Vincotech

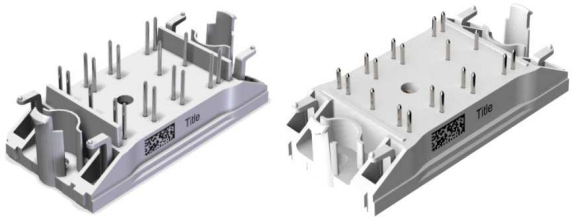
10-F0127PA008SC-L156E09
10-FZ127PA008SC-L156E08
datasheet

flow 7PACK 0 — **1200 V / 8 A**

Features

- Compact flow 0 housing
- Trench Fieldstop IGBT4 technology
- Compact and low inductance layout
- Built-in NTC

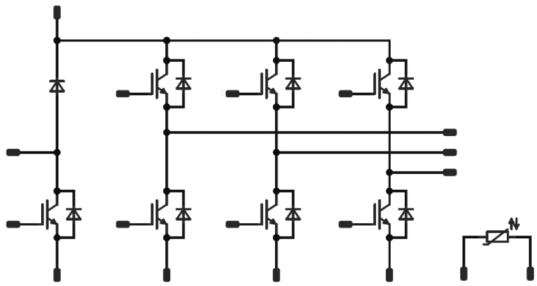
flow 0 housing



Target applications

- Motor Drives
- Power Generation

Schematic



Types

- 10-F0127PA0008SC-L156E09
- 10-FZ127PA0008SC-L156E08

Maximum Ratings

T_j=25°C, unless otherwise specified

Parameter	Symbol	Condition		Value	Unit
Inverter Switch\ Brake Switch					
Collector-emitter voltage	V_{CES}			1200	V
Collector current	I_C	T_j=$T_j$max	T_S=80°C	16	A
Repetitive peak collector current	I_{CRM}	t_p limited by $T_j$max		24	A
Total power dissipation	P_{tot}	T_j=$T_j$max	T_S=80°C	61	W
Gate-emitter voltage	V_{GES}			±20	V
Maximum Junction Temperature	T_{jmax}			175	°C

Parameter	Symbol	Conditions		Value	Unit
Inverter Diode\ Brake Diode					
Peak Repetitive Reverse Voltage	V_{RRM}			1200	V
Continuous (direct) forward current	I_F	$T_j=T_{jmax}$	T_h=80°C	20	A
Repetitive peak forward current	I_{FRM}			20	A
Total power dissipation	P_{tot}	$T_j=T_{jmax}$	T_h=80°C	46	W
Maximum Junction Temperature	T_{jmax}			175	°C

Parameter	Symbol	Conditions		Value	Unit
Brake Inverse Diode					
Peak Repetitive Reverse Voltage	V_{RRM}			1200	V
Continuous (direct) forward current	I_F	$T_j=T_{jmax}$	T_h=80°C	6	A
Repetitive peak forward current	I_{FRM}			6	A
Total power dissipation	P_{tot}	$T_j=T_{jmax}$	T_h=80°C	25	W
Maximum Junction Temperature	T_{jmax}			150	°C

Parameter	Symbol	Conditions		Value	Unit
Module Properties					
Thermal Properties					
Storage temperature	T_{stg}			-40...+125	°C
Operation Junction Temperature	T_{jop}			-40...+(T_{jmax} - 25)	°C
Isolation Properties					
Isolation voltage	V_{isol}	DC voltage	t_p=2s	4000	V
Creepage distance				min 12,7	mm
Clearance				min 12,7	mm
Comparative Tracking Index	CTI			>200	

Characteristic Values

Inverter Switch \ Brake Switch

Parameter	Symbol	Conditions					Value			Unit
			V_{GE} [V]	V_{CE} [V]	I_C [A]	T_j [°C]	Min	Typ	Max	
Static										
Gate-emitter threshold voltage	$V_{GE(th)}$	$V_{GE}=V_{CE}$			0,0005	25 125	5,3	5,8	6,3	V
Collector-emitter saturation voltage	V_{CEsat}		15		8	25 125 150	1,58	1,85 - 2,25	2,07	V
Collector-emitter cut-off current	I_{CES}		0	1200		25 125			1	µA
Gate-emitter leakage current	I_{GES}		20	0		25 125			120	nA
Internal gate resistance	r_g							none		Ω
Input capacitance	C_{ies}	f=1 MHz	0	25		25		490		pF
Reverse transfer capacitance	C_{res}							30		
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	Phase-Change Material λ=3,4W/mK						1,57		K/W
IGBT Switching										
Turn-on delay time	$t_{d(on)}$	R_{goff} = 32 Ω R_{gon} = 32 Ω	±15	600	8	25 125 150		71 71 72		ns
Rise time	t_r					25 125 150		19 23 22		
Turn-off delay time	$t_{d(off)}$					25 125 150		194 236 250		
Fall time	t_f					25 125 150		79 108 110		
Turn-on energy (per pulse)	E_{on}	Q_{rFWD} = 0,9 µC Q_{rFWD} = 1,6 µC Q_{rFWD} = 1,7 µC				25 125 150		0,499 0,748 0,796		mWs
Turn-off energy (per pulse)	E_{off}					25 125 150		0,435 0,624 0,657		

Inverter Diode\ Brake Diode

Parameter	Symbol	Conditions					Value			Unit
				V_r [V]	I_F [A]	T_j [°C]	Min	Typ	Max	
Static										
Forward voltage	V_F				10	25 125 150		1,76 - 1,68	2,05	V
Reverse leakage current	I_r			1200		25 150			2,7 -	µA
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	Phase-Change Material λ=3,4W/mK						2,07		K/W
FWD Switching										
Peak recovery current	I_{RRM}	di/dt = 452 A/µs di/dt = 399 A/µs di/dt = 403 A/µs	±15	600	8	25 125 150		8 10 10		A
Reverse recovery time	t_{rr}					25 125 150		251 383 411		ns
Recovered charge	Q_r					25 125 150		0,885 1,569 1,721		µC
Reverse recovered energy	E_{rec}					25 125 150		0,345 0,635 0,692		mWs
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 125 150		84 69 64		A/µs

Brake Inverse Diode

Parameter	Symbol	Conditions					Value			Unit
				V_r [V]	I_F [A]	T_j [°C]	Min	Typ	Max	
Static										
Forward voltage	V_F				3	25 125 150		1,65 - 1,51	1,6	V
Reverse leakage current	I_r			1200		25 150			250 -	µA
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	Phase-Change Material λ=3,4W/mK						2,8		K/W

