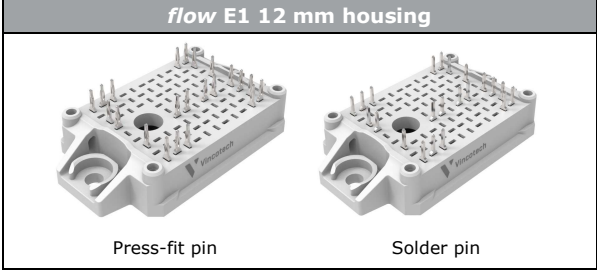
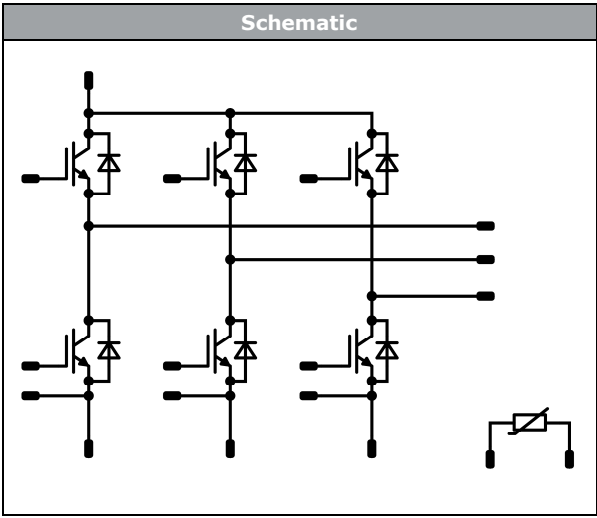




<i>flowPACK E1</i>	1200 V / 25 A
<div style="background-color: #eee; padding: 5px; margin-bottom: 5px;">Features</div> <ul style="list-style-type: none"> IGBT M7 with low V_{CEsat} and improved EMC behavior Standard industrial housing Optimized $R_{th(j-s)}$ with Phase Change Material Built-in NTC 	<div style="background-color: #eee; padding: 5px; margin-bottom: 5px;">flow E1 12 mm housing</div> <div style="text-align: center;">  <p style="display: flex; justify-content: space-around; margin-top: 5px;"> Press-fit pin Solder pin </p> </div>
<div style="background-color: #eee; padding: 5px; margin-bottom: 5px;">Target applications</div> <ul style="list-style-type: none"> Industrial Drives 	<div style="background-color: #eee; padding: 5px; margin-bottom: 5px;">Schematic</div> 
<div style="background-color: #eee; padding: 5px; margin-bottom: 5px;">Types</div> <ul style="list-style-type: none"> 10-EZ126PA025M7-L858F78T 10-E1126PA025M7-L858F78Z 	

Maximum Ratings

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

Parameter	Symbol	Condition	Value	Unit
Inverter Switch				
Collector-emitter voltage	V_{CES}		1200	V
Collector current	I_C		25	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}	50	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	79	W
Gate-emitter voltage	V_{GES}		±20	V
Short circuit ratings	t_{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	°C



Maximum Ratings

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

Parameter	Symbol	Condition	Value	Unit
Inverter Diode				
Peak repetitive reverse voltage	V_{RRM}		1200	V
Continuous (direct) forward current	I_F		25	A
Repetitive peak forward current	I_{FRM}	T_j limited by T_{jmax}	50	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	71	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			min. 12,7	mm
Clearance		with solder pins	8,62	mm
		with Press-fit pins	8,62	mm
Comparative Tracking Index	CTI		≥ 600	

*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		
Inverter Switch										
Static										
Gate-emitter threshold voltage	$V_{GE(th)}$		10	0,0025	25	5,4	6,0	6,6	V	
Collector-emitter saturation voltage	V_{CESat}	15		25	25 125 150		1,65 1,89 1,95	2,15	V	
Collector-emitter cut-off current	I_{CES}	0	1200		25			70	μA	
Gate-emitter leakage current	I_{GES}	20	0		25			500	nA	
Internal gate resistance	r_g						none		Ω	
Input capacitance	C_{ies}						4800		pF	
Output capacitance	C_{oes}	0	10		25		170			
Reverse transfer capacitance	C_{res}						57			
Gate charge	Q_g	15	600	25	25		180		nC	
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	$\lambda_{paste} = 3,4$ W/mK (PSX)					1,20		K/W	
Dynamic										
Turn-on delay time	$t_{d(on)}$	$R_{gon} = 16$ Ω $R_{goff} = 16$ Ω	±15	600	25	25		147	ns	
Rise time	t_r					125		149		
						150		145		
						25		29		
Turn-off delay time	$t_{d(off)}$					125		33		
						150		34		
		25		171						
Fall time	t_f	125		191						
		150		196						
		25		95						
Turn-on energy (per pulse)*	E_{on}	$Q_{tFWD} = 2,5$ μC $Q_{tFWD} = 3,9$ μC $Q_{tFWD} = 4,3$ μC				25		2,06	mWs	
						125		2,66		
						150		2,82		
Turn-off energy (per pulse)*	E_{off}					25		1,67		
						125		2,18		
						150		2,29		

* $L_s = 14$ nH



Characteristic Values

Parameter	Symbol	Conditions					Value			Unit
		V_{GE} [V]	V_{CE} [V]	I_C [A]	T_j [°C]	Min	Typ	Max		

Inverter Diode

Static

Parameter	Symbol	V_{GS} [V]	V_{DS} [V]	I_D [A]	T_j [°C]	Min	Typ	Max	Unit
Forward voltage	V_F			25	25 125 150		1,63 1,70 1,69	2,1	V
Reverse leakage current	I_R		1200		25			35	μA

Thermal

Parameter	Symbol	Conditions	Value	Unit
Thermal resistance junction to sink	$R_{th(j-s)}$	$\lambda_{paste} = 3,4$ W/mK (PSX)	1,34	K/W

