A0-VS122PA300M7-L757F70
A0-VP122PA300M7-L757F70T
datasheet

Vincotech

VINcoDUAL E3 | **1200 V / 300 A**

Features

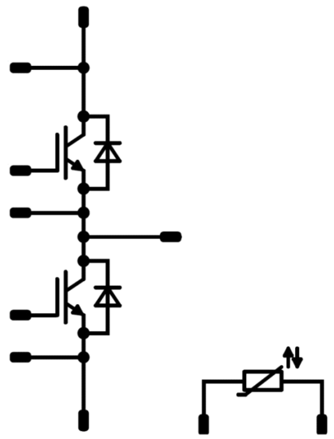
- IGBT M7 technology with low V_{CEsat} and improved EMC behavior
- New SoLid Cover Technology for higher reliability
- Industry standard housing
- Press-fit pin and pre-applied phase-change
- Thermal Interface Material available

VINco E3 housing

Target applications

- Industrial Drives
- Power Supply
- UPS

Schematic



Types

- A0-VS122PA300M7-L757F70
- A0-VP122PA300M7-L757F70T

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	315	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}	600	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ T_s = 80 °C	656	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	259	A
Repetitive peak forward current	I_{FRM}			600	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	473	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	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

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	$V_{GE(th)}$	$V_{GE} = V_{CE}$			0,03	25	5,4	6	6,6	V
Collector-emitter saturation voltage	V_{CEsat}		15		300	25 125 150		1,61 1,82 1,91	2,05	V
Collector-emitter cut-off current	I_{CES}		0	1200		25			510	µA
Gate-emitter leakage current	I_{GES}		20	0		25			1500	nA
Internal gate resistance	r_g							none		Ω
Input capacitance	C_{ies}							63000		
Output capacitance	C_{oes}		0	10		25		2100		pF
Reverse transfer capacitance	C_{res}							840		
Gate charge	Q_g		±15	600	300	25		3800		nC
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	phase-change material λ = 3,4 W/mK						0,14		K/W
Dynamic										
Turn-on delay time	$t_{d(on)}$	R_{goff} = 1 Ω R_{gon} = 1 Ω	±15	600	307	25 125 150		223 226 227		ns
Rise time	t_r					25 125 150		17 19 21		
Turn-off delay time	$t_{d(off)}$					25 125 150		254 281 290		
Fall time	t_f					25 125 150		76 103 114		
Turn-on energy (per pulse)	E_{on}	Q_{rFWD} = 34,4 µC Q_{rFWD} = 48,8 µC Q_{rFWD} = 54 µC				25 125 150		6,809 9,370 10,446		mWs
Turn-off energy (per pulse)	E_{off}					25 125 150		19,625 27,523 29,844		

*Including paralel device's leakage current

Characteristic Values

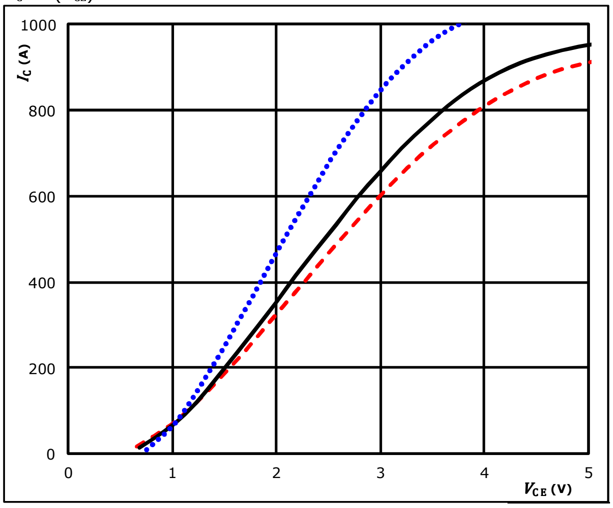
Parameter	Symbol	Conditions					Value			Unit
			V_{GE} [V] V_{GS} [V]	V_{CE} [V] V_{DS} [V] V_{F} [V]	I_{C} [A] I_{D} [A] I_{F} [A]	T_j [°C]	Min	Typ	Max	
Half-Bridge Diode										
Static										
Forward voltage	V_F				300	25 125 150		1,82 1,96 1,97	2,15	V
Reverse leakage current	I_R			1200		25			180	µA
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	phase-change material λ = 3,4 W/mK						0,20		K/W
Dynamic										
Peak recovery current	I_{RRM}					25 125 150		479 506 515		A
Reverse recovery time	t_{rr}					25 125 150		185 334 369		ns
Recovered charge	Q_r	di/dt = 20088 A/µs di/dt = 16728 A/µs di/dt = 16130 A/µs	±15	600	307	25 125 150		34,386 48,784 53,965		µC
Reverse recovered energy	E_{rec}					25 125 150		16,885 24,500 27,559		mWs
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 125 150		10178 9155 8498		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

$I_C = f(V_{CE})$

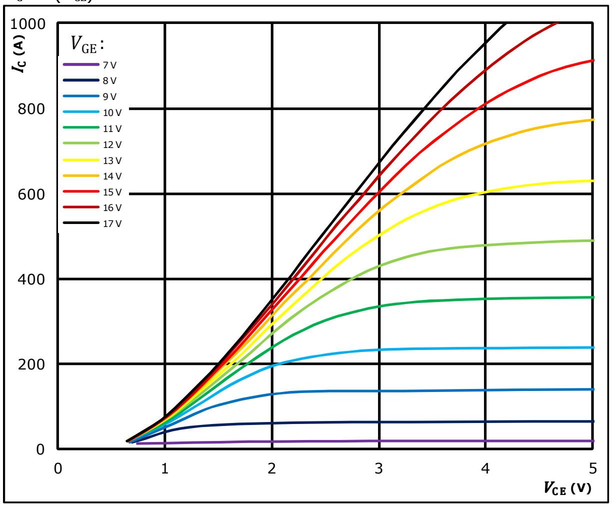


t_p =	250	μs		25 °C	dotted blue
V_{GE} =	15	V	T_j:	125 °C	solid black
				150 °C	dashed red