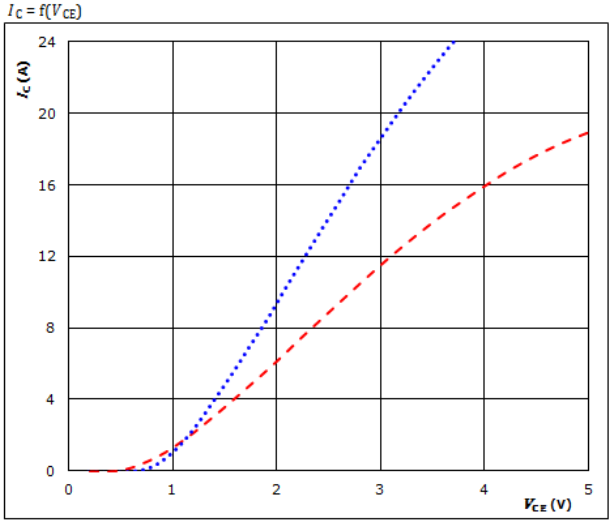
Thermistor

Parameter	Symbol	Conditions					Value			Unit
			V_{GE} [V]	V_{CE} [V]	I_C [A]	T_j [°C]	Min	Typ	Max	
Rated resistance	R					25		21,5		kΩ
Deviation of R100	$\Delta_{R/R}$	R100=1486 Ω				100	-4,5		+4,5	%
Power dissipation	P					25		210		mW
Power dissipation constant						25		3,5		mW/K
B-value	$B_{(25/50)}$					25		3884		K
B-value	$B_{(25/100)}$					25		3964		K
Vincotech NTC Reference									F	

Inverter Switch\ Brake Switch Characteristics

Typical output characteristics **IGBT**

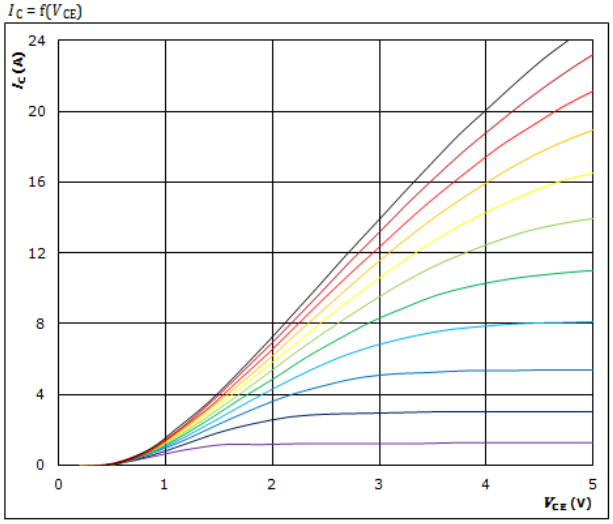
$I_C = f(V_{CE})$



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

Typical output characteristics **IGBT**

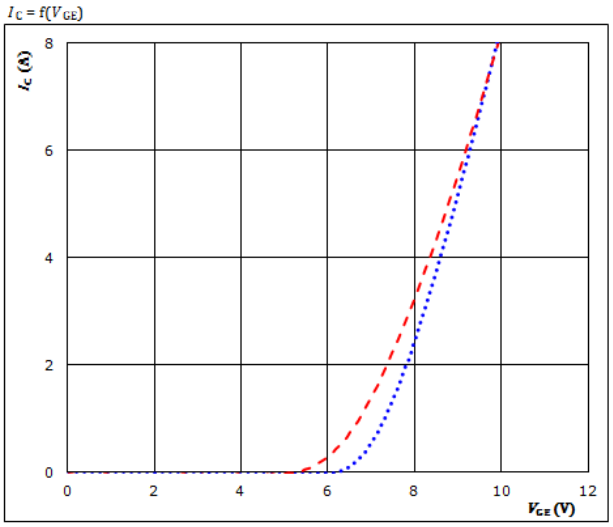
$I_C = f(V_{CE})$



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

Typical transfer characteristics **IGBT**

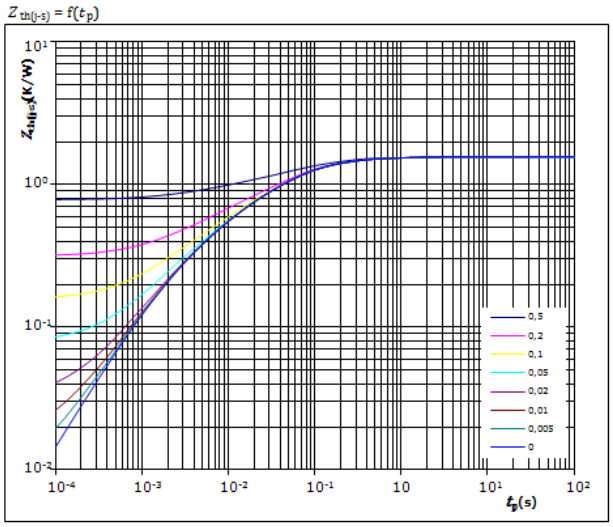
$I_C = f(V_{GE})$



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

Transient Thermal Impedance as function of Pulse duration **IGBT**

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



D =	t_p / T	
$R_{th(j-s)}$ =	1,57	K/W

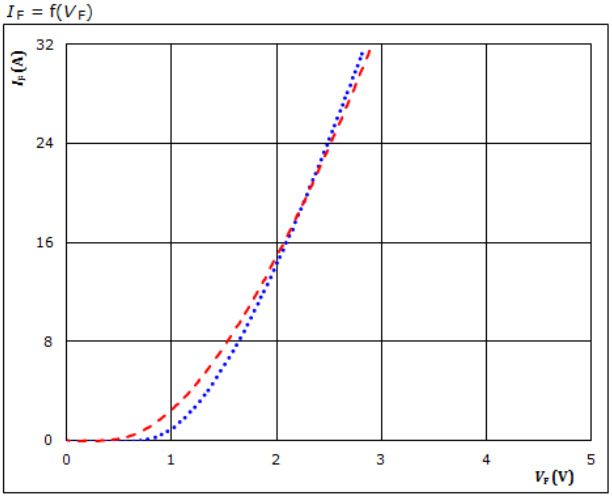
IGBT thermal model values

R_{th} (K/W)	τ (s)
1,42E-01	5,98E-01
6,32E-01	7,71E-02
3,98E-01	2,43E-02
2,86E-01	6,16E-03
1,08E-01	1,44E-03
1,62E-01	3,39E-04

