Vincotech

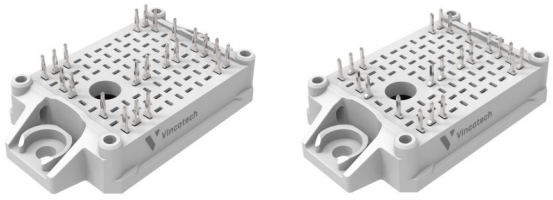
10-EZ066PA050SA-L855F38T
10-E1066PA050SA-L855F38Z
datasheet

flowPACK E1 **600 V / 50 A**

Features

- Trenchstop™ IGBT3 technology
- Standard industrial housing
- Optimized $R_{th(j-s)}$ with Phase Change Material
- Built-in NTC

flow E1 12 mm housing



Press-fit pin Solder pin

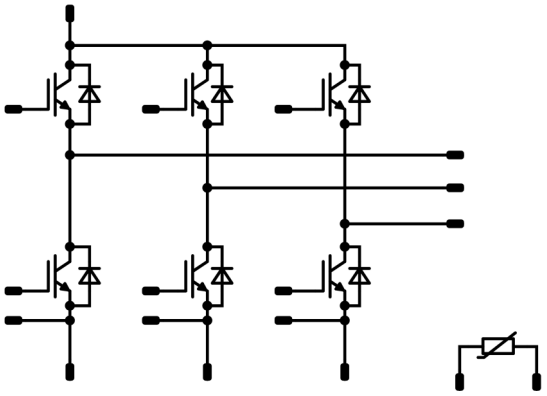
Target applications

- Industrial Drives

Types

- 10-EZ066PA050SA-L855F38T
- 10-E1066PA050SA-L855F38Z

Schematic



Maximum Ratings

T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Condition	Value	Unit
Inverter Switch				
Collector-emitter voltage	V_{CES}		600	V
Collector current	I_C	$T_j = T_{jmax}$ T_s = 80 °C	51	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}	150	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ T_s = 80 °C	95	W
Gate-emitter voltage	V_{GES}		±20	V
Short circuit ratings	t_{SC}	V_{GE} = 15 V V_{cc} = 360 V T_j = 150 °C	6	µs
Maximum junction temperature	T_{jmax}		175	°C

Maximum Ratings

T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Condition	Value	Unit
Inverter Diode				
Peak repetitive reverse voltage	V_{RRM}		600	V
Continuous (direct) forward current	I_F	T_j = T_{jmax} T_s = 80 °C	46	A
Repetitive peak forward current	I_{FRM}		100	A
Total power dissipation	P_{tot}	T_j = T_{jmax} T_s = 80 °C	67	W
Maximum junction temperature	T_{jmax}		175	°C
Module Properties				
General Properties				
Stray inductance	L_P		25	nH
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			min. 12,7	mm
Clearance			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	$V_{GE(th)}$	$V_{GE} = V_{CE}$			0,0008	25	5	5,8	6,5	V
Collector-emitter saturation voltage	V_{CEsat}		15		50	25 125 150	1,05	1,57 1,76 1,80	1,85	V
Collector-emitter cut-off current	I_{CES}		0	600		25			2,6	µA
Gate-emitter leakage current	I_{GES}		20	0		25			600	nA
Internal gate resistance	r_g							none		Ω
Input capacitance	C_{ies}	f= 1 Mhz	0	25		25		3140		pF
Output capacitance	C_{oes}							200		
Reverse transfer capacitance	C_{res}							93		
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						1,00		K/W
Dynamic										
Turn-on delay time	$t_{d(on)}$	R_{gon} = 8 Ω R_{goff} = 8 Ω	±15	300	50	25 150		95 100		ns
Rise time	t_r					25 150		14 18		
Turn-off delay time	$t_{d(off)}$					25 150		161 184		
Fall time	t_f					25 150		109 131		
Turn-on energy (per pulse)*	E_{on}	Q_{rFWD} = 2,3 µC Q_{rFWD} = 4,4 µC				25 150		0,675 1,02		mWs
Turn-off energy (per pulse)*	E_{off}					25 150		1,30 1,76		

* L_s = 14 nH

Characteristic Values

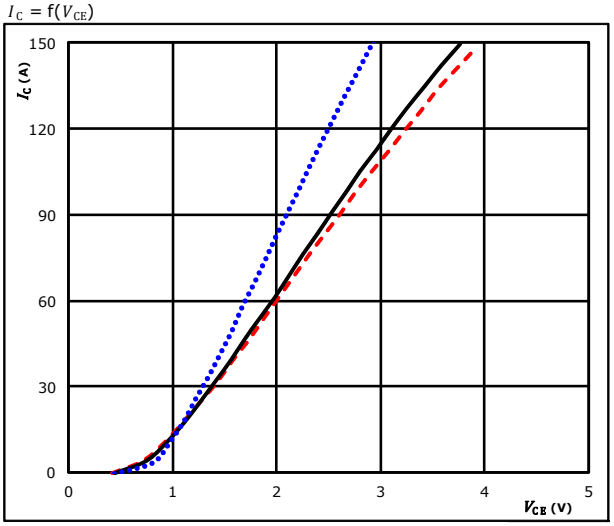
Parameter	Symbol	Conditions					Value			Unit
			V_{GE} [V] V_{GS} [V]	V_{CE} [V] V_{DS} [V] V_F [V]	I_C [A] I_D [A] I_F [A]	T_j [°C]	Min	Typ	Max	
Inverter Diode										
Static										
Forward voltage	V_F				50	25 125 150		1,64 1,56 1,54	1,9	V
Reverse leakage current	I_R			600		25			27	µA
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						1,41		K/W
Dynamic										
Peak recovery current	I_{RRM}	di/dt = 3939 A/µs di/dt = 3496 A/µs	±15	300	50	25 150		52 62		A
Reverse recovery time	t_{rr}					25 150		130 172		ns
Recovered charge	Q_r					25 150		2,29 4,37		µC
Reverse recovered energy	E_{rec}					25 150		0,515 0,92		mWs
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 150		3909 2375		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	

