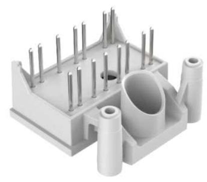
Vincotech

flow **PACK 0B**	**1200 V / 8 A**

Features

- IGBT4 (1200 V) technology
- Open emitter topology
- New ultra-compact housing
- Single-screw heat sink mounting

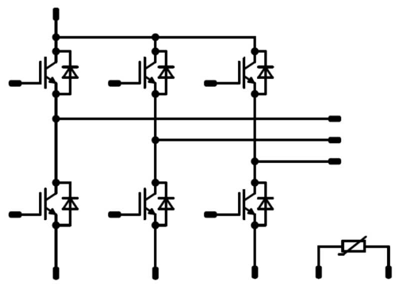
flow 0 17 mm housing



Target applications

- Dedicated design for motor drive

Schematic



Types

- 10-0B126PA008SC-M998F09

Inverter switch maximum ratings

Tj=25°C, unless otherwise specified

Parameter	Symbol	Condition		Value	Unit
Collector-emitter break down voltage	V_{CES}			1200	V
DC collector current	I_C	T_j=$T_j$max	T_h=80°C	13	A
Pulsed collector current	I_{Cpulse}	t_p limited by $T_j$max		24	A
Power dissipation	P_{tot}	T_j=$T_j$max	T_h=80°C	45	W
Gate-emitter peak voltage	V_{GE}			±20	V
Short circuit ratings	t_{SC} V_{CC}	Tj≤ 150°C VGE= 15V		10 800	µs V
Maximum Junction Temperature	$T_j$max			175	°C

Inverter diode maximum ratings

Tj=25°C, unless otherwise specified

Parameter	Symbol	Conditions		Value	Unit
Peak Repetitive Reverse Voltage	V_{RRM}			1200	V
DC forward current	I_F	T_j=$T_j$max	T_h=80°C	18	A
Repetitive peak forward current	I_{FRM}			20	A
Power dissipation	P_{tot}	T_j=$T_j$max	T_h=80°C	40	W
Maximum Junction Temperature	$T_j$max			175	°C

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Inverter switch characteristic values

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	$V_{GE(th)}$	$V_{GE}=V_{CE}$			0,0003	25 125	5,3	5,8	6,3	V
Collector-emitter saturation voltage	$V_{CE(sat)}$		15		8	25 150	1,58	1,85 2,25	2,07	V
Collector-emitter cut-off	I_{CES}		0	1200		25 125			1	µA
Gate-emitter leakage current	I_{GES}		20	0		25 125			120	nA
Integrated Gate resistor	R_{gint}							none		Ω
Input capacitance	C_{ies}	f=1 MHz	0	25		25		490		pF
Output capacitance	C_{oss}							36		
Reverse transfer capacitance	C_{rss}							30		
Gate charge	Q_{Gate}		15	960	8	25		53		nC
Thermal										
Thermal resistance chip to heatsink	R_{thJH}	Thermal grease thickness≤50um λ = 1 W/mK						2,1		K/W

Inverter dynamic values

Parameter	Symbol	Conditions					Value			Unit
			V_{GE} [V] or V_{GS} [V]	V_r [V] or V_{CE} [V]	I_C [A] or I_F [A] or I_D [A]	T_j [°C]	Min	Typ	Max	
IGBT Switching										
Turn-on delay time	$t_{d(on)}$	Rgoff=32Ω Rgon=32Ω	±15	600	8	25 150		58 59		ns
Rise time	t_r					25 150		23 22		
Turn-off delay time	$t_{d(off)}$					25 150		177 244		
Fall time	t_f					25 150		64 137		
Turn-on energy loss per pulse	E_{on}	QrrFWD=0,8uC				25 150		0,510 0,826		mWs
Turn-off energy loss per pulse	E_{off}					25 150		0,455 0,784		
FWD Switching										
Peak recovery current	I_{RRM}	338	±15	600	8	25 150		7 9		A
Reverse recovery time	t_{rr}	338				25 150		241 416		ns
Reverse recovery charge	Q_{rr}	338				25 150		0,808 1,658		µC
Reverse recovered energy	E_{rec}	338				25 150		0,315 0,661		mWs
Peak rate of fall of recovery current	di(rec)max /dt	338				25 150		89 51		A/µs

