



flowDUAL E1

1200 V / 50 A

Topology features

- Common emitter point Half Bridge
- Temperature sensor

Component features

- Easy paralleling
- Low turn-off losses
- Low collector emitter saturation voltage
- Positive temperature coefficient
- Short tail current
- Switching optimized for EMC

Housing features

- Base isolation: Al₂O₃
- Convex shaped substrate for superior thermal contact
- Compact housing
- CTI600 housing material
- Thermo-mechanical push-and-pull force relief
- Press-fit pin
- Reliable cold welding connection

Target applications

- Embedded Drives
- General Purpose Drives
- Industrial Drives

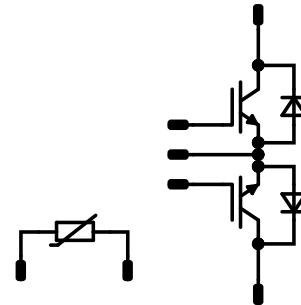
Types

- 10-EZ122PC050M7-PL37F78T

flow E1 12 mm housing



Schematic





Vincotech

10-EZ122PC050M7-PL37F78T
datasheet

Maximum Ratings

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

Parameter	Symbol	Conditions	Value	Unit
AC Switch				
Collector-emitter voltage	V_{CES}		1200	V
Collector current (DC current)	I_C	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	60	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}	100	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	124	W
Gate-emitter voltage	V_{GES}		± 20	V
Short circuit ratings	i_{SC}	$V_{GE} = 15\text{ V}$, $V_{CC} = 800\text{ V}$ $T_j = 150\text{ °C}$	9,5	μs
Maximum junction temperature	T_{jmax}		175	$^{\circ}\text{C}$

AC Diode

Peak repetitive reverse voltage	V_{RRM}		1200	V
Forward current (DC current)	I_F	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	46	A
Repetitive peak forward current	I_{FRM}	t_p limited by T_{jmax}	100	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	81	W
Maximum junction temperature	T_{jmax}		175	$^{\circ}\text{C}$

Module Properties

Thermal Properties

Storage temperature	T_{stg}		-40...+125	$^{\circ}\text{C}$
Operation temperature under switching condition	T_{jop}		-40...+($T_{jmax} - 25$)	$^{\circ}\text{C}$

Isolation Properties

Isolation voltage	V_{isol}	DC Test Voltage* $t_p = 2\text{ s}$	6000	V
Creepage distance			>12,7	mm
Clearance			8,89	mm
Comparative Tracking Index	CTI		≥ 600	

*100 % tested in production



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10-EZ122PC050M7-PL37F78T
datasheet

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		

AC Switch

Static

Gate-emitter threshold voltage	$V_{GE(th)}$		10	0,005	25	5,4	6	6,6	V
Collector-emitter saturation voltage	$V_{CE(sat)}$	15		50	25 125 150		1,55 1,77 1,83	1,9 ⁽¹⁾	V
Collector-emitter cut-off current	I_{CES}	0	1200		25			0,09	mA
Gate-emitter leakage current	I_{GES}	20	0		25			0,5	μA
Internal gate resistance	r_g						None		Ω
Input capacitance	C_{ies}						10000		pF
Output capacitance	C_{oes}	0	10		25		350		pF
Reverse transfer capacitance	C_{res}						130		pF
Gate charge	Q_g	$V_{CC} = 600$ V	0/15		50	25	380		nC

Thermal

Thermal resistance junction to sink ⁽²⁾	$R_{th(j-s)}$	$\lambda_{paste} = 3,4$ W/mK (PSX)					0,77		K/W
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Dynamic⁽³⁾

Turn-on delay time	$t_{d(on)}$	$R_{gon} = 8$ Ω $R_{goff} = 8$ Ω	±15	600	50	25	169,67		ns
						125	167,73		
						150	166,23		
Rise time	t_r					25	41,88		
						125	42,96		
						150	44,35		
Turn-off delay time	$t_{d(off)}$					25	178,83		
						125	206,75		
		150	213,27						
Fall time	t_f					25	86,94		ns
						125	116,65		
						150	122,12		
Turn-on energy (per pulse)	E_{on}	$Q_{tFWD} = 4,29$ μC $Q_{tFWD} = 6,88$ μC $Q_{tFWD} = 7,76$ μC				25	4,09		mWs
						125	5,24		
						150	5,56		
Turn-off energy (per pulse)	E_{off}					25	3,62		mWs
						125	5,02		
						150	5,36		



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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		

AC Diode

Static

Forward voltage	V_F				50	25 125 150		1,66 1,78 1,79	2,1 ⁽¹⁾	V
Reverse leakage current	I_R	$V_r = 1200$ V				25			40	μA

Thermal

Thermal resistance junction to sink ⁽²⁾	$R_{th(j-s)}$	$\lambda_{paste} = 3,4$ W/mK (PSX)						1,18		K/W
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Dynamic⁽³⁾

Peak recovery current	I_{RM}					25 125 150		32,43 34,78 35,94		A
Reverse recovery time	t_{rr}					25 125 150		319,46 458,54 502,29		ns
Recovered charge	Q_r	$di/dt=1081$ A/μs $di/dt=842$ A/μs $di/dt=927$ A/μs	±15	600	50	25 125 150		4,29 6,88 7,76		μC
Reverse recovered energy	E_{rec}					25 125 150		1,46 2,48 2,83		mWs
Peak rate of fall of recovery current	$(di_r/dt)_{max}$					25 125 150		355,16 177,19 151,97		A/μs



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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 R100	$A_{R/R}$	$R_{100} = 499 \Omega$			100	3,2		3,3	%
Power dissipation	P				25		130		mW
Power dissipation constant	d				25		1,3		mW/K
B-value	$B_{(25/50)}$	Tol. $\pm 1 \%$					3380		K
Vincotech Thermistor Reference								V	

(1) Value at chip level

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

(3) The dynamic characterization was measured in a normal half-bridge configuration, which combines two 10-EZ122PC050M7-PL37F78T modules. Please consider, that the commutation loop in this configuration takes place between both modules.



