
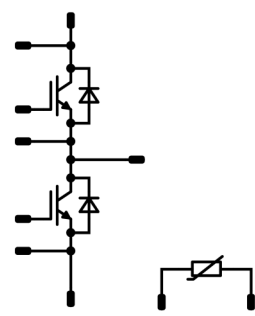




Vincotech

**A0-VS122PA200M7-L756F70**  
**A0-VP122PA200M7-L756F70T**  
datasheet

VINcoDUAL E3		1200 V / 200 A
<b>Features</b> <ul style="list-style-type: none"><li>• IGBT Mitsubishi gen 7 technology with low <math>V_{CEsat}</math> and improved EMC behavior</li><li>• New SoLid Cover Technology for higher reliability</li><li>• Industry standard housing</li><li>• Press-fit pin and pre-applied phase-change</li><li>• Thermal Interface Material available</li></ul>		<b>VINco E3 housing</b> 
<b>Target applications</b> <ul style="list-style-type: none"><li>• Industrial Drives</li><li>• Power Supply</li><li>• UPS</li></ul>		<b>Schematic</b> 
<b>Types</b> <ul style="list-style-type: none"><li>• A0-VS122PA200M7-L756F70</li><li>• A0-VP122PA200M7-L756F70T</li></ul>		

## Maximum Ratings

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

Parameter	Symbol	Condition	Value	Unit
<b>Half-Bridge Switch</b>				
Collector-emitter voltage	$V_{CES}$		1200	V
Collector current	$I_C$	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	231	A
Repetitive peak collector current	$I_{CRM}$	$t_p$ limited by $T_{jmax}$	400	A
Total power dissipation	$P_{tot}$	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	449	W
Gate-emitter voltage	$V_{GES}$		±20	V
Maximum junction temperature	$T_{jmax}$		175	°C



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## Maximum Ratings

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

Parameter	Symbol	Condition	Value	Unit
<b>Half-Bridge Diode</b>				
Peak repetitive reverse voltage	$V_{RRM}$		1200	V
Continuous (direct) forward current	$I_F$	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	182	A
Repetitive peak forward current	$I_{FRM}$		400	A
Total power dissipation	$P_{tot}$	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	343	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* $t_p = 2\text{ s}$	6000	V
		AC Voltage $t_p = 1\text{ min}$	2500	V
Creepage distance			18,1	mm
Clearance			16,2	mm
Comparative Tracking Index	CTI		> 200	

\*100 % tested in production



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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	$V_{GE(th)}$	$V_{GE} = V_{CE}$			0,02	25	5,4	6	6,6	V
Collector-emitter saturation voltage	$V_{CEsat}$		15		200	25 125 150		1,53 1,70 1,75	1,85	V
Collector-emitter cut-off current	$I_{CES}$		0	1200		25			200	μA
Gate-emitter leakage current	$I_{GES}$		20	0		25			1000	nA
Input capacitance	$C_{ies}$		0	10		25		42000		pF
Output capacitance	$C_{oes}$							1400		
Reverse transfer capacitance	$C_{res}$							560		
Gate charge	$Q_g$		15	600	200	25		1400		nC

#### Thermal

Thermal resistance junction to sink	$R_{th(j-s)}$	$\lambda_{paste} = 3,4 \text{ W/mK}$ (PSX)						0,21		K/W
-------------------------------------	---------------	---	--	--	--	--	--	------	--	-----

#### Dynamic

Turn-on delay time	$t_{d(on)}$	$R_{gon} = 4 \Omega$ $R_{goff} = 4 \Omega$	$\pm 15$	600	200	25 125 150		353 353 350		ns
Rise time	$t_r$					25 125 150		48 55 57		
Turn-off delay time	$t_{d(off)}$					25 125 150		293 324 326		
Fall time	$t_f$					25 125 150		61 97 110		
Turn-on energy (per pulse)	$E_{on}$					25 125 150		15,915 21,048 23,273		mWs
Turn-off energy (per pulse)	$E_{off}$					25 125 150		12,400 16,874 18,546		



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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 Diode

#### Static

Forward voltage	$V_F$				200	25 125 150		1,82 1,96 1,97	2,1	V
Reverse leakage current	$I_R$			1200		25			80	μA

#### Thermal

Thermal resistance junction to sink	$R_{th(j-s)}$	$\lambda_{paste} = 3,4 \text{ W/mK}$ (PSX)						0,28		K/W
-------------------------------------	---------------	---	--	--	--	--	--	------	--	-----

#### Dynamic

Peak recovery current	$I_{RRM}$	$di/dt = 3709 \text{ A/}\mu\text{s}$ $di/dt = 3860 \text{ A/}\mu\text{s}$ $di/dt = 3690 \text{ A/}\mu\text{s}$	$\pm 15$	600	200	25 125 150		151 164 169		A
Reverse recovery time	$t_{rr}$					25 125 150		383 439 471		ns
Recovered charge	$Q_r$					25 125 150		21,860 31,146 35,186		μC
Reverse recovered energy	$E_{rec}$					25 125 150		8,262 11,802 13,432		mWs
Peak rate of fall of recovery current	$(di_{rr}/dt)_{max}$					25 125 150		880 848 995		A/μs