Inverter Diode\ Brake Diode Characteristics

Typical forward characteristics **FWD**

$I_F = f(V_F)$

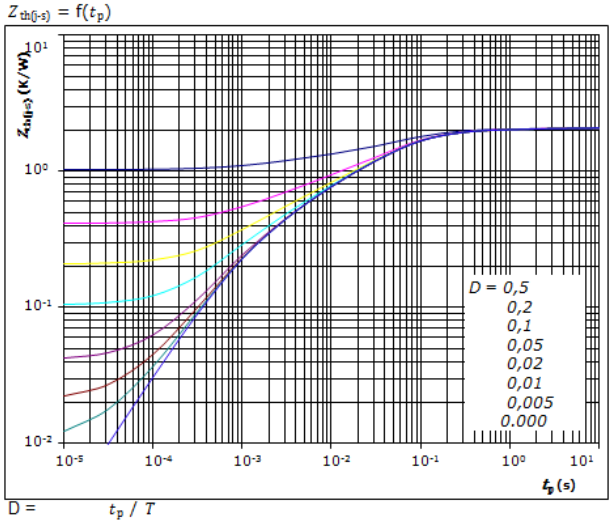


t_p = 250 µs

T_j: 25 °C, 125 °C, 150 °C

Transient thermal impedance as a function of pulse width **FWD**

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



D = t_p / T

$R_{th(j-s)}$ = 2,07 K/W

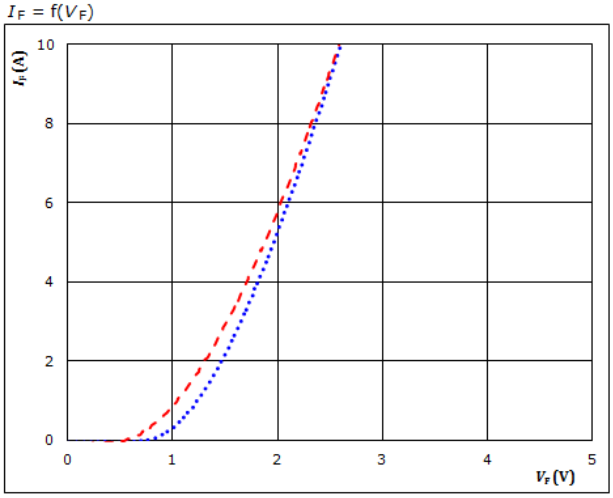
FWD thermal model values

R (K/W)	τ (s)
5,09E-02	4,26E+00
1,55E-01	5,03E-01
7,75E-01	7,89E-02
5,33E-01	2,68E-02
3,54E-01	5,03E-03
1,97E-01	9,09E-04

Brake Inverse Diode Characteristics

Typical forward characteristics **FWD**

$I_F = f(V_F)$

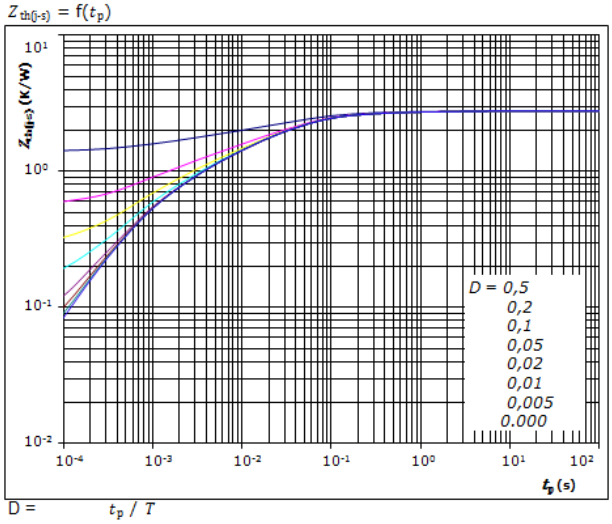


t_p = 250 µs

T_j: 25 °C, 125 °C, 150 °C

Transient thermal impedance as a function of pulse width **FWD**

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



D = t_p / T

$R_{th(j-s)}$ = 2,8 K/W

FWD thermal model values

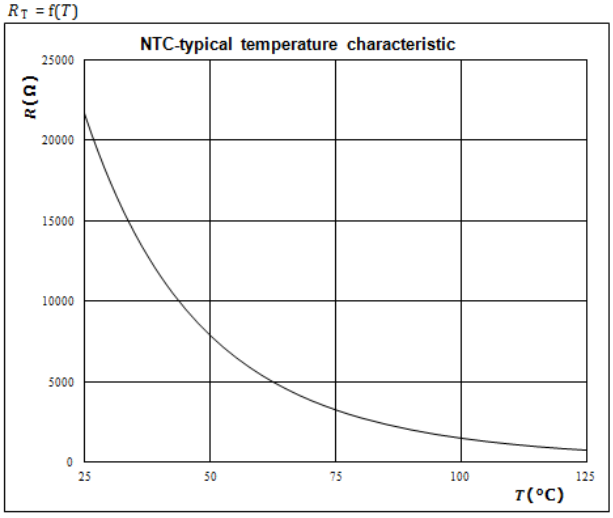
R (K/W)	τ (s)
7,82E-02	2,45E+00
1,95E-01	2,65E-01
9,84E-01	4,77E-02
6,58E-01	1,23E-02
5,09E-01	2,70E-03
3,71E-01	5,98E-04

Thermistor Characteristics

Thermistor typical temperature characteristic

Typical NTC characteristic
as a function of temperature

$R_T = f(T)$

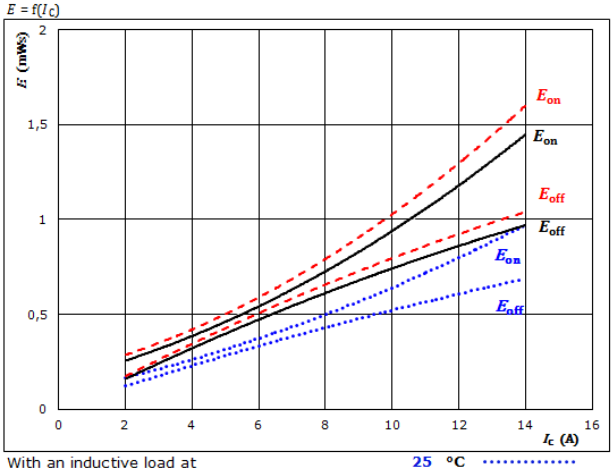


Inverter\ Brake Switching Characteristics

Figure 1. **IGBT**

Typical switching energy losses as a function of collector current

$E = f(I_C)$



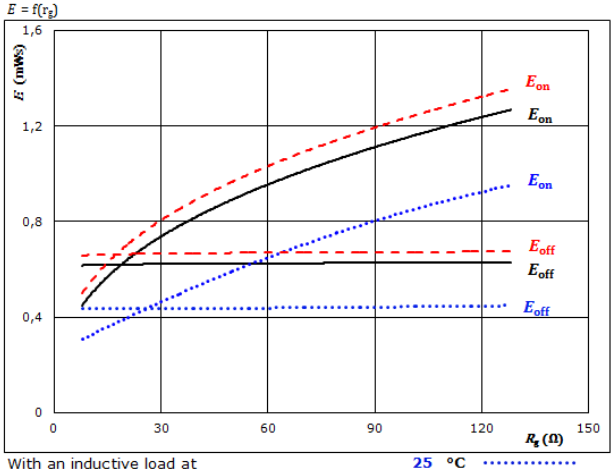
With an inductive load at

V_{CE} =	600	V	T_j:	25 °C
V_{GE} =	±15	V		125 °C
R_{gon} =	32	Ω		150 °C
R_{goff} =	32	Ω		

