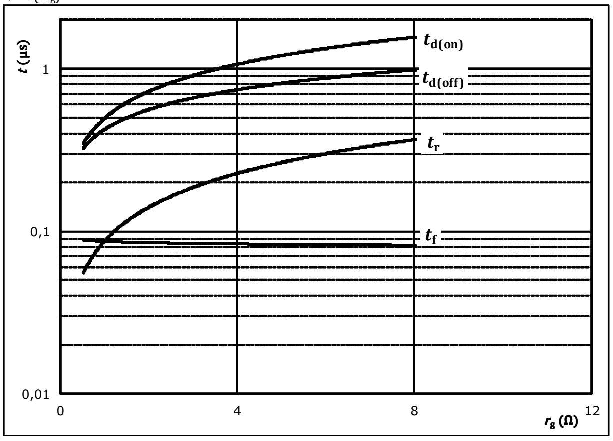
With an inductive load at

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

$t = f(R_g)$



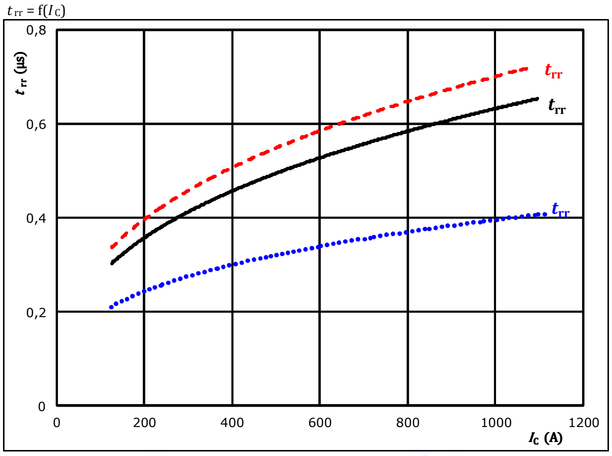
With an inductive load at

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

$t_{rr} = f(I_C)$

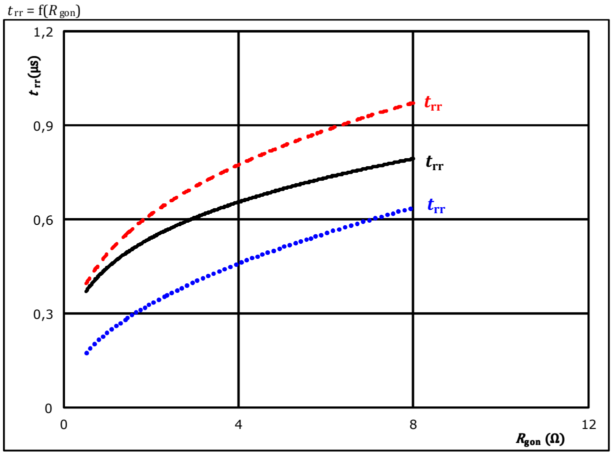


At						
V_{CE} =	600	V		25	°C	dotted (blue)
V_{GE} =	±15	V	T_j:	125	°C	solid (black)
R_{gon} =	2	Ω		150	°C	dashed (red)

figure 8. **FWD**

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

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



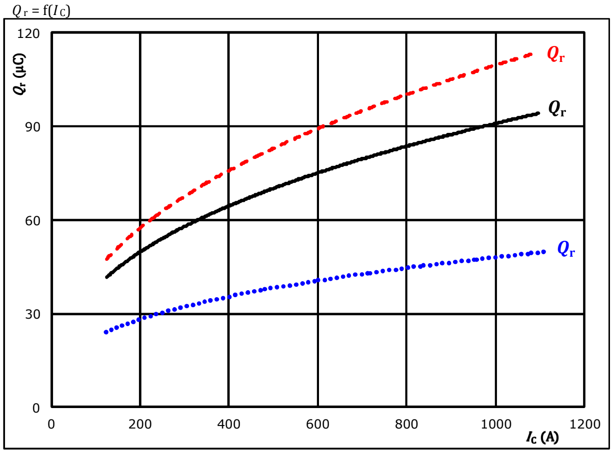
At						
V_{CE} =	600	V		25	°C	dotted (blue)
V_{GE} =	±15	V	T_j:	125	°C	solid (black)
I_C =	626	A		150	°C	dashed (red)