### Thermistor

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



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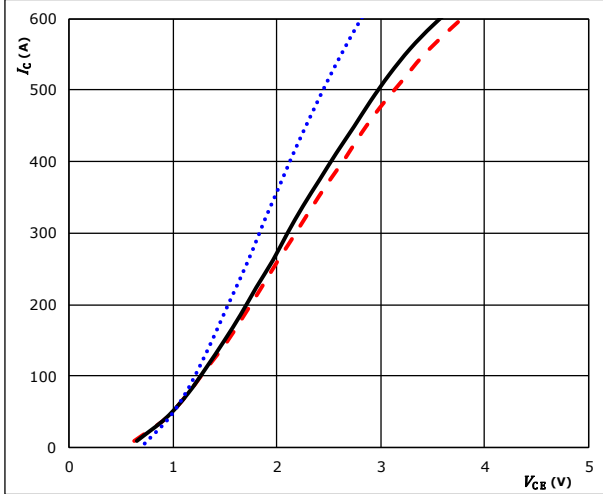
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datasheet

## Half-Bridge Switch Characteristics

**figure 1.** IGBT

Typical output characteristics

$$I_C = f(V_{CE})$$

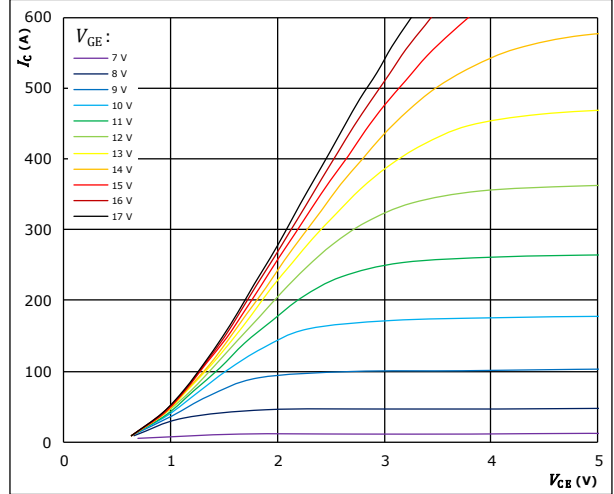


$t_p = 250 \mu s$   
 $V_{GE} = 15 V$   
 $T_j: 25 \text{ } ^\circ C$  (blue dotted line)  
 $125 \text{ } ^\circ C$  (black solid line)  
 $150 \text{ } ^\circ C$  (red dashed line)

**figure 2.** IGBT

Typical output characteristics

$$I_C = f(V_{CE})$$

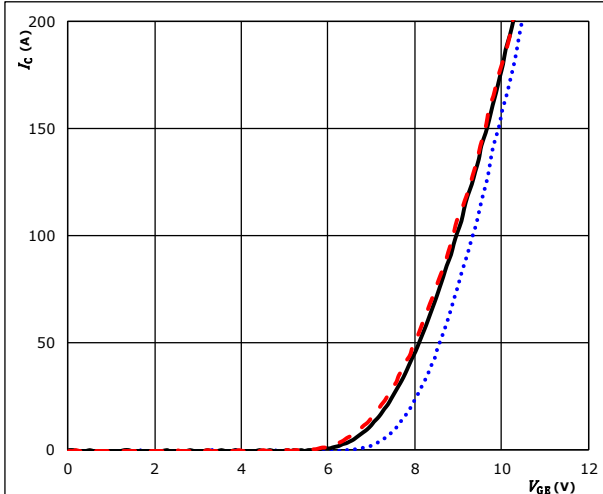


$t_p = 250 \mu s$   
 $T_j = 150 \text{ } ^\circ C$   
 $V_{GE}$  from 7 V to 17 V in steps of 1 V

**figure 3.** IGBT

Typical transfer characteristics

$$I_C = f(V_{GE})$$

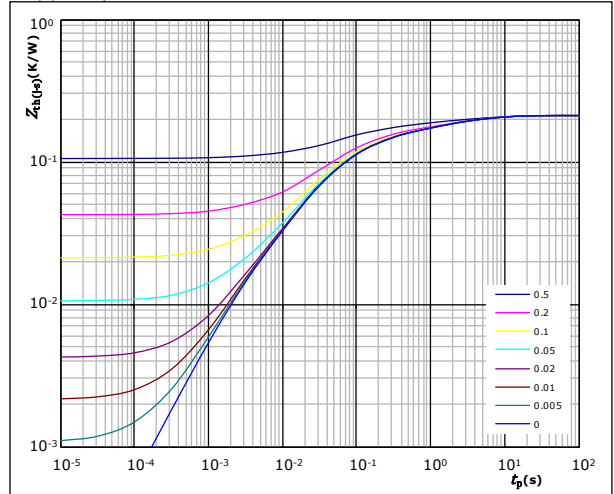


$t_p = 250 \mu s$   
 $V_{CE} = 10 V$   
 $T_j: 25 \text{ } ^\circ C$  (blue dotted line)  
 $125 \text{ } ^\circ C$  (black solid line)  
 $150 \text{ } ^\circ C$  (red dashed line)

**figure 4.** IGBT

Transient thermal impedance as function of pulse duration

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



$$D = t_p / T$$

$$R_{th(j-s)} = 0,21 \text{ K/W}$$

IGBT thermal model values

$R$ (K/W)	$\tau$ (s)
2,33E-02	6,08E+00
3,66E-02	1,45E+00
6,73E-02	1,71E-01
7,56E-02	3,15E-02
8,67E-03	2,71E-03