Figure 2. **IGBT**

Typical switching energy losses as a function of gate resistor

$E = f(r_g)$



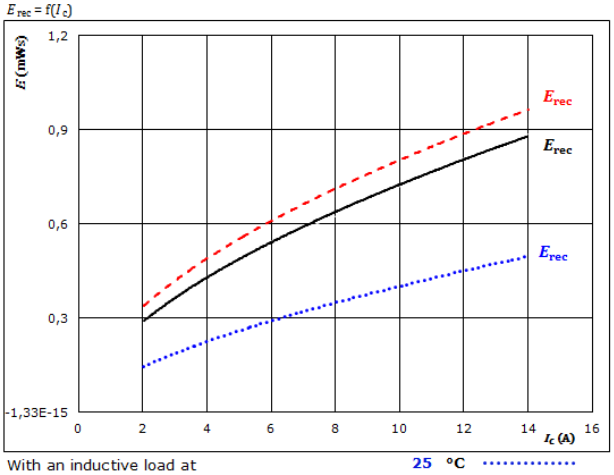
With an inductive load at

V_{CE} =	600	V	T_j:	25 °C
V_{GE} =	±15	V		125 °C
I_C =	8	A		150 °C

Figure 3. **FWD**

Typical reverse recovered energy loss as a function of collector current

$E_{rec} = f(I_C)$



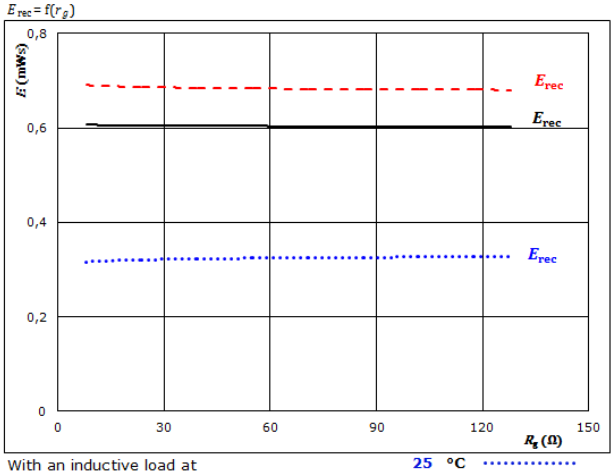
With an inductive load at

V_{CE} =	600	V	T_j:	25 °C
V_{GE} =	±15	V		125 °C
R_{gon} =	32	Ω		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

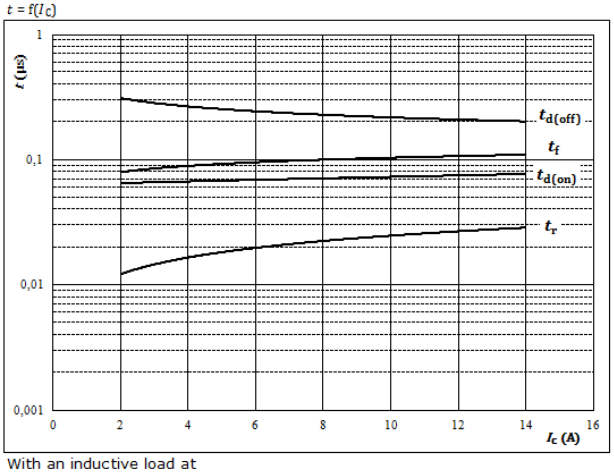
V_{CE} =	600	V	T_j:	25 °C
V_{GE} =	±15	V		125 °C
I_C =	8	A		150 °C