figure 2. IGBT

Typical output characteristics

$I_C = f(V_{CE})$

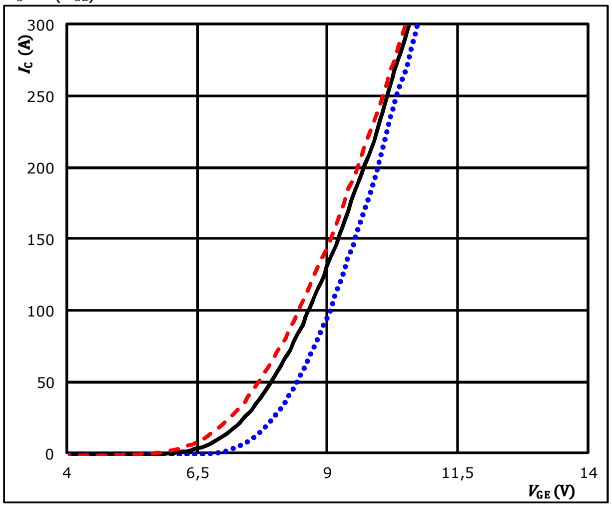


t_p = 250 μs
T_j = 150 °C
V_{GE} from 7 V to 17 V in steps of 1 V

figure 3. IGBT

Typical transfer characteristics

$I_C = f(V_{GE})$

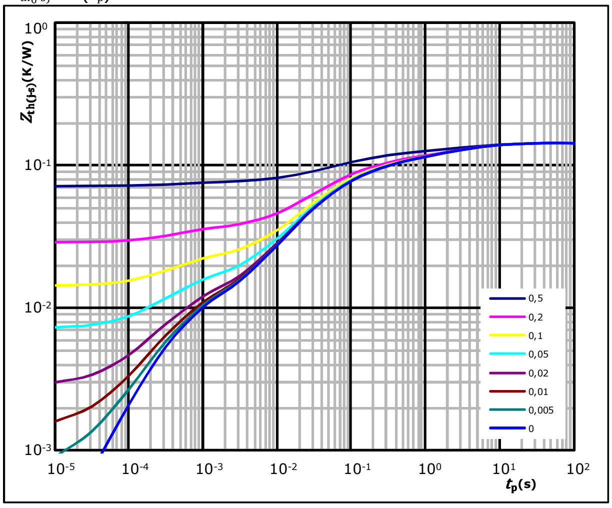


t_p =	100	μs		25 °C	dotted blue
V_{CE} =	10	V	T_j:	125 °C	solid black
				150 °C	dashed red

figure 4. IGBT

Transient thermal impedance as function of pulse duration

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



D = t_p / T
$R_{th(j-s)}$ = 0,14 K/W

IGBT thermal model values

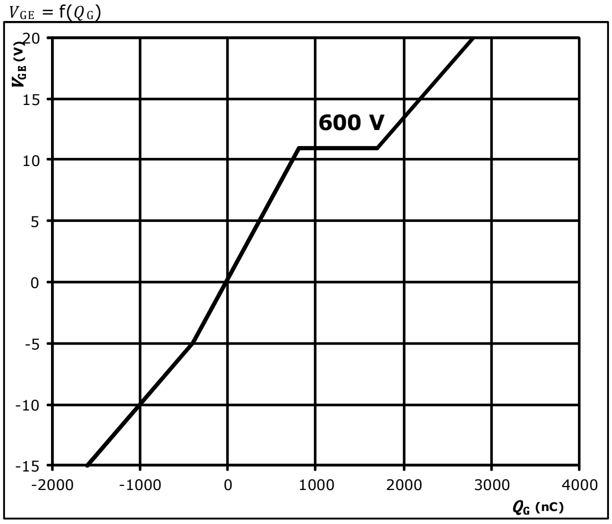
R (K/W)	τ (s)
2,06E-02	6,07E+00
2,32E-02	1,29E+00
3,01E-02	2,03E-01
4,46E-02	4,88E-02
1,79E-02	1,30E-02
8,61E-03	4,01E-04

Half-Bridge Switch Characteristics

figure 5. **IGBT**

Gate voltage vs gate charge

V_{GE} = f(Q_G)

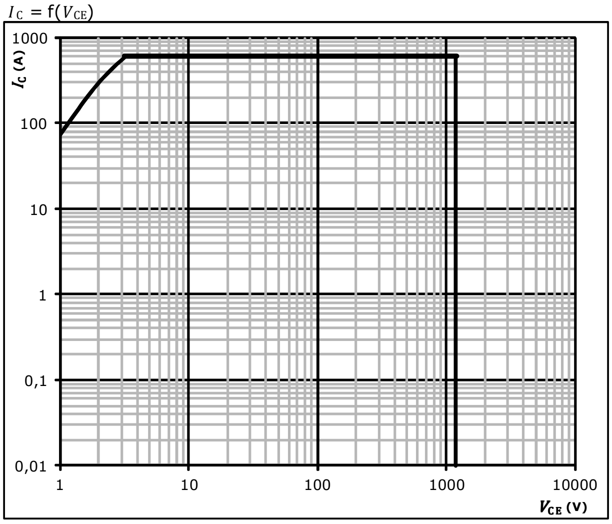


I_C=	300	A
V_{GE} =	±15	V
V_{CC} =	600	V

figure 6. **IGBT**

Safe operating area

I_C = f(V_{CE})



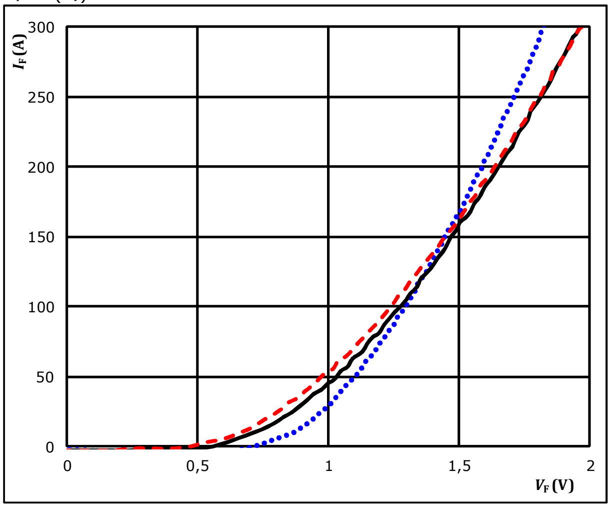
D =	single pulse	
T_s =	80	ºC
V_{GE} =	±15	V
T_j =	T_{jmax}	