Dynamic

Parameter	Symbol	V_{GS} [V]	V_{DS} [V]	I_D [A]	T_j [°C]	Min	Typ	Max	Unit
Peak recovery current	I_{RRM}				25 125 150		21 23 23		A
Reverse recovery time	t_{rr}				25 125 150		254 367 404		ns
Recovered charge	Q_r			±15	600	25	2,54 3,88 4,28		μC
Reverse recovered energy	E_{rec}					25 125 150	0,884 1,45 1,61		mWs
Peak rate of fall of recovery current	$(di_{rr}/dt)_{max}$					25 125 150	217 134 132		A/μs

Thermistor

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

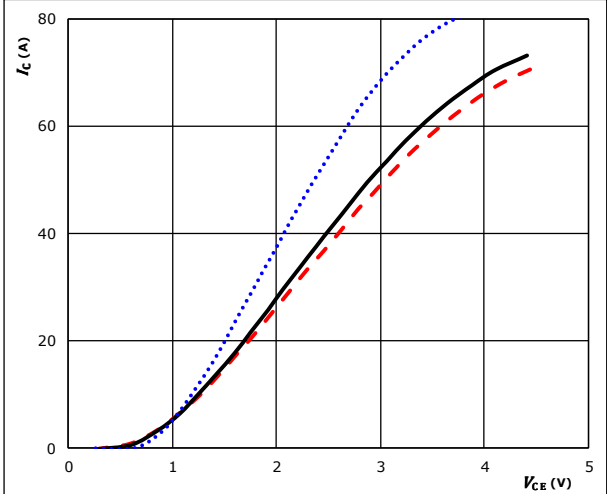


Inverter Switch Characteristics

figure 1. IGBT

Typical output characteristics

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

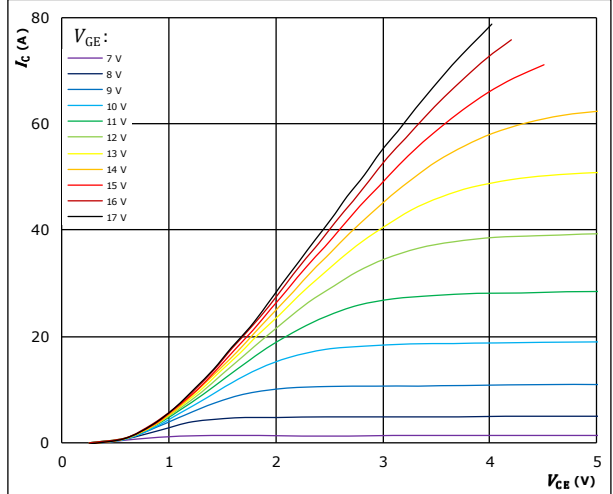


$t_p = 250 \mu\text{s}$ $T_j: 25 \text{ }^\circ\text{C}$ (dotted blue)
 $V_{GE} = 15 \text{ V}$ $T_j: 125 \text{ }^\circ\text{C}$ (solid black)
 $T_j: 150 \text{ }^\circ\text{C}$ (dashed red)

figure 2. IGBT

Typical output characteristics

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

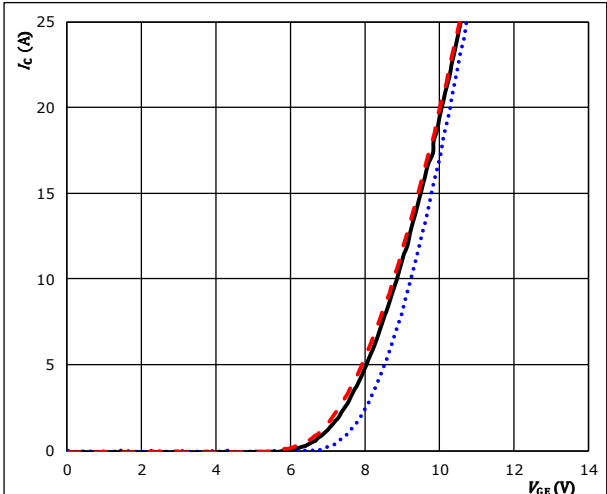


$t_p = 250 \mu\text{s}$ $T_j = 125 \text{ }^\circ\text{C}$
 V_{GE} from 7 V to 17 V in steps of 1 V

figure 3. IGBT

Typical transfer characteristics

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

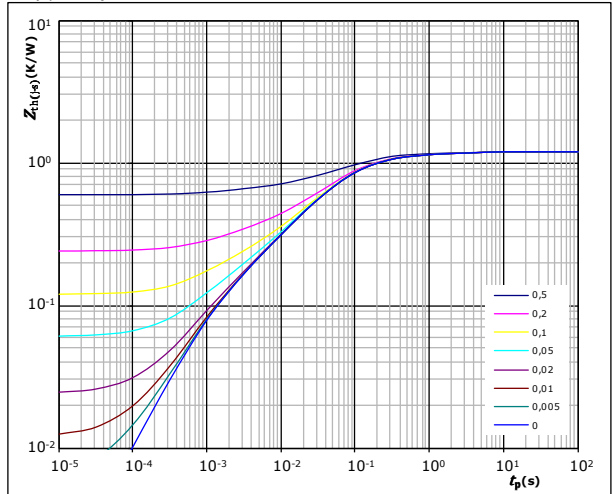


$t_p = 100 \mu\text{s}$ $T_j: 25 \text{ }^\circ\text{C}$ (dotted blue)
 $V_{CE} = 10 \text{ V}$ $T_j: 125 \text{ }^\circ\text{C}$ (solid black)
 $T_j: 150 \text{ }^\circ\text{C}$ (dashed red)