Half Bridge Switching Characteristics

figure 9. **FWD**

Typical recovered charge as a function of collector current

$Q_r = f(I_C)$

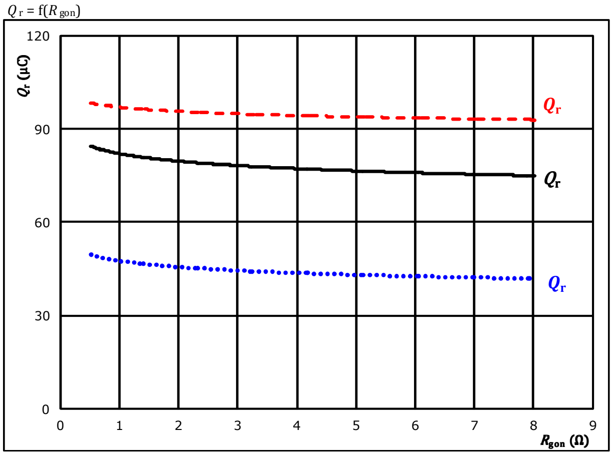


At					
V_{CE} =	600	V		25 °C	···········
V_{GE} =	±15	V	T_j:	125 °C	———
R_{gon} =	2	Ω		150 °C	– – –

figure 10. **FWD**

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

$Q_r = f(R_{gon})$

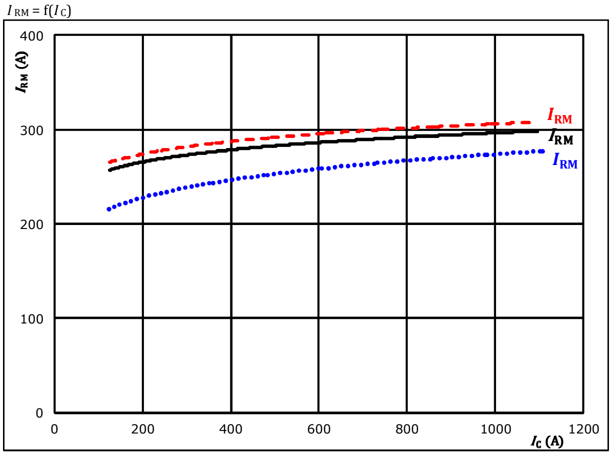


At					
V_{CE}=	600	V		25 °C	···········
V_{GE} =	±15	V	T_j:	125 °C	———
I_C=	626	A		150 °C	– – –

figure 11. **FWD**

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

$I_{RM} = f(I_C)$

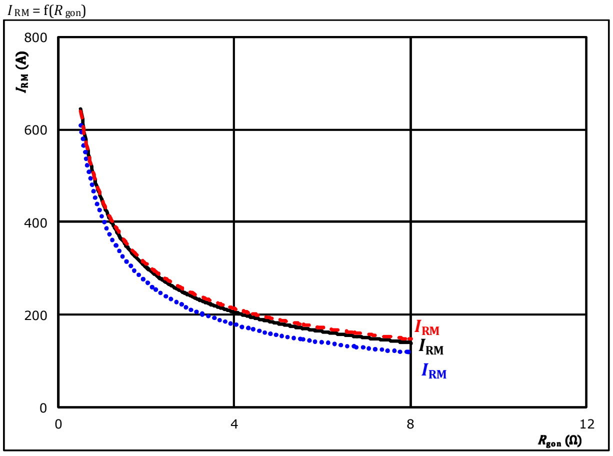


At					
V_{CE}:	600	V		25 °C	···········
V_{GE} =	±15	V	T_j:	125 °C	———
R_{gon} =	2	Ω		150 °C	– – –