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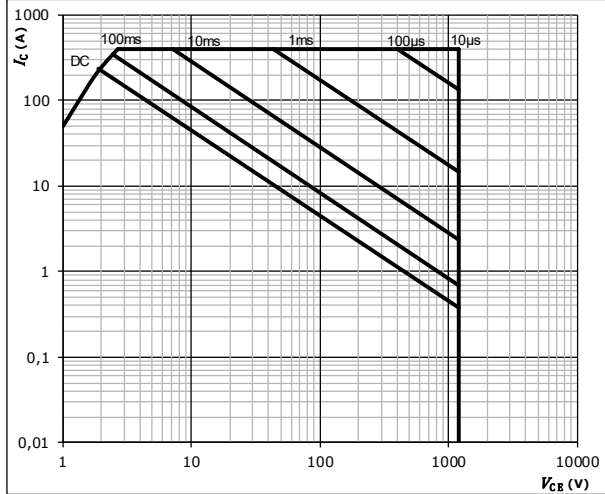
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datasheet

## Half-Bridge Switch Characteristics

**figure 5.** IGBT

Safe operating area

$$I_C = f(V_{CE})$$



$D =$  single pulse  
 $T_s =$  80 °C  
 $V_{GE} =$  0 V  
 $T_j =$   $T_{jmax}$



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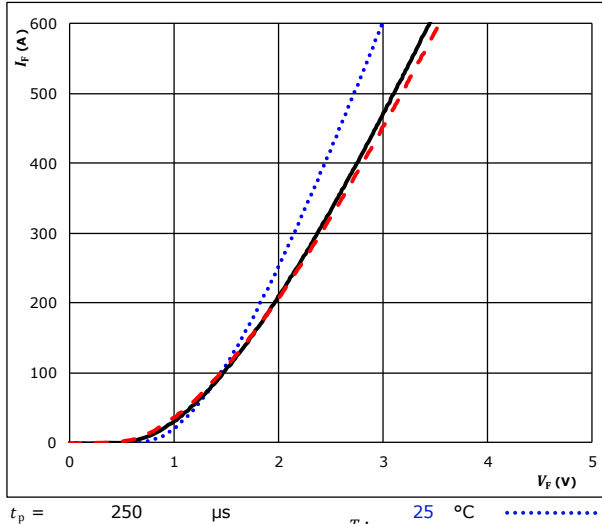
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## Half-Bridge Diode Characteristics

**figure 1.** FWD

Typical forward characteristics

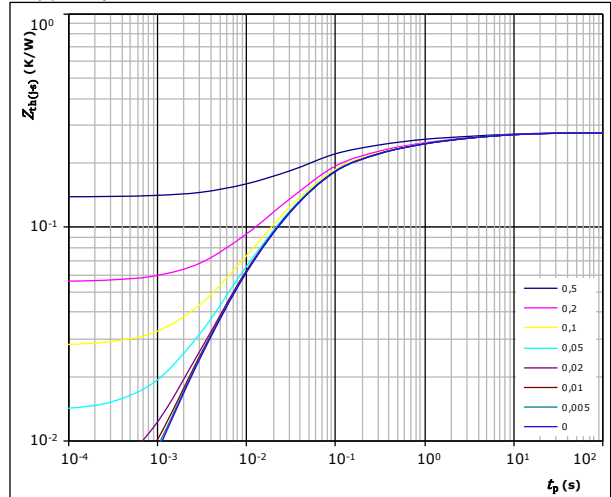
$$I_F = f(V_F)$$



**figure 2.** FWD

Transient thermal impedance as a function of pulse width

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



$$D = t_p / T$$

$$R_{th(j-s)} = 0,28 \text{ K/W}$$

FWD thermal model values

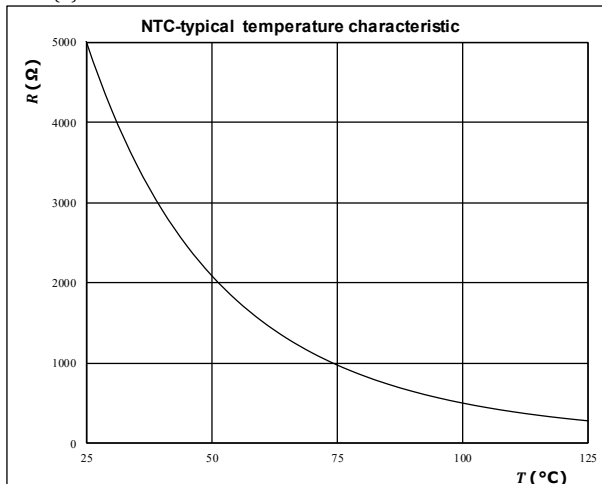
$R$ (K/W)	$\tau$ (s)
1,27E-02	1,04E+01
3,22E-02	1,79E+00
6,57E-02	2,21E-01
1,32E-01	3,76E-02
3,46E-02	6,33E-03