figure 4. IGBT

Transient thermal impedance as function of pulse duration

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



$D = t_p / T$
 $R_{th(j-s)} = 1,20 \text{ K/W}$

IGBT thermal model values

R (K/W)	τ (s)
7,19E-02	2,96E+00
1,76E-01	3,16E-01
6,46E-01	6,48E-02
2,16E-01	1,08E-02
8,54E-02	1,15E-03

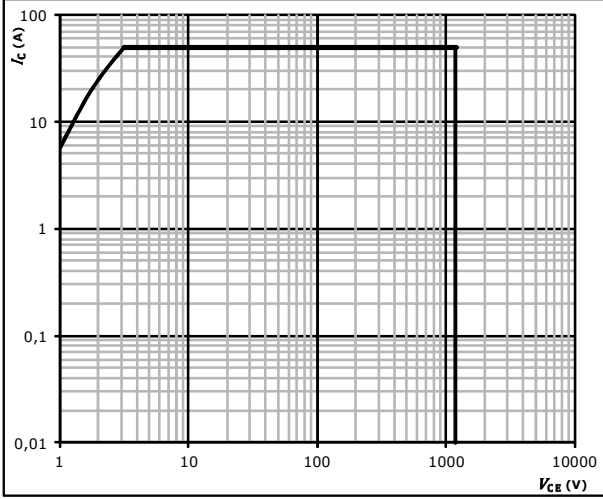


Inverter Switch Characteristics

figure 5. IGBT

Safe operating area

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



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

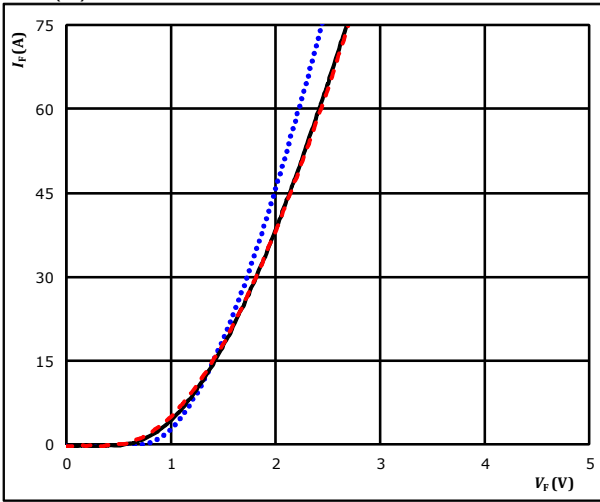


Inverter Diode Characteristics

figure 1. FWD

Typical forward characteristics

$$I_F = f(V_F)$$

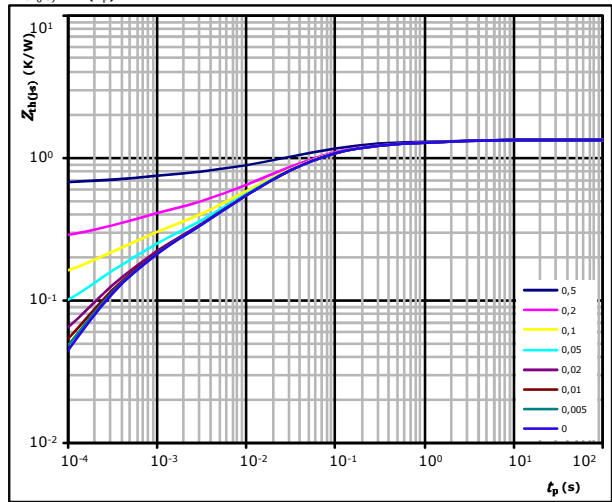


$t_p = 250 \mu s$ T_j : 25 °C
 125 °C ———
 150 °C - - - -

figure 2. FWD

Transient thermal impedance as a function of pulse width

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



$D = t_p / T$
 $R_{th(j-s)} = 1,34 \text{ K/W}$
 FWD thermal model values

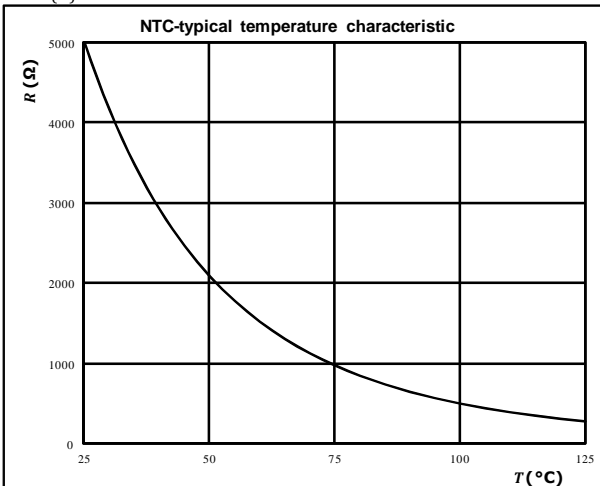
$R \text{ (K/W)}$	$\tau \text{ (s)}$
7,90E-02	2,29E+00
1,38E-01	2,89E-01
5,15E-01	5,53E-02
3,34E-01	1,22E-02
1,30E-01	2,48E-03
1,40E-01	3,42E-04

