Vincotech

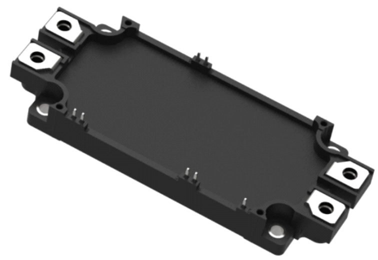
A0-VS122PA450M7-L758F70
A0-VP122PA450M7-L758F70T
datasheet

VINcoDUAL E3 | **1200 V / 450 A**

Features

- 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

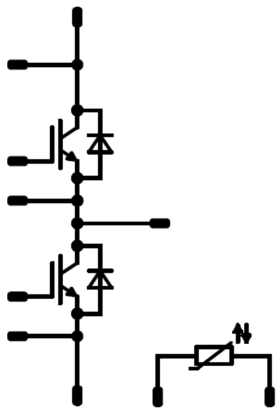
VINco E3 housing



Target applications

- Industrial Drives
- Power Supply
- UPS

Schematic



Types

- A0-VS122PA450M7-L758F70
- A0-VP122PA450M7-L758F70T

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	421	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}	900	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ T_s = 80 °C	793	W
Gate-emitter voltage	V_{GES}		±20	V
Short circuit ratings	t_{SC}	V_{GE} = 15 V V_{cc} = 800 V T_j = 150 °C	9,5	µs
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	355	A
Repetitive peak forward current	I_{FRM}			900	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	613	W
Maximum junction temperature	T_{jmax}			175	°C

Module Properties

Thermal Properties

Parameter	Symbol	Condition		Value	Unit
Storage temperature	T_{stg}			-40…+125	°C
Operation temperature under switching condition	T_{jop}			-40…(T_{jmax} - 25)	°C

Isolation Properties

Parameter	Symbol	Condition		Value	Unit
Isolation voltage	V_{isol}	DC Test Voltage*	t_p = 2 s	6000	V
		AC Voltage	t_p = 1 min	2500	V
Creepage distance				18,1	mm
Clearance				16,2	mm
Comparative Tracking Index	CTI			> 200	

* 100 % tested in production

Vincotech

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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 Switch										
Static										
Gate-emitter threshold voltage	$V_{GE(th)}$	$V_{GE} = V_{CE}$		10	0,045	25	5,4	6	6,6	V
Collector-emitter saturation voltage	V_{CEsat}		15		450	25 125 150		1,53 1,78 1,85	2,05	V
Collector-emitter cut-off current*	I_{CES}		0	1200		25			750	µA
Gate-emitter leakage current	I_{GES}		20	0		25			1500	nA
Internal gate resistance	r_g							1		Ω
Input capacitance	C_{ies}		0	10		25		90000		pF
Output capacitance	C_{oes}							2640		
Reverse transfer capacitance	C_{res}							960		
Gate charge	Q_g		±15	600	450	25		5500		nC
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	phase-change material λ = 3,4 W/mK						0,12		K/W
Dynamic										
Turn-on delay time	$t_{d(on)}$	R_{goff} = 1 Ω R_{gon} = 1 Ω	±15	600	450	25 125 150		408 421 418		ns
Rise time	t_r					25 125 150		57 67 73		
Turn-off delay time	$t_{d(off)}$					25 125 150		342 379 389		
Fall time	t_f					25 125 150		66 95 123		
Turn-on energy (per pulse)	E_{on}	Q_{rFWD} = 40,9 µC Q_{rFWD} = 64,2 µC Q_{rFWD} = 80,8 µC				25 125 150		32,950 46,123 57,955		mWs
Turn-off energy (per pulse)	E_{off}					25 125 150		31,594 42,453 55,600		

* Including parallel device's leakage current

Characteristic Values

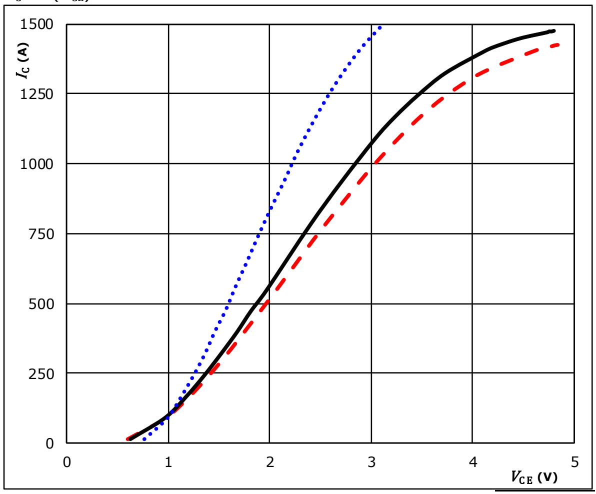
Parameter	Symbol	Conditions					Value			Unit
			V_{GE} [V] V_{GS} [V]	V_{CE} [V] V_{DS} [V] V_F [V]	I_C [A] I_D [A] I_F [A]	T_j [°C]	Min	Typ	Max	
Half-Bridge Diode										
Static										
Forward voltage	V_F				450	25 125		1,60 1,65	2,15	V
Reverse leakage current	I_R			1200		25			270	µA
Thermal										
Thermal resistance junction to sink	$R_{th(j\text{-}s)}$	phase-change material λ = 3,4 W/mK						0,16		K/W
Dynamic										
Peak recovery current	I_{RRM}	di/dt = 8123 A/µs di/dt = 6768 A/µs di/dt = 9620 A/µs	±15	600	450	25 125 150		347 373 413		A
Reverse recovery time	t_{rr}					25 125 150		264 430 433		ns
Recovered charge	Q_r					25 125 150		40,859 64,228 80,754		µC
Reverse recovered energy	E_{rec}					25 125 150		15,883 24,807 31,620		mWs
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 125 150		3020 2564 3852		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