Inverter Switch Characteristics

figure 1. **IGBT**

Typical output characteristics

$I_C = f(V_{CE})$

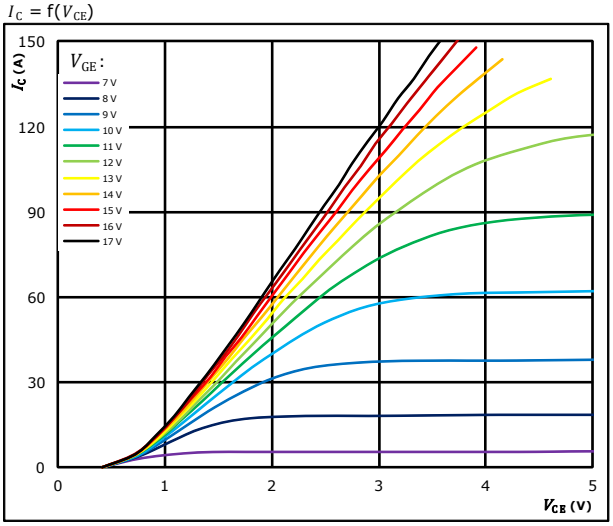


t_p =	250	µs		
V_{GE} =	15	V	T_j:	25 °C
				125 °C
				150 °C

figure 2. **IGBT**

Typical output characteristics

$I_C = f(V_{CE})$

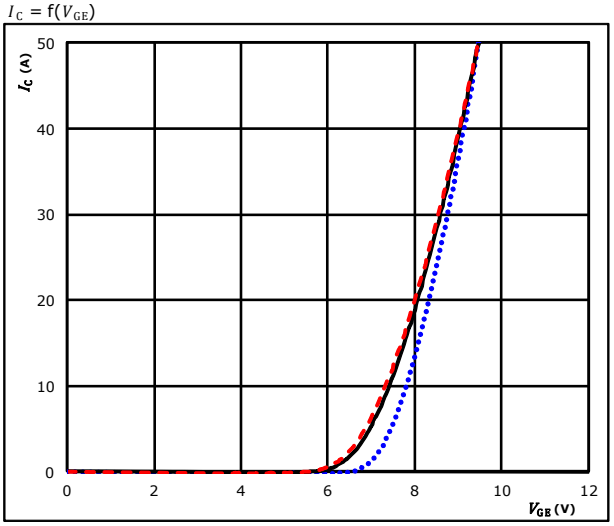


t_p =	250	µs
T_j =	150	°C
V_{GE} from	7 V to 17 V in steps of 1 V	

figure 3. **IGBT**

Typical transfer characteristics

$I_C = f(V_{GE})$

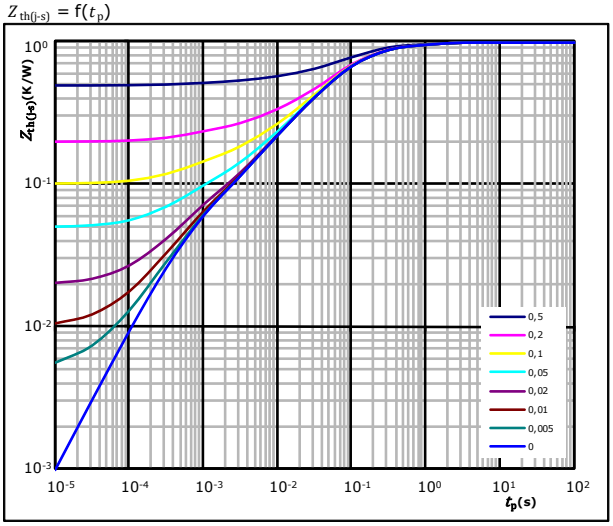


t_p =	100	µs		
V_{CE} =	10	V	T_j:	25 °C
				125 °C
				150 °C

figure 4. **IGBT**

Transient thermal impedance as function of pulse duration

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



D =	t_p / T	
$R_{th(j-s)}$ =	1,00	K/W

IGBT thermal model values

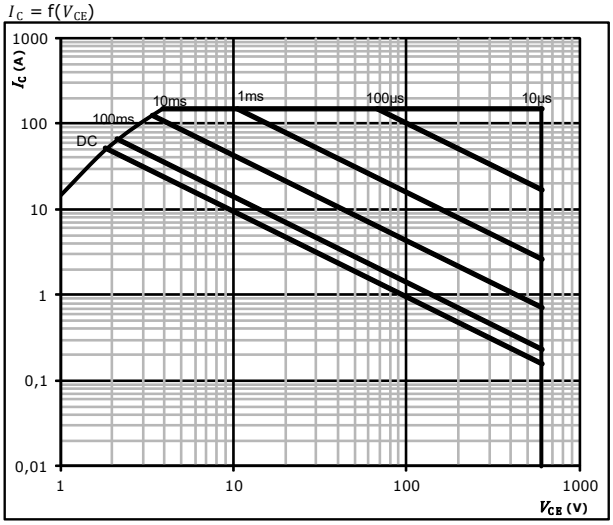
R (K/W)	τ (s)
1,45E-01	7,02E-01
5,28E-01	9,42E-02
2,00E-01	2,95E-02
8,09E-02	5,41E-03
4,17E-02	5,79E-04