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Inverter diode characteristic values

Parameter	Symbol	Conditions					Value			Unit
		dI_F/dt [A/us]		V_r [V]	I_F [A]	T_j	Min	Typ	Max	
Static										
Forward voltage	V_F				10	25°C 150°C		1,76 1,68	2,05	V
Reverse leakage current	I_{rm}			1200		25°C 150°C			2,7 -	μA
Thermal										
Thermal resistance chip to heatsink	R_{thJH}	Thermal grease thickness≤50um λ = 1 W/mK						2,4		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	ΔR/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	

Module Properties

Parameter	Symbol	Conditions		Value	Unit
Thermal Properties					
Storage temperature	T_{stg}			-40…+125	°C
Operation temperature under switching condition	T_{op}			-40…+(Tjmax - 25)	°C
Insulation Properties					
Insulation voltage	V_{is}	DC voltage	t=2s	4000	V
Creepage distance				min 12,7	mm
Clearance				min 12,7	mm
Comparative tracking index	CTI			>200	

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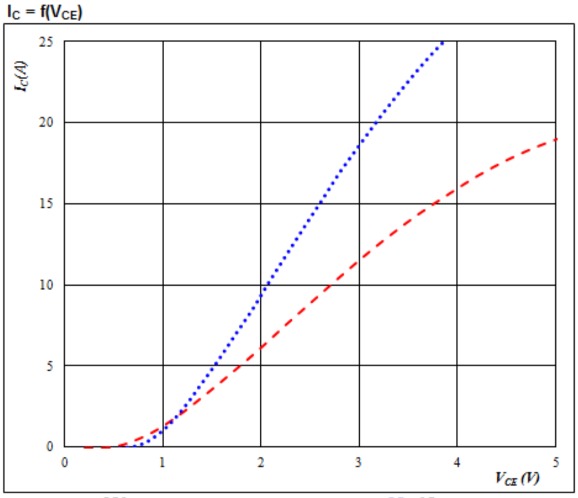
Inverter switch characteristics