Inverter\ Brake Switching Characteristics

Figure 5. IGBT

Typical switching times as a function of collector current

$t = f(I_C)$



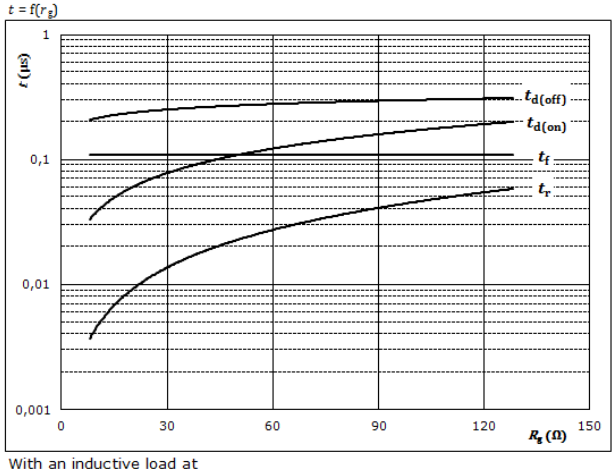
With an inductive load at

T_j =	150	°C
V_{CE} =	600	V
V_{GE} =	±15	V
R_{gon} =	32	Ω
R_{goff} =	32	Ω

Figure 6. IGBT

Typical switching times as a function of gate resistor

$t = f(r_g)$



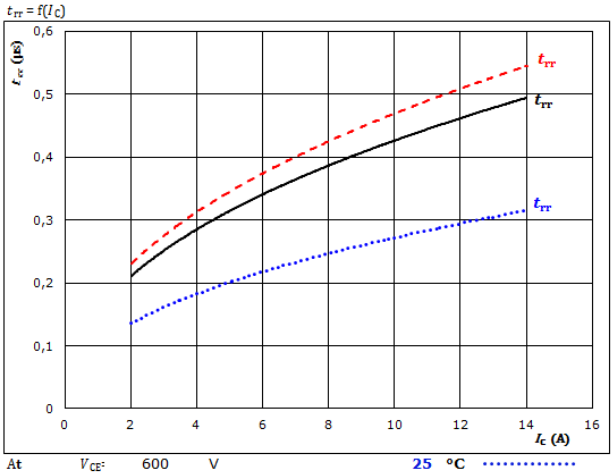
With an inductive load at

T_j =	150	°C
V_{CE} =	600	V
V_{GE} =	±15	V
I_C =	8	A

Figure 7. FWD

Typical reverse recovery time as a function of collector current

$t_{rr} = f(I_C)$

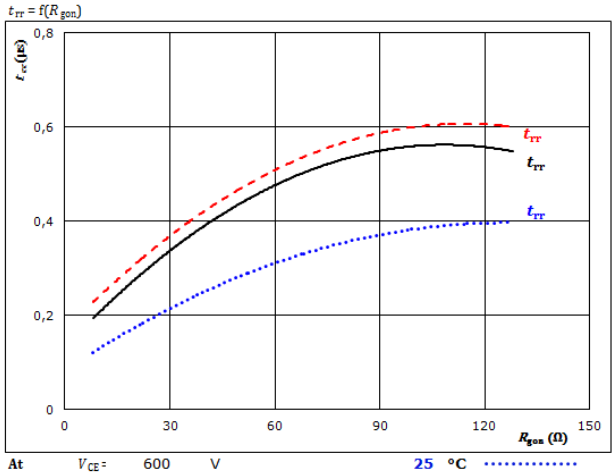


At	V_{CE}:	600	V		25 °C
	V_{GE} =	±15	V	T_j:	125 °C
	R_{gon} =	32	Ω		150 °C

Figure 8. FWD

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

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



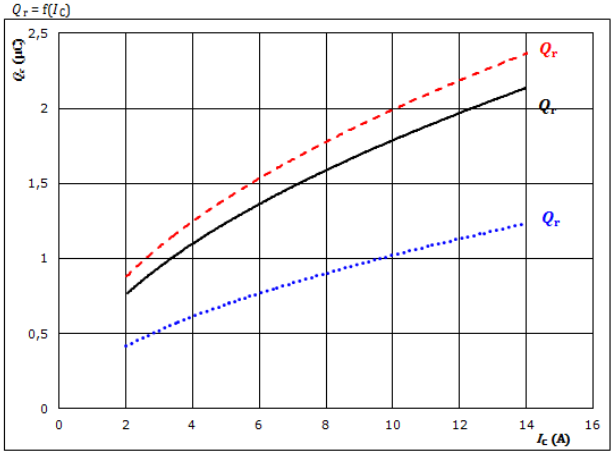
At	V_{CE} =	600	V		25 °C
	V_{GE} =	±15	V	T_j:	125 °C
	I_C =	8	A		150 °C

Inverter\ Brake Switching Characteristics

Figure 9. FWD

Typical recovered charge as a function of collector current

$Q_r = f(I_C)$

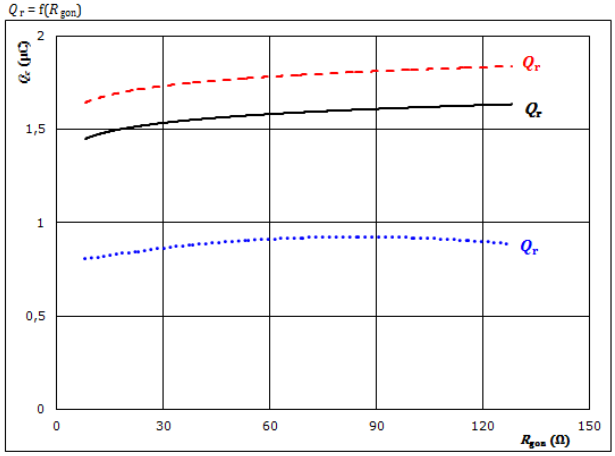


At					
	V_{CE} =	600	V		25 °C
	V_{GE} =	±15	V	T_j:	125 °C
	R_{gon} =	32	Ω		150 °C

Figure 10. FWD

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

$Q_r = f(R_{gon})$

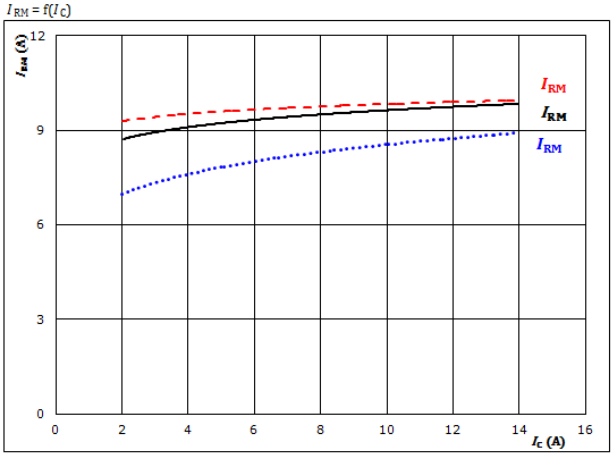


At					
	V_{CE}=	600	V		25 °C
	V_{GE} =	±15	V	T_j:	125 °C
	I_C=	8	A		150 °C

Figure 11. FWD

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

$I_{RM} = f(I_C)$

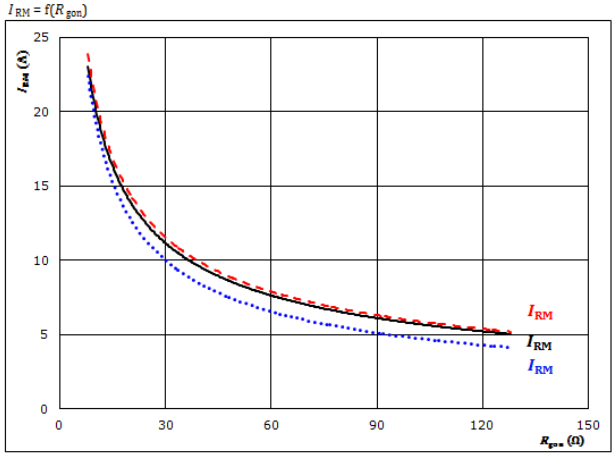


At					
	V_{CE}	600	V		25 °C
	V_{GE} =	±15	V	T_j:	125 °C
	R_{gon} =	32	Ω		150 °C

Figure 12. FWD

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

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



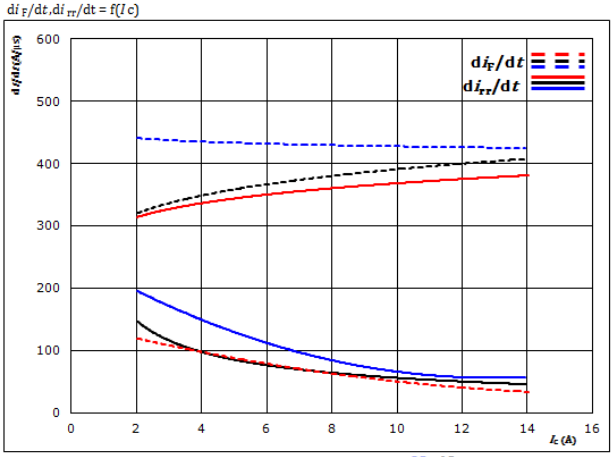
At					
	V_{CE} =	600	V		25 °C
	V_{GE} =	±15	V	T_j:	125 °C
	I_C =	8	A		150 °C