Thermistor Characteristics

figure 1. Thermistor

Typical NTC characteristic
 as a function of temperature

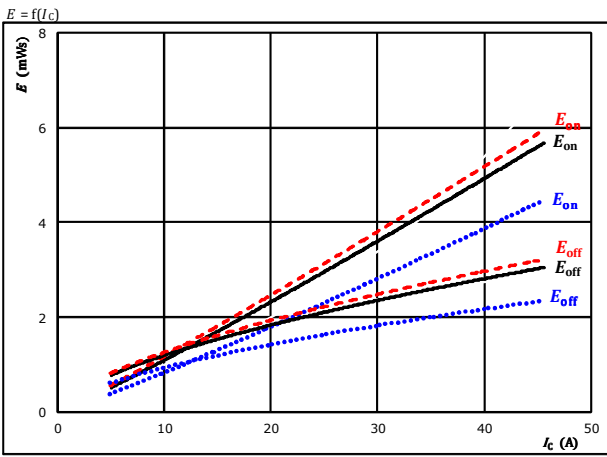
$$R = f(T)$$





Inverter Switching Characteristics

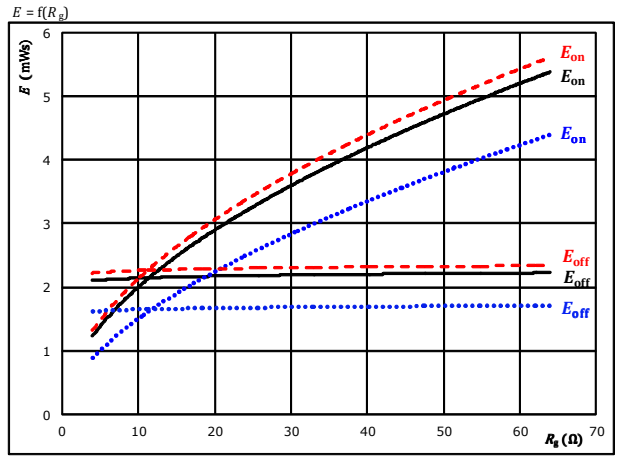
figure 1. IGBT
 Typical switching energy losses as a function of collector current



With an inductive load at
 $V_{CE} = 600$ V
 $V_{GE} = \pm 15$ V
 $R_{gon} = 16$ Ω
 $R_{goff} = 16$ Ω

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

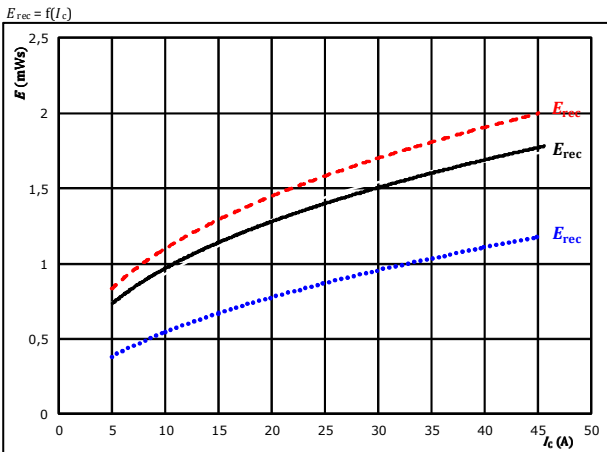
figure 2. IGBT
 Typical switching energy losses as a function of gate resistor



With an inductive load at
 $V_{CE} = 600$ V
 $V_{GE} = \pm 15$ V
 $I_C = 25$ A

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

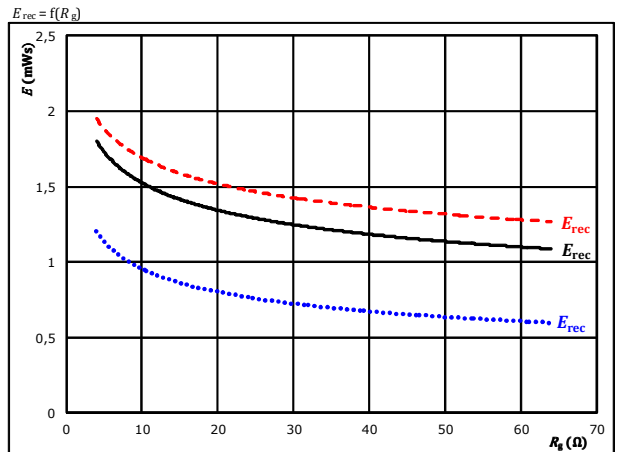
figure 3. FWD
 Typical reverse recovered energy loss as a function of collector current



With an inductive load at
 $V_{CE} = 600$ V
 $V_{GE} = \pm 15$ V
 $R_{gon} = 16$ Ω

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

figure 4. FWD
 Typical reverse recovered energy loss as a function of gate resistor