Typical output characteristics IGBT

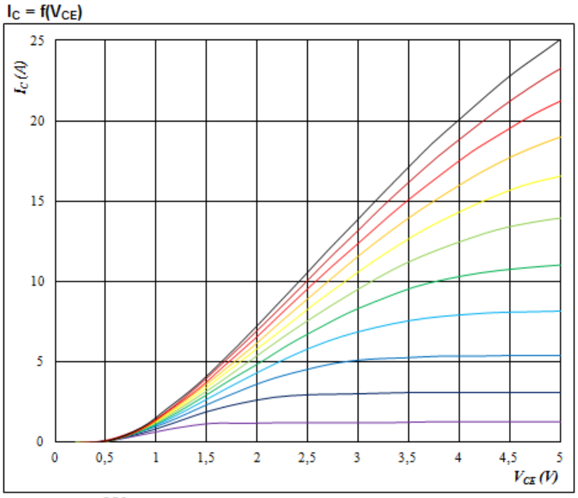
$I_C = f(V_{CE})$



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

Typical output characteristics IGBT

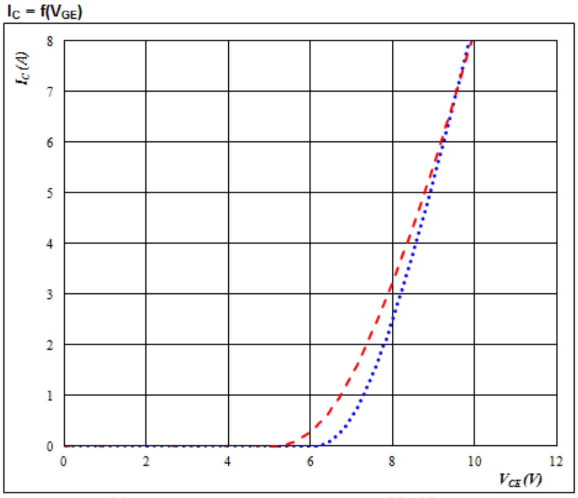
$I_C = f(V_{CE})$



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

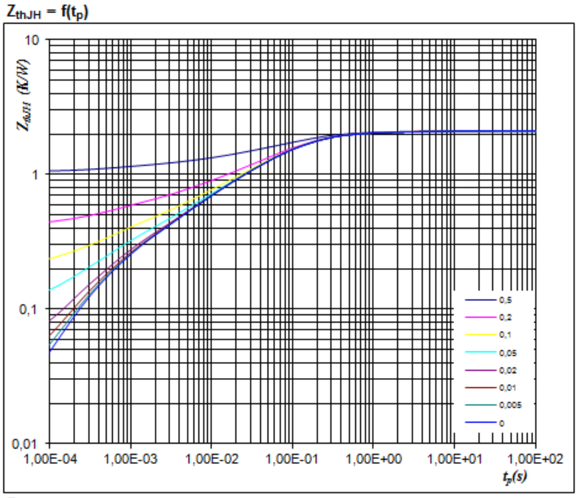
$I_C = f(V_{GE})$



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

Transient thermal impedance as a function of pulse width IGBT

$Z_{thJH} = f(t_p)$



D = t_p / T
R_{thJH} = 2,1 K/W

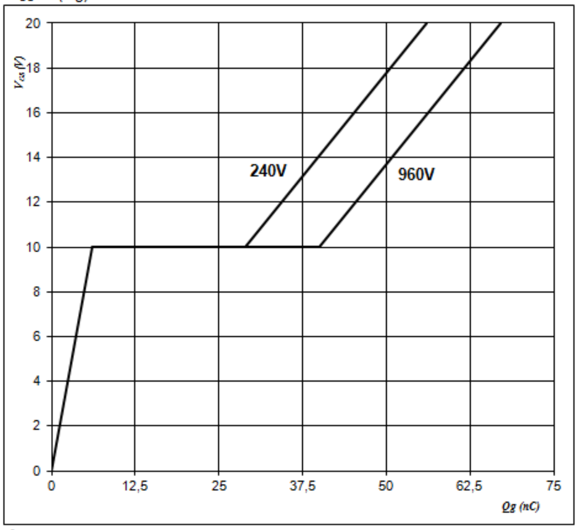
IGBT thermal model values

R (K/W)	Tau (s)
6,03E-02	4,78E+00
1,65E-01	5,92E-01
7,42E-01	1,24E-01
5,13E-01	3,81E-02
3,31E-01	8,51E-03
1,32E-01	1,73E-03
1,28E-01	3,64E-04

