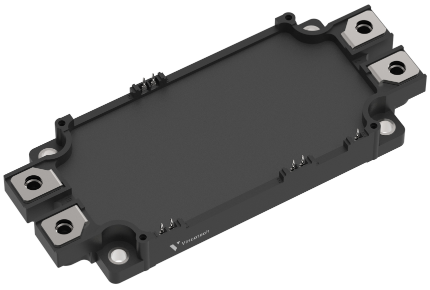
A0-VP122PA450M7-L758F70T
datasheet

VINcoDUAL E3 — 1200 V / 450 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

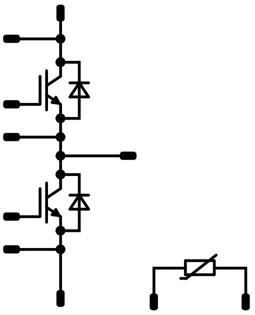
VINco E3s 17 mm housing



Target applications

- Industrial Drives
- Power Supply
- UPS

Schematic



Types

- A0-VP122PA450M7-L758F70T

Maximum Ratings

T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Conditions		Value	Unit
Half-Bridge Switch					
Collector-emitter voltage	V_{CES}			1200	V
Collector current (DC current)	I_C	$T_j = T_{jmax}$	T_s = 80 °C	422	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	792	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
Half-Bridge Diode					
Peak repetitive reverse voltage	V_{RRM}			1200	V
Forward current (DC current)	I_F	$T_j = T_{jmax}$	T_s = 80 °C	346	A
Repetitive peak forward current	I_{FRM}	t_p limited by T_{jmax}		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					
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
Isolation voltage	V_{isol}	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					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	
Half-Bridge Switch										
Static										
Gate-emitter threshold voltage	$V_{GE(th)}$			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 1,86	1,85(1)	V
Collector-emitter cut-off current	I_{CES}		0	1200		25			300	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		pF
Reverse transfer capacitance	C_{res}							960		pF
Gate charge	Q_g	V_{CC} = 600 V	15		450	25		3000		nC
Thermal										
Thermal resistance junction to sink (2)	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						0,12		K/W
Dynamic										
Turn-on delay time	$t_{d(on)}$	R_{gon} = 1 Ω R_{goff} = 1 Ω	±15	600	450	25 125 150		408 421 418		ns
Rise time	t_r					25 125 150		57 67 73		ns
Turn-off delay time	$t_{d(off)}$					25 125 150		342 379 389		ns
Fall time	t_f					25 125 150		66,09 94,9 122,54		ns
Turn-on energy (per pulse)	E_{on}	Q_{rFWD}=40,86 µC Q_{rFWD}=64,23 µC Q_{rFWD}=80,75 µC				25 125 150		32,95 46,12 57,96		mWs
Turn-off energy (per pulse)	E_{off}					25 125 150		31,59 42,45 55,6		mWs

Characteristic Values

Parameter	Symbol	Conditions	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	Unit
Half-Bridge Diode										
Static										
Forward voltage	V_F				450	25 125 150		1,67 1,89 1,9	2,1(1)	V
Reverse leakage current	I_R	V_r = 1200 V				25			120	µA
Thermal										
Thermal resistance junction to sink (2)	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						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		347,35 372,81 412,54		A
Reverse recovery time	t_{rr}					25 125 150		263,47 430,04 433,06		ns
Recovered charge	Q_r					25 125 150		40,86 64,23 80,75		µC
Reverse recovered energy	E_{rec}					25 125 150		15,88 24,81 31,62		mWs
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 125 150		3020 2564 3852		A/µs

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	
Thermistor										
Static										
Rated resistance	R					25		5		kΩ
Deviation of R_{100}	$\Delta_{R/R}$	R_{100} = 493 Ω				100	-5		5	%
Power dissipation	P							245		mW
Power dissipation constant	d					25		1,4		mW/K
B-value	$B_{(25/50)}$	Tol. ±2 %						3375		K
B-value	$B_{(25/100)}$	Tol. ±2 %						3437		K
Vincotech Thermistor Reference									K	

(1) Value at chip level

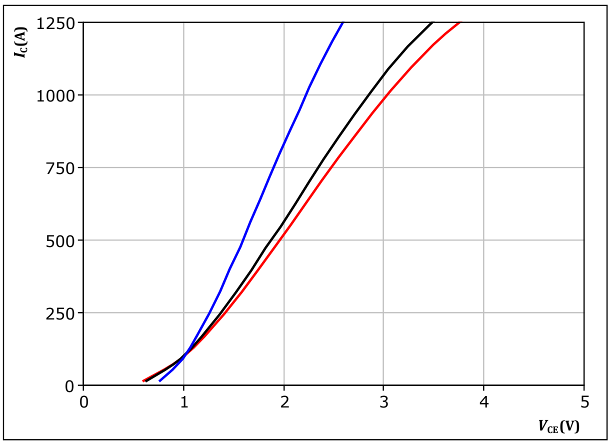
(2) Only valid with pre-applied Vincotech thermal interface material.