AC Switch Characteristics

figure 1. IGBT

Typical output characteristics
 $I_C = f(V_{CE})$

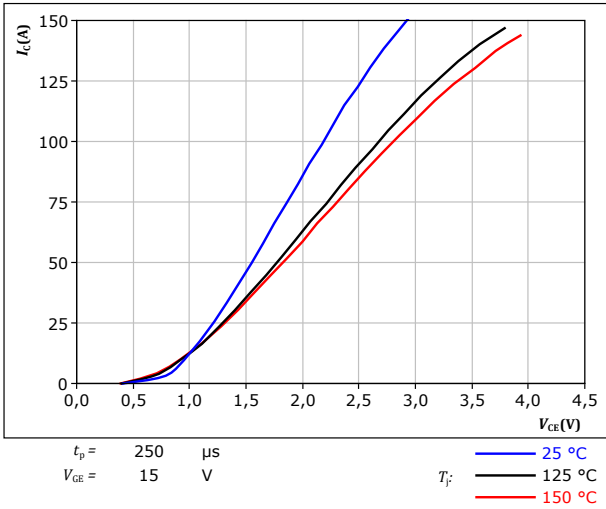


figure 2. IGBT

Typical output characteristics
 $I_C = f(V_{CE})$

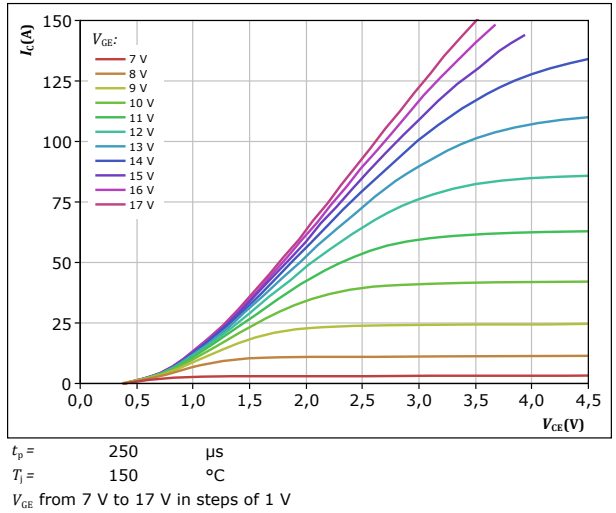


figure 3. IGBT

Typical transfer characteristics
 $I_C = f(V_{GE})$

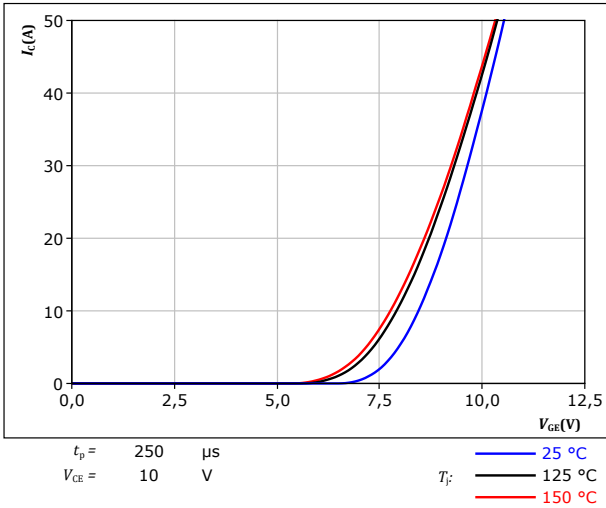
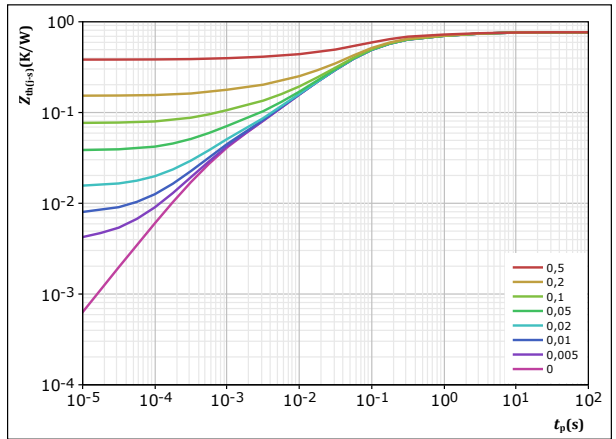


figure 4. IGBT

Transient thermal impedance as a function of pulse width
 $Z_{th(j-s)} = f(t_p)$



$D = t_p / T$
 $R_{th(j-s)} = 0,766 \text{ K/W}$

IGBT thermal model values

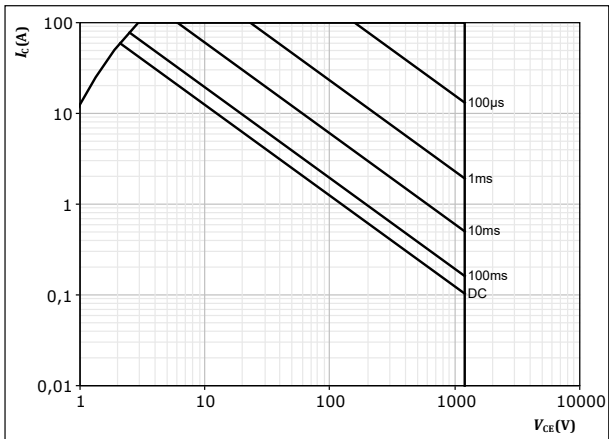
R (K/W)	τ (s)
4,42E-02	4,45E+00
9,11E-02	9,15E-01
2,73E-01	1,28E-01
2,59E-01	4,34E-02
6,73E-02	6,94E-03
3,15E-02	6,91E-04