Inverter switch characteristics

Gate voltage vs Gate charge IGBT

$V_{GS} = f(Qg)$

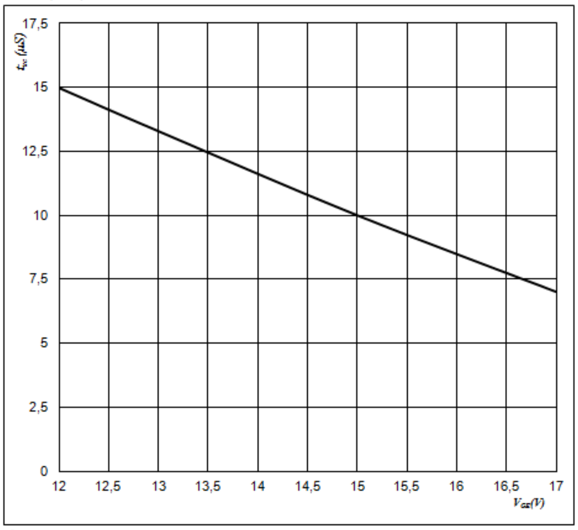


At

I_C=	8	A

Short circuit withstand time as a function of Vge IGBT

$t_{sc} = f(V_{GE})$

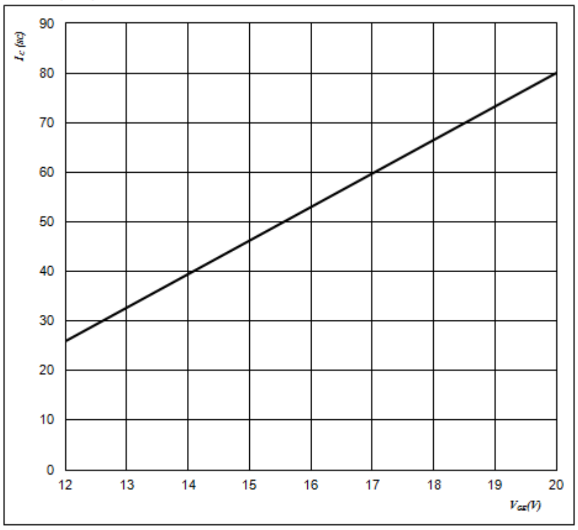


At

V_{CE} =	600	V
T_j ≤	25	°C

Typical short circuit collector current as a function of Vge IGBT

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



At

V_{CE} ≤	600	V
T_j =	25	°C

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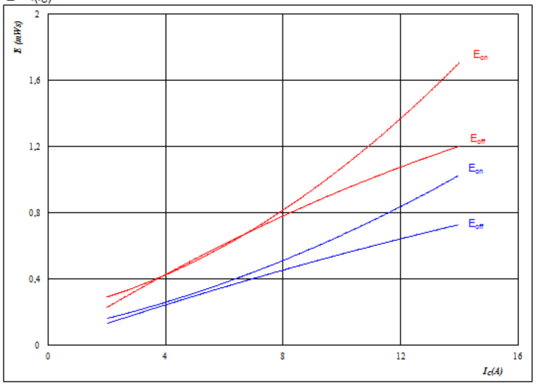
Inverter switching characteristics

Figure 1. IGBT

Typical switching energy losses as a function of collector current

E = f(I_C)



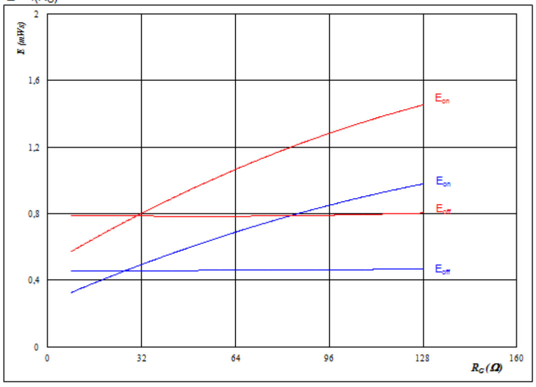
With an inductive load at

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

Figure 2. IGBT

Typical switching energy losses as a function of gate resistor

E = f(R_G)



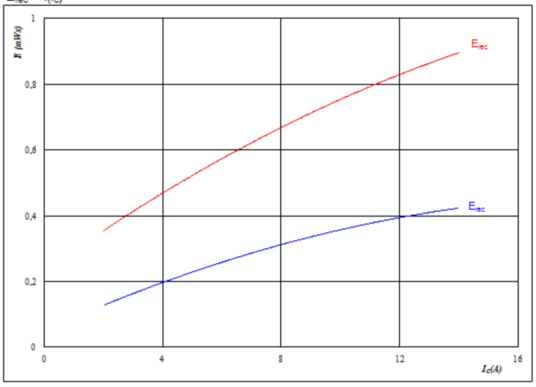
With an inductive load at

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

Figure 3. FWD

Typical reverse recovery energy loss as a function of collector (drain) current

E_{rec} = f(I_c)