## Thermistor Characteristics

**figure 1.** Thermistor

Typical NTC characteristic  
 as a function of temperature

$$R = f(T)$$





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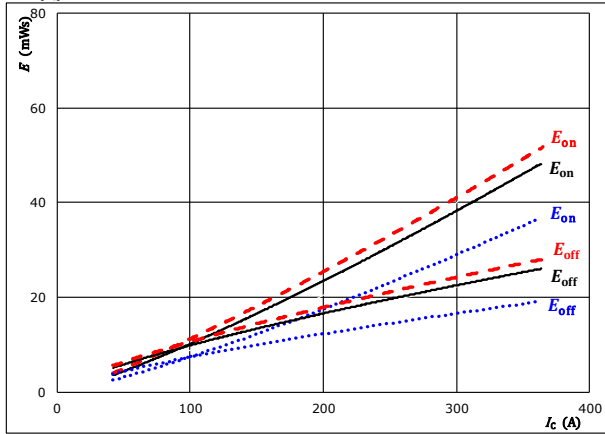
datasheet

## 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  
 $V_{GE} = \pm 15$  V  
 $R_{gon} = 4$   $\Omega$   
 $R_{goff} = 4$   $\Omega$

$T_j$ :

25 °C

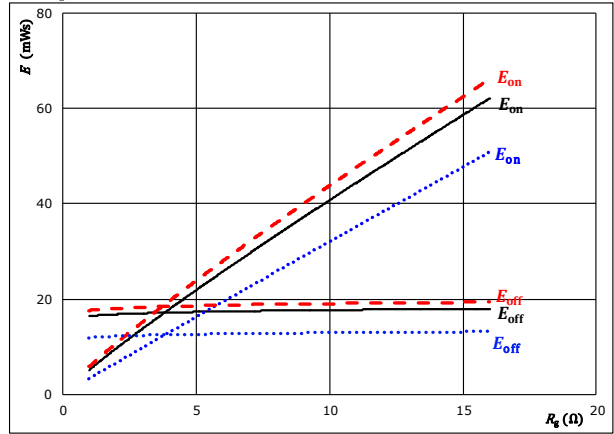
125 °C

150 °C

**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  
 $V_{GE} = \pm 15$  V  
 $I_C = 200$  A

$T_j$ :

25 °C

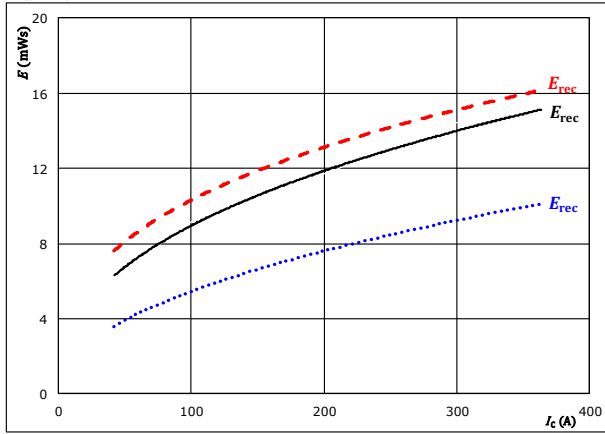
125 °C

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  
 $V_{GE} = \pm 15$  V  
 $R_{gon} = 4$   $\Omega$

$T_j$ :

25 °C

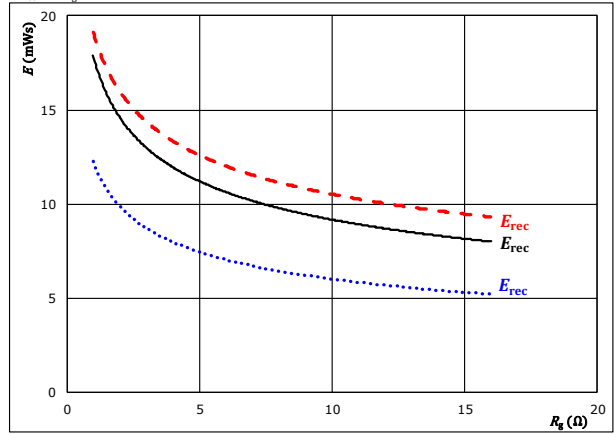
125 °C

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  
 $V_{GE} = \pm 15$  V  
 $I_C = 200$  A

$T_j$ :

25 °C

125 °C

150 °C



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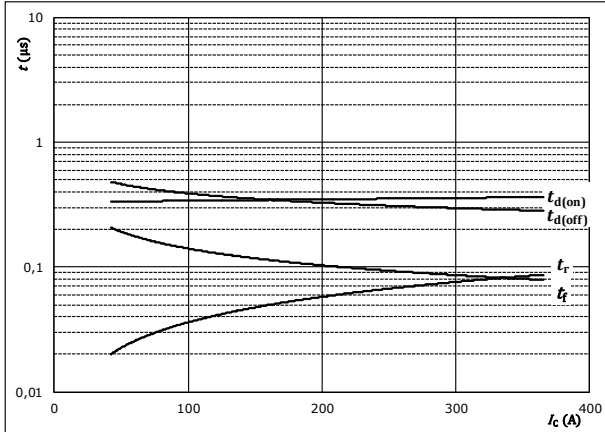
datasheet