AC Switch Characteristics

figure 5. IGBT

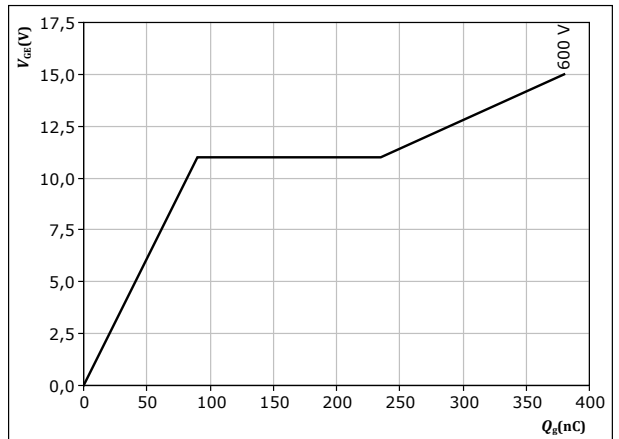
Safe operating area
 $I_C = f(V_{CE})$



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

figure 6. IGBT

Gate voltage vs gate charge
 $V_{GE} = f(Q_g)$



$I_C = 50$ A
 $T_j = 25$ °C



AC Diode Characteristics

figure 7. FWD

Typical forward characteristics

$$I_F = f(V_F)$$

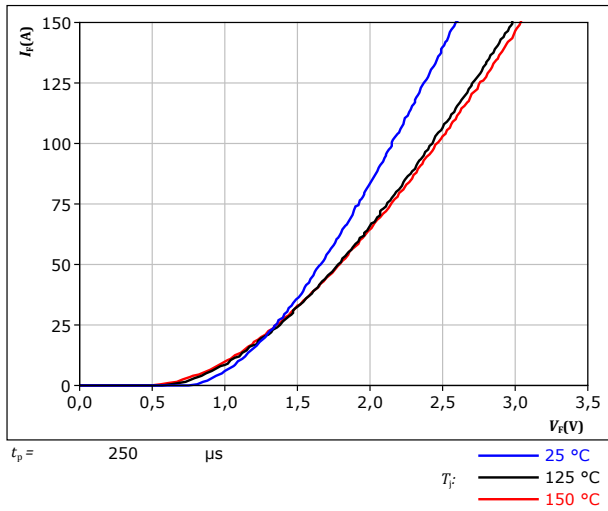
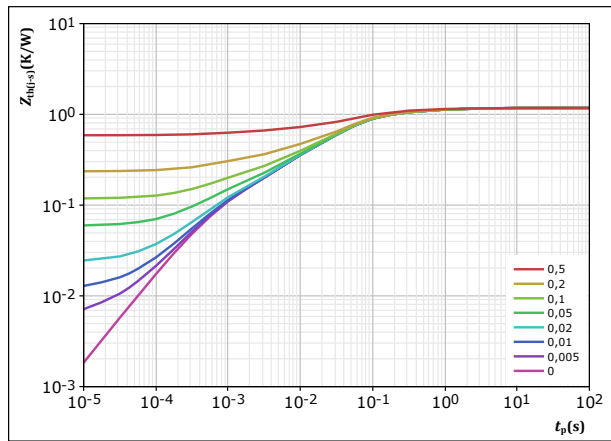


figure 8. FWD

Transient thermal impedance as a function of pulse width

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



$D = t_p / T$
 $R_{th(j-s)} = 1,176 \text{ K/W}$
 FWD thermal model values

R (K/W)	τ (s)
5,11E-02	2,77E+00
1,82E-01	3,47E-01
6,76E-01	5,08E-02
1,81E-01	6,27E-03
8,64E-02	6,09E-04

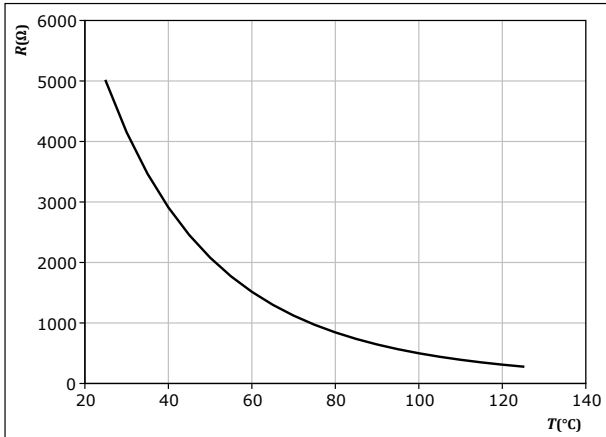


Thermistor Characteristics

figure 9. Thermistor

Typical NTC characteristic as function of temperature

$$R_T = f(T)$$

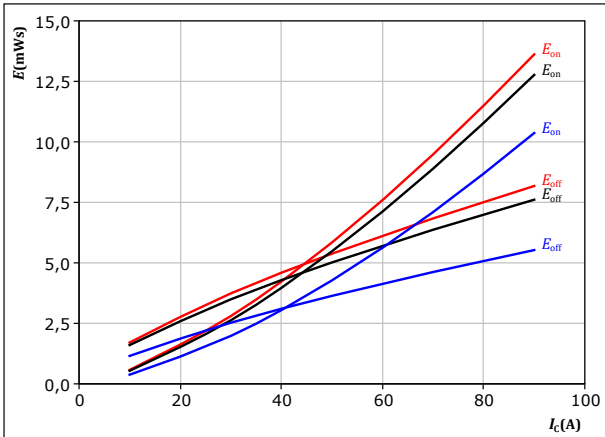




AC Switching Characteristics

figure 10. IGBT

Typical switching energy losses as a function of collector current
 $E = f(I_c)$

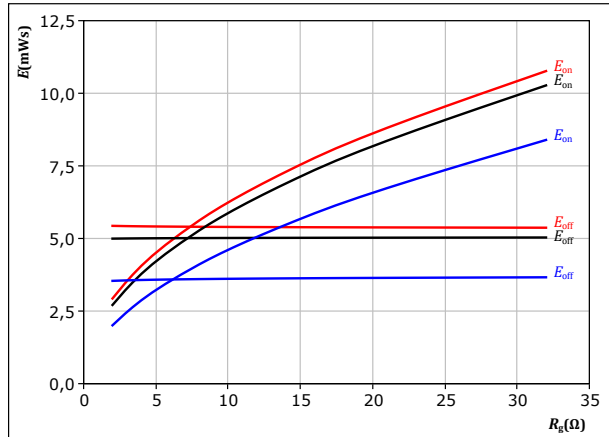


With an inductive load at

$V_{CE} =$	600	V	$T_j:$	25 °C
$V_{GE} =$	±15	V		125 °C
$R_{g(on)} =$	8	Ω		150 °C
$R_{g(off)} =$	8	Ω		

figure 11. IGBT

Typical switching energy losses as a function of IGBT turn on gate resistor
 $E = f(R_g)$