$I_C = f(V_{CE})$

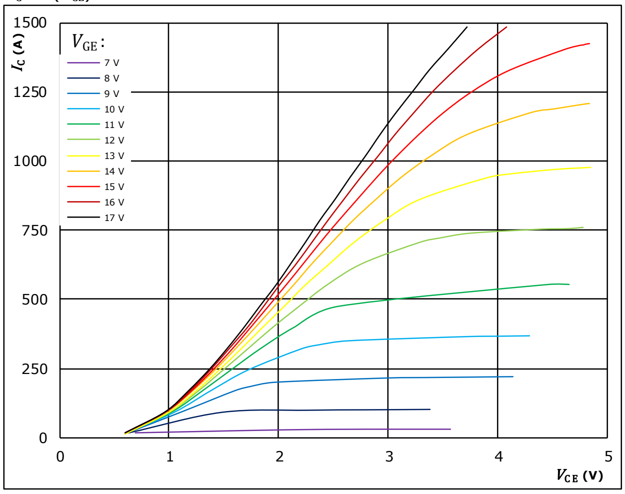


t_p =	250	µs		25 °C	dotted
V_{GE} =	15	V	T_j:	125 °C	solid
				150 °C	dashed

figure 2. **IGBT**

Typical output characteristics

$I_C = f(V_{CE})$

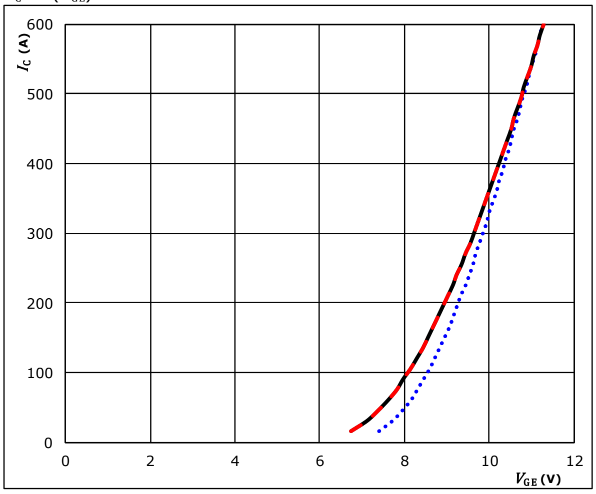


t_p =	250	µs
T_j =	125	°C
V_{GE} from	7 V to 17 V in steps of 1 V	

figure 3. **IGBT**

Typical transfer characteristics

$I_C = f(V_{GE})$

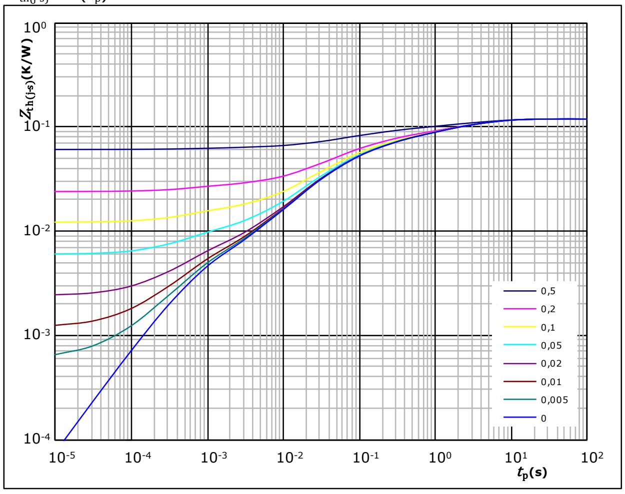


t_p =	250	µs		25 °C	dotted
V_{CE} =	0	V	T_j:	125 °C	solid
				150 °C	dashed

figure 4. **IGBT**

Transient thermal impedance as function of pulse duration

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



D =	t_p / T	
$R_{th(j-s)}$ =	0,12	K/W

IGBT thermal model values

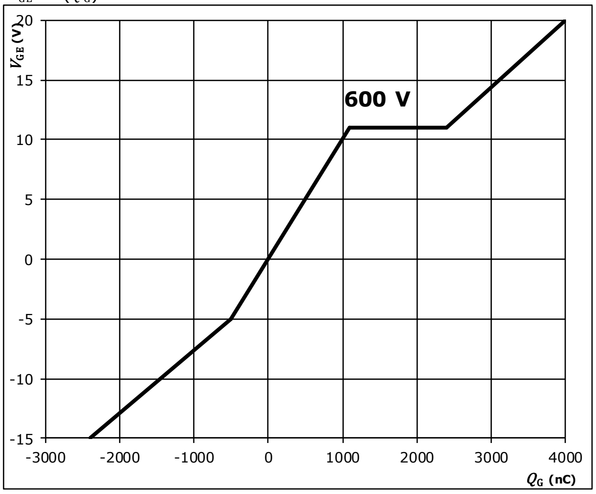
R (K/W)	τ (s)
2,37E-02	4,78E+00
2,53E-02	1,20E+00
2,84E-02	1,98E-01
2,94E-02	4,71E-02
8,82E-03	1,33E-02
4,11E-03	6,77E-04