## Half-Bridge Switching Characteristics

figure 5. IGBT

Typical switching times as a function of collector current

$$t = f(I_C)$$



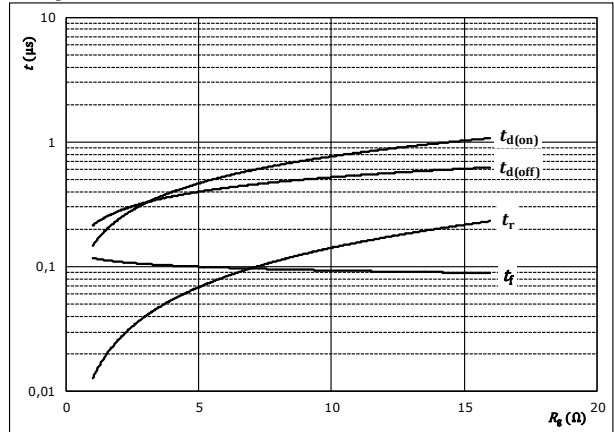
With an inductive load at

$T_j =$	150	°C
$V_{CE} =$	600	V
$V_{GE} =$	±15	V
$R_{gon} =$	4	Ω
$R_{goff} =$	4	Ω

figure 6. IGBT

Typical switching times as a function of gate resistor

$$t = f(R_g)$$



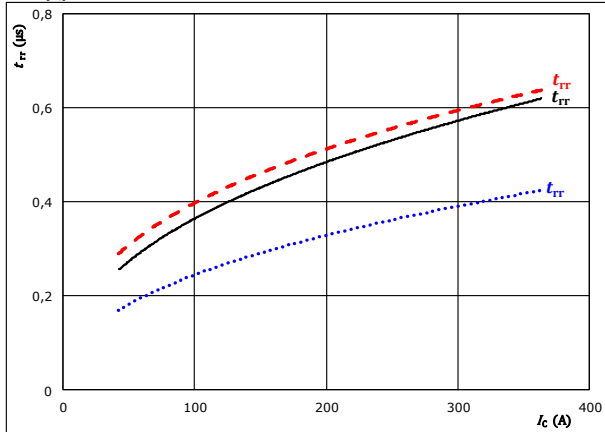
With an inductive load at

$T_j =$	150	°C
$V_{CE} =$	600	V
$V_{GE} =$	±15	V
$I_C =$	200	A

figure 7. FWD

Typical reverse recovery time as a function of collector current

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



With an inductive load at

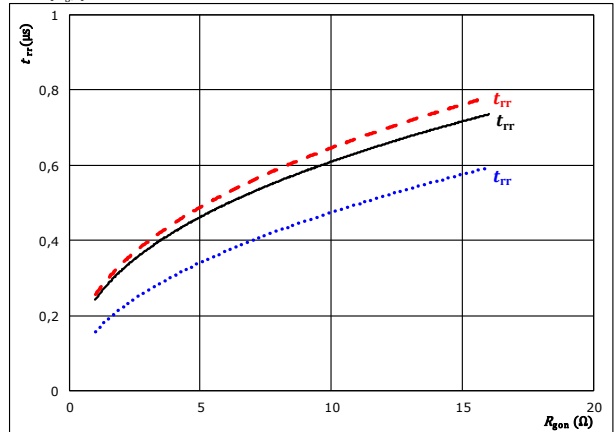
$V_{CE} =$	600	V
$V_{GE} =$	±15	V
$R_{gon} =$	4	Ω

$T_j:$	25 °C	.....
	125 °C	————
	150 °C	-----

figure 8. FWD

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

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



With an inductive load at

$V_{CE} =$	600	V
$V_{GE} =$	±15	V
$I_C =$	200	A

$T_j:$	25 °C	.....
	125 °C	————
	150 °C	-----



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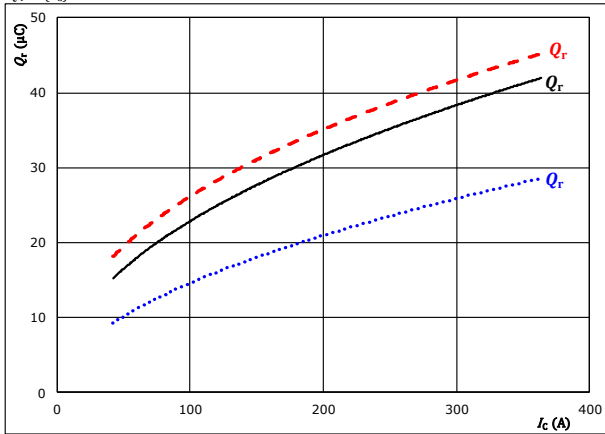
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## Half-Bridge Switching Characteristics

**figure 9.** FWD

Typical recovered charge as a function of collector current

$$Q_r = f(I_C)$$



With an inductive load at

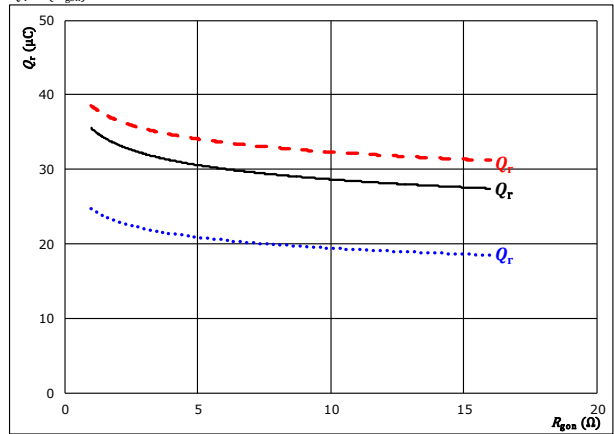
$V_{CE} = 600$  V  
 $V_{GE} = \pm 15$  V  
 $R_{gon} = 4$   $\Omega$