Half-Bridge Diode Characteristics

figure 1. **FWD**

Typical forward characteristics

$I_F = f(V_F)$



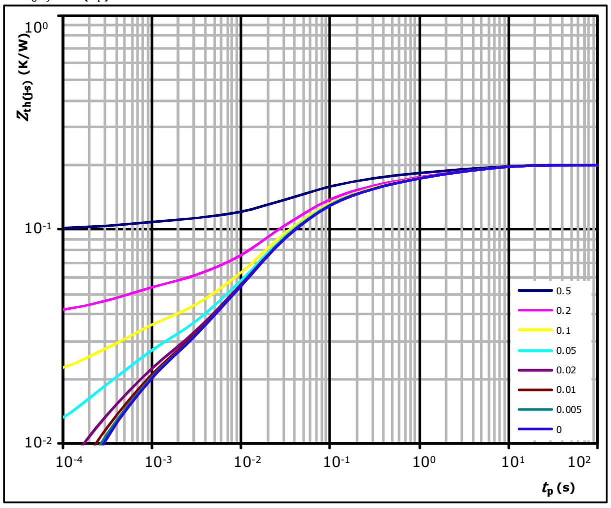
t_p = 250 µs

T_j: 25 °C, 125 °C, 150 °C

figure 2. **FWD**

Transient thermal impedance as a function of pulse width

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



$D = t_p / T$

$R_{th(j-s)}$ = 0,20 K/W

FWD thermal model values

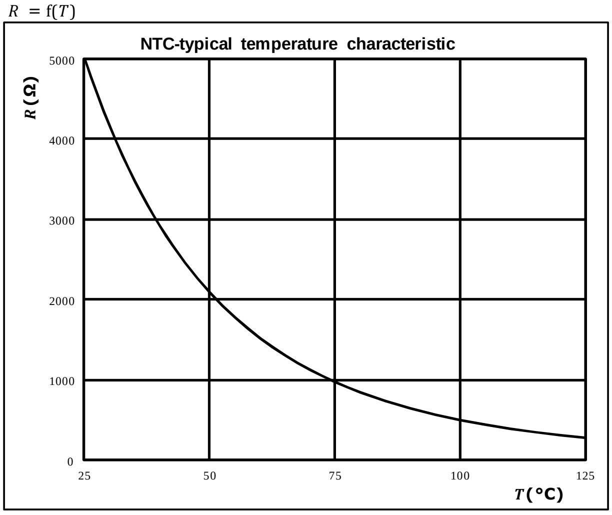
R (K/W)	τ (s)
2,04E-02	5,59E+00
2,34E-02	1,13E+00
3,69E-02	2,01E-01
6,34E-02	4,50E-02
3,60E-02	1,31E-02
7,69E-03	1,56E-03
1,29E-02	3,42E-04

Thermistor Characteristics

figure 1. **Thermistor**

Typical NTC characteristic
as a function of temperature

$R = f(T)$

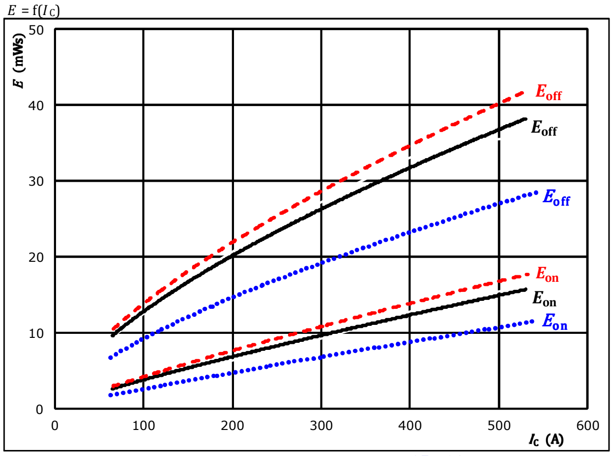


Half-Bridge Switching Characteristics

figure 1. **IGBT**

Typical switching energy losses as a function of collector current

$E = f(I_C)$



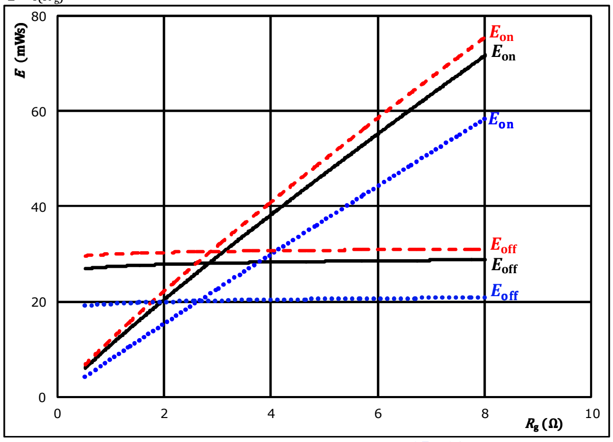
With an inductive load at

V_{CE} =	600	V	T_j:	25 °C	············
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