Half-Bridge Switch Characteristics

figure 1. IGBT

Typical output characteristics

$I_C = f(V_{CE})$



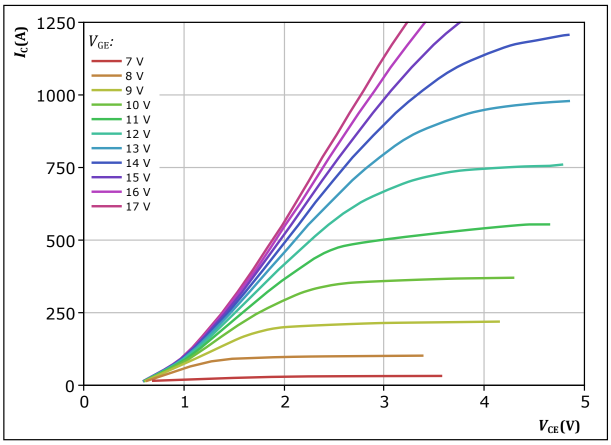
t_p =	250	µs
V_{GE} =	15	V

T_j: 25 °C, 125 °C, 150 °C

figure 2. IGBT

Typical output characteristics

$I_C = f(V_{CE})$



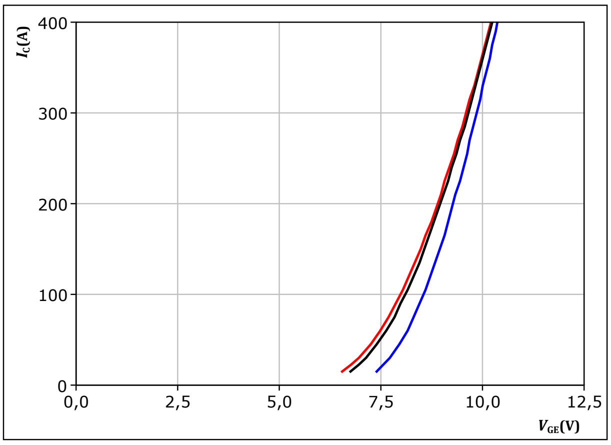
t_p =	250	µs
T_j =	150	°C

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

figure 3. IGBT

Typical transfer characteristics

$I_C = f(V_{GE})$



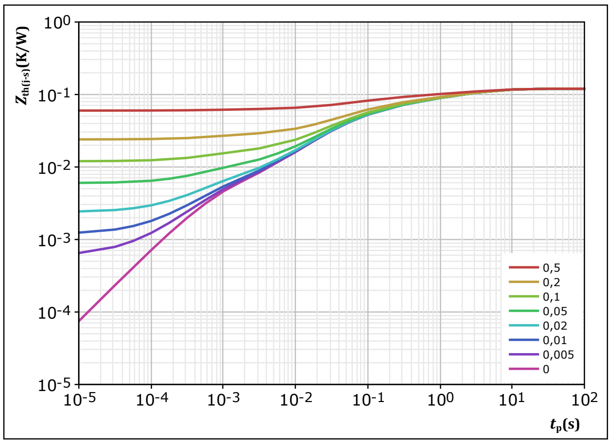
t_p =	250	µs
V_{CE} =	10	V

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

IGBT thermal model values

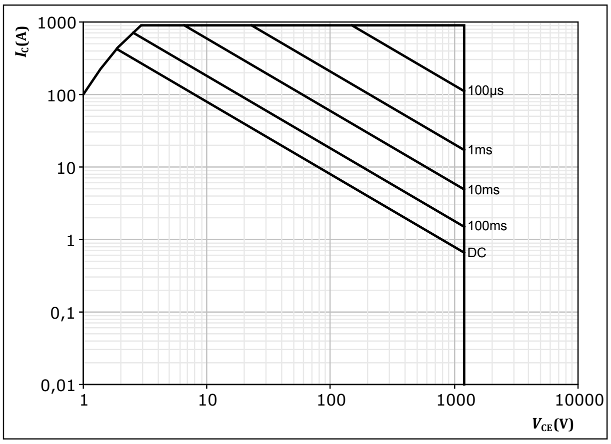
R (K/W)	τ (s)
2,37E-02	4,78E+00
2,54E-02	1,20E+00
2,85E-02	1,98E-01
2,95E-02	4,71E-02
8,84E-03	1,33E-02
4,12E-03	6,77E-04

Half-Bridge Switch Characteristics

figure 5. **IGBT**

Safe operating area

I_C = f(V_{CE})