$T_j$ : 25 °C (dotted blue)  
 125 °C (solid black)  
 150 °C (dashed red)

**figure 10.** FWD

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

$$Q_r = f(R_{gon})$$



With an inductive load at

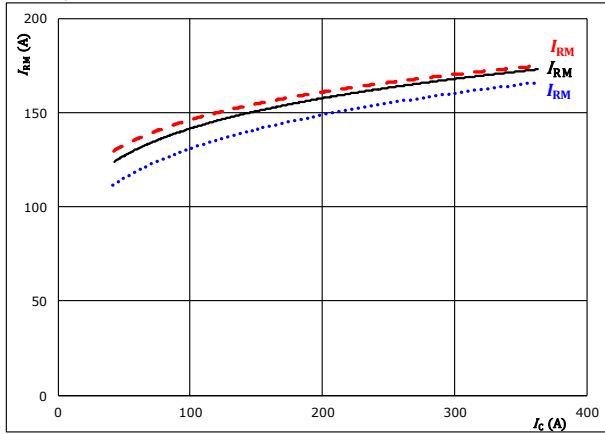
$V_{CE} = 600$  V  
 $V_{GE} = \pm 15$  V  
 $I_C = 200$  A

$T_j$ : 25 °C (dotted blue)  
 125 °C (solid black)  
 150 °C (dashed red)

**figure 11.** FWD

Typical peak reverse recovery current as a function of collector current

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



With an inductive load at

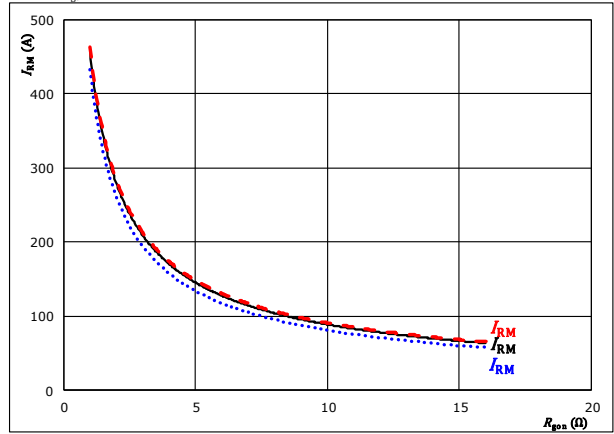
$V_{CE} = 600$  V  
 $V_{GE} = \pm 15$  V  
 $R_{gon} = 4$   $\Omega$

$T_j$ : 25 °C (dotted blue)  
 125 °C (solid black)  
 150 °C (dashed red)

**figure 12.** FWD

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

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



With an inductive load at

$V_{CE} = 600$  V  
 $V_{GE} = \pm 15$  V  
 $I_C = 200$  A

$T_j$ : 25 °C (dotted blue)  
 125 °C (solid black)  
 150 °C (dashed red)



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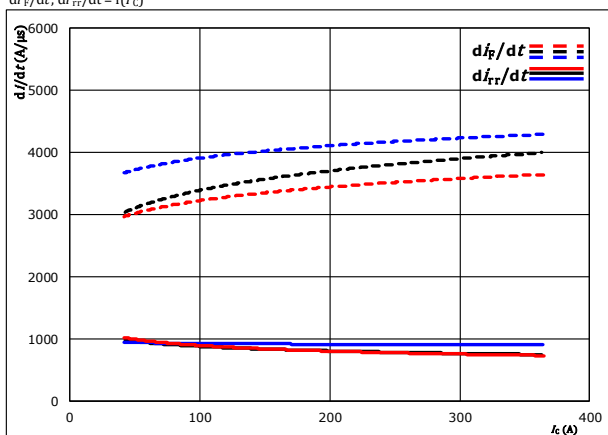
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datasheet

## Half-Bridge Switching Characteristics

figure 13. FWD

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

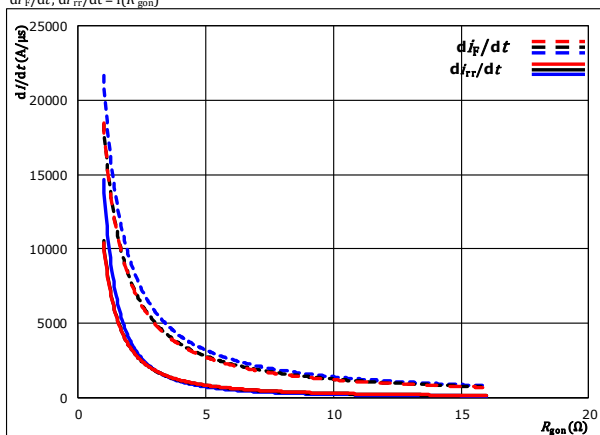


With an inductive load at

$V_{CE} = 600$  V  
 $V_{GE} = \pm 15$  V  
 $R_{gon} = 4$   $\Omega$   
 $T_j: 25$  °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  
 $di_f/dt, di_{rr}/dt = f(R_{gon})$