Half-Bridge Switch Characteristics

figure 5. **IGBT**

Gate voltage vs gate charge

$V_{GE} = f(Q_G)$

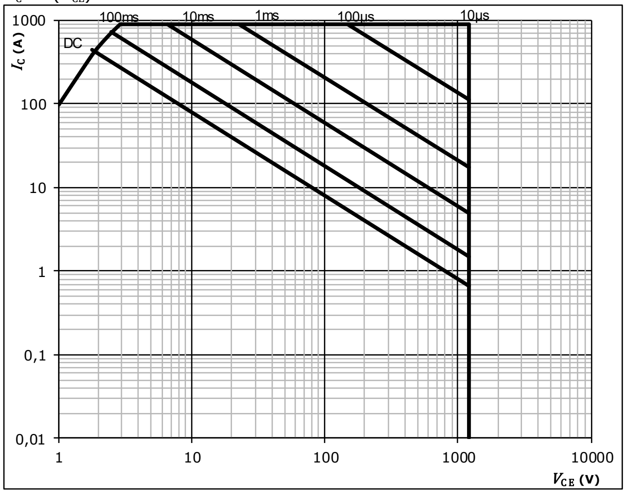


$I_C =$ 450 A

figure 6. **IGBT**

Safe operating area

$I_C = f(V_{CE})$



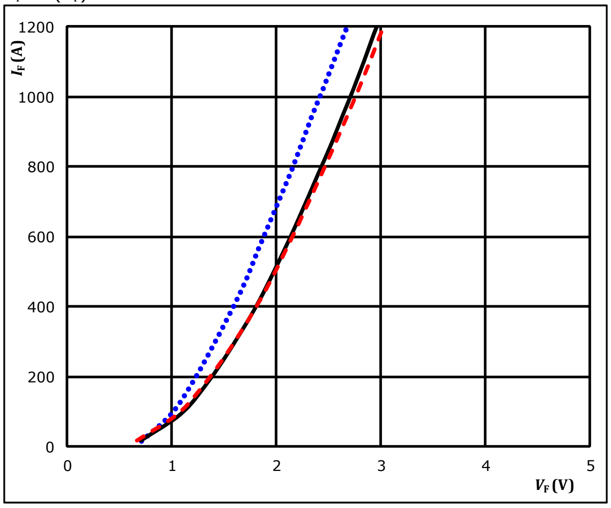
D =	single pulse	
T_s =	80	ºC
V_{GE} =	±15	V
T_j =	T_{jmax}	

Half-Bridge Diode Characteristics

figure 1. **Diode**

Typical forward characteristics

$I_F = f(V_F)$



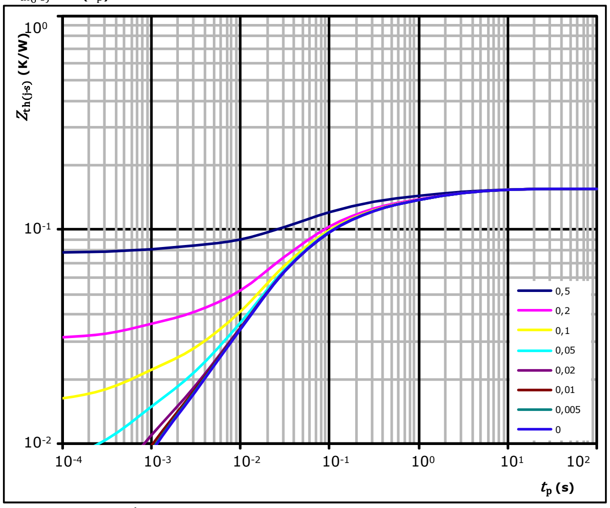
t_p = 250 μs

T_j: 25 °C ; 125 °C ; 150 °C

figure 2. **Diode**

Transient thermal impedance as a function of pulse width

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



$D = t_p / T$

$R_{th(j\text{-}s)}$ = 0,16 K/W

Diode thermal model values

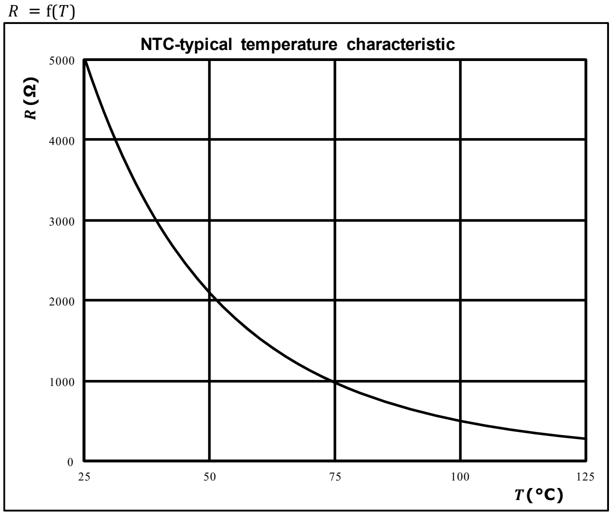
R (K/W)	τ (s)
1,07E-02	1,64E+00
2,30E-02	3,40E-01
4,13E-02	5,39E-02
4,89E-02	1,35E-02
2,30E-02	4,19E-03
8,01E-03	2,65E-04

Thermistor Characteristics

figure 1. **Thermistor**

Typical NTC characteristic as a function of temperature

$R = f(T)$

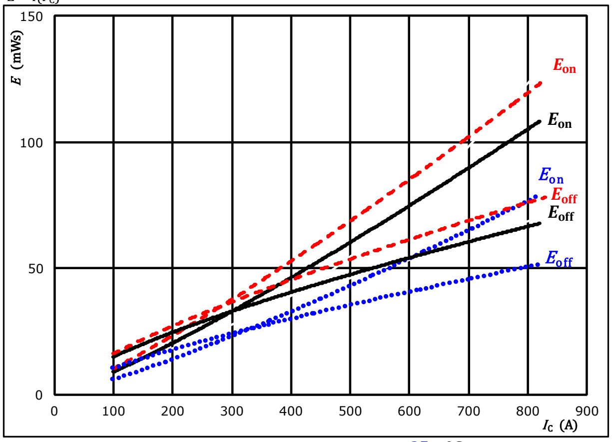


Half-Bridge Switch Switching Characteristics

figure 1. **IGBT**

Typical switching energy losses as a function of collector current

$E = f(I_C)$



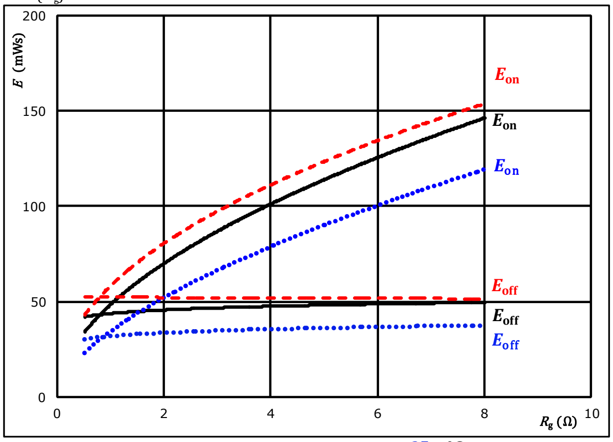
With an inductive load at

V_{CE} =	600	V	T_j:	25 °C	············
V_{GE} =	±15	V		125 °C	——
R_{gon} =	1	Ω		150 °C	– – –
R_{goff} =	1	Ω			