figure 12. **FWD**

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

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



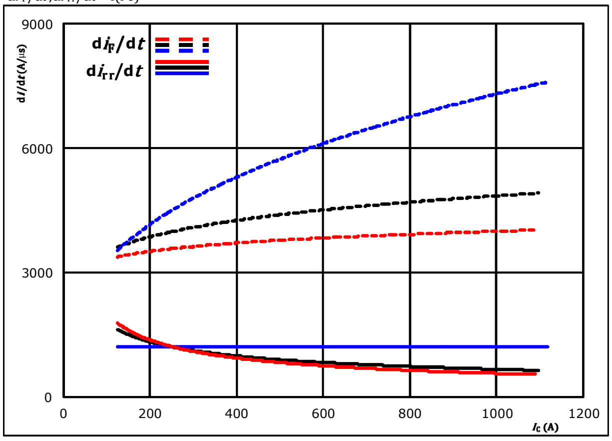
At					
V_{CE} =	600	V		25 °C	···········
V_{GE} =	±15	V	T_j:	125 °C	———
I_C =	626	A		150 °C	– – –

Half Bridge Switching Characteristics

figure 13. **FWD**

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

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

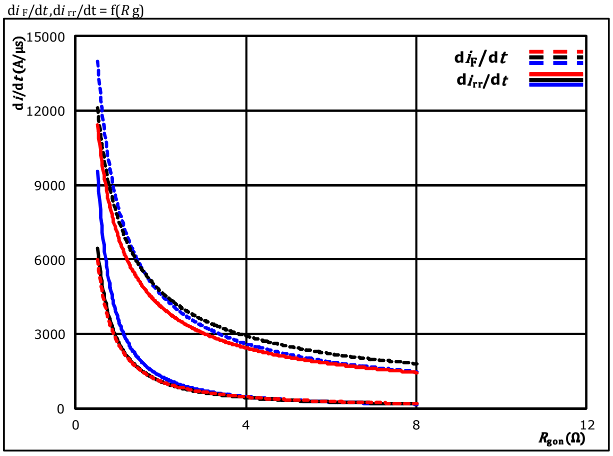


At					
V_{CE} =	600	V		25	°C
V_{GE} =	±15	V	T_j:	125	°C
R_{gon} =	2	Ω		150	°C

figure 14. **FWD**

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

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

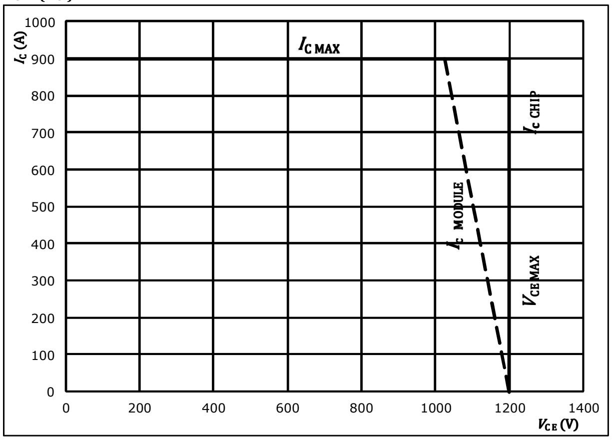


At					
V_{CE} =	600	V		25	°C
V_{GE} =	±15	V	T_j:	125	°C
I_C =	626	A		150	°C