Inverter Switch Characteristics

figure 5. **IGBT**

Safe operating area

$I_C = f(V_{CE})$



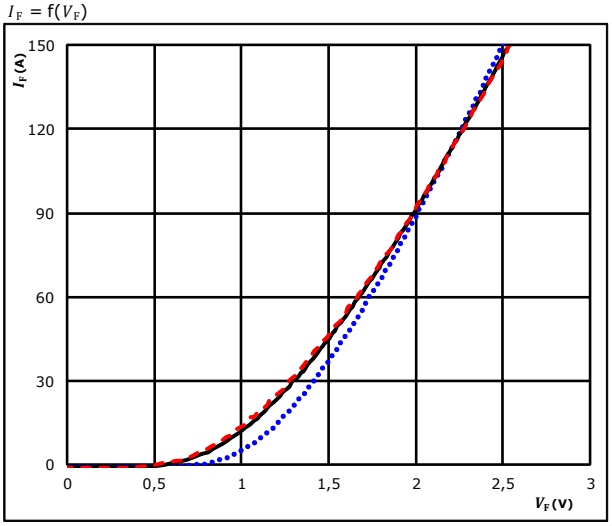
D =	single pulse	
T_s =	80	ºC
V_{GE} =	±15	V
T_j =	T_{jmax}	

Inverter Diode Characteristics

figure 1. **FWD**

Typical forward characteristics

$I_F = f(V_F)$



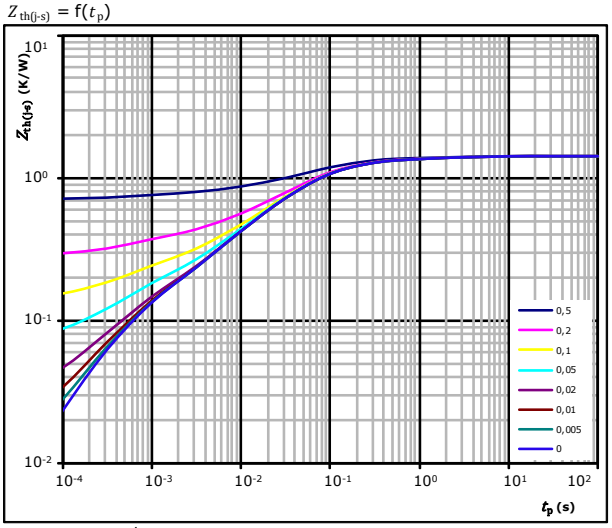
t_p = 250 µs

T_j: 25 °C, 125 °C, 150 °C

figure 2. **FWD**

Transient thermal impedance as a function of pulse width

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



$D = t_p / T$

$R_{th(j-s)}$ = 1,41 K/W

FWD thermal model values

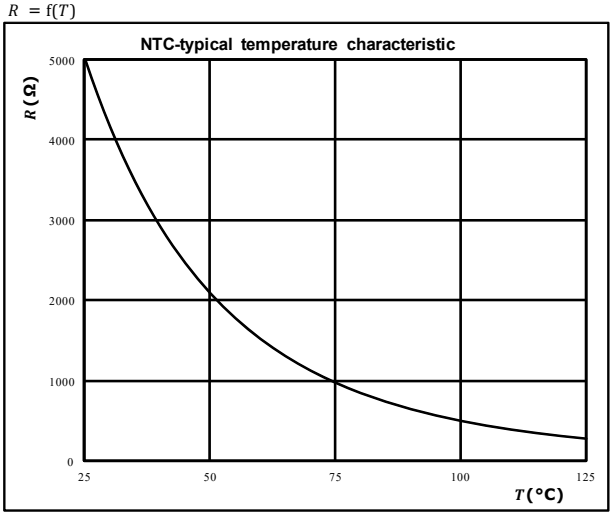
R (K/W)	τ (s)
7,38E-02	2,82E+00
1,47E-01	4,00E-01
6,53E-01	7,18E-02
3,22E-01	2,02E-02
1,24E-01	4,33E-03
9,40E-02	4,82E-04

Thermistor Characteristics

figure 1. **Thermistor**

Typical NTC characteristic
as a function of temperature

$R = f(T)$

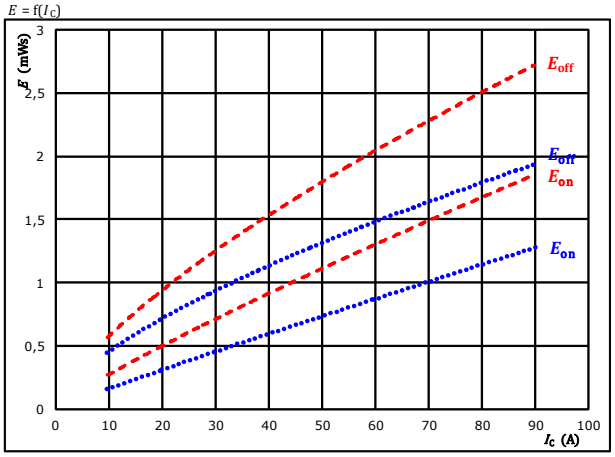


Inverter Switching Characteristics

figure 1. IGBT

Typical switching energy losses as a function of collector current

$E = f(I_C)$



With an inductive load at

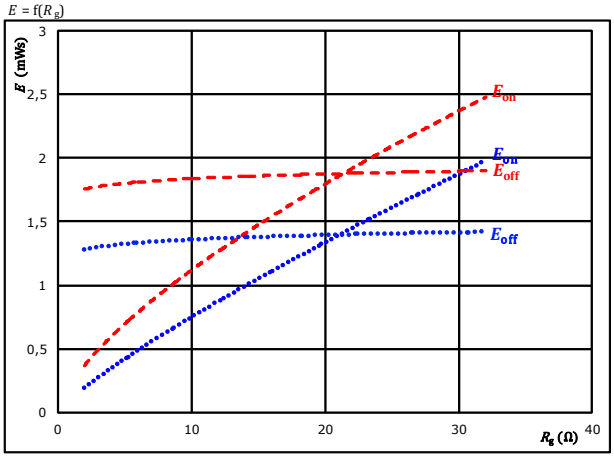
V_{CE} =	300	V
V_{GE} =	±15	V
R_{gon} =	8	Ω
R_{goff} =	8	Ω