With an inductive load at
 $V_{CE} = 600$ V
 $V_{GE} = \pm 15$ V
 $I_C = 25$ A

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



Inverter Switching Characteristics

figure 5. IGBT
 Typical switching times as a function of collector current

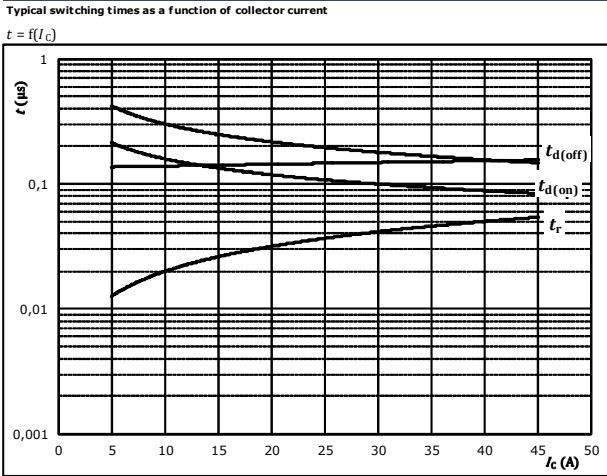


figure 6. IGBT
 Typical switching times as a function of gate resistor

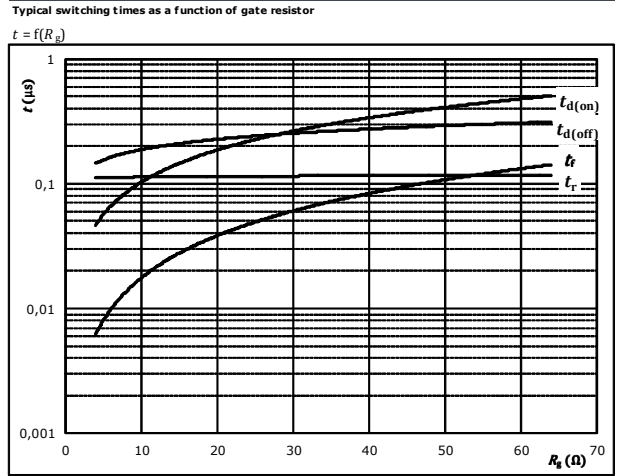


figure 7. FWD
 Typical reverse recovery time as a function of collector current

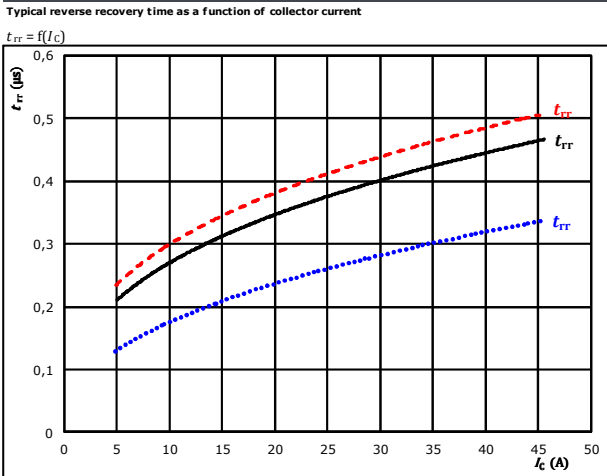
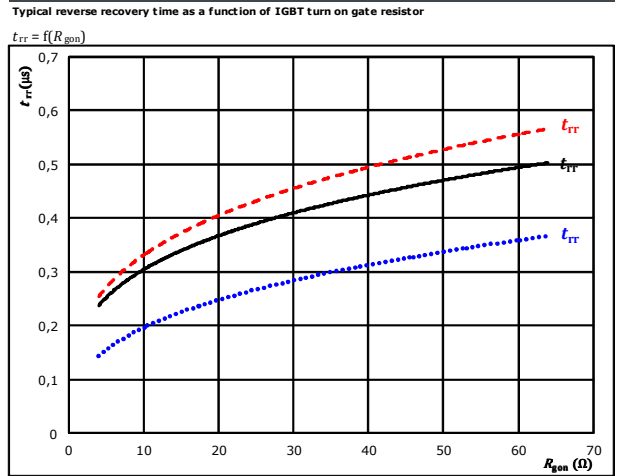


figure 8. FWD
 Typical reverse recovery time as a function of IGBT turn on gate resistor





Inverter Switching Characteristics

figure 9. FWD

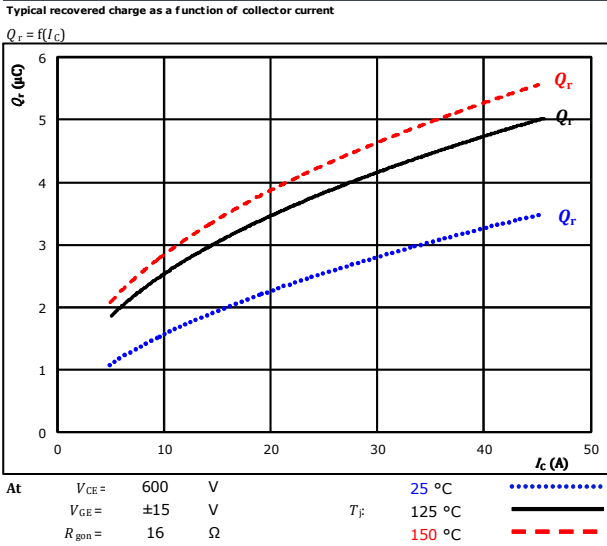


figure 10. FWD

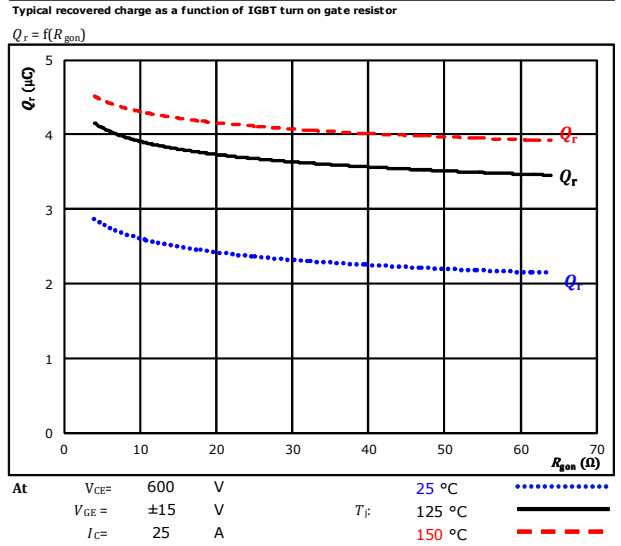


figure 11. FWD

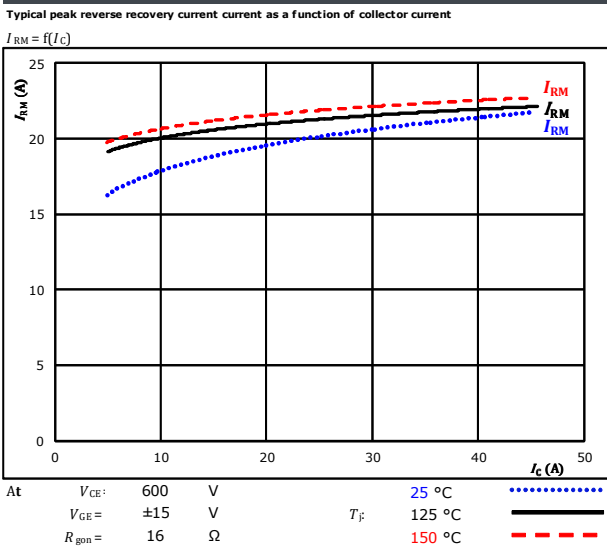
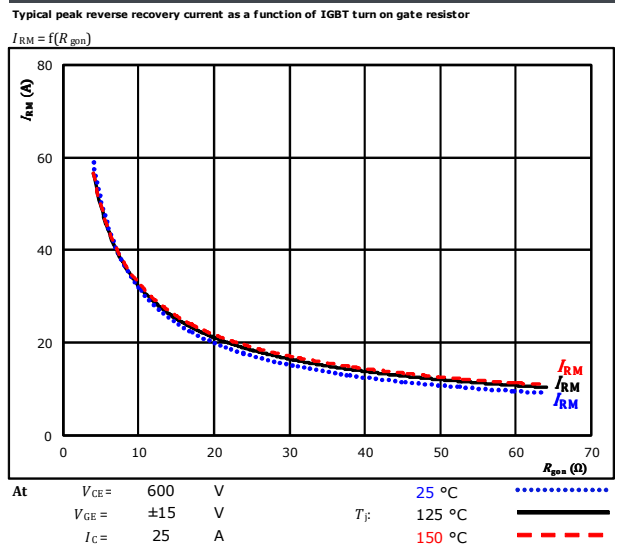