$E = f(R_g)$



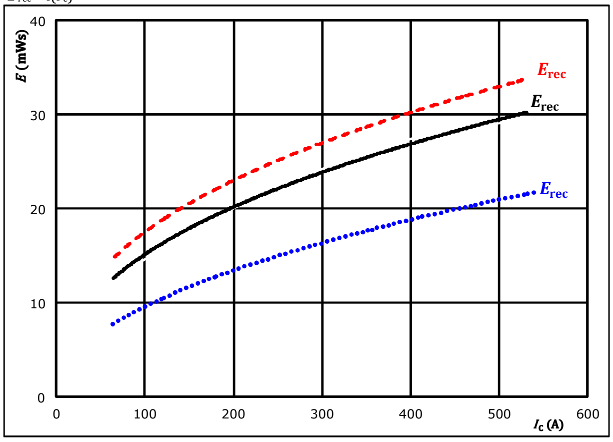
With an inductive load at

V_{CE} =	600	V	T_j:	25 °C	············
V_{GE} =	±15	V		125 °C	———
I_C =	307	A		150 °C	– – –

figure 3. **FWD**

Typical reverse recovered energy loss as a function of collector current

$E_{rec} = f(I_C)$



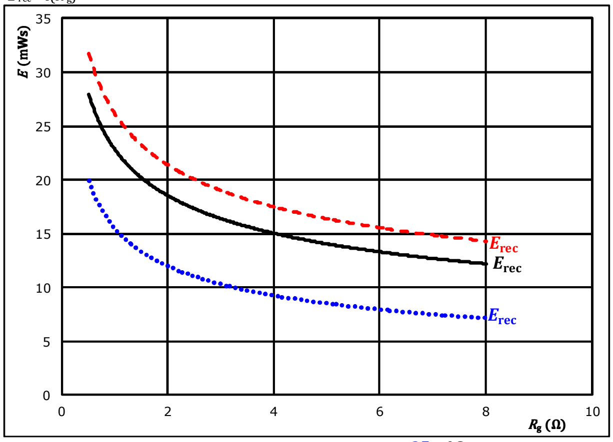
With an inductive load at

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

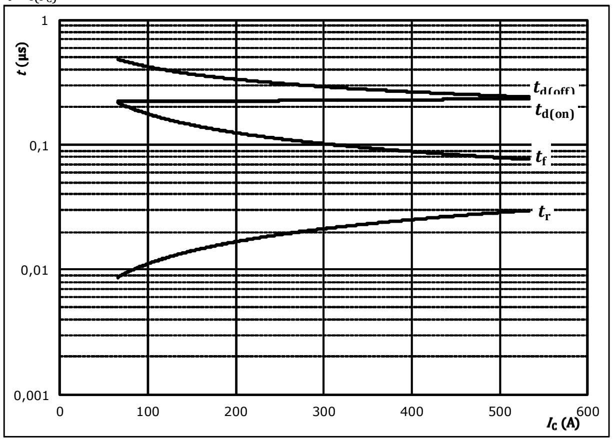
V_{CE} =	600	V	T_j:	25 °C	············
V_{GE} =	±15	V		125 °C	———
I_C =	307	A		150 °C	– – –