figure 15. **IGBT**

Reverse bias safe operating area

$I_C = f(V_{CE})$



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

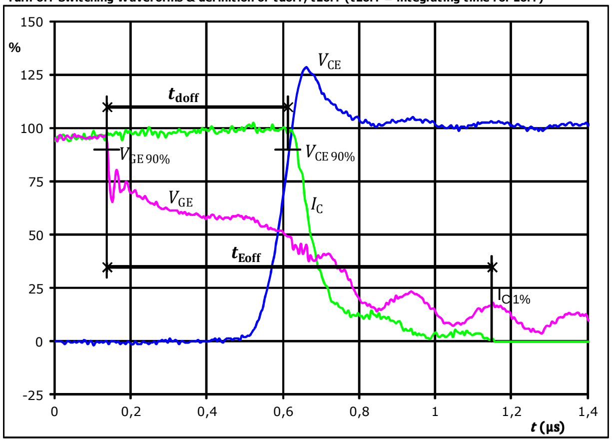
Half Bridge Switching Characteristics

General conditions

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

figure 1. **IGBT**

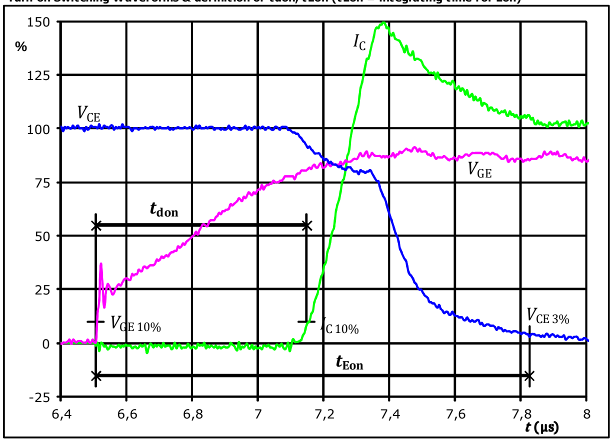
Turn-off Switching Waveforms & definition of tdoff, tEoff (tEoff = integrating time for Eoff)



$V_{GE}(0\%)$ =	-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 2. **IGBT**

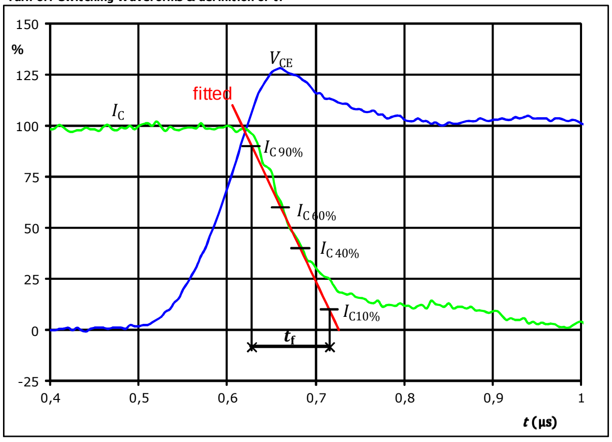
Turn-on Switching Waveforms & definition of tdon, tEon (tEon = integrating time for Eon)



$V_{GE}(0\%)$ =	-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 3. **IGBT**

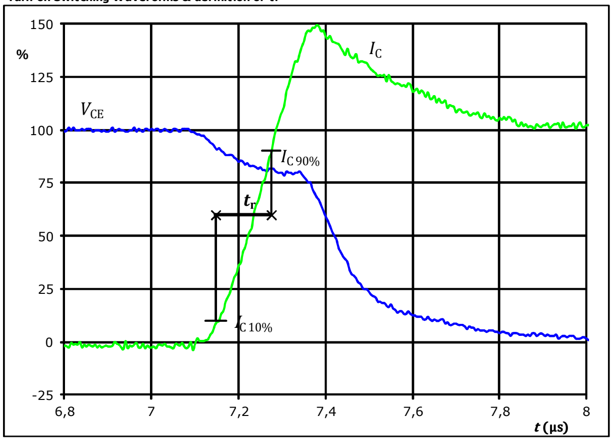
Turn-off Switching Waveforms & definition of tf