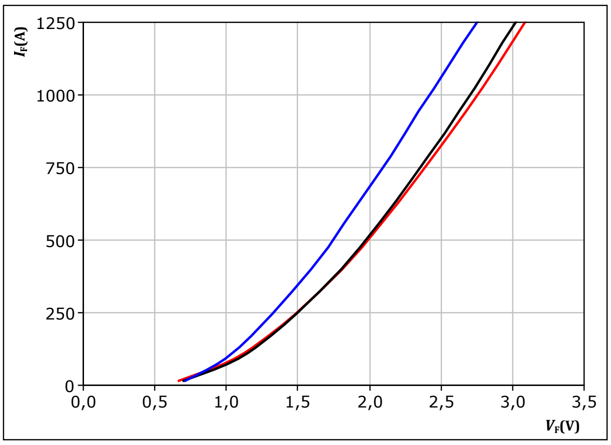
D =	single pulse	
T_s =	80	°C
V_{GE} =	15	V
T_j =	T_{jmax}	

Half-Bridge Diode Characteristics

figure 6. **FWD**

Typical forward characteristics

$I_F = f(V_F)$



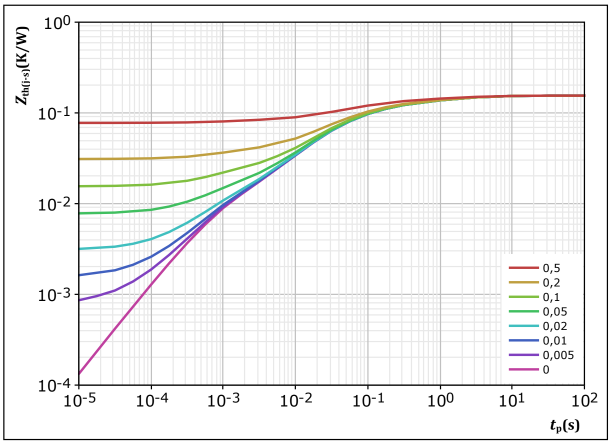
t_p = 250 µs

T_j: 25 °C, 125 °C, 150 °C

figure 7. **FWD**

Transient thermal impedance as a function of pulse width

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



$D = t_p / T$

$R_{th(j-s)}$ = 0,155 K/W

FWD thermal model values

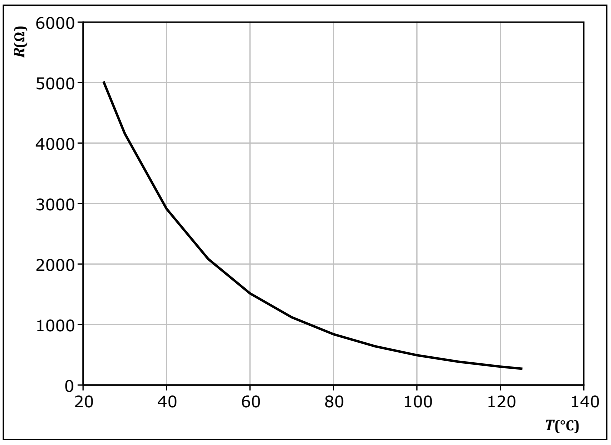
R (K/W)	τ (s)
1,07E-02	4,93E+00
2,30E-02	1,02E+00
4,13E-02	1,62E-01
4,89E-02	4,06E-02
2,30E-02	1,26E-02
8,01E-03	7,94E-04

Thermistor Characteristics

figure 8.	Thermistor

Typical NTC characteristic as function of temperature

R_T = f(T)