T_j: 25 °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

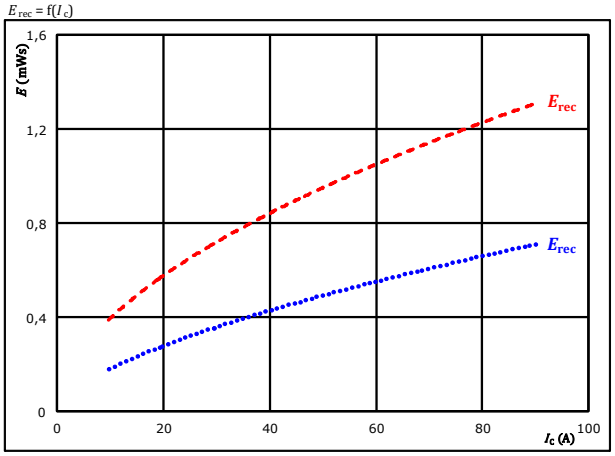
V_{CE} =	300	V
V_{GE} =	±15	V
I_C =	50	A

T_j: 25 °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

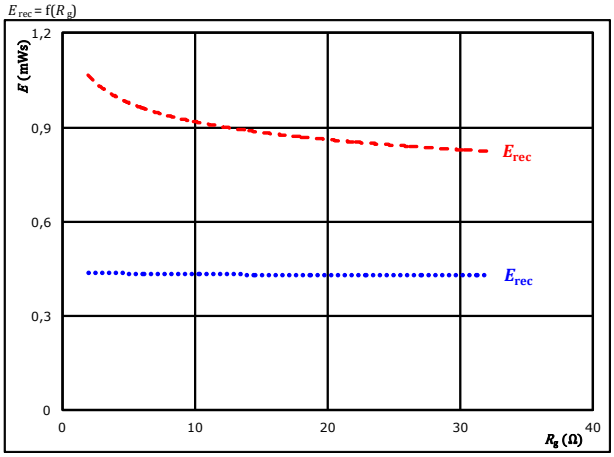
V_{CE} =	300	V
V_{GE} =	±15	V
R_{gon} =	8	Ω

T_j: 25 °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} =	300	V
V_{GE} =	±15	V
I_C =	50	A