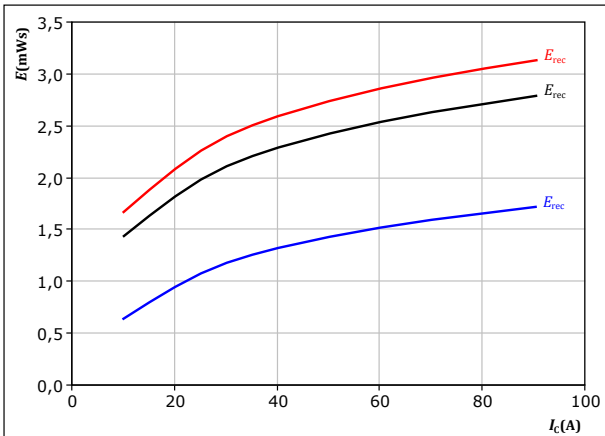


With an inductive load at

$V_{CE} =$	600	V	$T_j:$	25 °C
$V_{GE} =$	±15	V		125 °C
$I_c =$	50	A		150 °C

figure 12. FWD

Typical reverse recovered energy loss as a function of collector current
 $E_{rec} = f(I_c)$

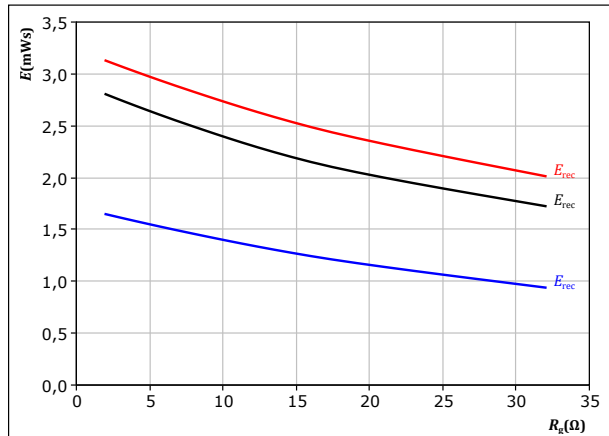


With an inductive load at

$V_{CE} =$	600	V	$T_j:$	25 °C
$V_{GE} =$	±15	V		125 °C
$R_{g(on)} =$	8	Ω		150 °C

figure 13. FWD

Typical reverse recovered energy loss as a function of IGBT turn on gate resistor
 $E_{rec} = f(R_g)$



With an inductive load at

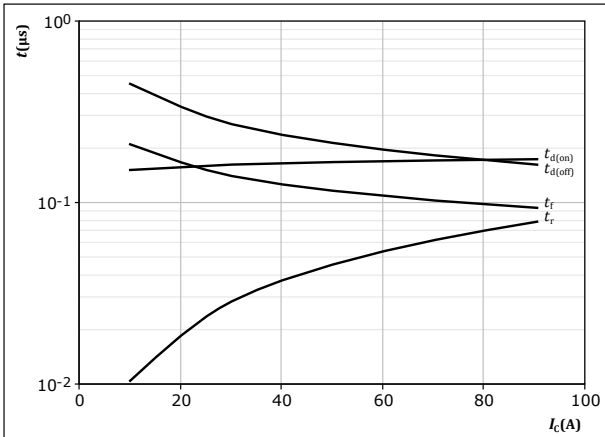
$V_{CE} =$	600	V	$T_j:$	25 °C
$V_{GE} =$	±15	V		125 °C
$I_c =$	50	A		150 °C



AC Switching Characteristics

figure 14. IGBT

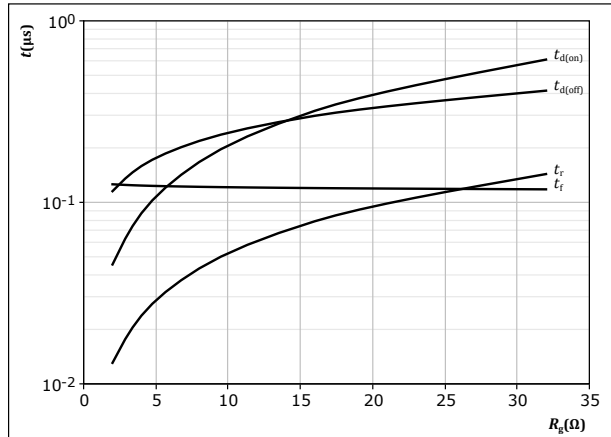
Typical switching times as a function of collector current
 $t = f(I_c)$



With an inductive load at
 $T_j = 150 \text{ }^\circ\text{C}$
 $V_{CE} = 600 \text{ V}$
 $V_{GE} = \pm 15 \text{ V}$
 $R_{gon} = 8 \text{ } \Omega$
 $R_{goff} = 8 \text{ } \Omega$

figure 15. IGBT

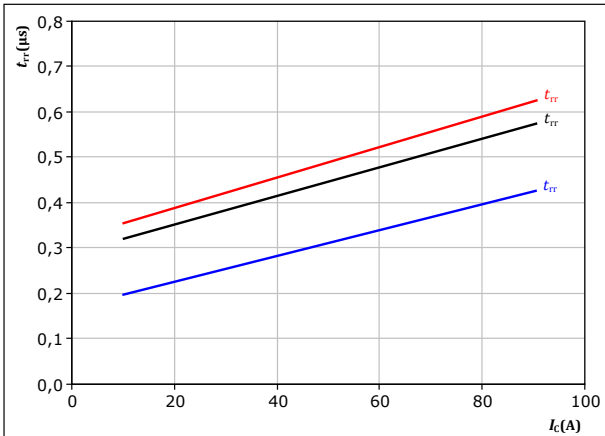
Typical switching times as a function of IGBT turn on gate resistor
 $t = f(R_g)$