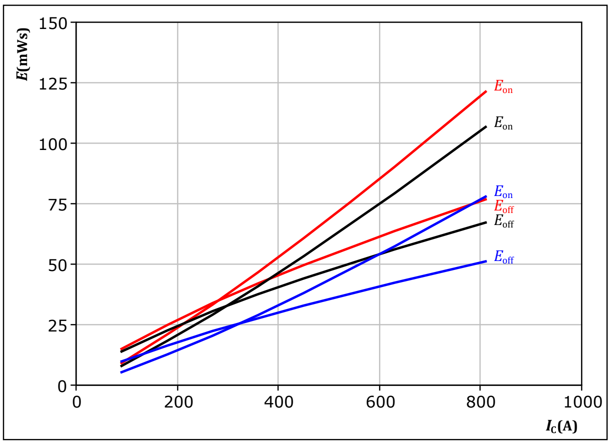


Half-Bridge Switching Characteristics

figure 9. **IGBT**

Typical switching energy losses as a function of collector current

$E = f(I_C)$



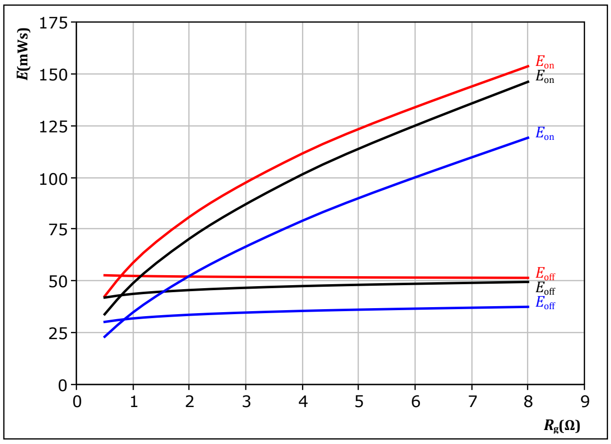
With an inductive load at

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 10. **IGBT**

Typical switching energy losses as a function of gate resistor

$E = f(R_g)$



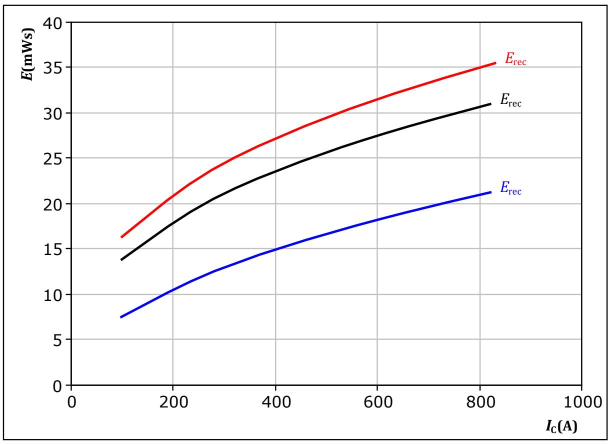
With an inductive load at

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

figure 11. **FWD**

Typical reverse recovered energy loss as a function of collector current

$E_{rec} = f(I_C)$



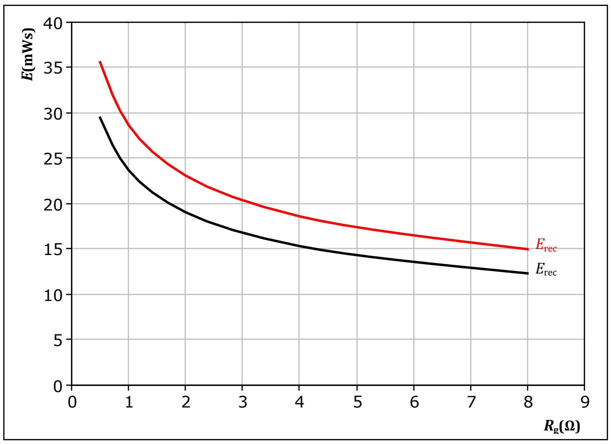
With an inductive load at

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

figure 12. **FWD**

Typical reverse recovered energy loss as a function of gate resistor

$E_{rec} = f(R_g)$



With an inductive load at

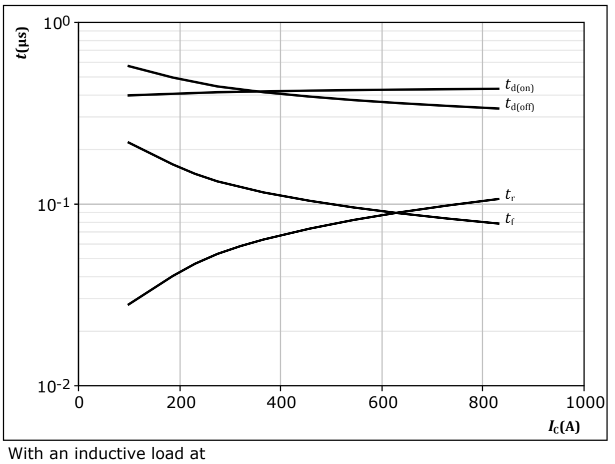
V_{CE} =	600	V	T_j:	125 °C
V_{GE} =	±15	V		150 °C
I_C =	450	A		

Half-Bridge Switching Characteristics

figure 13. **IGBT**

Typical switching times as a function of collector current

t = f(I_C)



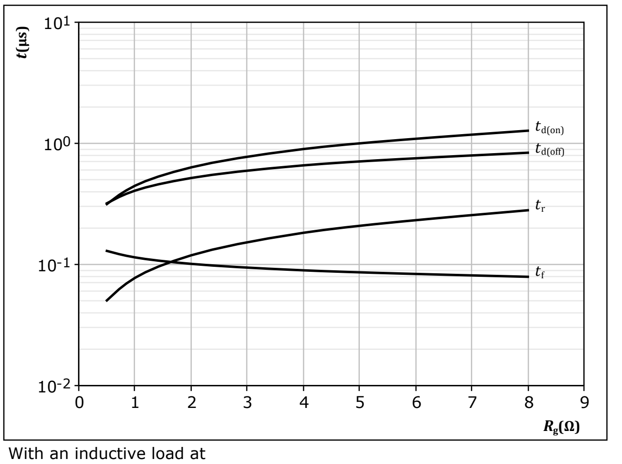
With an inductive load at

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

figure 14. **IGBT**

Typical switching times as a function of gate resistor

t = f(R_g)