Inverter\ Brake Switching Characteristics

Figure 13. FWD

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

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

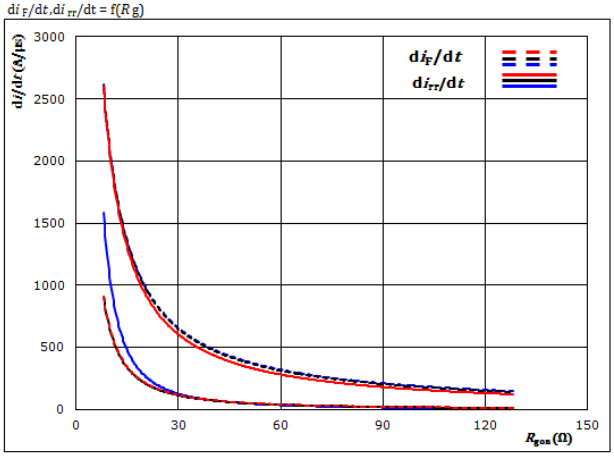


At					
	V_{CE}	600	V		25 °C
	V_{GE} =	±15	V	T_j:	125 °C
	R_{gon} =	32	Ω		150 °C

Figure 14. FWD

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

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

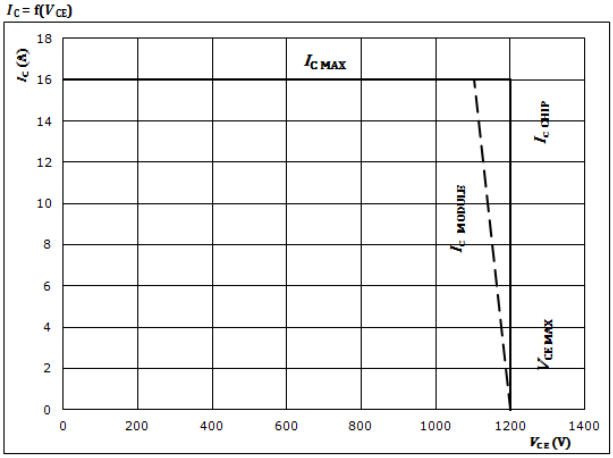


At			
	V_{CE} =	600	V
	V_{GE} =	±15	V
	I_C =	8	A

Figure 15. IGBT

Reverse bias safe operating area

$I_C = f(V_{CE})$



At

T_j =	175	°C
Rgon =	32	Ω
Rgoff =	32	Ω

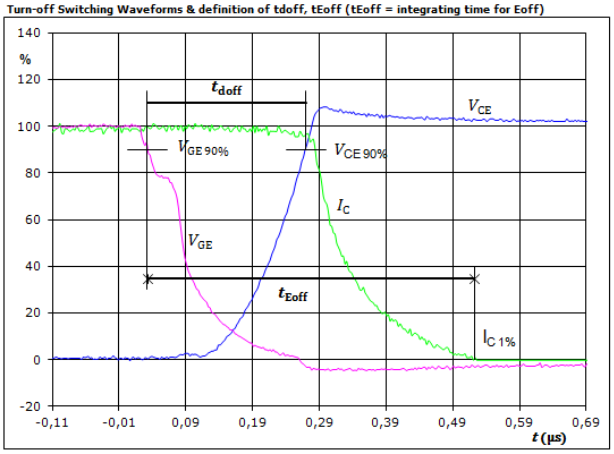
Inverter\ Brake Switching Definitions

General conditions

T_j	=	125 °C
R_{gon}	=	32 Ω
R_{goff}	=	32 Ω

Figure 1. IGBT

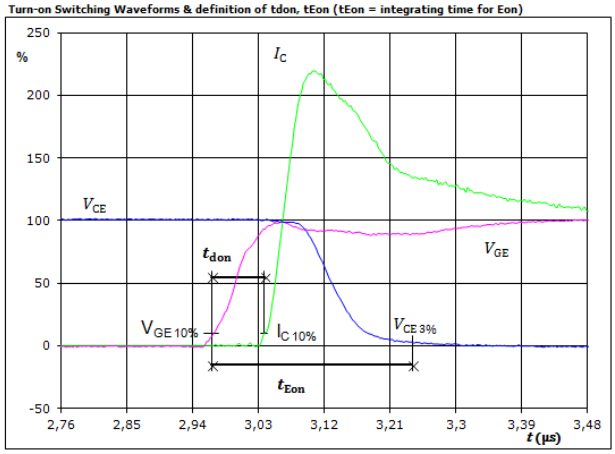
Turn-off Switching Waveforms & definition of tdoff, tEoff (tEoff = integrating time for Eoff)



V_{GE} (0%) =	-15	V
V_{GE} (100%) =	15	V
V_C (100%) =	600	V
I_C (100%) =	8	A
t_{doff} =	0,236	µs
t_{Eoff} =	0,490	µs

Figure 2. IGBT

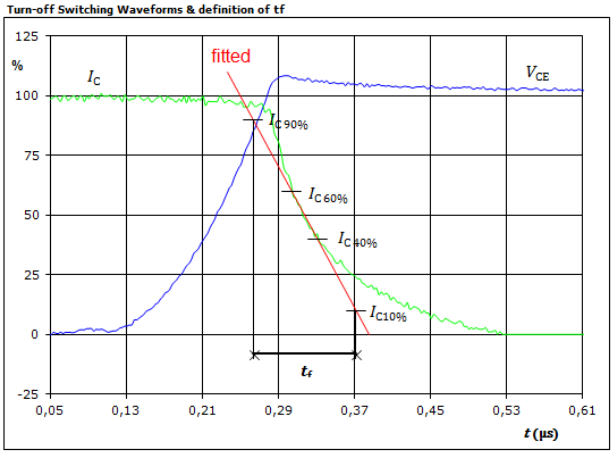
Turn-on Switching Waveforms & definition of tdon, tEon (tEon = integrating time for Eon)



V_{GE} (0%) =	-15	V
V_{GE} (100%) =	15	V
V_C (100%) =	600	V
I_C (100%) =	8	A
t_{don} =	0,071	µs
t_{Eon} =	0,275	µs

Figure 3. IGBT

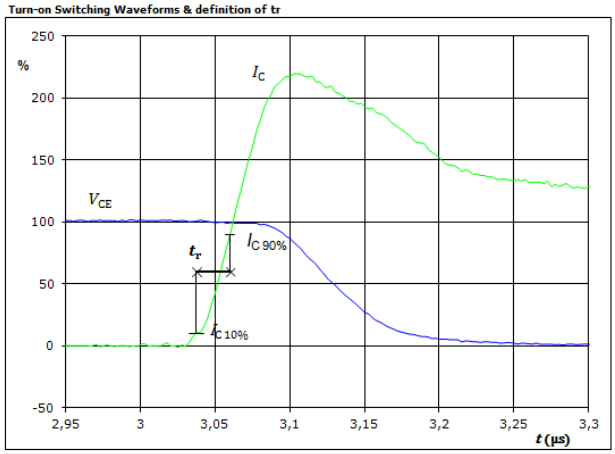
Turn-off Switching Waveforms & definition of tf