With an inductive load at
 $T_j = 150 \text{ }^\circ\text{C}$
 $V_{CE} = 600 \text{ V}$
 $V_{GE} = \pm 15 \text{ V}$
 $I_c = 50 \text{ A}$

figure 16. FWD

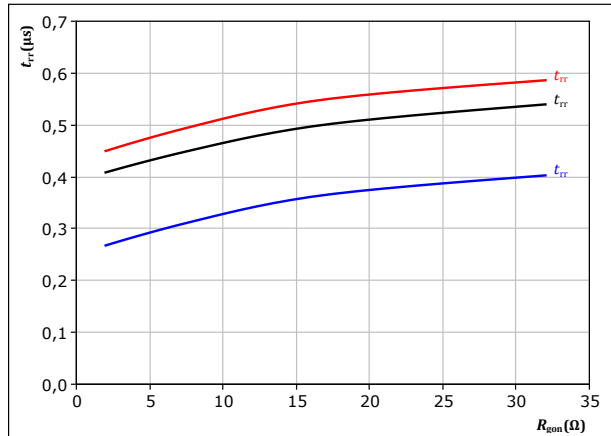
Typical reverse recovery time as a function of collector current
 $t_{rr} = f(I_c)$



With an inductive load at
 $V_{CE} = 600 \text{ V}$
 $V_{GE} = \pm 15 \text{ V}$
 $R_{gon} = 8 \text{ } \Omega$
 T_j : 25 $^\circ\text{C}$ (blue), 125 $^\circ\text{C}$ (black), 150 $^\circ\text{C}$ (red)

figure 17. FWD

Typical reverse recovery time as a function of IGBT turn on gate resistor
 $t_{rr} = f(R_{gon})$



With an inductive load at
 $V_{CE} = 600 \text{ V}$
 $V_{GE} = \pm 15 \text{ V}$
 $I_c = 50 \text{ A}$
 T_j : 25 $^\circ\text{C}$ (blue), 125 $^\circ\text{C}$ (black), 150 $^\circ\text{C}$ (red)

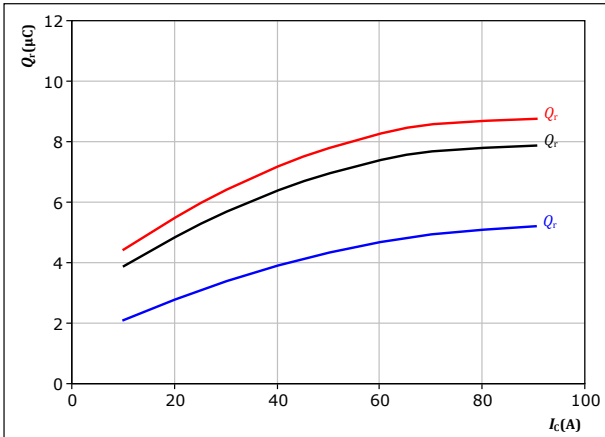


AC Switching Characteristics

figure 18. FWD

Typical recovered charge as a function of collector current

$$Q_r = f(I_c)$$



With an inductive load at

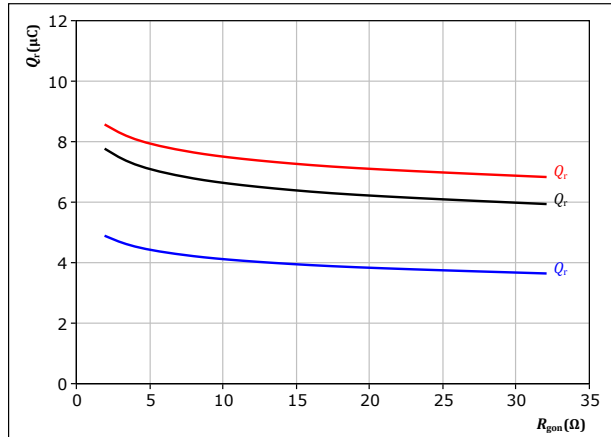
$V_{CE} = 600$ V
 $V_{GE} = \pm 15$ V
 $R_{gon} = 8$ Ω

T_j : — 25 °C
— 125 °C
— 150 °C

figure 19. FWD

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

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



With an inductive load at

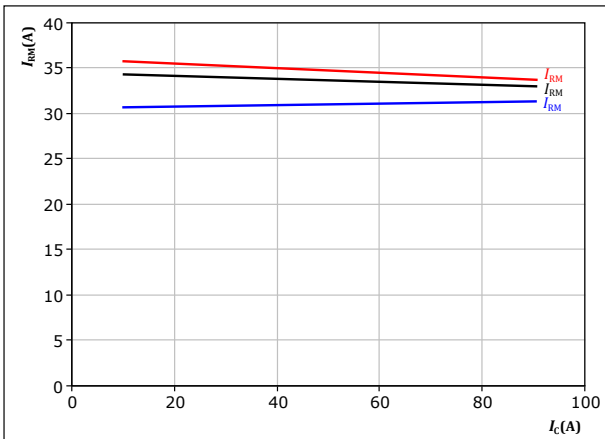
$V_{CE} = 600$ V
 $V_{GE} = \pm 15$ V
 $I_c = 50$ A

T_j : — 25 °C
— 125 °C
— 150 °C

figure 20. FWD

Typical peak reverse recovery current as a function of collector current

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



With an inductive load at

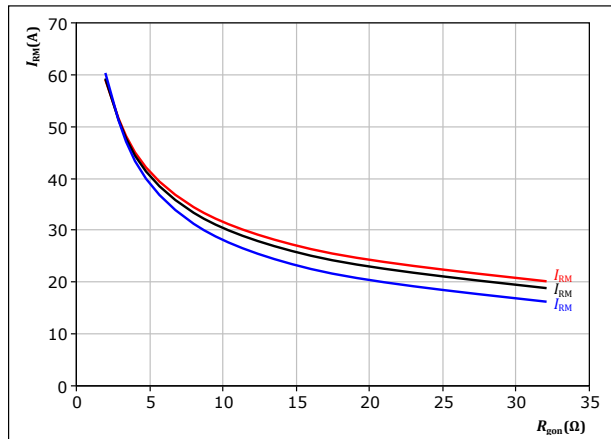
$V_{CE} = 600$ V
 $V_{GE} = \pm 15$ V
 $R_{gon} = 8$ Ω