figure 2. **IGBT**

Typical switching energy losses as a function of gate resistor

$E = f(R_g)$



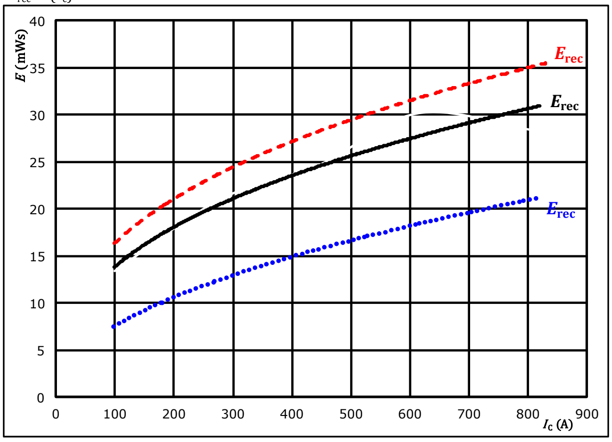
With an inductive load at

V_{CE} =	600	V	T_j:	25 °C	············
V_{GE} =	±15	V		125 °C	——
I_C =	450	A		150 °C	– – –

figure 3. **FWD**

Typical reverse recovered energy loss as a function of collector current

$E_{rec} = f(I_c)$



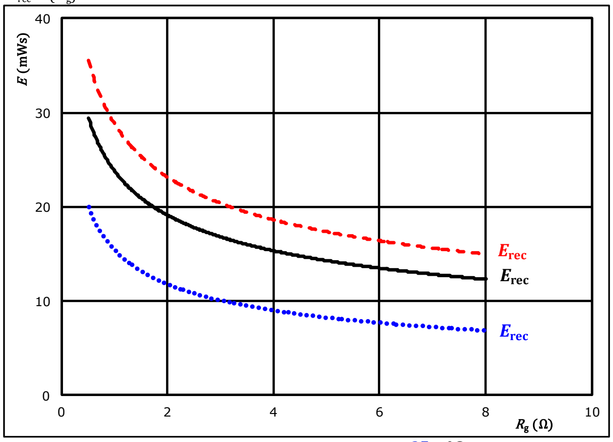
With an inductive load at

V_{CE} =	600	V	T_j:	25 °C	············
V_{GE} =	±15	V		125 °C	——
R_{gon} =	1	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

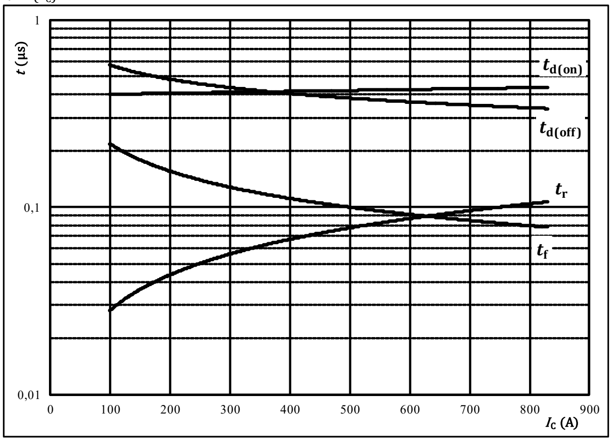
V_{CE} =	600	V	T_j:	25 °C	············
V_{GE} =	±15	V		125 °C	——
I_C =	450	A		150 °C	– – –

Half-Bridge Switch Switching Characteristics

figure 5. IGBT

Typical switching times as a function of collector current

$t = f(I_C)$



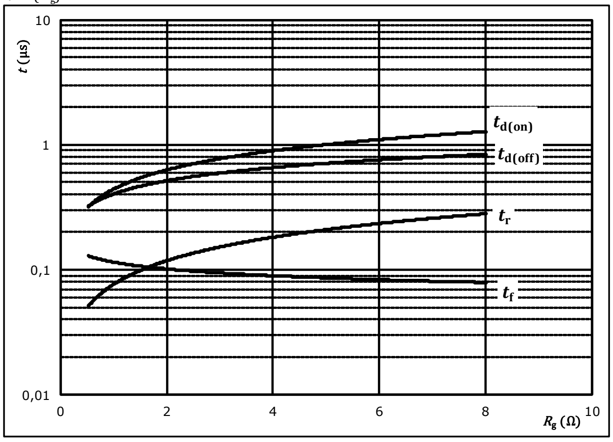
With an inductive load at

T_j =	150	°C
V_{CE} =	600	V
V_{GE} =	±15	V
R_{gon} =	1	Ω
R_{goff} =	1	Ω

figure 6. IGBT

Typical switching times as a function of gate resistor

$t = f(R_g)$



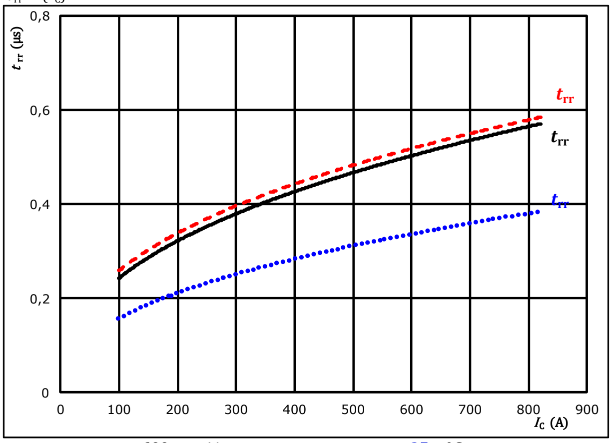
With an inductive load at

T_j =	150	°C
V_{CE} =	600	V
V_{GE} =	±15	V
I_C =	450	A

figure 7. FWD

Typical reverse recovery time as a function of collector current

$t_{rr} = f(I_C)$

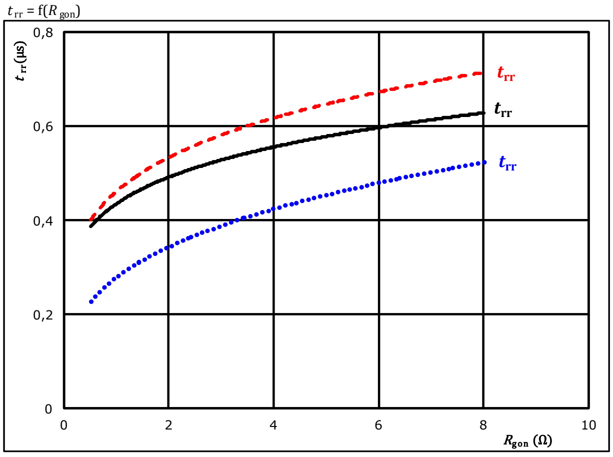


At					
V_{CE} =	600	V		25 °C	··········
V_{GE} =	±15	V	T_j:	125 °C	———
R_{gon} =	1	Ω		150 °C	– – –