Half-Bridge Switching Characteristics

figure 5. **IGBT**

Typical switching times as a function of collector current

$t = f(I_C)$



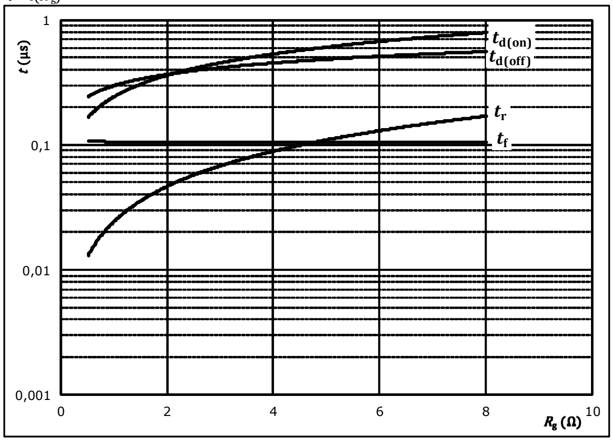
With an inductive load at

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

figure 6. **IGBT**

Typical switching times as a function of gate resistor

$t = f(R_g)$



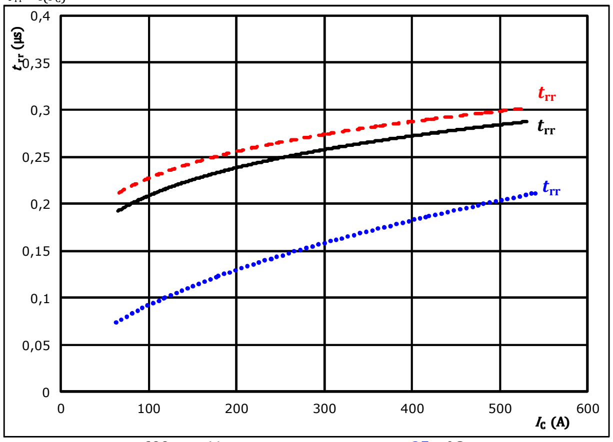
With an inductive load at

T_j =	150	°C
V_{CE} =	600	V
V_{GE} =	±15	V
I_C =	307	A

figure 7. **FWD**

Typical reverse recovery time as a function of collector current

$t_{rr} = f(I_C)$

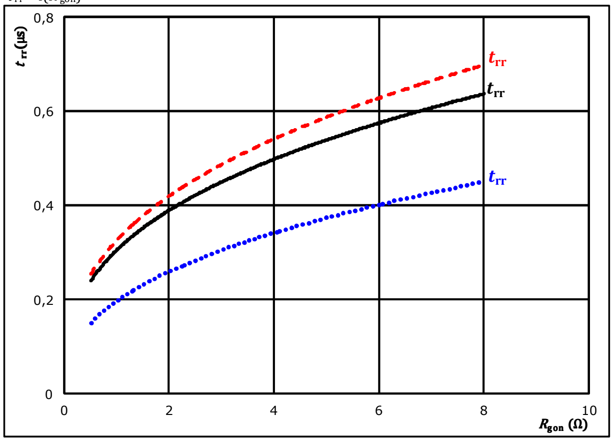


At					
V_{CE} =	600	V		25	°C
V_{GE} =	±15	V	T_j:	125	°C
R_{gon} =	1	Ω		150	°C

figure 8. **FWD**

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

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



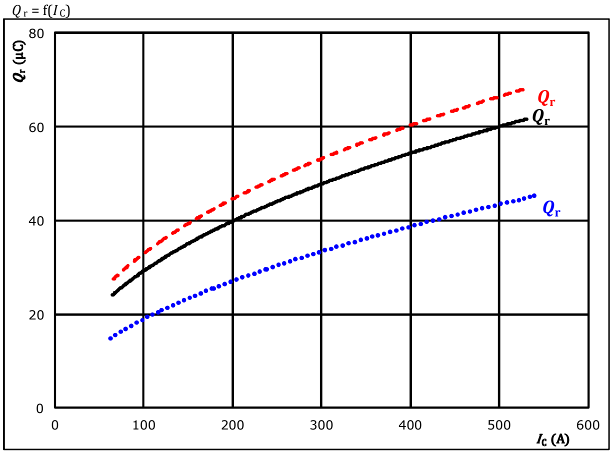
At					
V_{CE} =	600	V		25	°C
V_{GE} =	±15	V	T_j:	125	°C
I_C =	307	A		150	°C

Half-Bridge Switching Characteristics

figure 9. FWD

Typical recovered charge as a function of collector current

$Q_r = f(I_C)$

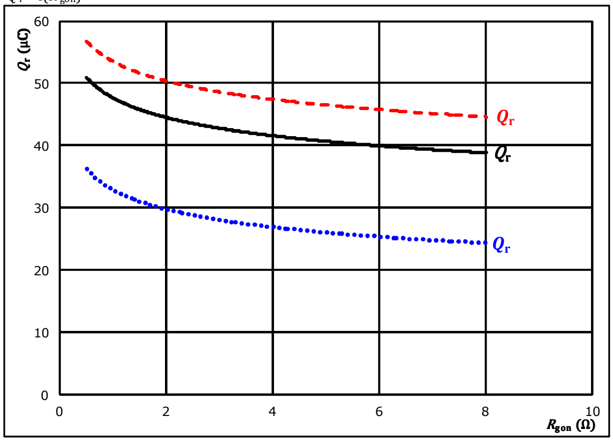


At					
V_{CE} =	600	V	T_j:	25 °C	dotted
V_{GE} =	±15	V		125 °C	solid
R_{gon} =	1	Ω		150 °C	dashed

figure 10. FWD

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

$Q_r = f(R_{gon})$

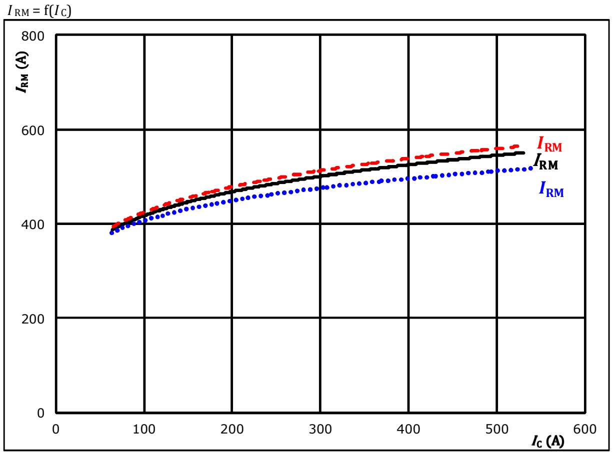


At					
V_{CE}=	600	V	T_j:	25 °C	dotted
V_{GE} =	±15	V		125 °C	solid
I_C=	307	A		150 °C	dashed

figure 11. FWD

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

$I_{RM} = f(I_C)$

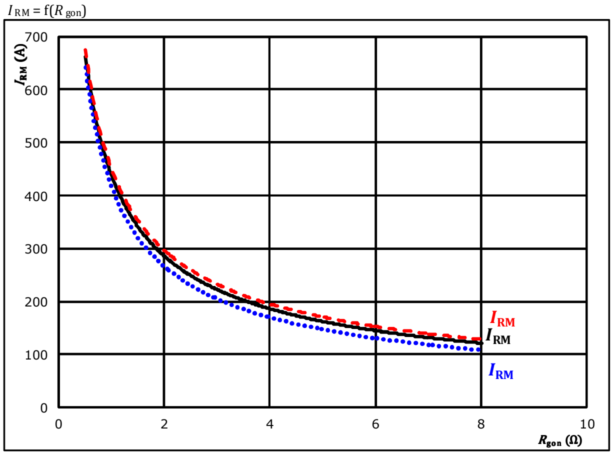


At					
V_{CE}:	600	V	T_j:	25 °C	dotted
V_{GE} =	±15	V		125 °C	solid
R_{gon} =	1	Ω		150 °C	dashed

figure 12. FWD

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

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



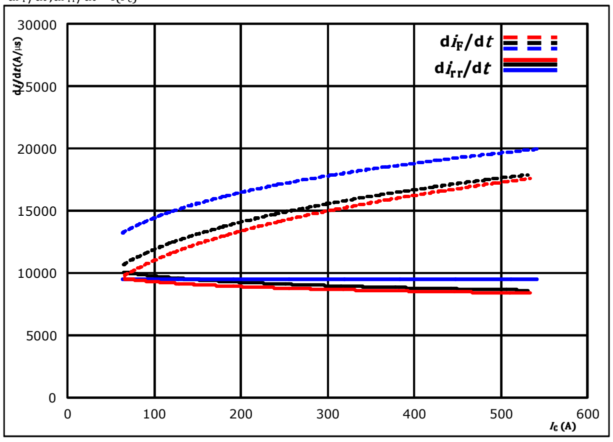
At					
V_{CE} =	600	V	T_j:	25 °C	dotted
V_{GE} =	±15	V		125 °C	solid
I_C =	307	A		150 °C	dashed