V_C (100%) =	600	V
I_C (100%) =	8	A
t_f =	0,108	µs

Figure 4. IGBT

Turn-on Switching Waveforms & definition of tr

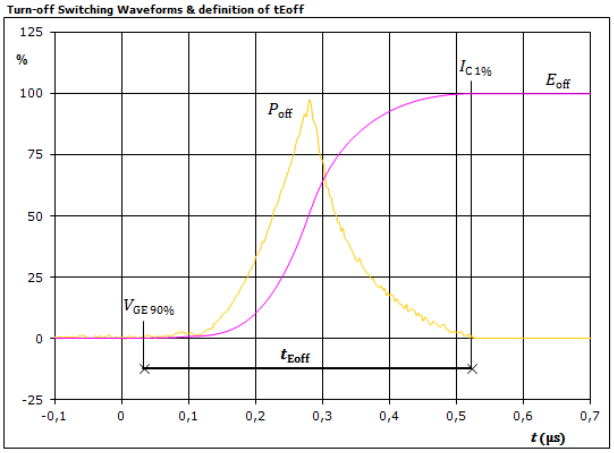


V_C (100%) =	600	V
I_C (100%) =	8	A
t_r =	0,023	µs

Inverter\ Brake Switching Definitions

Figure 5. IGBT

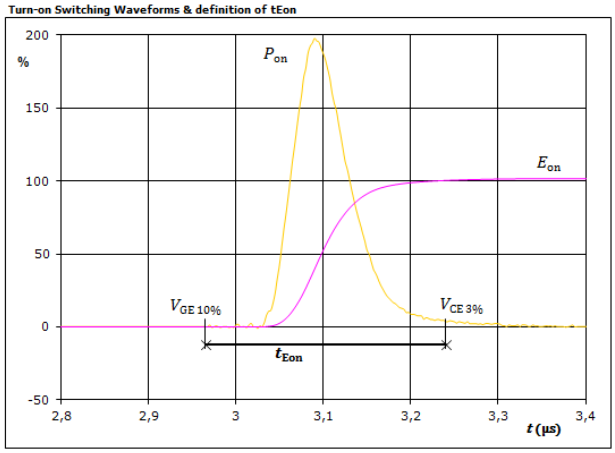
Turn-off Switching Waveforms & definition of tEoff



P_{off} (100%) =	4,93	kW
E_{off} (100%) =	0,62	mJ
t_{Eoff} =	0,49	µs

Figure 6. IGBT

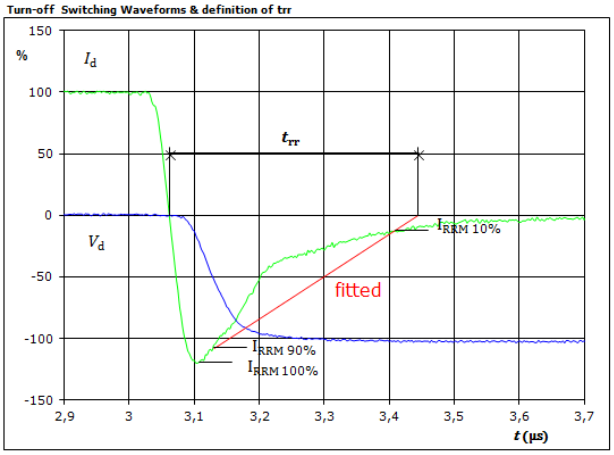
Turn-on Switching Waveforms & definition of tEon



P_{on} (100%) =	4,93	kW
E_{on} (100%) =	0,75	mJ
t_{Eon} =	0,27	µs

Figure 7. FWD

Turn-off Switching Waveforms & definition of trr

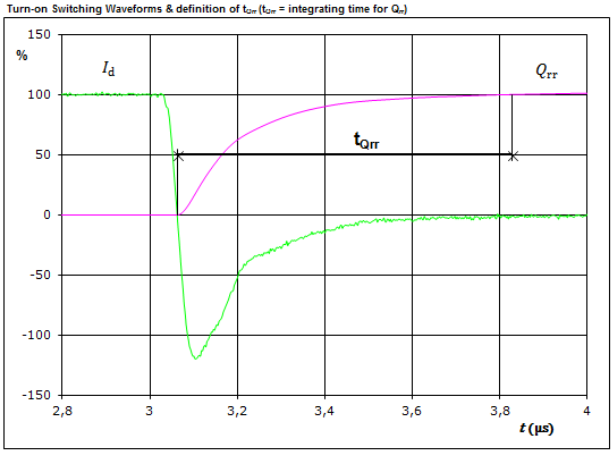


V_d (100%) =	600	V
I_d (100%) =	8	A
I_{RRM} (100%) =	-10	A
t_{rr} =	0,383	µs

Inverter\ Brake Switching Definitions

Figure 8. **FWD**

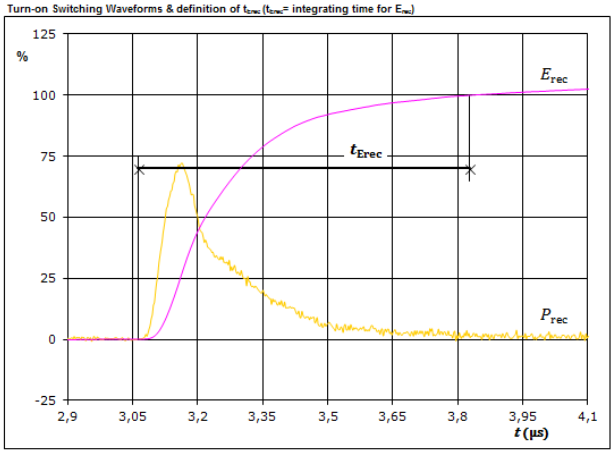
Turn-on Switching Waveforms & definition of t_{Qrr} (t_{Qrr} = integrating time for Q_{rr})



I_d (100%) =	8	A
Q_{rr} (100%) =	1,57	µC
t_{Qrr} =	0,76	µs

Figure 9. **FWD**

Turn-on Switching Waveforms & definition of t_{Erec} (t_{Erec}= integrating time for E_{rec})