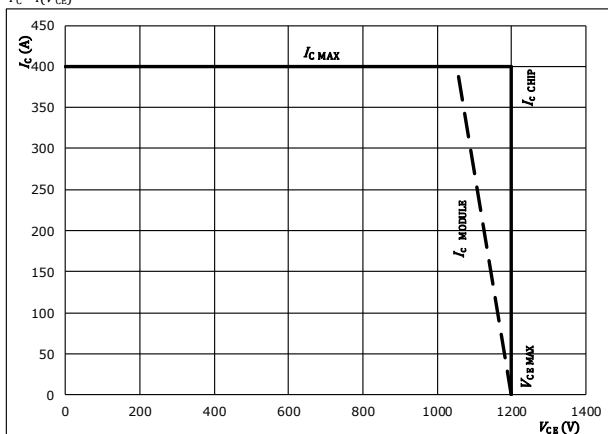
With an inductive load at

$V_{CE} = 600$  V  
 $V_{GE} = \pm 15$  V  
 $I_C = 200$  A  
 $T_j: 25$  °C  
 $125$  °C  
 $150$  °C

figure 15. IGBT

Reverse bias safe operating area

$I_C = f(V_{CE})$



At

$T_j = 150$  °C  
 $R_{gon} = 4$   $\Omega$   
 $R_{goff} = 4$   $\Omega$



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## Half-Bridge Switching Definitions

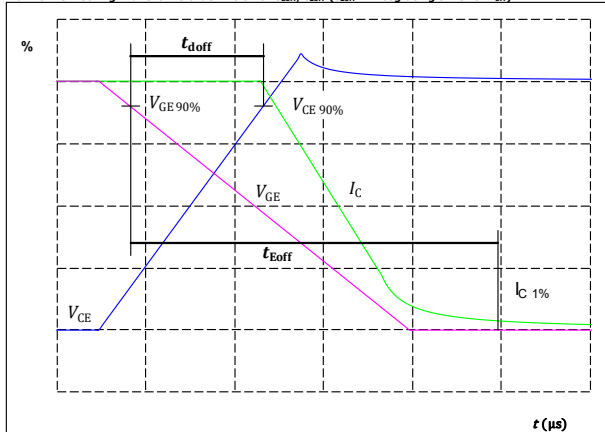
### General conditions

$T_j$	=	150 °C
$R_{gon}$	=	4 $\Omega$
$R_{goff}$	=	4 $\Omega$

figure 1.

IGBT

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

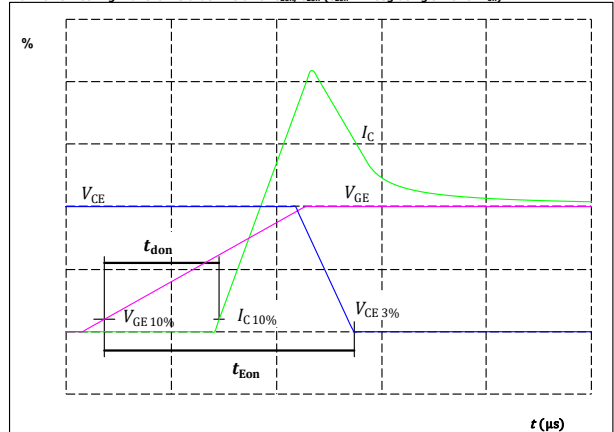


$V_{GE}(0\%) =$	-15	V
$V_{GE}(100\%) =$	15	V
$V_C(100\%) =$	600	V
$I_C(100\%) =$	200	A
$t_{doff} =$	326	ns

figure 2.

IGBT

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

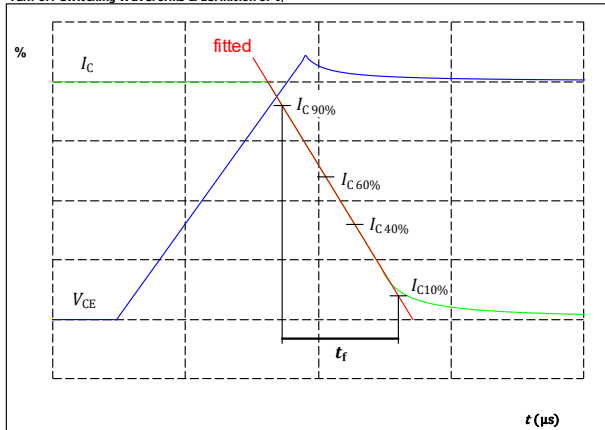


$V_{GE}(0\%) =$	-15	V
$V_{GE}(100\%) =$	15	V
$V_C(100\%) =$	600	V
$I_C(100\%) =$	200	A
$t_{don} =$	350	ns

figure 3.

IGBT

Turn-off Switching Waveforms & definition of  $t_f$

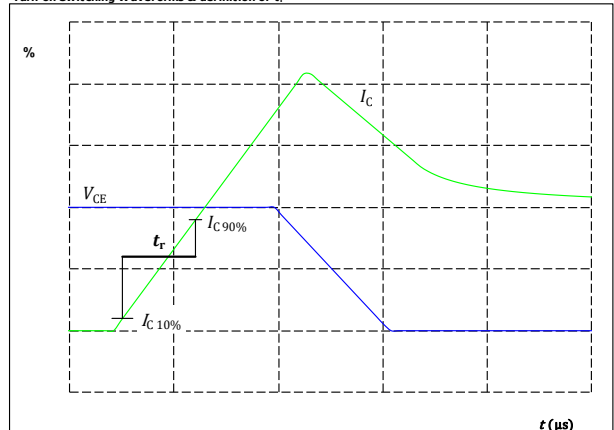


$V_C(100\%) =$	600	V
$I_C(100\%) =$	200	A
$t_f =$	110	ns

figure 4.