figure 8. FWD

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

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



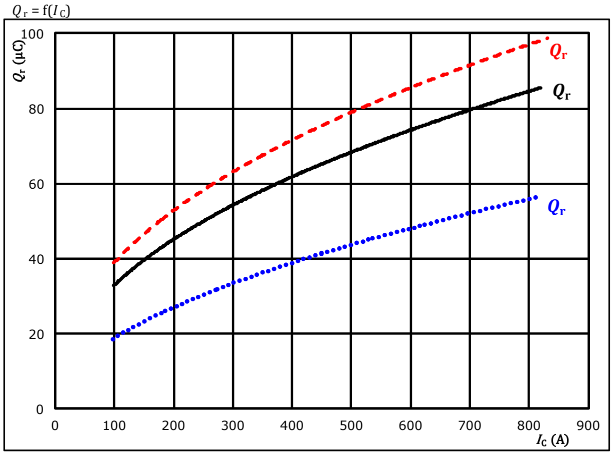
At					
V_{CE} =	600	V		25 °C	··········
V_{GE} =	±15	V	T_j:	125 °C	———
I_C =	450	A		150 °C	– – –

Half-Bridge Switch Switching Characteristics

figure 9. FWD

Typical recovered charge as a function of collector current

$Q_r = f(I_C)$

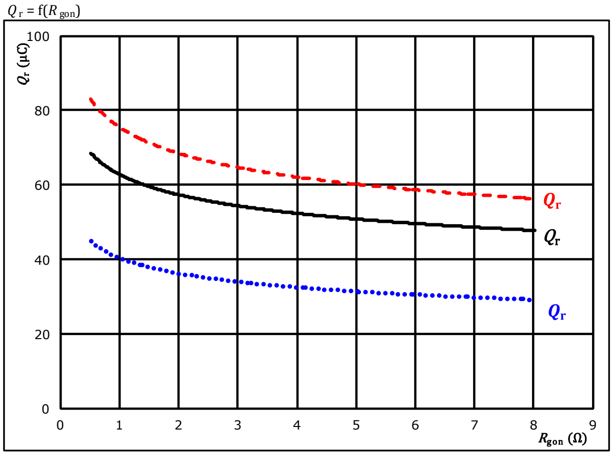


At				
V_{CE} =	600	V	T_j: 25 °C	blue dotted
V_{GE} =	±15	V	125 °C	black solid
R_{gon} =	1	Ω	150 °C	red dashed

figure 10. FWD

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

$Q_r = f(R_{gon})$

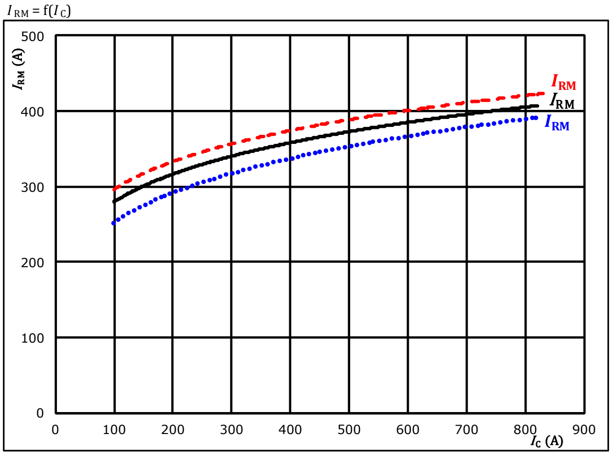


At				
V_{CE}=	600	V	T_j: 25 °C	blue dotted
V_{GE} =	±15	V	125 °C	black solid
I_C=	450	A	150 °C	red dashed

figure 11. FWD

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

$I_{RM} = f(I_C)$

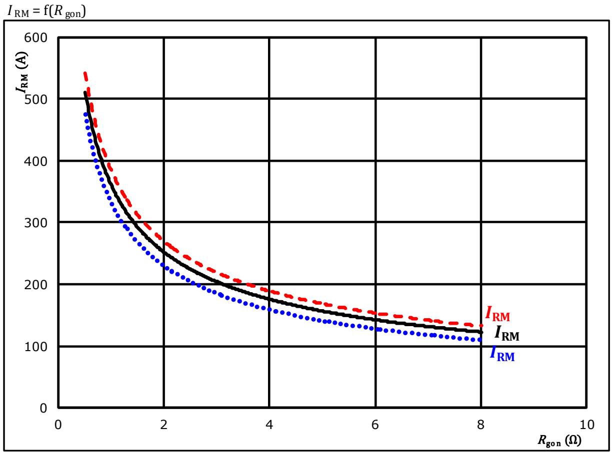


At				
V_{CE}:	600	V	T_j: 25 °C	blue dotted
V_{GE} =	±15	V	125 °C	black solid
R_{gon} =	1	Ω	150 °C	red dashed

figure 12. FWD

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

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



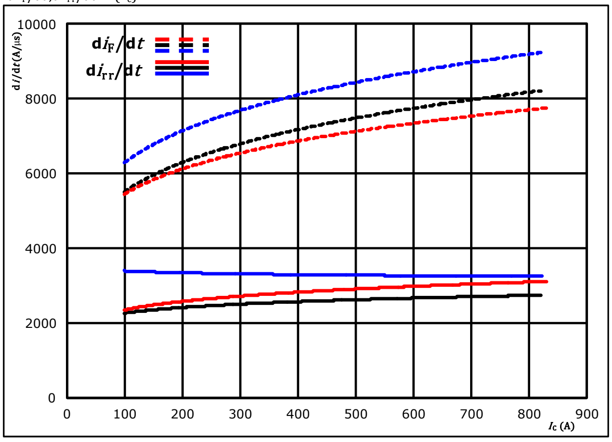
At				
V_{CE} =	600	V	T_j: 25 °C	blue dotted
V_{GE} =	±15	V	125 °C	black solid
I_C =	450	A	150 °C	red dashed