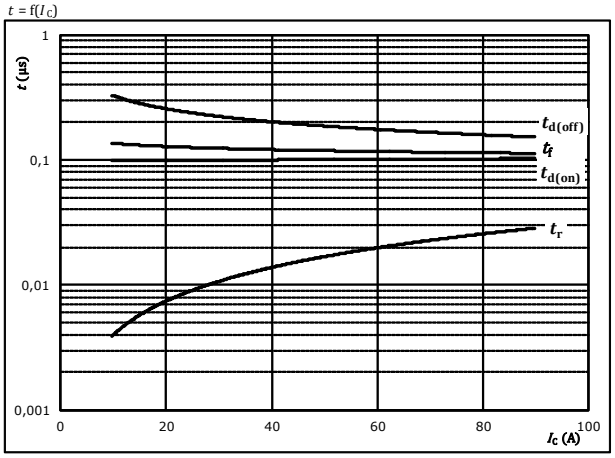
T_j: 25 °C, 150 °C

Inverter Switching Characteristics

figure 5. **IGBT**

Typical switching times as a function of collector current

$t = f(I_C)$



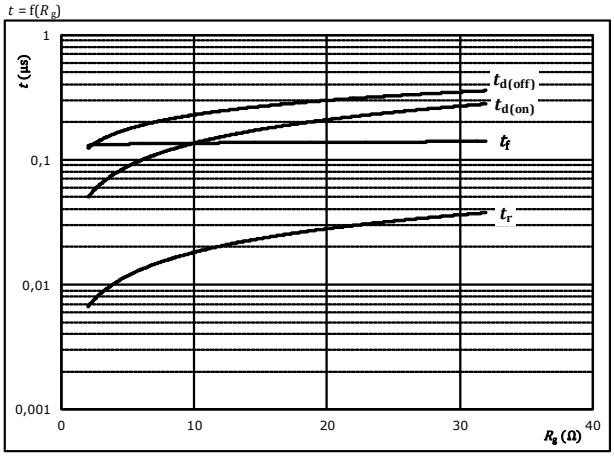
With an inductive load at

T_j =	150	°C
V_{CE} =	300	V
V_{GE} =	±15	V
R_{gon} =	8	Ω
R_{goff} =	8	Ω

figure 6. **IGBT**

Typical switching times as a function of gate resistor

$t = f(R_g)$



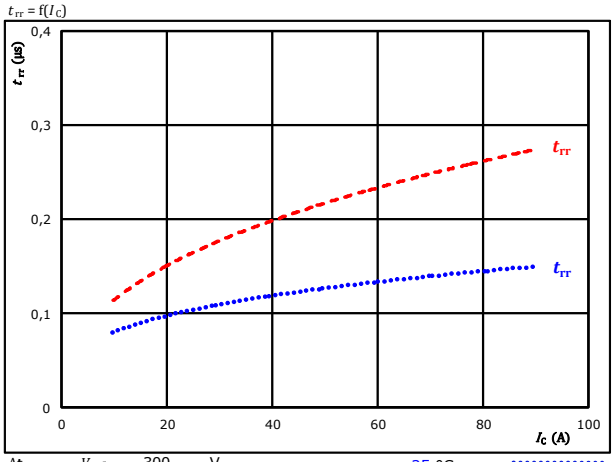
With an inductive load at

T_j =	150	°C
V_{CE} =	300	V
V_{GE} =	±15	V
I_C =	50	A

figure 7. **FWD**

Typical reverse recovery time as a function of collector current

$t_{rr} = f(I_C)$

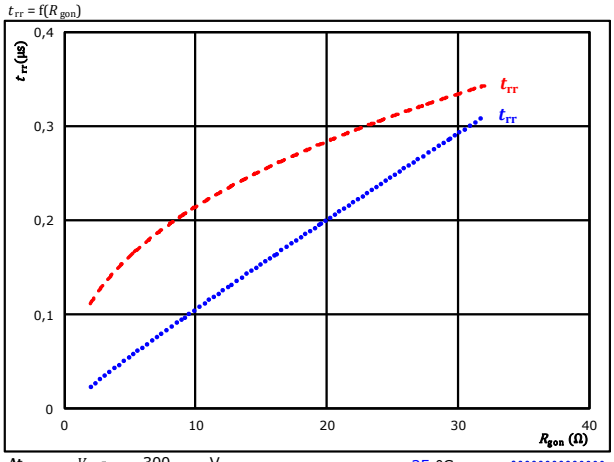


At					
	V_{CE} =	300	V	T_j:	25 °C
	V_{GE} =	±15	V		150 °C
	R_{gon} =	8	Ω		

figure 8. **FWD**

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

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



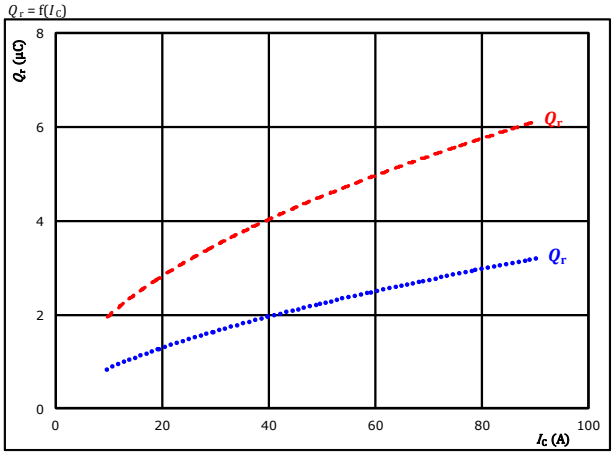
At					
	V_{CE} =	300	V	T_j:	25 °C
	V_{GE} =	±15	V		150 °C
	I_C =	50	A		

Inverter Switching Characteristics

figure 9. **FWD**

Typical recovered charge as a function of collector current

$Q_r = f(I_C)$

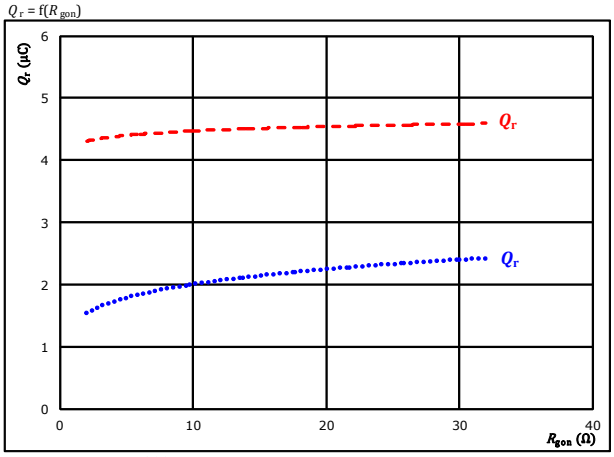


At						
	V_{CE} =	300	V	T_j:	25 °C	·····
	V_{GE} =	±15	V		150 °C	– – –
	R_{gon} =	8	Ω			

figure 10. **FWD**

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

$Q_r = f(R_{gon})$

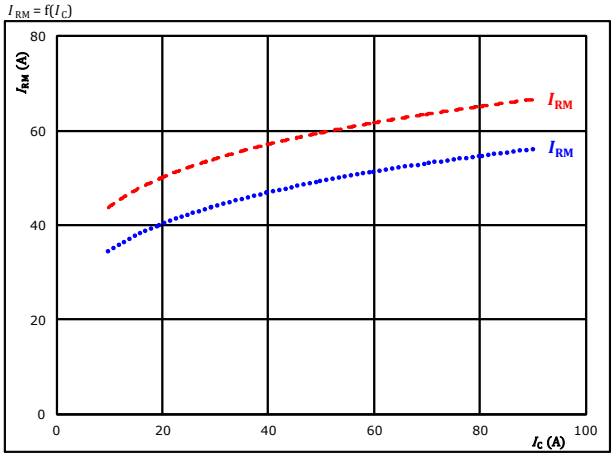


At						
	V_{CE}=	300	V	T_j:	25 °C	·····
	V_{GE} =	±15	V		150 °C	– – –
	I_C=	50	A			

figure 11. **FWD**

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

$I_{RM} = f(I_C)$

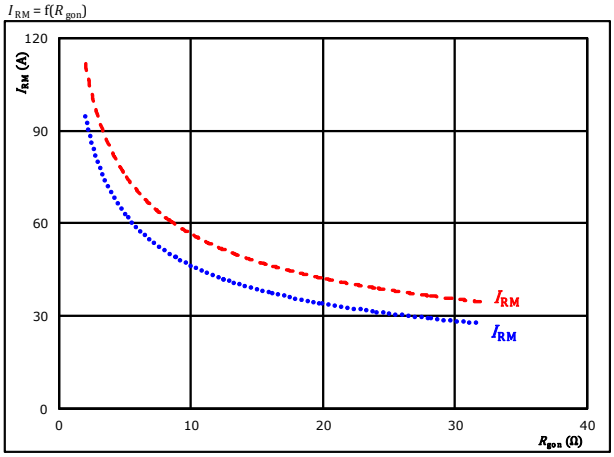


At						
	V_{CE} =	300	V	T_j:	25 °C	·····
	V_{GE} =	±15	V		150 °C	– – –
	R_{gon} =	8	Ω			