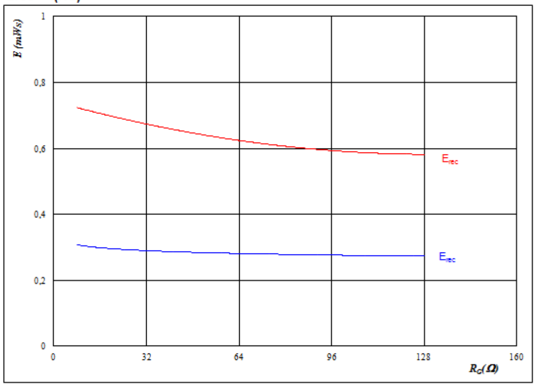
With an inductive load at

T_j =	25/125/150	°C	R_{gon} =	32	Ω
V_{CE} =	600	V	R_{goff} =	32,015	Ω
V_{GE} =	±15	V			

Figure 4. FWD

Typical reverse recovery energy loss as a function of gate resistor

Erec = f(RG)



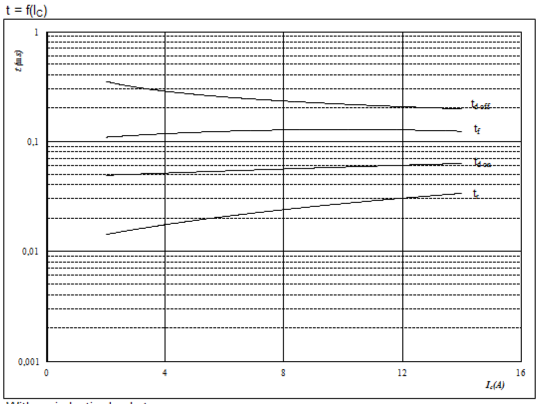
With an inductive load at

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

Figure 5. IGBT

Typical switching times as a function of collector current

t = f(I_C)



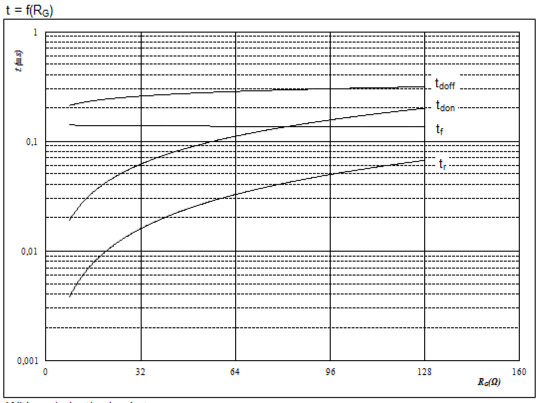
With an inductive load at

T_j =	0	°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)

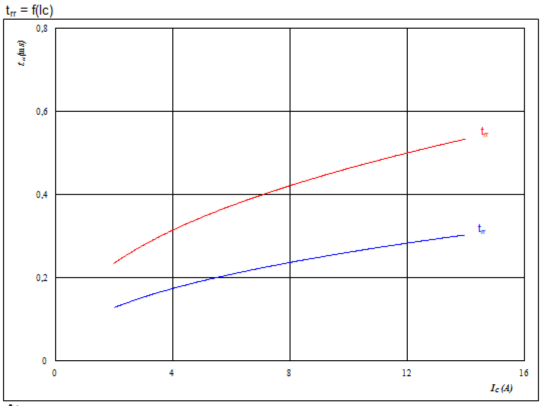


With an inductive load at

T_j =	0	°C
V_{CE} =	600	V
V_{GE} =	±15	V
I_C =	8	A

Inverter switching characteristics

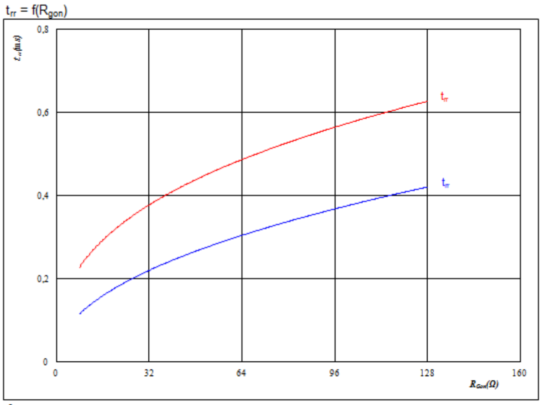
Figure 7. FWD
Typical reverse recovery time as a function of collector current
$t_{rr} = f(I_C)$