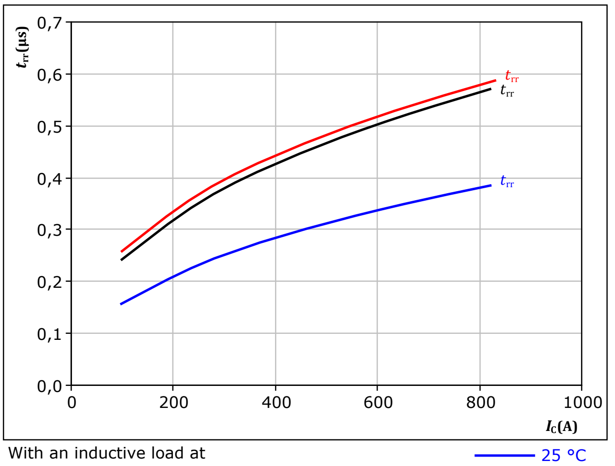
With an inductive load at

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

figure 15. **FWD**

Typical reverse recovery time as a function of collector current

t_{rr} = f(I_C)



With an inductive load at

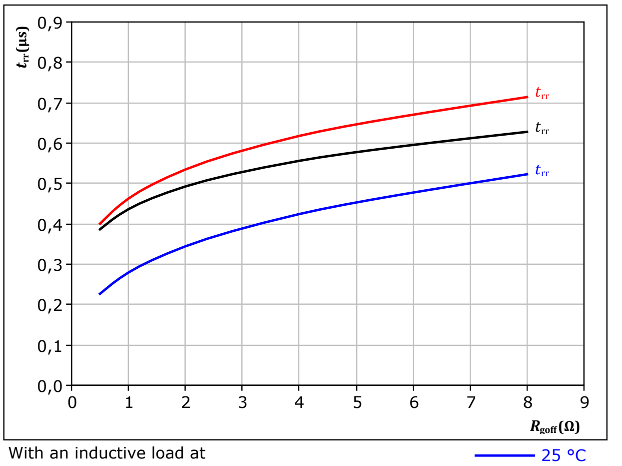
V_{CE} =	600	V
V_{GE} =	±15	V
R_{gon} =	1	Ω

T_j: 25 °C, 125 °C, 150 °C

figure 16. **FWD**

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

t_{rr} = f(R_{goff})



With an inductive load at

V_{CE} =	600	V
V_{GE} =	±15	V
I_C =	450	A

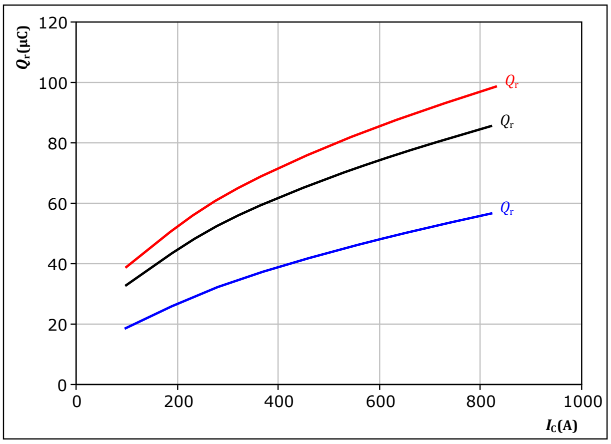
T_j: 25 °C, 125 °C, 150 °C

Half-Bridge Switching Characteristics

figure 17. **FWD**

Typical recovered charge as a function of collector current

Q_r = f(I_C)



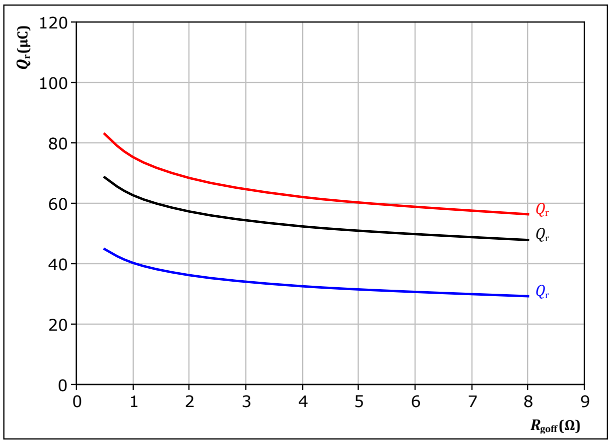
With an inductive load at

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

figure 18. **FWD**

Typical recovered charge as a function of turn off gate resistor

Q_r = f(R_{goff})