Half-Bridge Switch Switching Characteristics

figure 13. **FWD**

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

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

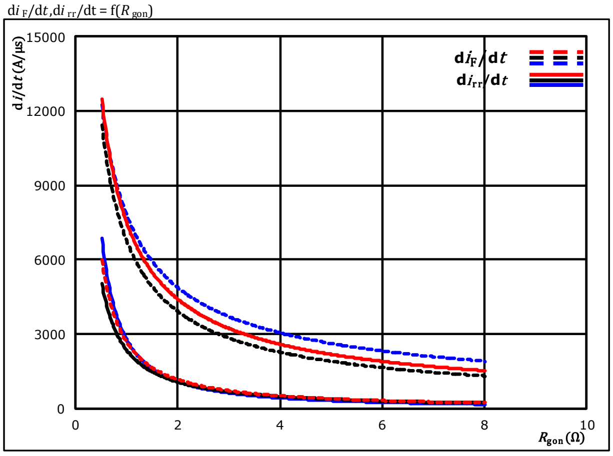


At	V_{CE} =	600	V		25	°C
	V_{GE} =	±15	V	T_j:	125	°C
	R_{gon} =	1	Ω		150	°C

figure 14. **FWD**

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

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

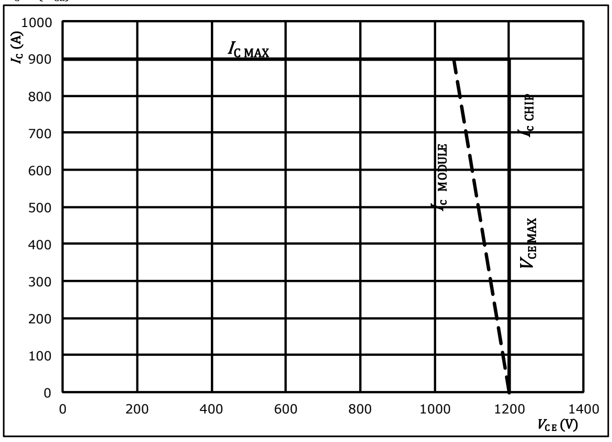


At	V_{CE} =	600	V		25	°C
	V_{GE} =	±15	V	T_j:	125	°C
	I_C=	450	A		150	°C

figure 15. **IGBT**

Reverse bias safe operating area

$I_C = f(V_{CE})$



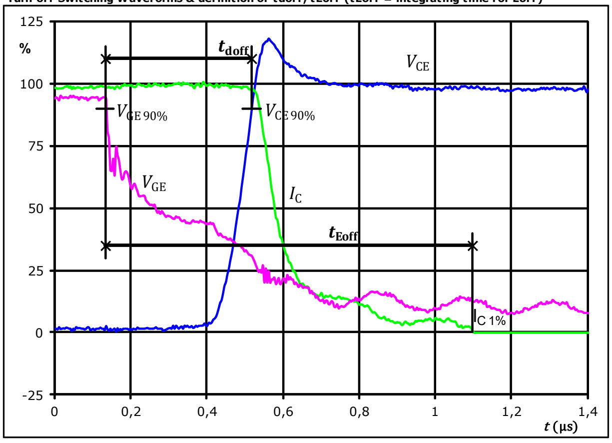
At	T_j =	175	°C
	R_{gon} =	1	Ω
	R_{goff} =	1	Ω

Half-Bridge Switch Switching Definitions

General conditions		
T_j	=	125 °C
R_{gon}	=	1 Ω
R_{goff}	=	1 Ω

figure 1. IGBT

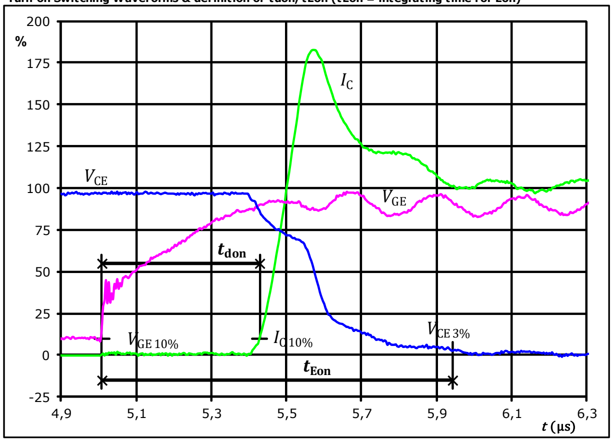
Turn-off Switching Waveforms & definition of tdoff, tEoff (tEoff = integrating time for Eoff)



$V_{GE}(0\%)$ =	-15	V
$V_{GE}(100\%)$ =	15	V
$V_C(100\%)$ =	600	V
$I_C(100\%)$ =	449	A
t_{doff} =	0,379	μs
t_{Eoff} =	0,964	μs

figure 2. IGBT

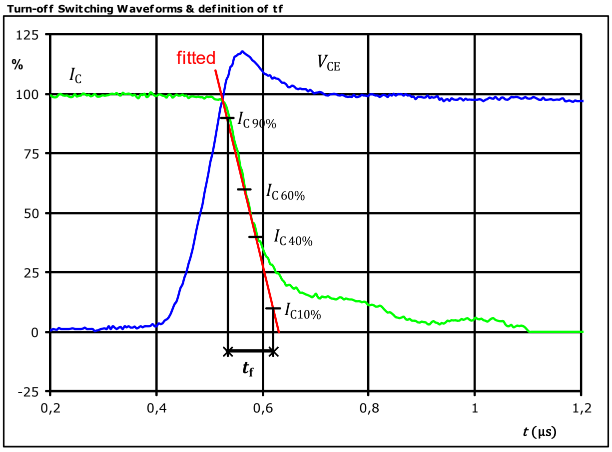
Turn-on Switching Waveforms & definition of tdon, tEon (tEon = integrating time for Eon)