figure 12. **FWD**

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

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



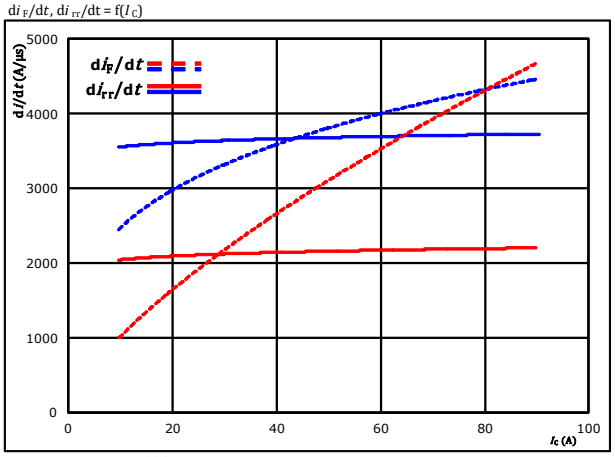
At						
	V_{CE} =	300	V	T_j:	25 °C	·····
	V_{GE} =	±15	V		150 °C	– – –
	I_C =	50	A			

Inverter Switching Characteristics

figure 13. **FWD**

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

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

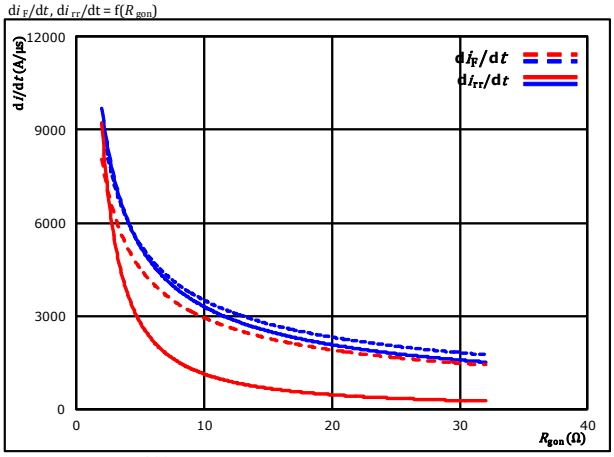


At						
	V_{CE} =	300	V	T_j:	25 °C	
	V_{GE} =	±15	V		150 °C	
	R_{gon} =	8	Ω			

figure 14. **FWD**

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

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

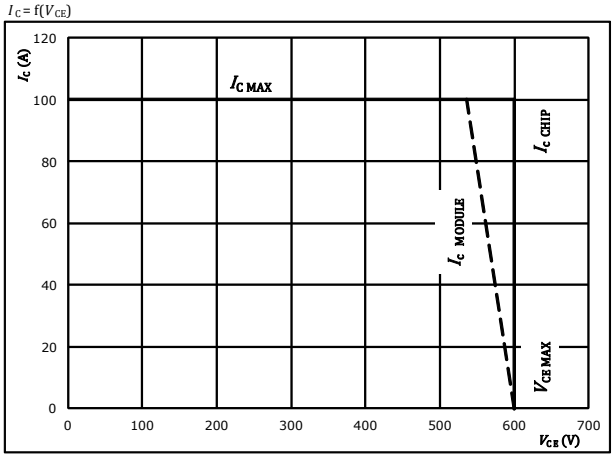


At						
	V_{CE} =	300	V	T_j:	25 °C	
	V_{GE} =	±15	V		150 °C	
	I_C =	50	A			

figure 15. **IGBT**

Reverse bias safe operating area

$I_C = f(V_{CE})$



At

T_j =	150	°C	
R_{gon} =	8	Ω	
R_{goff} =	8	Ω	

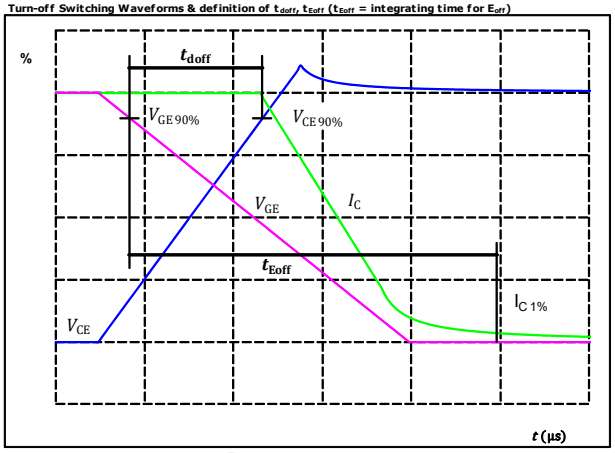
Inverter Switching Definitions

General conditions

T_j	=	125 °C
R_{gon}	=	8 Ω
R_{goff}	=	8 Ω

figure 1. IGBT

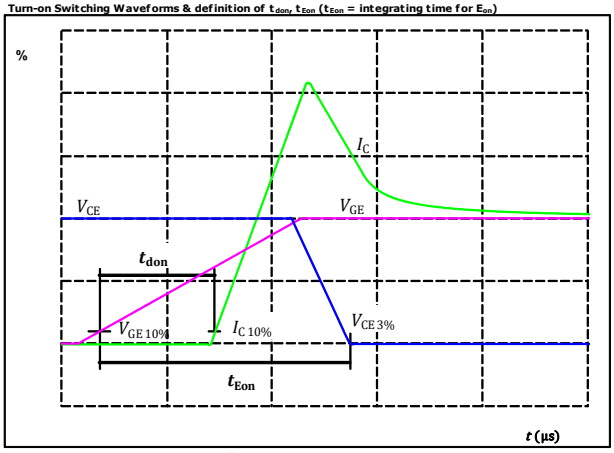
Turn-off Switching Waveforms & definition of t_{doff}, t_{Eoff} (t_{Eoff} = integrating time for E_{off})