T_j : — 25 °C
— 125 °C
— 150 °C

figure 21. 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
 $I_c = 50$ A

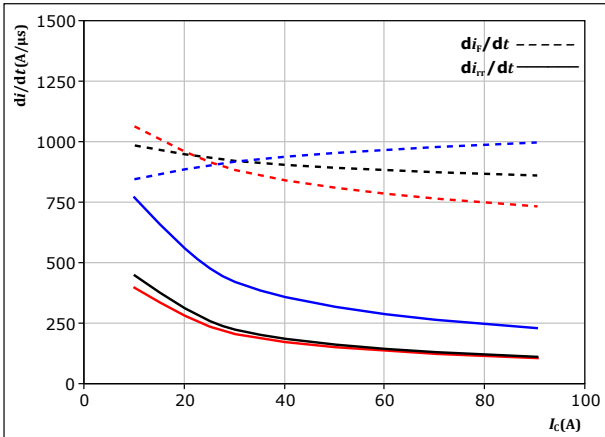
T_j : — 25 °C
— 125 °C
— 150 °C



AC Switching Characteristics

figure 22. FWD

Typical rate of fall of forward and reverse recovery current as a function of collector current
 $di_f/dt, di_r/dt = f(I_c)$



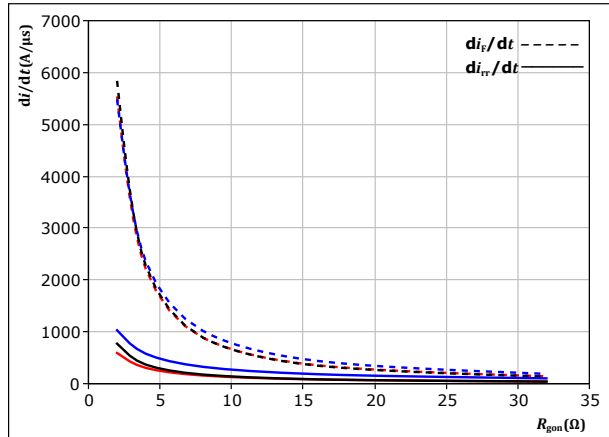
With an inductive load at

$V_{CE} = 600 \text{ V}$
 $V_{GE} = \pm 15 \text{ V}$
 $R_{gon} = 8 \ \Omega$

$T_j = 25 \text{ }^\circ\text{C}$
 $125 \text{ }^\circ\text{C}$
 $150 \text{ }^\circ\text{C}$

figure 23. FWD

Typical rate of fall of forward and reverse recovery current as a function of turn on gate resistor
 $di_f/dt, di_r/dt = f(R_{gon})$



With an inductive load at

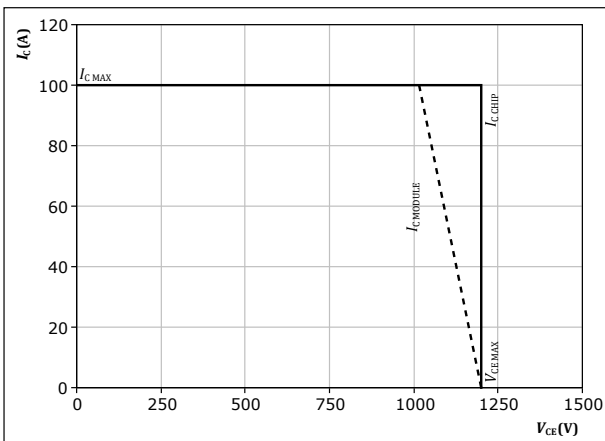
$V_{CE} = 600 \text{ V}$
 $V_{GE} = \pm 15 \text{ V}$
 $I_c = 50 \text{ A}$

$T_j = 25 \text{ }^\circ\text{C}$
 $125 \text{ }^\circ\text{C}$
 $150 \text{ }^\circ\text{C}$

figure 24. IGBT

Reverse bias safe operating area

$I_c = f(V_{CE})$



At $T_j = 150 \text{ }^\circ\text{C}$
 $R_{gon} = 8 \ \Omega$
 $R_{goff} = 8 \ \Omega$