$V_{GE}(0\%)$ =	-15	V
$V_{GE}(100\%)$ =	15	V
$V_C(100\%)$ =	600	V
$I_C(100\%)$ =	449	A
t_{don} =	0,421	μs
t_{Eon} =	0,934	μs

figure 3. IGBT

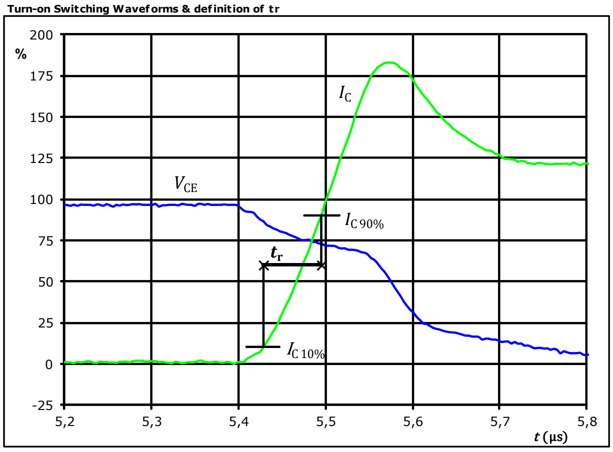
Turn-off Switching Waveforms & definition of tf



$V_C(100\%)$ =	600	V
$I_C(100\%)$ =	449	A
t_f =	0,095	μs

figure 4. IGBT

Turn-on Switching Waveforms & definition of tr

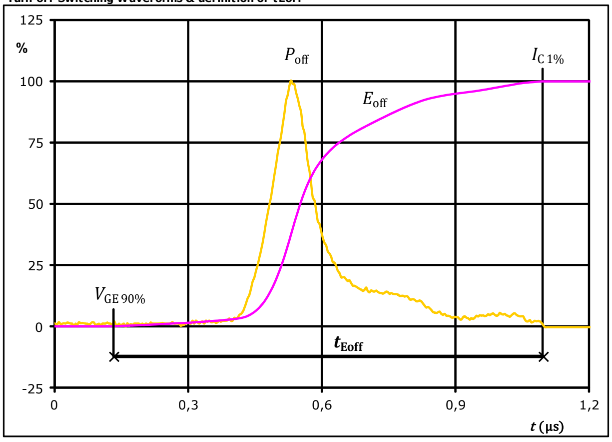


$V_C(100\%)$ =	600	V
$I_C(100\%)$ =	449	A
t_r =	0,067	μs

Half-Bridge Switch Switching Characteristics

figure 5. **IGBT**

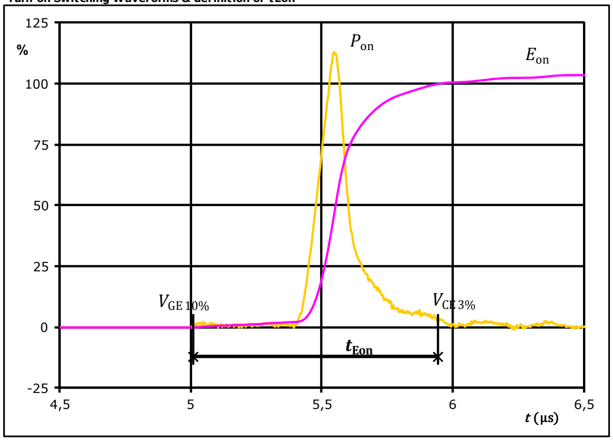
Turn-off Switching Waveforms & definition of tEoff



P_{off} (100%) =	269,36	kW
E_{off} (100%) =	42,45	mJ
t_{Eoff} =	0,96	µs

figure 6. **IGBT**

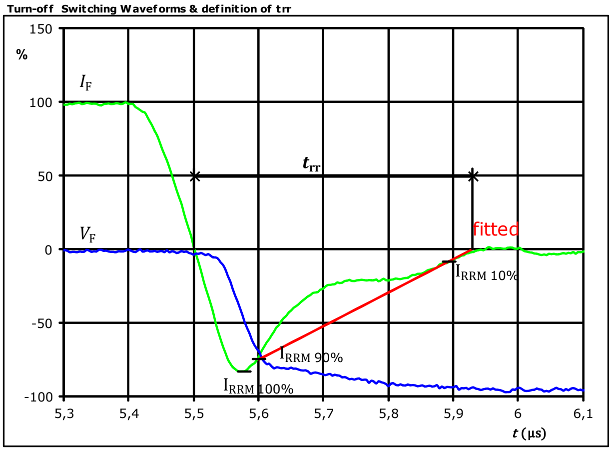
Turn-on Switching Waveforms & definition of tEon