Half-Bridge Switching Characteristics

figure 13. **FWD**

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

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

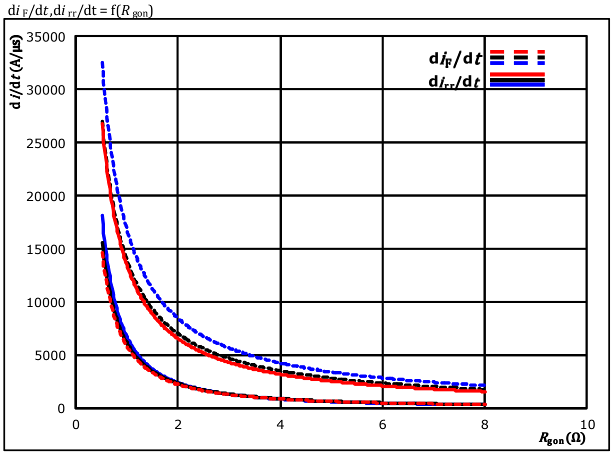


At						
V_{CE} =	600	V		25	°C	•••••••••••
V_{GE} =	±15	V	T_j:	125	°C	———
R_{gon} =	1	Ω		150	°C	– – –

figure 14. **FWD**

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

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

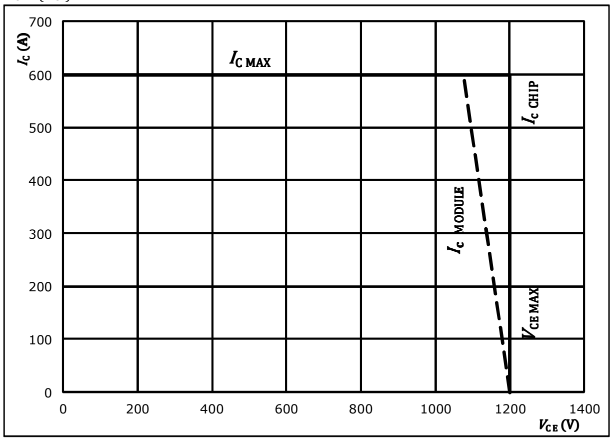


At						
V_{CE} =	600	V		25	°C	•••••••••••
V_{GE} =	±15	V	T_j:	125	°C	———
I_C=	307	A		150	°C	– – –

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

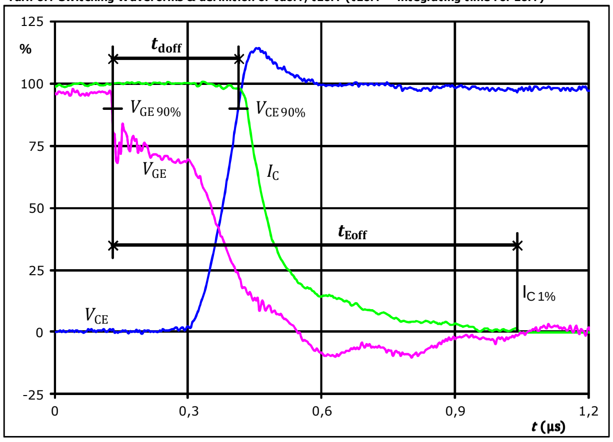
Half-Bridge Switching Definitions

General conditions

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

figure 1. **IGBT**

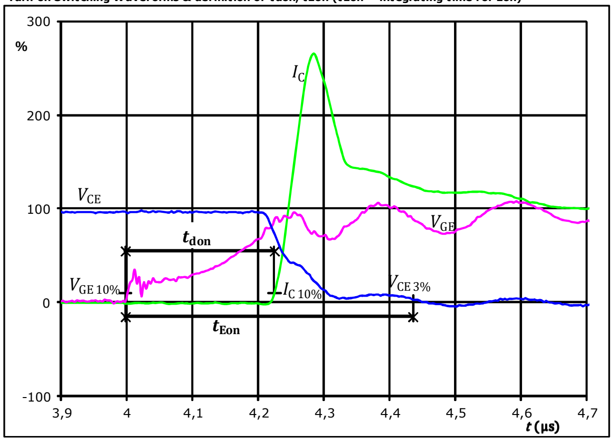
Turn-off Switching Waveforms & definition of tdoff, tEoff (tEoff = integrating time for Eoff)



$V_{GE}(0\%)$ =	-15	V
$V_{GE}(100\%)$ =	15	V
$V_C(100\%)$ =	600	V
$I_C(100\%)$ =	305	A
t_{doff} =	0,281	µs
t_{Eoff} =	0,910	µs

figure 2. **IGBT**

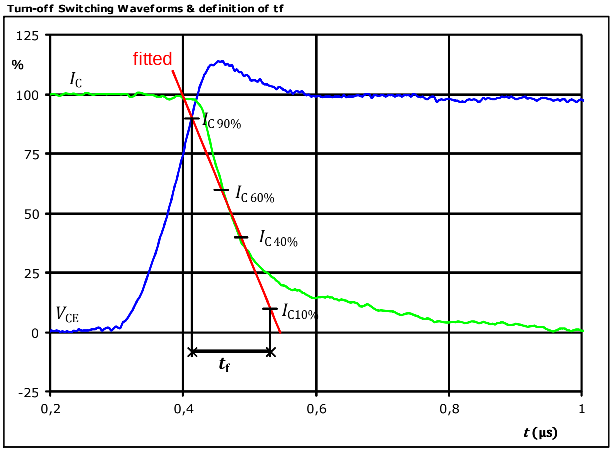
Turn-on Switching Waveforms & definition of tdon, tEon (tEon = integrating time for Eon)



$V_{GE}(0\%)$ =	-15	V
$V_{GE}(100\%)$ =	15	V
$V_C(100\%)$ =	600	V
$I_C(100\%)$ =	305	A
t_{don} =	0,226	µs
t_{Eon} =	0,437	µs

figure 3. **IGBT**

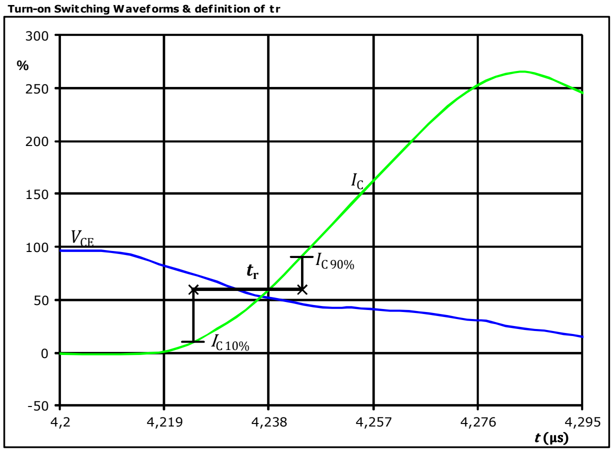
Turn-off Switching Waveforms & definition of tf