figure 12. FWD

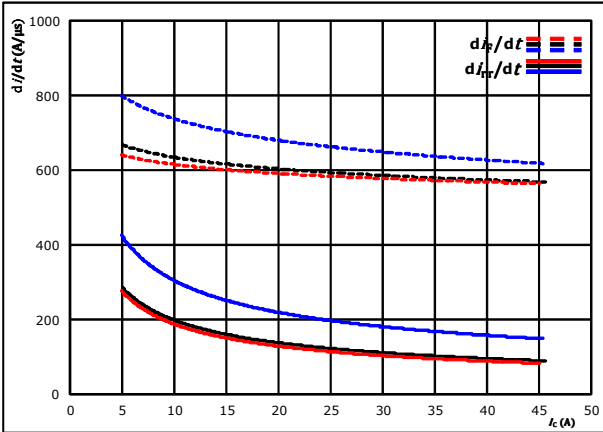




Inverter Switching Characteristics

figure 13. FWD

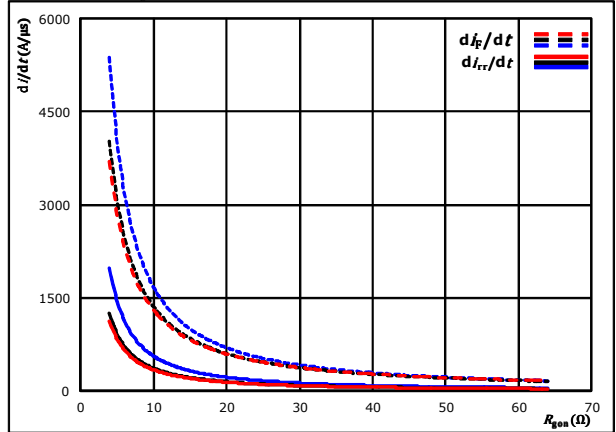
Typical rate of fall of forward and reverse recovery current as a function of collector current
 $di_f/dt, di_{rr}/dt = f(I_c)$



At $V_{CE} = 600$ V $T_j = 25$ °C
 $V_{GE} = \pm 15$ V $T_j = 125$ °C
 $R_{g0n} = 16$ Ω $T_j = 150$ °C

figure 14. FWD

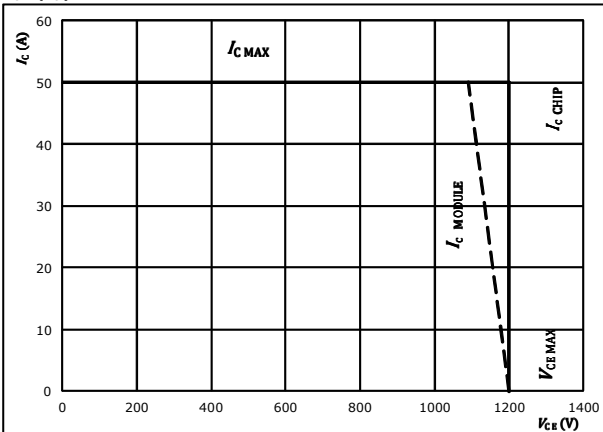
Typical rate of fall of forward and reverse recovery current as a function of IGBT turn on gate resistor
 $di_f/dt, di_{rr}/dt = f(R_{g0n})$



At $V_{CE} = 600$ V $T_j = 25$ °C
 $V_{GE} = \pm 15$ V $T_j = 125$ °C
 $I_c = 25$ A $T_j = 150$ °C

figure 15. IGBT

Reverse bias safe operating area
 $I_c = f(V_{CE})$



At $T_j = 125$ °C
 $R_{g0n} = 16$ Ω
 $R_{g0ff} = 16$ Ω

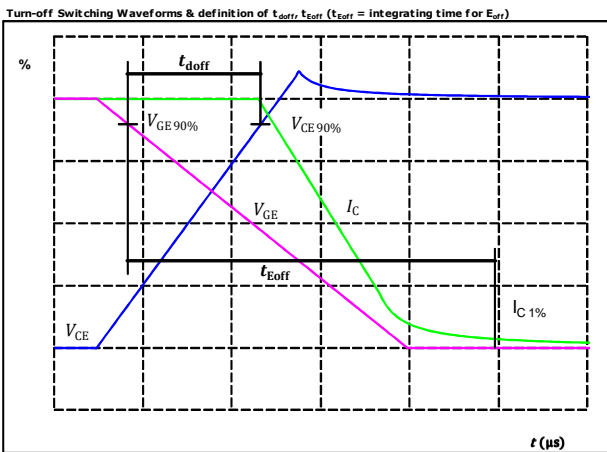


Inverter Switching Definitions

General conditions

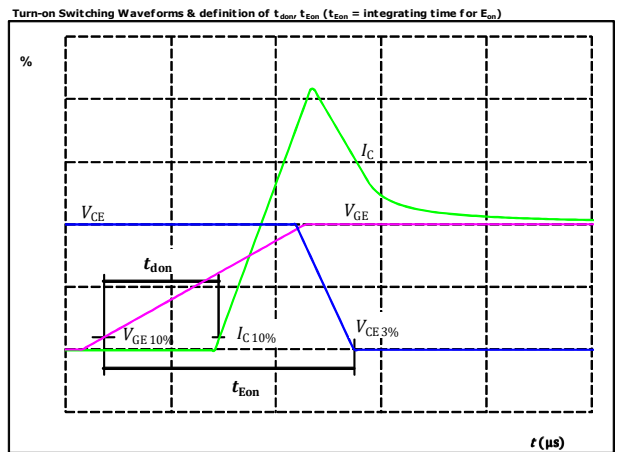
T_j	=	125 °C
R_{gon}	=	16 Ω
R_{goff}	=	16 Ω