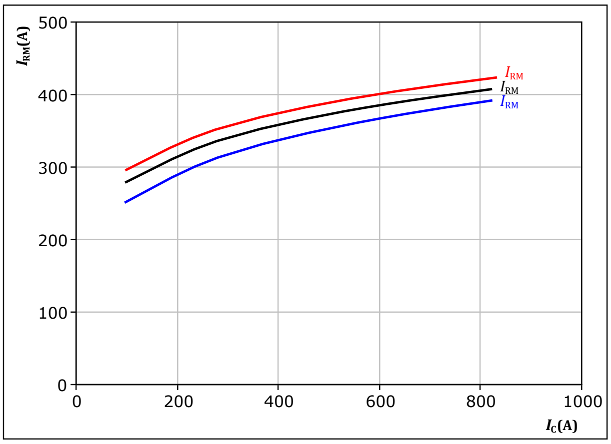
With an inductive load at

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

figure 19. **FWD**

Typical peak reverse recovery current as a function of collector current

I_{RM} = f(I_C)



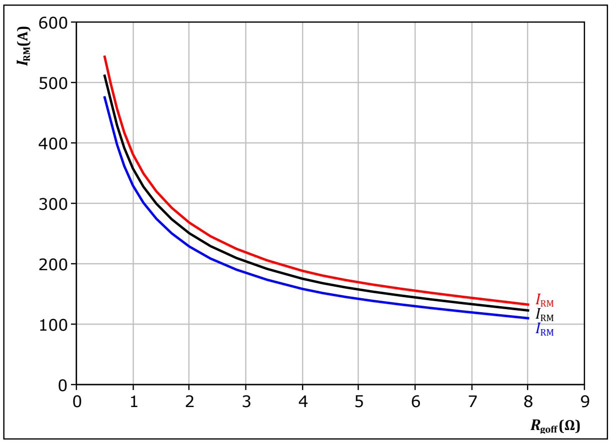
With an inductive load at

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

figure 20. **FWD**

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

I_{RM} = f(R_{goff})



With an inductive load at

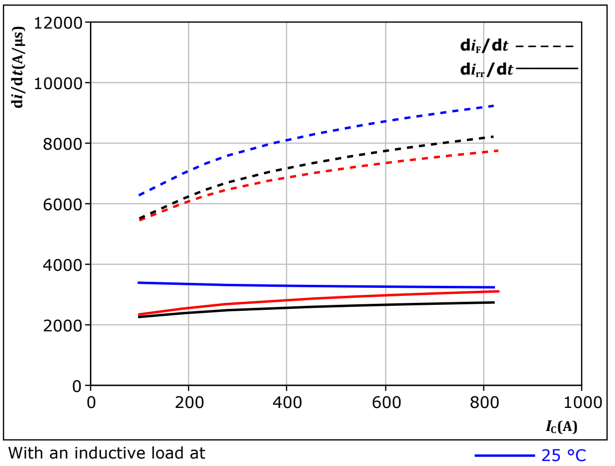
V_{CE} =	600	V	T_j:	25 °C
V_{GE} =	±15	V		125 °C
I_C =	450	A		150 °C

Half-Bridge Switching Characteristics

figure 21. **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)



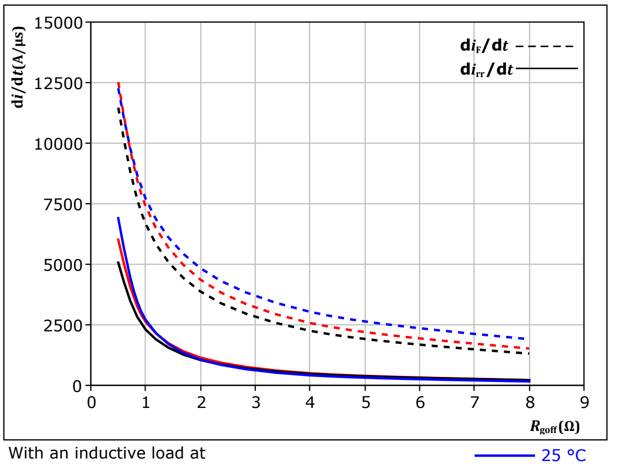
With an inductive load at

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

figure 22. **FWD**

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

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



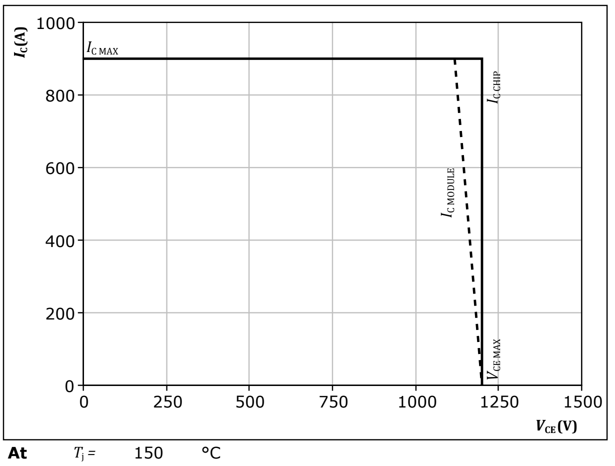
With an inductive load at

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

figure 23. **IGBT**

Reverse bias safe operating area

I_C = f(V_{CE})