$V_{GE}(0\%)$ =	-15	V
$V_{GE}(100\%)$ =	15	V
$V_C(100\%)$ =	300	V
$I_C(100\%)$ =	50	A
t_{doff} =	184	ns

figure 2. IGBT

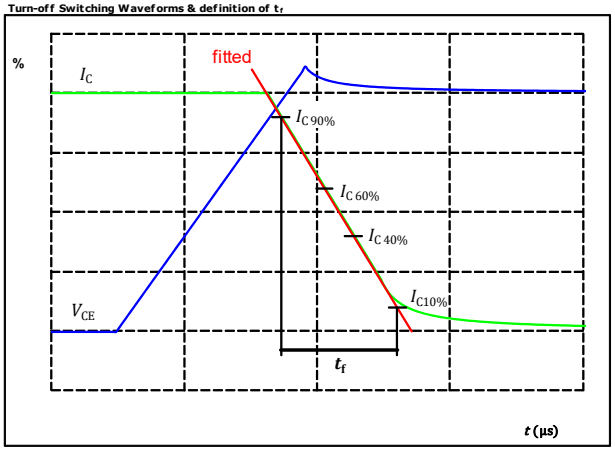
Turn-on Switching Waveforms & definition of t_{don}, t_{Eon} (t_{Eon} = integrating time for E_{on})



$V_{GE}(0\%)$ =	-15	V
$V_{GE}(100\%)$ =	15	V
$V_C(100\%)$ =	300	V
$I_C(100\%)$ =	50	A
t_{don} =	100	ns

figure 3. IGBT

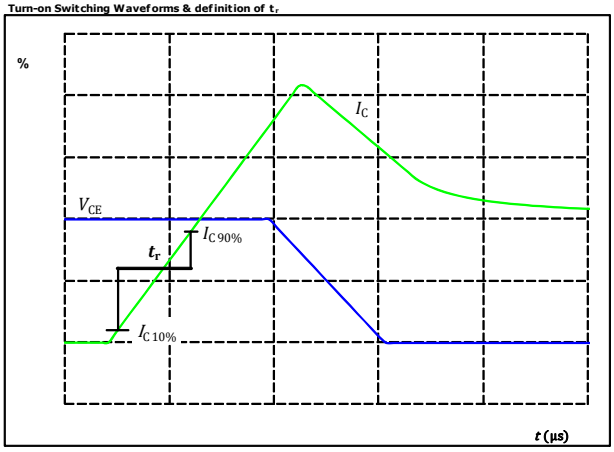
Turn-off Switching Waveforms & definition of t_f



$V_C(100\%)$ =	300	V
$I_C(100\%)$ =	50	A
t_f =	131	ns

figure 4. IGBT

Turn-on Switching Waveforms & definition of t_r

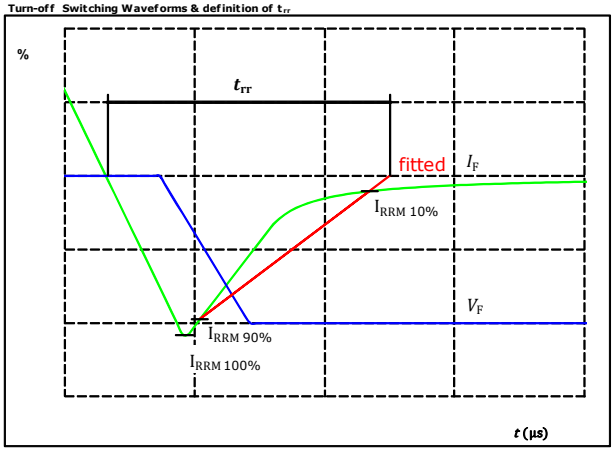


$V_C(100\%)$ =	300	V
$I_C(100\%)$ =	50	A
t_r =	18	ns

Inverter Switching Characteristics

figure 5. **FWD**

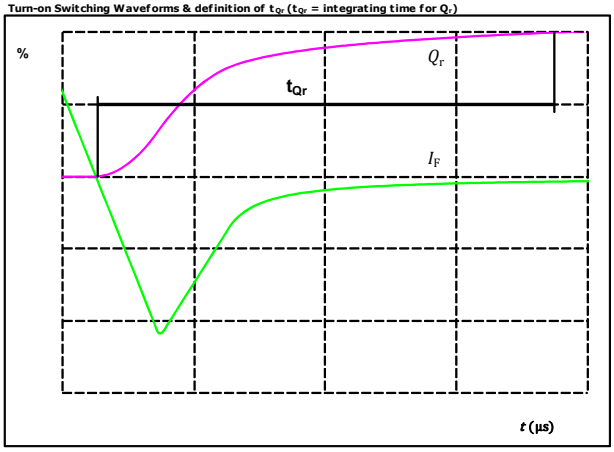
Turn-off Switching Waveforms & definition of t_{rr}



$V_F(100\%)$ =	300	V
$I_F(100\%)$ =	50	A
$I_{RRM}(100\%)$ =	62	A
t_{rr} =	172	ns

figure 6. **FWD**

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



$I_F(100\%)$ =	50	A
$Q_r(100\%)$ =	4,37	µC

Ordering Code & Marking

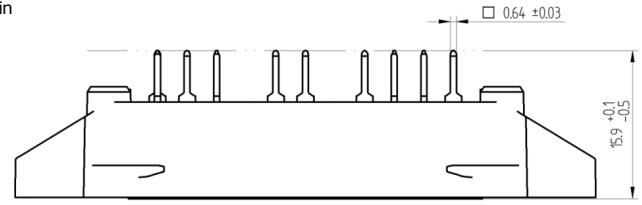
Version	Ordering Code
without thermal paste 12 mm housing with press-fit pins	10-EZ066PA050SA-L855F38T
with thermal paste 12 mm housing with press-fit pins	10-EZ066PA050SA-L855F38T-/3/
without thermal paste 12 mm housing with solder pins	10-E1066PA050SA-L855F38Z
with thermal paste 12 mm housing with solder pins	10-E1066PA050SA-L855F38Z-/3/