P_{rec} (100%) =	4,93	kW
E_{rec} (100%) =	0,63	mJ
t_{Erec} =	0,76	µs

Vincotech

10-F0127PA008SC-L156E09
10-FZ127PA008SC-L156E08
datasheet

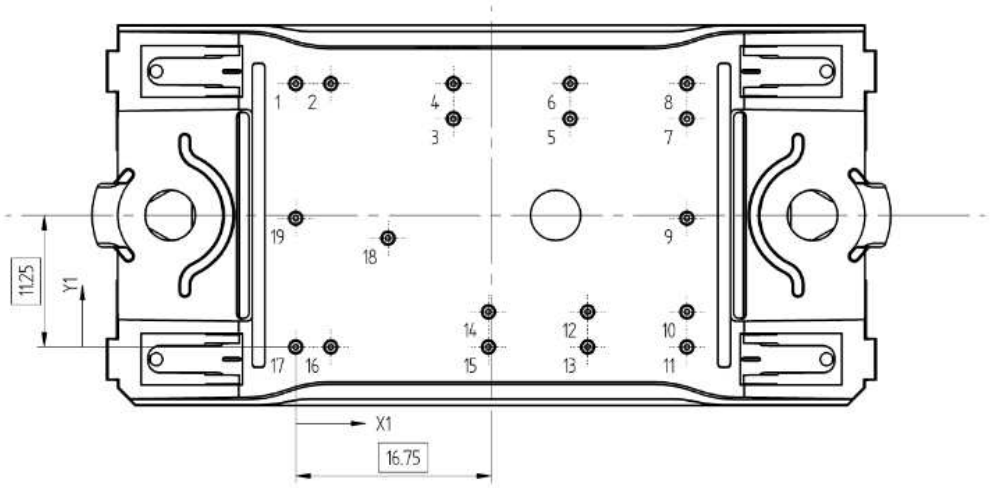
Ordering Code & Marking

Version	Ordering Code	in DataMatrix as	in packaging barcode as
without thermal paste with 17mm housing	10-F0127PA0008SC-L156E09	L156E09	L156E09
without thermal paste with 12mm housing	10-FZ127PA0008SC-L156E08	L156E08	L156E08

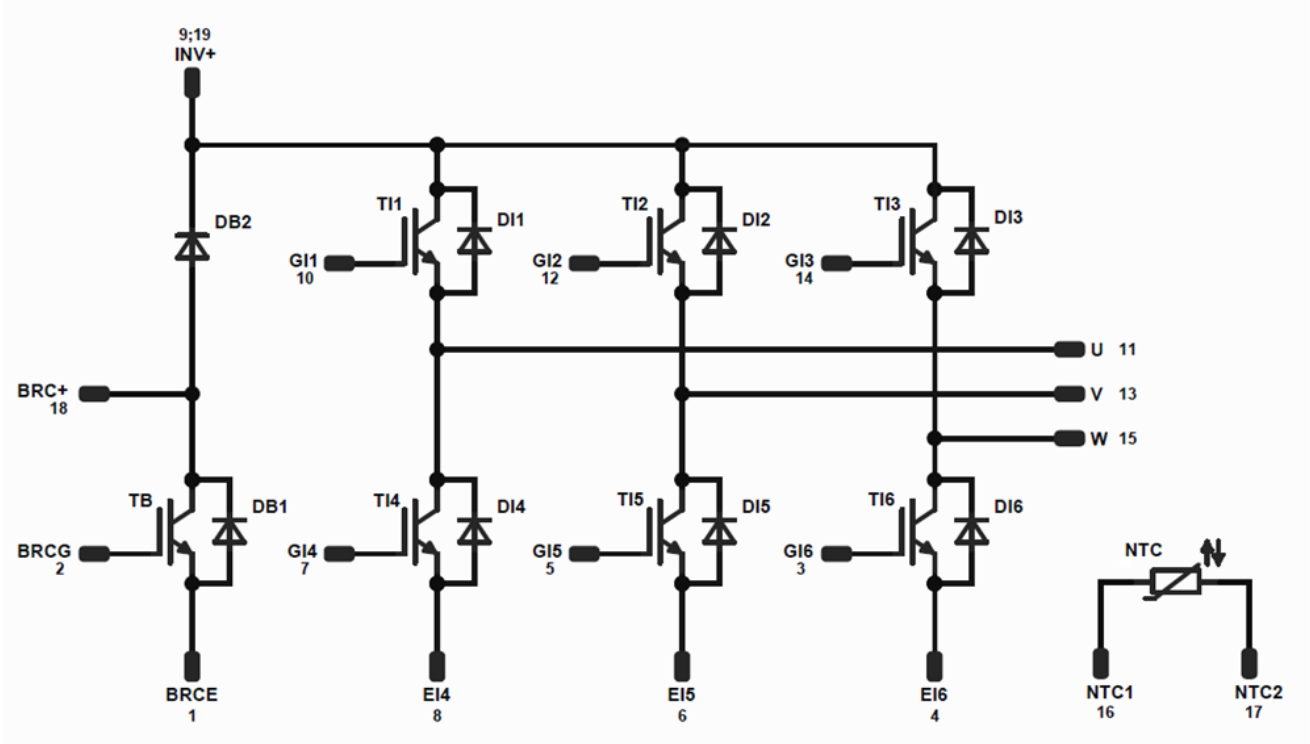
	Name		Date code	UL & Vinco	Lot	Serial
Text	NN-NNNNNNNNNNNNN-NNNNNNNN		WWYY	UL Vinco	LLLLL	SSSS
	Type&Ver	**Lot number**	**Serial**	**Date code**		
Datamatrix	TTTTTTTVV	LLLLL	SSSS	WWYY		

Outline

Pin table [mm]			
Pin	X	Y	Function
1	0	22,5	BRCE
2	3	22,5	BRCG
3	13,5	19,5	GI6
4	13,5	22,5	EI6
5	23,5	19,5	GI5
6	23,5	22,5	EI5
7	33,5	19,5	GI4
8	33,5	22,5	EI4
9	33,5	11	INV+
10	33,5	3	GI1
11	33,5	0	U
12	25	3	GI2
13	25	0	V
14	16,5	3	GI3
15	16,5	0	W
16	3	0	NTC1
17	0	0	NTC2
18	7,9	9,3	BRC+
19	0	11	INV+



Pinout



Identification

ID	Component	Voltage	Current	Function	Comment
TI1,TI2,TI3 TI4,TI5,TI6	IGBT	1200V	8A	Inverter Switch	
DI1,DI2,DI3 DI4,DI5,DI6	FWD	1200V	10A	Inverter Diode	
TB	IGBT	1200V	8A	Brake Switch	
DB2	FWD	1200V	10A	Brake Diode	
DB1	FWD	1200V	3A	Brake Inverse Diode	
NTC	NTC	-	-	Thermistor	

Packaging instruction					
Standard packaging quantity (SPQ)	135	>SPQ	Standard	<SPQ	Sample

Handling instruction
Handling instructions for *flow* 0 packages see vincotech.com website.

Package data
Package data for *flow* 0 packages see vincotech.com website.

Document No.:	Date:	Modification:	Pages
10-Fx127PA0008SC-L156E0x-D4-14	23 Jul. 2015	New outline drawing	16

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