P_{on} (100%) =	269,36	kW
E_{on} (100%) =	46,12	mJ
t_{Eon} =	0,93	µs

figure 7. **FWD**

Turn-off Switching Waveforms & definition of trr

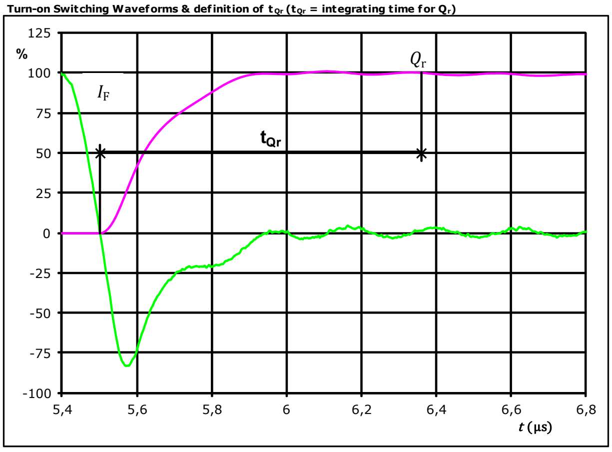


V_F (100%) =	600	V
I_F (100%) =	449	A
I_{RRM} (100%) =	-373	A
t_{rr} =	0,430	µs

Half-Bridge Switch Switching Characteristics

figure 8. **FWD**

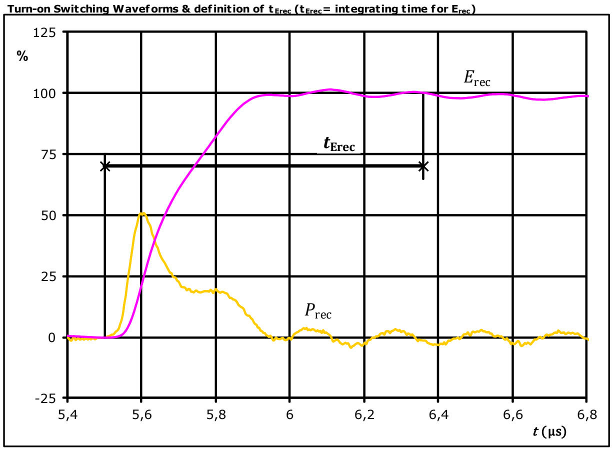
Turn-on Switching Waveforms & definition of t_{Qr} (t_{Qr} = integrating time for Q_r)



I_F (100%) =	449	A
Q_r (100%) =	64,23	µC
t_{Qr} =	0,86	µs

figure 9. **FWD**

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

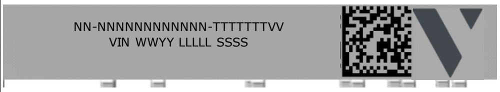


P_{rec} (100%) =	269,36	kW
E_{rec} (100%) =	24,81	mJ
t_{Erec} =	0,86	µs

A0-VS122PA450M7-L758F70
A0-VP122PA450M7-L758F70T
datasheet

Ordering Code & Marking

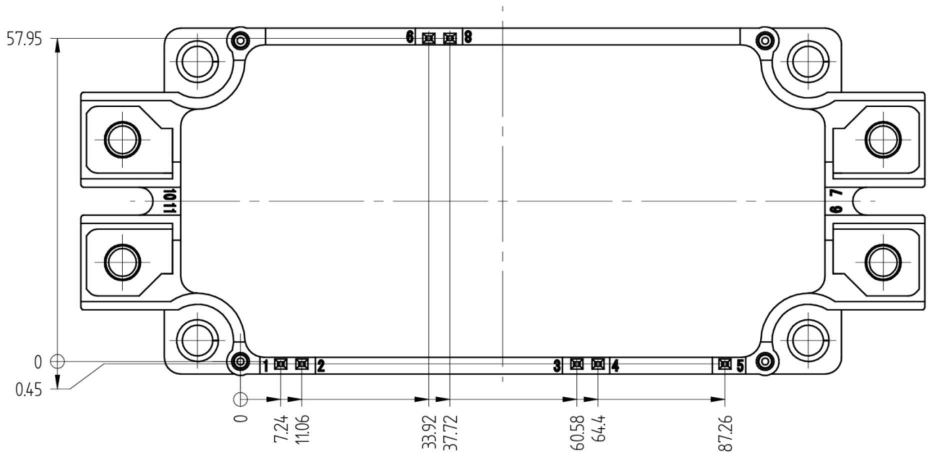
Version	Ordering Code
without thermal paste 17 mm housing with solder pins	A0-VS122PA450M7-L758F70
with thermal paste 17 mm housing with solder pins	A0-VS122PA450M7-L758F70-/3/
without thermal paste 17 mm housing with press-fit pins	A0-VP122PA450M7-L758F70T
with thermal paste 17 mm housing with press-fit pins	A0-VP122PA450M7-L758F70T-/3/



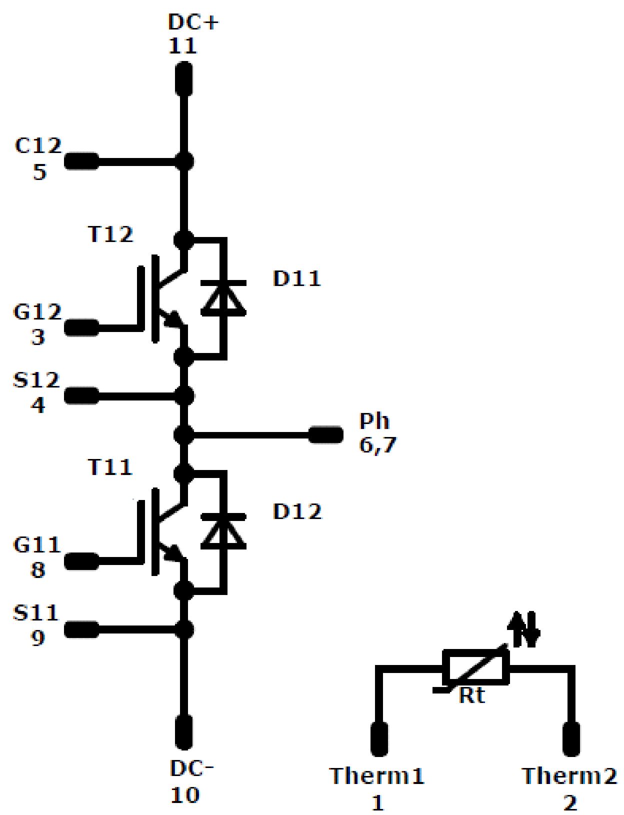
Text	Name		Date code	VIN	Lot	Serial
	NN-NNNNNNNNNNNN-TTTTTTTVV		WWYY	VIN	LLLLL	SSSS
Datamatrix	Type&Ver	Lot number	Serial	Date code		
	TTTTTTTVV	LLLLL	SSSS	WWYY		

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+



Pinout



Identification

ID	Component	Voltage	Current	Function	Comment
T11,T12	IGBT	1200 V	450 A	Half-Bridge Switch	
D11,D12	FWD	1200 V	450 A	Half-Bridge Diode	
Rt	NTC			Thermistor	

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

Handling instruction
Handling instructions for VINco E3 packages see vincotech.com website.

Package data
Package data for VINco E3 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
A0-Vx122PA450M7-L758F70x-D4-14	26 Sep. 2019	Change of Zth curves Short circuit ratings added	1, 5 1, 6