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

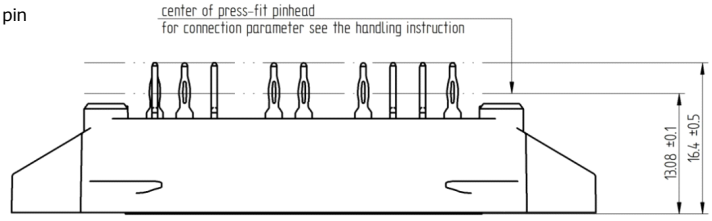
Outline

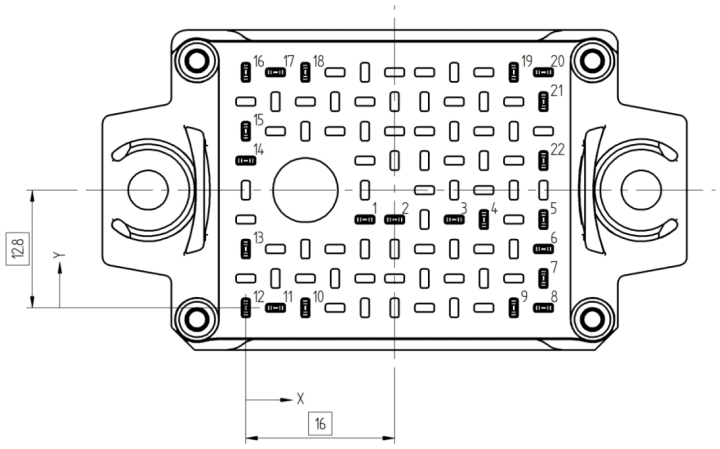
Pin table			
Pin	X	Y	Function
1	12,8	9,6	DC+
2	16	9,6	DC+
3	22,4	9,6	Therm1
4	25,6	9,6	Therm2
5	32	9,6	DC-2
6	32	6,4	S13
7	32	3,2	DC-1
8	32	0	S11
9	28,8	0	G11
10	6,4	0	Ph1
11	3,2	0	Ph1
12	0	0	G12
13	0	6,4	G14
14	0	16	Ph2
15	0	19,2	Ph2
16	0	25,6	G16
17	3,2	25,6	Ph3
18	6,4	25,6	Ph3
19	28,8	25,6	G15
20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

Solder pin



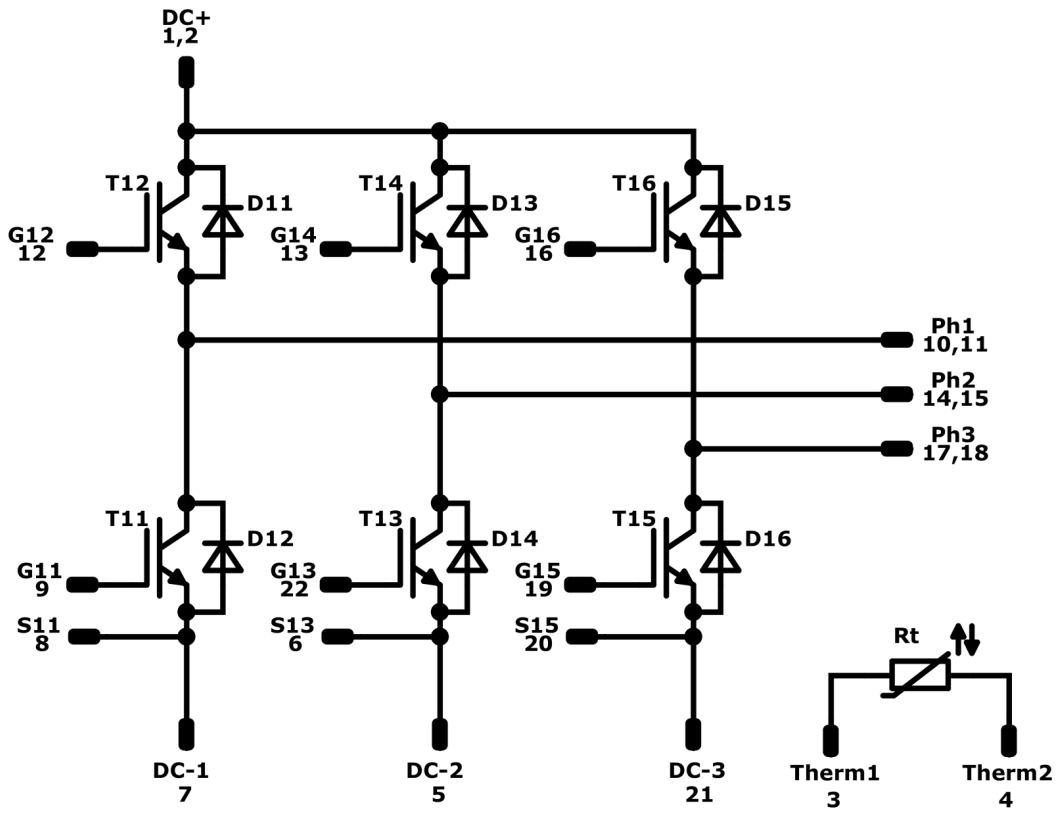
Press-fit pin





Tolerance of pinpositions: ±0,4mm at the end of pins
Dimension of coordinate axis is only offset without tolerance

Pinout



Identification

ID	Component	Voltage	Current	Function	Comment
T11, T12, T13, T14, T15, T16	IGBT	600 V	50 A	Inverter Switch	
D11, D12, D13, D14, D15, D16	FWD	600 V	50 A	Inverter Diode	
Rt	NTC			Thermistor	

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

Handling instruction
Handling instructions for *flow* E1 packages see vincotech.com website.

Package data
Package data for *flow* 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-Ex066PA050SA-L855F38x-D3-14	30 May. 2019	Correction of I_c/I_f values Outline updated	1 14