At	T_j =	150	°C
	R_{gon} =	1	Ω
	R_{goff} =	1	Ω

Half-Bridge Switching Definitions

figure 24. **IGBT**

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

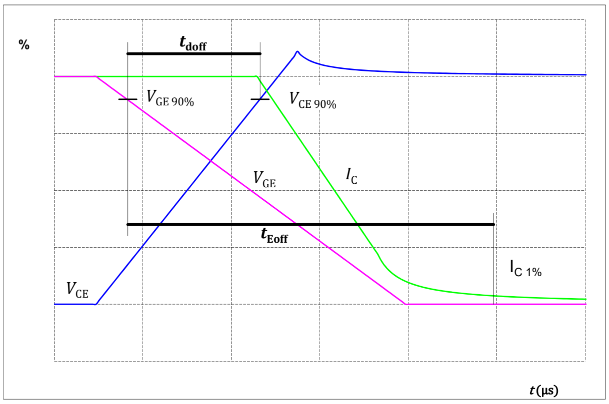


figure 25. **IGBT**

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

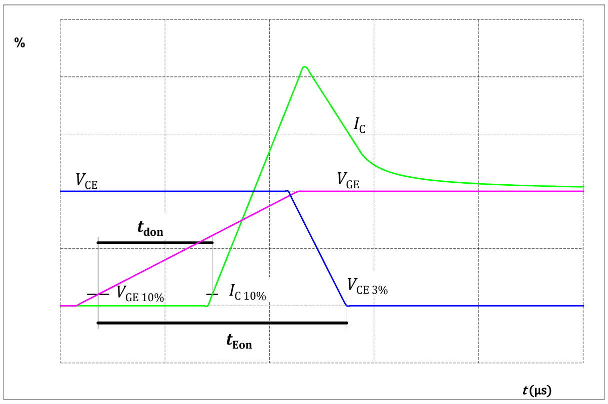


figure 26. **IGBT**

Turn-off Switching Waveforms & definition of t_f

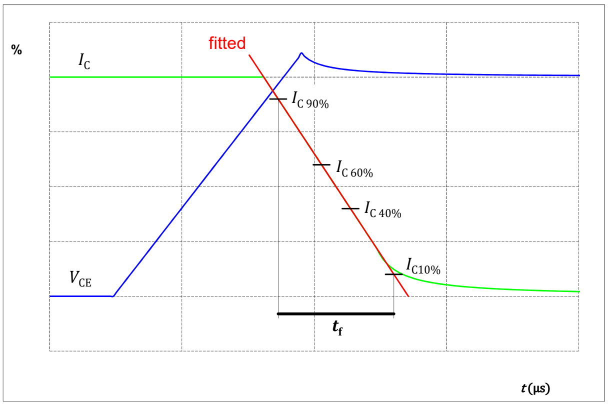
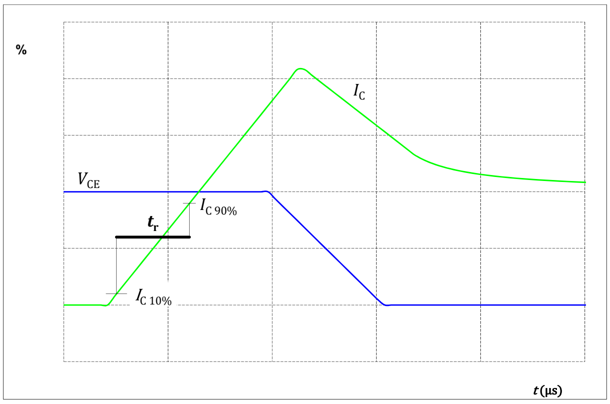