figure 1. IGBT



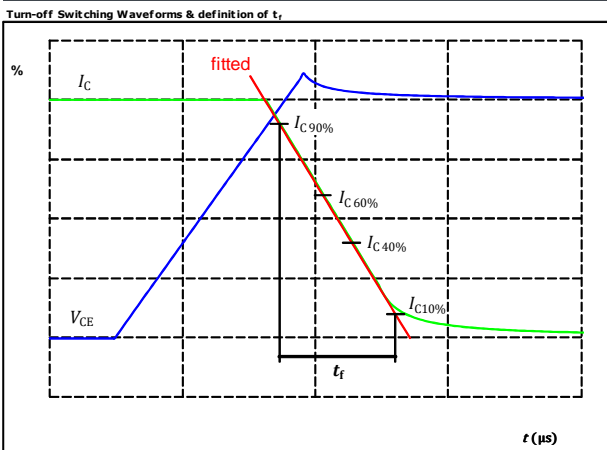
$V_{GE}(0\%) =$	-15	V
$V_{GE}(100\%) =$	15	V
$V_C(100\%) =$	600	V
$I_C(100\%) =$	25	A
$t_{doff} =$	191	ns

figure 2. IGBT



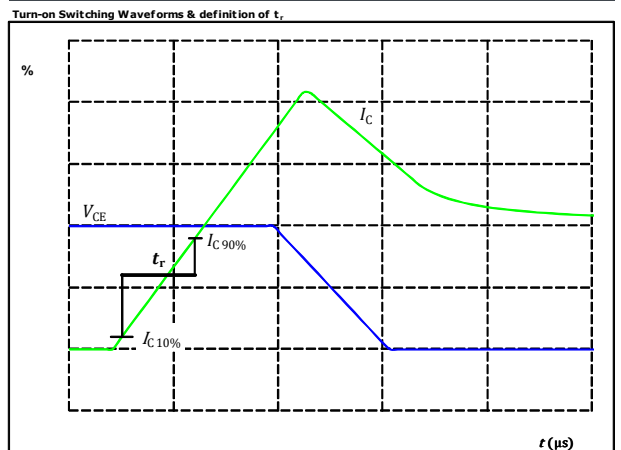
$V_{GE}(0\%) =$	-15	V
$V_{GE}(100\%) =$	15	V
$V_C(100\%) =$	600	V
$I_C(100\%) =$	25	A
$t_{don} =$	149	ns

figure 3. IGBT



$V_C(100\%) =$	600	V
$I_C(100\%) =$	25	A
$t_f =$	110	ns

figure 4. IGBT

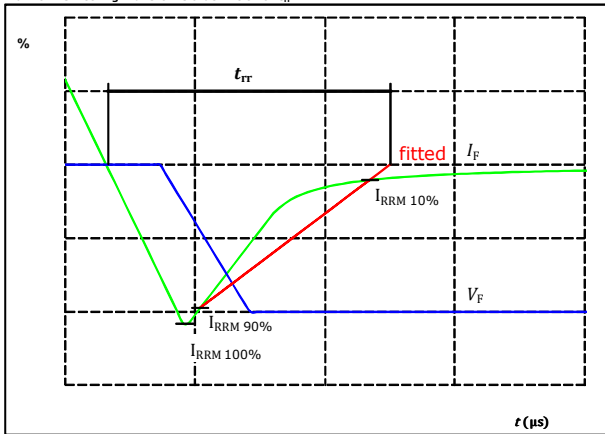


$V_C(100\%) =$	600	V
$I_C(100\%) =$	25	A
$t_r =$	33	ns



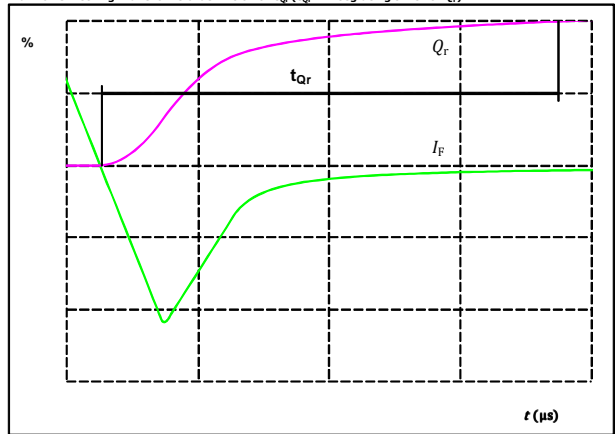
Inverter Switching Characteristics

figure 5. FWD
 Turn-off Switching Waveforms & definition of t_{rr}



$V_F(100\%) =$	600	V
$I_F(100\%) =$	25	A
$I_{RRM}(100\%) =$	23	A
$t_{rr} =$	367	ns

figure 6. FWD
 Turn-on Switching Waveforms & definition of t_{qr} (t_{qr} = integrating time for Q_r)