AC Switching Definitions

figure 25. IGBT

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

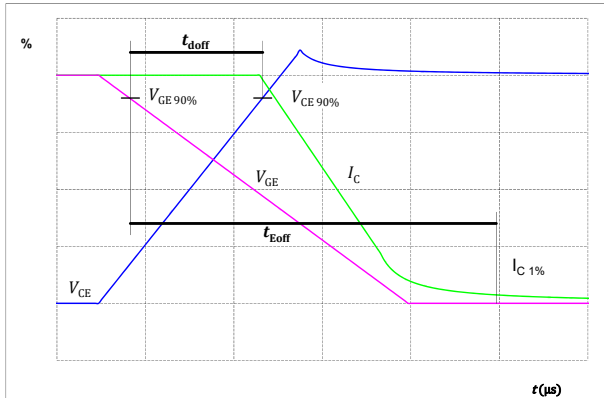


figure 26. IGBT

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

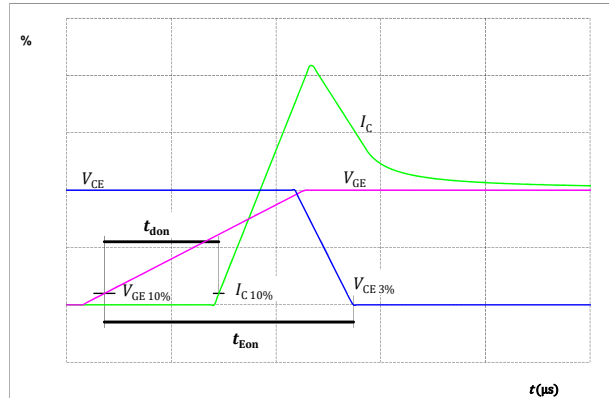


figure 27. IGBT

Turn-off Switching Waveforms & definition of t_f

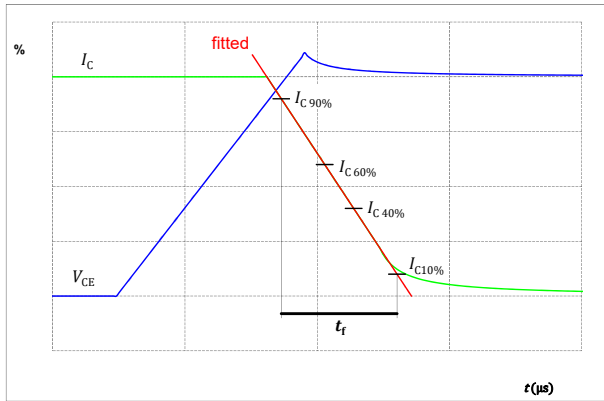
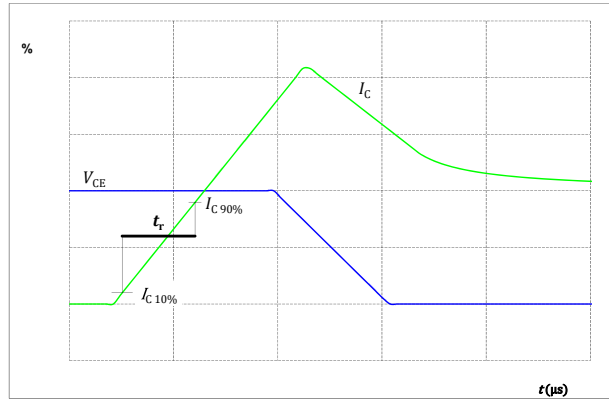


figure 28. IGBT

Turn-on Switching Waveforms & definition of t_r





AC Switching Definitions

figure 29. FWD

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

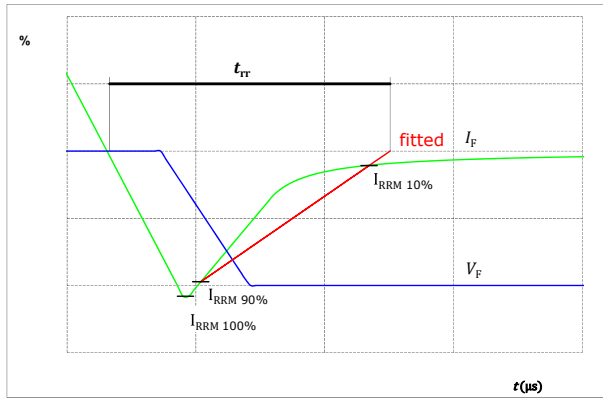
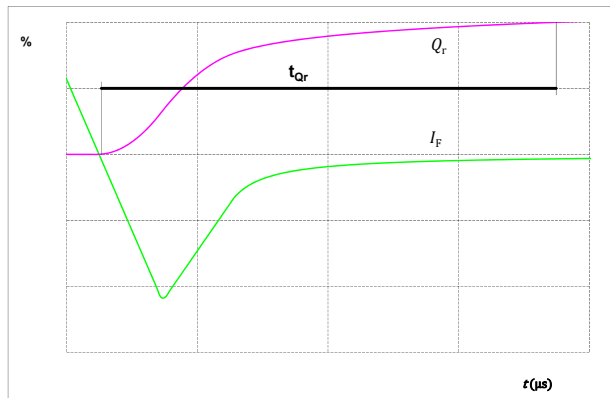