$V_C(100\%)$ =	600	V
$I_C(100\%)$ =	305	A
t_f =	0,103	µs

figure 4. **IGBT**

Turn-on Switching Waveforms & definition of tr

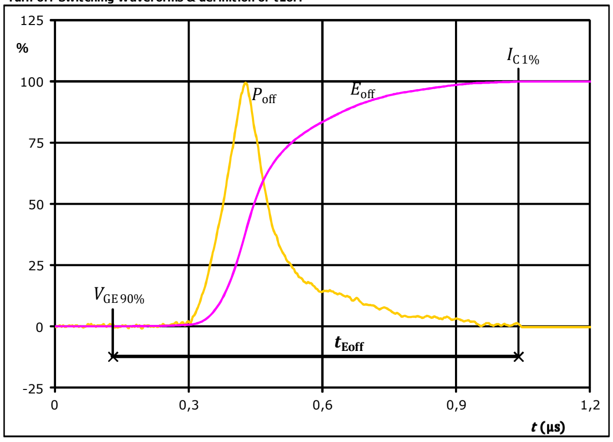


$V_C(100\%)$ =	600	V
$I_C(100\%)$ =	305	A
t_r =	0,019	µs

Half-Bridge Switching Characteristics

figure 5. IGBT

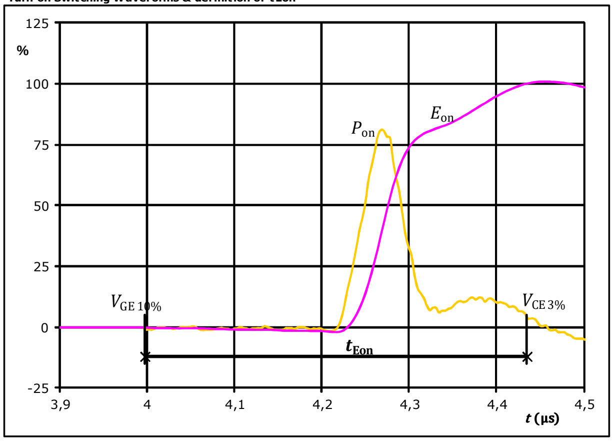
Turn-off Switching Waveforms & definition of tEoff



P_{off} (100%) =	183,29	kW
E_{off} (100%) =	27,52	mJ
t_{Eoff} =	0,91	µs

figure 6. IGBT

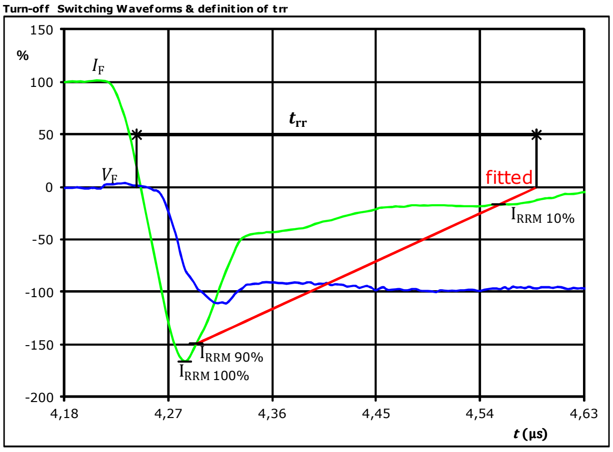
Turn-on Switching Waveforms & definition of tEon



P_{on} (100%) =	183,29	kW
E_{on} (100%) =	9,37	mJ
t_{Eon} =	0,44	µs

figure 7. FWD

Turn-off Switching Waveforms & definition of trr

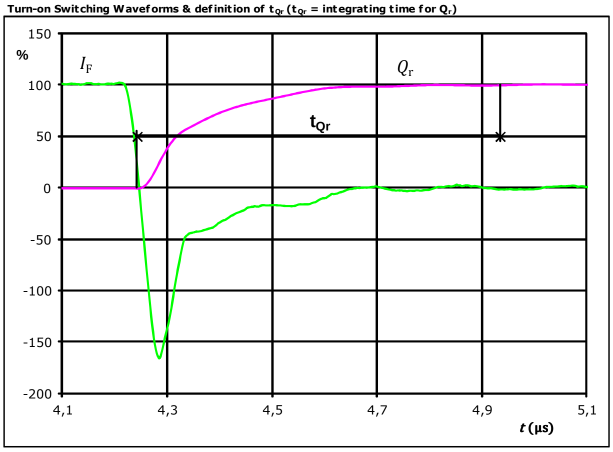


V_F (100%) =	600	V
I_F (100%) =	305	A
I_{RRM} (100%) =	-506	A
t_{rr} =	0,334	µs

Half-Bridge Switching Characteristics

figure 8. **FWD**

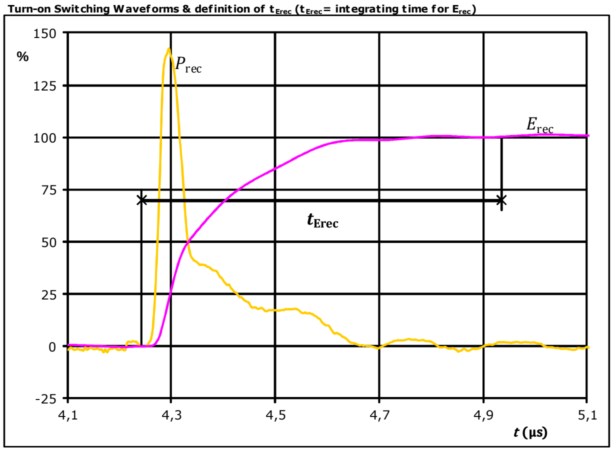
Turn-on Switching Waveforms & definition of t_{Qr} (t_{Qr} = integrating time for Q_r)