At

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

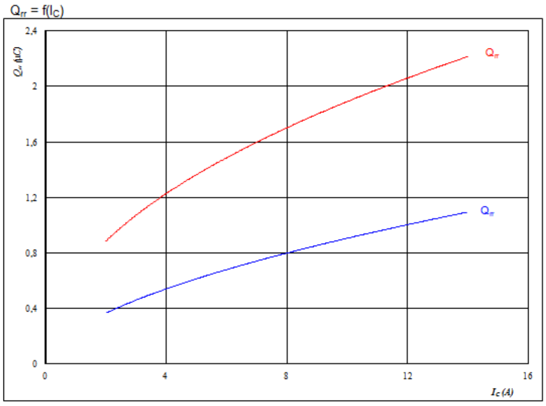
Figure 8. FWD
Typical reverse recovery time as a function of IGBT turn on gate resistor
$t_{rr} = f(R_{gon})$



At

T_j =	25/125/150	°C
V_R =	600	V
I_F =	8	A
V_{GE} =	±15	V

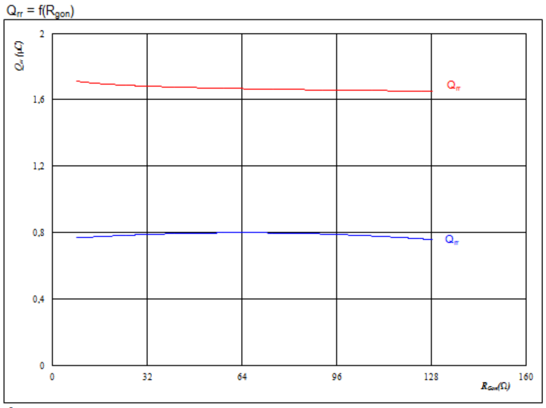
Figure 9. FWD
Typical reverse recovery charge as a function of collector current
$Q_{rr} = f(I_C)$



At

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

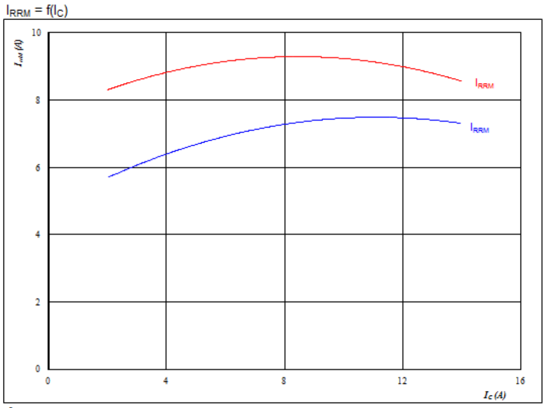
Figure 10. FWD
Typical reverse recovery charge as a function of IGBT turn on gate resistor
$Q_{rr} = f(R_{gon})$



At

T_j =	25/125/150	°C
V_R =	600	V
I_F =	8	A
V_{GE} =	±15	V

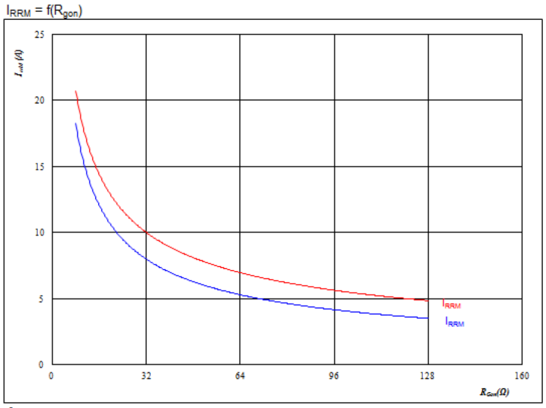
Figure 11. FWD
Typical reverse recovery current as a function of collector current
$I_{RRM} = f(I_C)$