figure 30. FWD

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




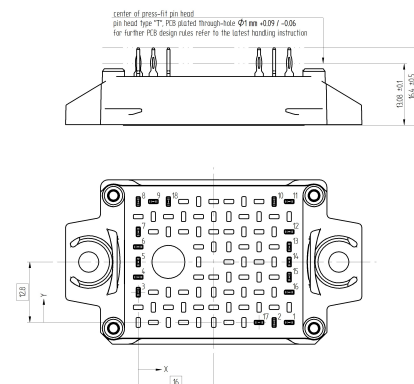


Vincotech

10-EZ122PC050M7-PL37F78T
datasheet

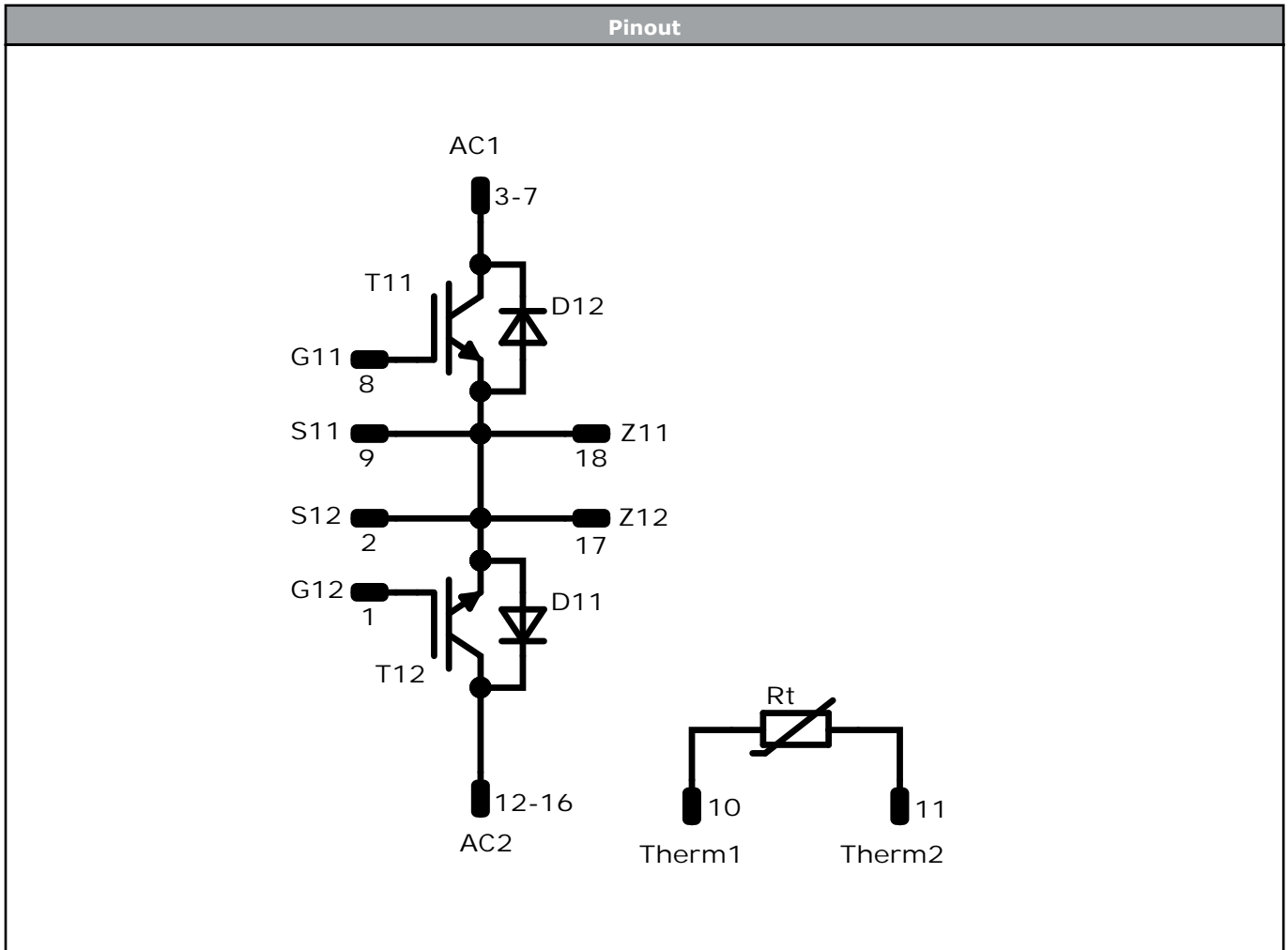
Ordering Code	
Version	Ordering Code
Without thermal paste	10-EZ122PC050M7-PL37F78T
With thermal paste (3,4 W/mK, PSX-P7)	10-EZ122PC050M7-PL37F78T-/3/

Marking						
	Text	Name NN-NNNNNNNNNNNNNN- TTTTTV	Date code WWYY	UL & VIN UL VIN	Lot LLLLL	Serial SSSS
	Datamatrix	Type&Ver TTTTTTTV	Lot number LLLLL	Serial SSSS	Date code WWYY	

Outline																																																																																				
<table border="1"> <thead> <tr> <th colspan="4">Pin table [mm]</th> </tr> <tr> <th>Pin</th> <th>X</th> <th>Y</th> <th>Function</th> </tr> </thead> <tbody> <tr><td>1</td><td>32</td><td>0</td><td>G12</td></tr> <tr><td>2</td><td>28,8</td><td>0</td><td>S12</td></tr> <tr><td>3</td><td>0</td><td>6,4</td><td>AC1</td></tr> <tr><td>4</td><td>0</td><td>9,6</td><td>AC1</td></tr> <tr><td>5</td><td>0</td><td>12,8</td><td>AC1</td></tr> <tr><td>6</td><td>0</td><td>16</td><td>AC1</td></tr> <tr><td>7</td><td>0</td><td>19,2</td><td>AC1</td></tr> <tr><td>8</td><td>0</td><td>25,6</td><td>G11</td></tr> <tr><td>9</td><td>3,2</td><td>25,6</td><td>S11</td></tr> <tr><td>10</td><td>28,8</td><td>25,6</td><td>Therm1</td></tr> <tr><td>11</td><td>32</td><td>25,6</td><td>Therm2</td></tr> <tr><td>12</td><td>32</td><td>19,2</td><td>AC2</td></tr> <tr><td>13</td><td>32</td><td>16</td><td>AC2</td></tr> <tr><td>14</td><td>32</td><td>12,8</td><td>AC2</td></tr> <tr><td>15</td><td>32</td><td>9,6</td><td>AC2</td></tr> <tr><td>16</td><td>32</td><td>6,4</td><td>AC2</td></tr> <tr><td>17</td><td>25,6</td><td>0</td><td>Z12</td></tr> <tr><td>18</td><td>6,4</td><td>25,6</td><td>Z11</td></tr> </tbody> </table>					Pin table [mm]				Pin	X	Y	Function	1	32	0	G12	2	28,8	0	S12	3	0	6,4	AC1	4	0	9,6	AC1	5	0	12,8	AC1	6	0	16	AC1	7	0	19,2	AC1	8	0	25,6	G11	9	3,2	25,6	S11	10	28,8	25,6	Therm1	11	32	25,6	Therm2	12	32	19,2	AC2	13	32	16	AC2	14	32	12,8	AC2	15	32	9,6	AC2	16	32	6,4	AC2	17	25,6	0	Z12	18	6,4	25,6	Z11
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 <p>center of press-fit pin head pin head type "T", PCB plated through-hole Ø1 mm ±0,05 / -0,06 for further P&S design rules refer to the latest handling instruction</p> <p>Tolerance of positions: ±0,1mm at the end of pin Dimension of coordinate axis is only effect without tolerance</p>																																																																																				



Vincotech



Identification					
ID	Component	Voltage	Current	Function	Comment
T11, T12	IGBT	1200 V	50 A	AC Switch	
D12, D11	FWD	1200 V	50 A	AC Diode	
Rt	Thermistor			Thermistor	



Packaging instruction				
Standard packaging quantity (SPQ) 100	>SPQ	Standard	<SPQ	Sample

Handling instruction
Handling instructions for <i>flow</i> E1 packages see vincotech.com website.

Package data
Package data for <i>flow</i> E1 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 UL 1557 recognized under E192116 up to a junction temperature under switching condition $T_{j,op}=175^{\circ}C$ and up to 3500VAC/1min isolation voltage. For more information see vincotech.com website.



Document No.:	Date:	Modification:	Pages
10-EZ122PC050M7-PL37F78T-D1-14	12 Apr. 2024		

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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.