I_F (100%) =	305	A
Q_r (100%) =	48,78	µC
t_{Qr} =	0,69	µs

figure 9. **FWD**

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



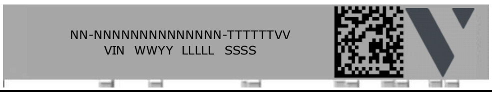
P_{rec} (100%) =	183,29	kW
E_{rec} (100%) =	24,50	mJ
t_{Erec} =	0,69	µs

A0-VS122PA300M7-L757F70
A0-VP122PA300M7-L757F70T
datasheet

Vincotech

Ordering Code & Marking

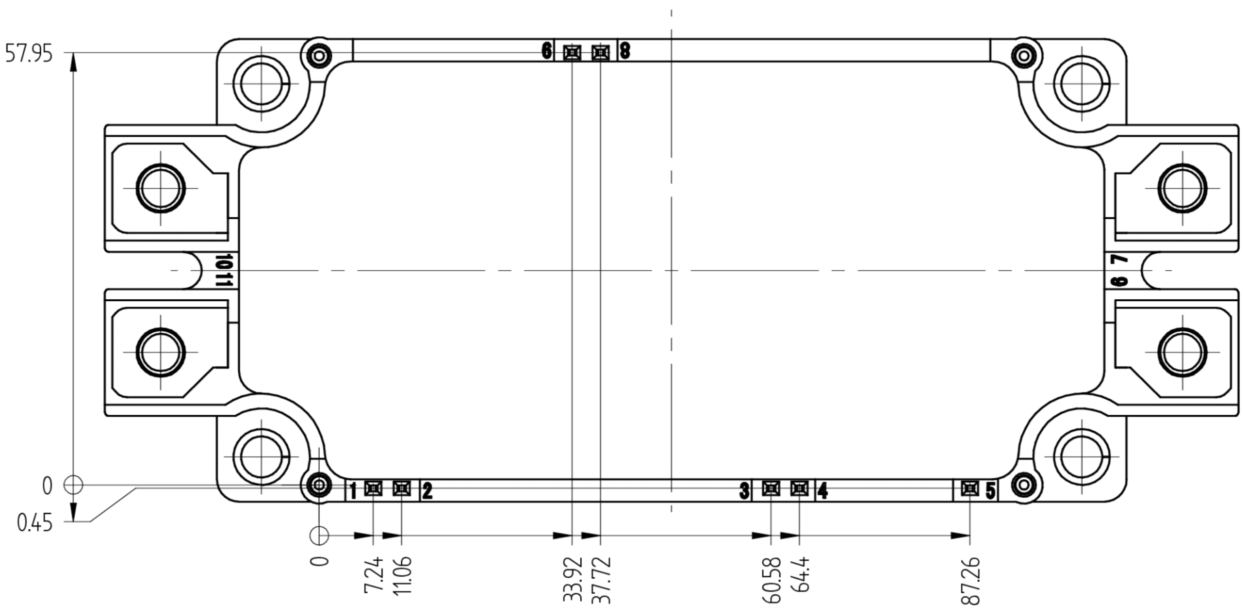
Version	Ordering Code
without thermal paste 17 mm housing with solder pins	A0-VS122PA300M7-L757F70
with thermal paste 17 mm housing with solder pins	A0-VS122PA300M7-L757F70-/3/
without thermal paste 17 mm housing with Press-fit	A0-VP122PA300M7-L757F70T
with thermal paste 17 mm housing with Press-fit pins	A0-VP122PA300M7-L757F70T-/3/



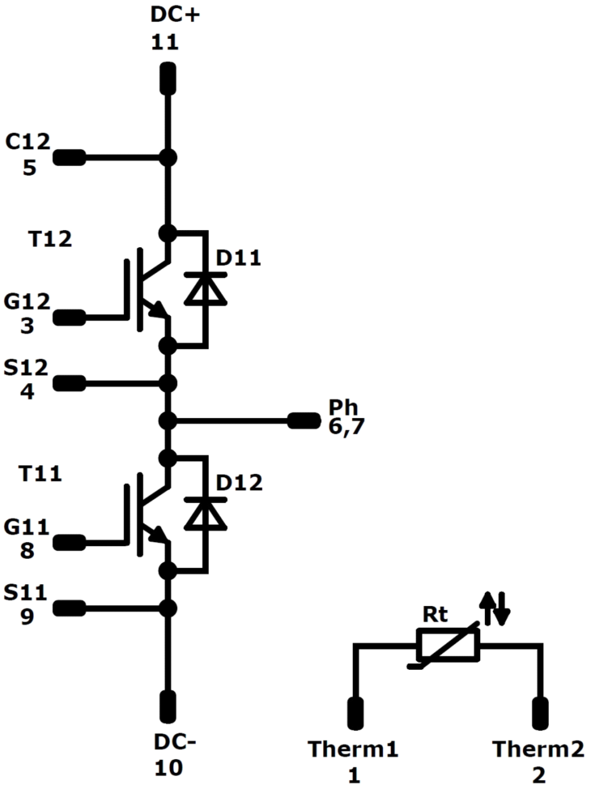
Text	Name	Date code	UL & VIN	Lot	Serial
	NN-NNNNNNNNNNNNNN-TTTTTTVV	WWYY	UL VIN	LLLLL	SSSS
Datamatrix	Type&Ver	Lot number	Serial	Date code	
	TTTTTTTVV	LLLLL	SSSS	WWYY	

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+



Pinout



Identification

ID	Component	Voltage	Current	Function	Comment
T11 , T12	IGBT	1200 V	300 A	Half-Bridge Switch	
D11 , D12	FWD	1200 V	300 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-VS122PA300M7-L757F70-D2-14	27 Oct. 2017	Correct package data and marking; set R_{gon}/R_{goff} to 1 Ohm, adjust collector emitter cut-off current	All