$I_F(100\%) =$	25	A
$Q_r(100\%) =$	3,88	μC



10-EZ126PA025M7-L858F78T
10-E1126PA025M7-L858F78Z
 datasheet

Vincotech

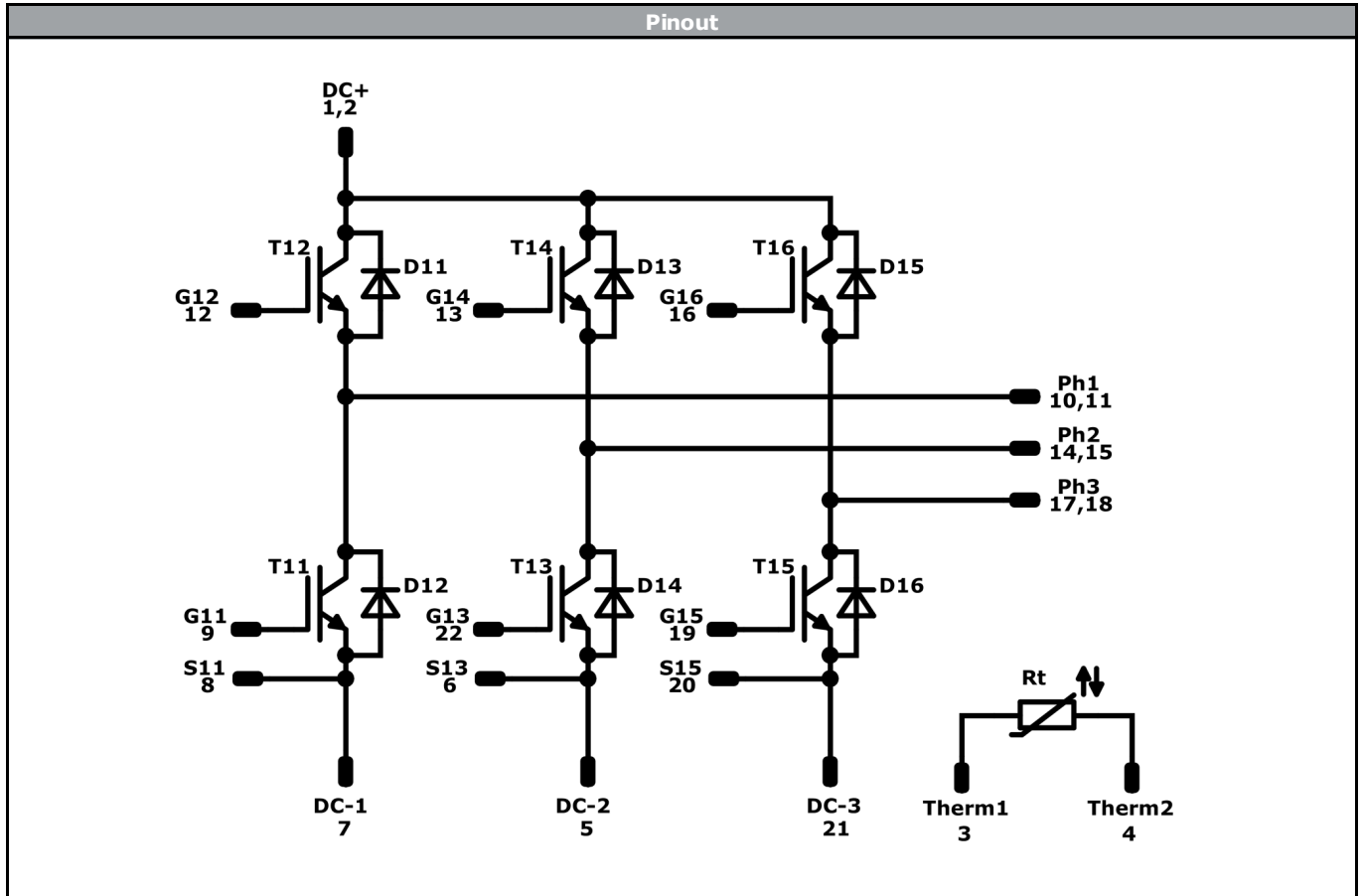
Ordering Code & Marking											
Version				Ordering Code							
without thermal paste 12 mm housing with Press-fit pins				10-EZ126PA025M7-L858F78T							
without thermal paste 12 mm housing with solder pins				10-E1126PA025M7-L858F78Z							
with thermal paste 12 mm housing with Press-fit pins				10-EZ126PA025M7-L858F78T-/3/							
with thermal paste 12 mm housing with solder pins				10-E1126PA025M7-L858F78Z-/3/							
NN-NNNNNNNNNNNN TTTTIV WWYY UL VIN LLLLL SSSS			Text	Name	Date code	UL & VIN	Lot	Serial			
				NN-NNNNNNNNNNNN-TTTTIV				WWYY	UL VIN	LLLLL	SSSS
				Datamatrix	Type&Ver	Lot number	Serial	Date code			
				TTTTIV	LLLLL	SSSS	WWYY				

Pin table				Outline	
Pin	X	Y	Function		
1	12,8	9,6	DC+	L858F78T	
2	16	9,6	DC+		
3	22,4	9,6	Therm1		
4	25,6	9,6	Therm2		
5	32	9,6	DC-2		
6	32	6,4	S13		
7	32	3,2	DC-1		
8	32	0	S11		
9	28,8	0	G11		
10	6,4	0	Ph1		
11	3,2	0	Ph1		
12	0	0	G12		
13	0	6,4	G14		
14	0	16	Ph2		
15	0	19,2	Ph2		
16	0	25,6	G16		
17	3,2	25,6	Ph3	L858F78Z	
18	6,4	25,6	Ph3		
19	28,8	25,6	G15		
20	32	25,6	S15		
21	32	22,4	DC-3		
22	32	16	G13		

Tolerance of disposition: ±0.05mm at the end of pins.
Dimension of coordinate axis is only offset without tolerance.



Vincotech



Identification					
ID	Component	Voltage	Current	Function	Comment
T11, T12, T13, T14, T15, T16	IGBT	1200 V	25 A	Inverter Switch	
D11, D12, D13, D14, D15, D16	FWD	1200 V	25 A	Inverter Diode	
Rt	NTC			Thermistor	




Vincotech

10-EZ126PA025M7-L858F78T
10-E1126PA025M7-L858F78Z
datasheet

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.

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
10-Ex126PA025M7-L858F78x-D3-14	03 Dec. 2018	Rth,Imax,Ptot values of Inverter Switch updated	1, 3, 5

DISCLAIMER

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