At

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

Figure 12. FWD
Typical reverse recovery current as a function of IGBT turn on gate resistor
$I_{RRM} = f(R_{gon})$



At

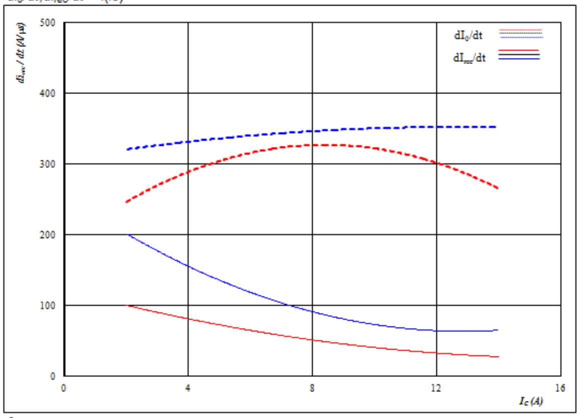
T_j =	25/125/150	°C	V_{GE} =	±15	V
V_R =	600	V			
I_F =	8	A			

Inverter switching characteristics

Figure 13. FWD

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

$dI_0/dt, dI_{rec}/dt = f(I_C)$

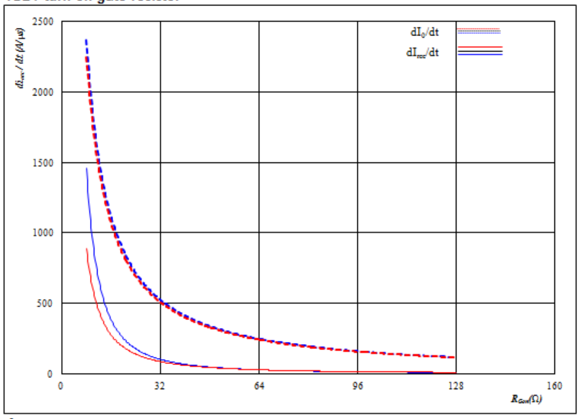


At

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

Figure 14. FWD

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



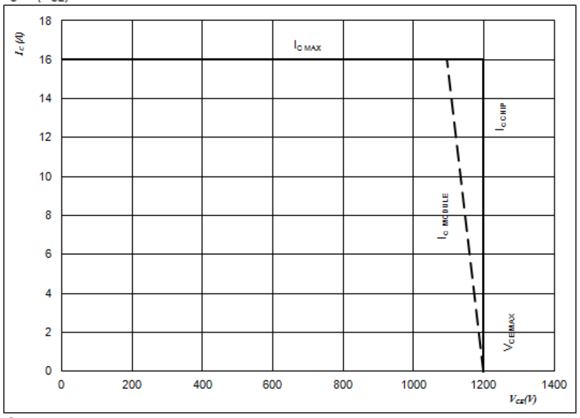
At

Tj =	25/125/150	°C
V_R =	600	V
I_F =	8	A
V_{GE} =	±15	V

Figure 15. IGBT

Reverse bias safe operating area

$I_C = f(V_{CE})$



At

T_j =	175	°C
Rgon =	32	Ω
Rgoff =	32	Ω

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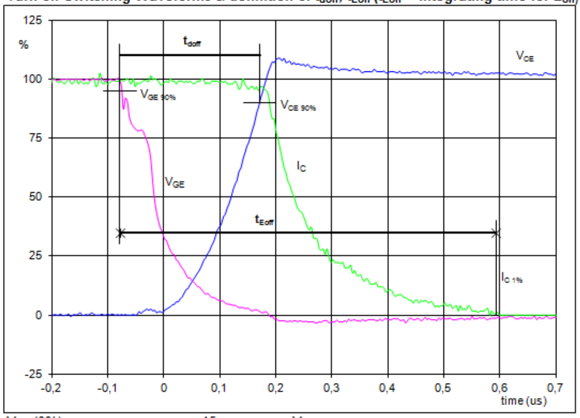
Switching Definitions