figure 27. **IGBT**

Turn-on Switching Waveforms & definition of t_r



Half-Bridge Switching Definitions

figure 28. **FWD**

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

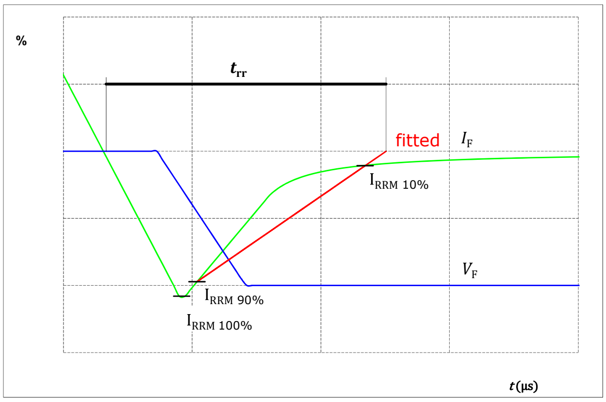
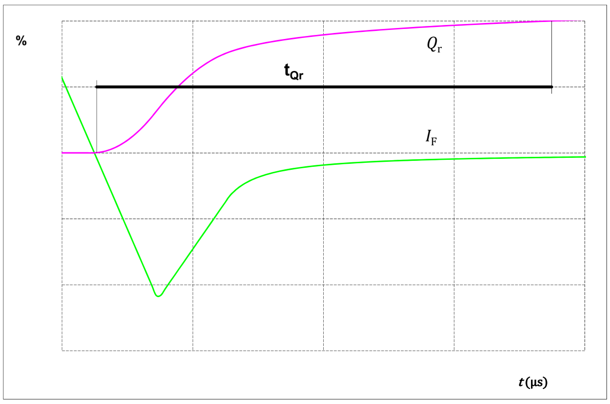


figure 29. **FWD**

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



Ordering Code

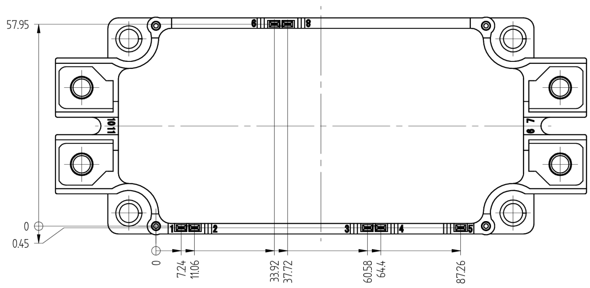
Version	Ordering Code
Without thermal paste	A0-VP122PA450M7-L758F70T
With thermal paste (3,4 W/mK, PSX-P7)	A0-VP122PA450M7-L758F70T-/3/

Marking

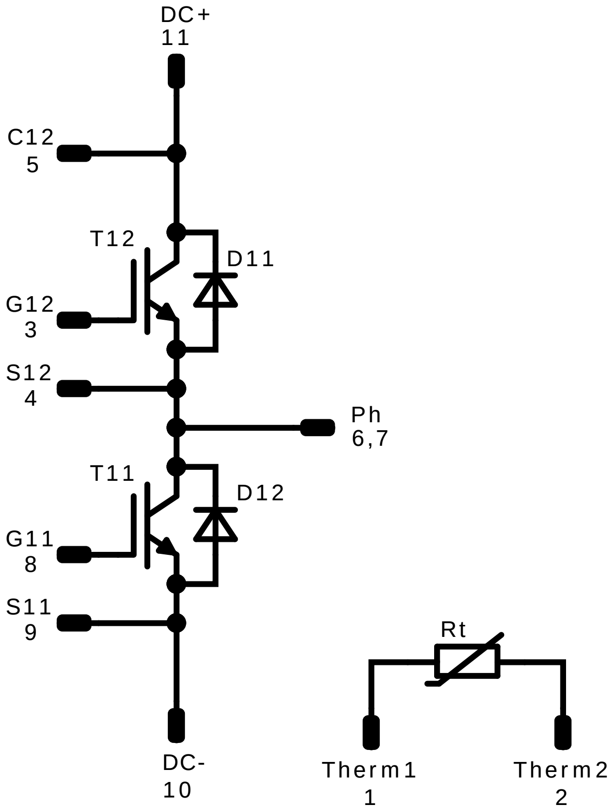
						
	Text	**Name**	**VIN**	**Date code**	**Lot**	**Serial**
		NN-NNNNNNNNNNNNNN-TTTTTTTVV	VIN	WWYY	LLLLL	SSSS
	Datamatrix	**Type&Ver**	**Lot number**	**Serial**	**Date code**	
		TTTTTTTVV	LLLLL	SSSS	WWYY	

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+
12	not assembled		
13	not assembled		
14	not assembled		
15	not assembled		
16	not assembled		
17	not assembled		
18	not assembled		
19	not assembled		
20	not assembled		
21	not assembled		
22	not assembled		
23	not assembled		
24	not assembled		
25	not assembled		
26	not assembled		
27	not assembled		
28	not assembled		
29	not assembled		
30	not assembled		
31	not assembled		
32	not assembled		



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 E3s packages see vincotech.com website.

Package data
Package data for VINco E3s packages see vincotech.com website.

Vincotech thermistor reference
See Vincotech thermistor reference table at 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-VP122PA450M7-L758F70T-D5-14	27 Sep. 2021	Static characteristics of the Diode is updated R Tau pairs are updated New datasheet format, module is unchanged	