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

figure 4. **IGBT**

Turn-on Switching Waveforms & definition of tr

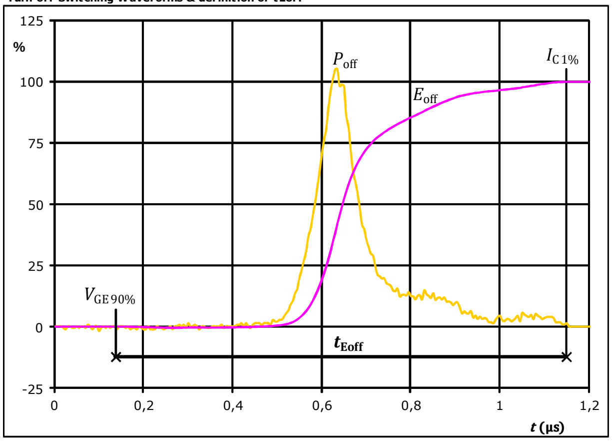


$V_C(100\%)$ =	600	V
$I_C(100\%)$ =	616	A
t_r =	0,128	µs

Half Bridge Switching Characteristics

figure 5. **IGBT**

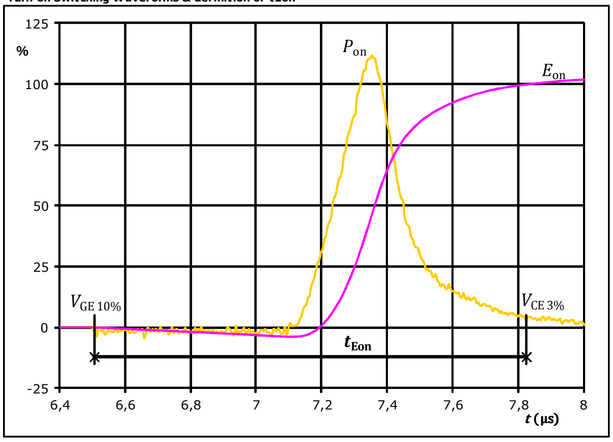
Turn-off Switching Waveforms & definition of tEoff



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

figure 6. **IGBT**

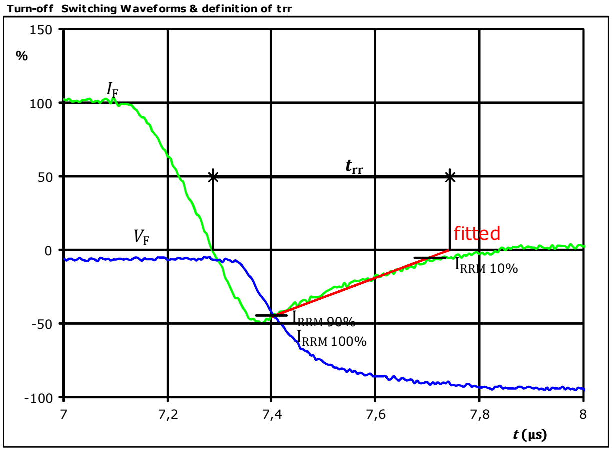
Turn-on Switching Waveforms & definition of tEon



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

figure 7. **FWD**

Turn-off Switching Waveforms & definition of trr

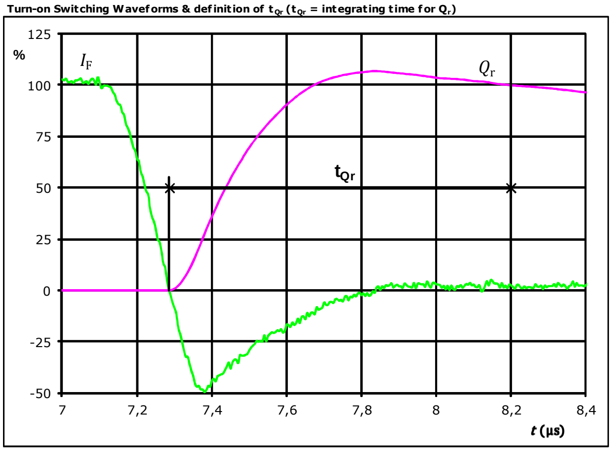


V_F (100%) =	600	V
I_F (100%) =	616	A
I_{RRM} (100%) =	-309	A
t_{rr} =	0,536	μs

Half Bridge Switching Characteristics

figure 8. **FWD**

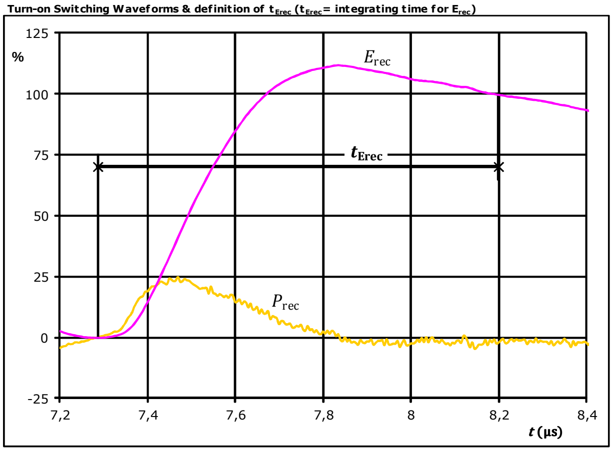
Turn-on Switching Waveforms & definition of t_{Qr} (t_{Qr} = integrating time for Q_r)