IGBT

Turn-on Switching Waveforms & definition of  $t_r$



$V_C(100\%) =$	600	V
$I_C(100\%) =$	200	A
$t_r =$	57	ns



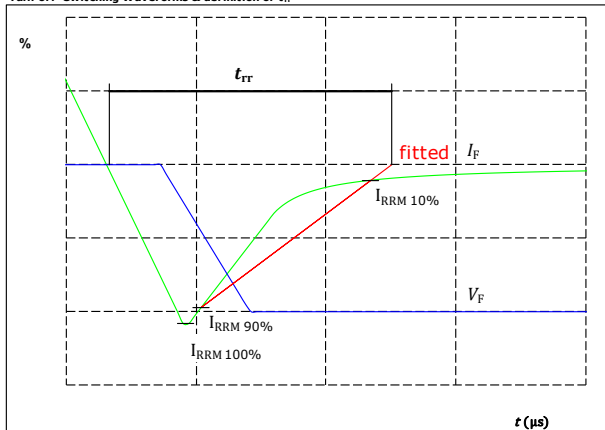
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datasheet

## Half-Bridge Switching Characteristics

figure 5. FWD

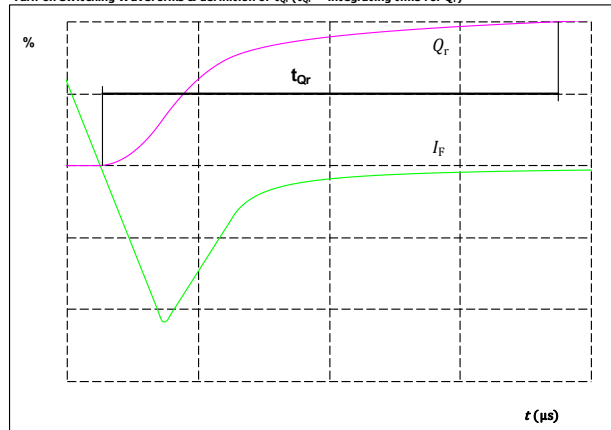
Turn-off Switching Waveforms & definition of  $t_{rr}$



$V_F(100\%) =$	600	V
$I_F(100\%) =$	200	A
$I_{RRM}(100\%) =$	169	A
$t_{rr} =$	471	ns

figure 6. FWD

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





$I_F(100\%) =$	200	A
$Q_r(100\%) =$	35	μC



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**A0-VS122PA200M7-L756F70**  
**A0-VP122PA200M7-L756F70T**  
datasheet

Ordering Code & Marking							
Version			Ordering Code				
without thermal paste with solder pins			A0-VS122PA200M7-L756F70				
with thermal paste with solder pins			A0-VS122PA200M7-L756F70-/3/				
without thermal paste with Press-fit pins			A0-VP122PA200M7-L756F70T				
with thermal paste with Press-fit pins			A0-VP122PA200M7-L756F70T-/3/				
<div><div>NN-NNNNNNNNNN-TTTTTTVV VIN WWYY LLLLL SSSS</div><div></div></div>	Text	Name		Date code	UL & VIN	Lot	Serial
		NN-NNNNNNNNNN-TTTTTTVV		WWYY	UL VIN	LLLLL	SSSS
		Datamatrix	Type&Ver	Lot number	Serial	Date code	
		TTTTTTTVV	LLLLL	SSSS	WWYY		

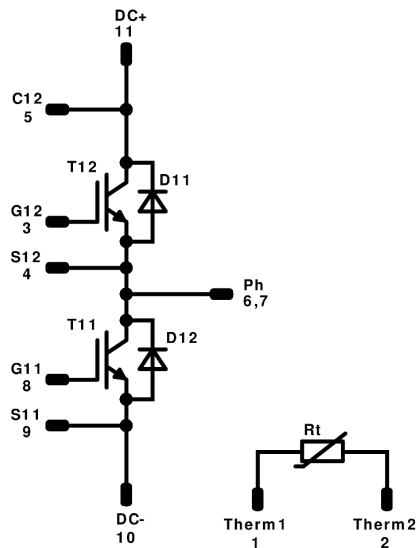
Pin table			
Pin	X	Y	Functions
1	7,24	-0,45	Therm1
2	11,06	-0,45	Therm2
3	60,58	-0,45	G12
4	64,4	-0,45	S12
5	87,26	-0,45	C12
6	-	-	Ph
7	-	-	Ph
8	37,72	57,95	G11
9	33,92	57,95	S11
10	-	-	DC-
11	-	-	DC+



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datasheet

**Pinout**



**Identification**

ID	Component	Voltage	Current	Function	Comment
T11, T12	IGBT	1200 V	200 A	Half-Bridge Switch	
D11, D12	FWD	1200 V	200 A	Half-Bridge Diode	
Rt	NTC			Thermistor	




Vincotech

**A0-VS122PA200M7-L756F70**  
**A0-VP122PA200M7-L756F70T**  
datasheet

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-Vx122PA200M7-L756F70x-D1-14	08 May. 2019		

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2. A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.