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

figure 9. **FWD**

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



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

A0-VS122PA600M7-L759F70
A0-VP122PA600M7-L759F70T
datasheet

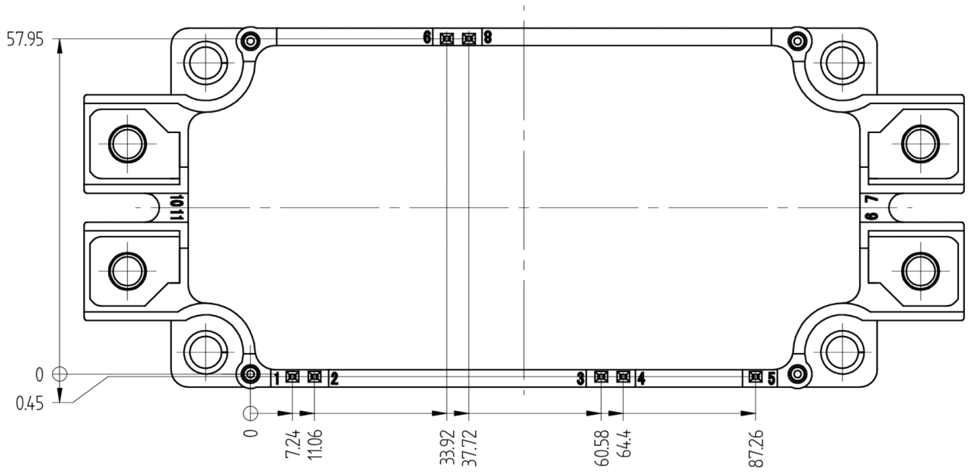
Ordering Code & Marking

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/

Text	Name		Date code	UL & VIN	Lot	Serial
	NN-NNNNNNNNNNNNNN-TTTTTTVV		WWYY	UL VIN	LLLLL	SSSS
Datamatrix	Type&Ver	Lot number	Serial	Date code		
	TTTTTTTVV	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+



Vincotech

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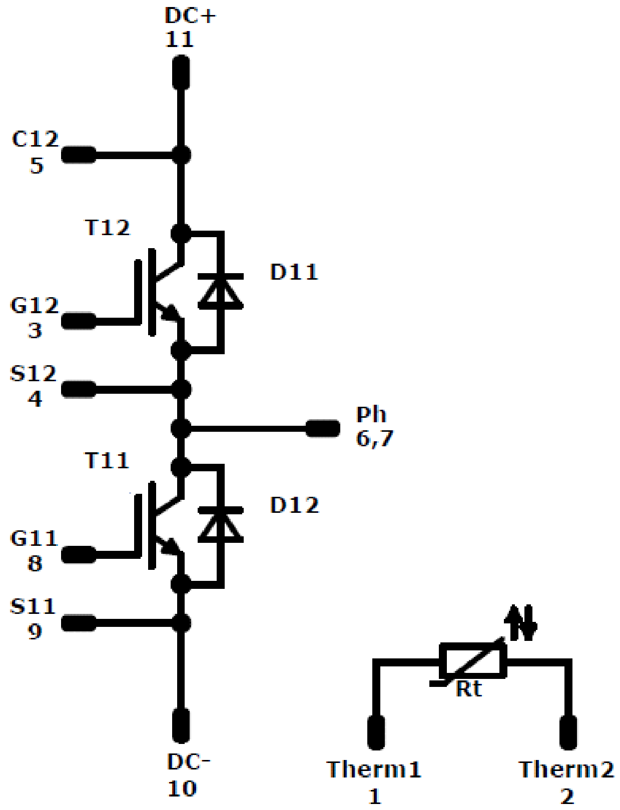
A0-VP122PA600M7-L759F70T
datasheet

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	

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

Document No.:	Date:	Modification:	Pages
A0-Vx122PA600M7-L759F70x-D2-14	20 Feb. 2017	Add thermistor parameter	4, 6