General conditions		
T_j	=	150 °C
R_{gon}	=	32 Ω
R_{goff}	=	32 Ω

Figure 1. IGBT

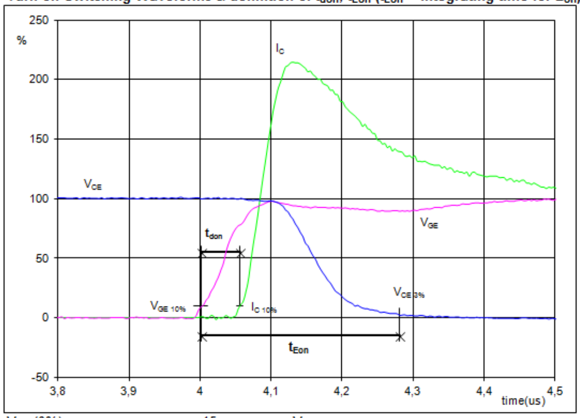
Turn-off Switching Waveforms & definition of t_{doff}, t_{Eoff} (t_{Eoff} = integrating time for E_{off})



V_{GE} (0%) =	-15	V
V_{GE} (100%) =	15	V
V_C (100%) =	600	V
I_C (100%) =	8	A
t_{doff} =	0,24	µs
t_{Eoff} =	0,67	µs

Figure 2. IGBT

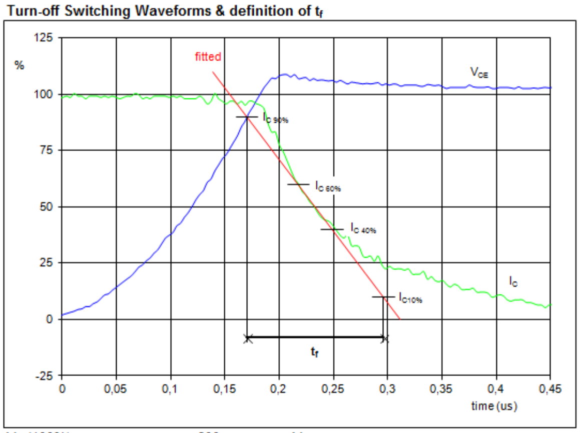
Turn-on Switching Waveforms & definition of t_{don}, t_{Eon} (t_{Eon} = integrating time for E_{on})



V_{GE} (0%) =	-15	V
V_{GE} (100%) =	15	V
V_C (100%) =	600	V
I_C (100%) =	8	A
t_{don} =	0,06	µs
t_{Eon} =	0,28	µs

Figure 3. IGBT

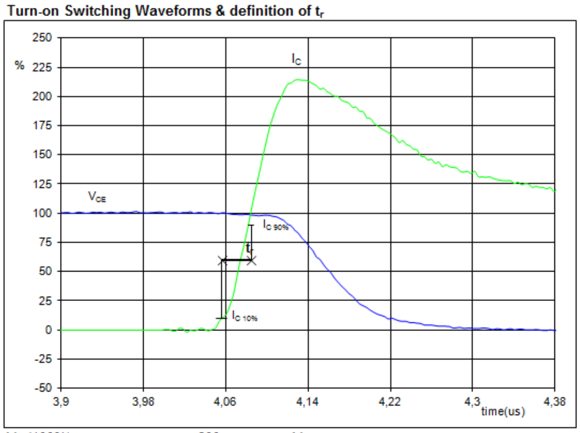
Turn-off Switching Waveforms & definition of t_f



V_C (100%) =	600	V
I_C (100%) =	8	A
t_f =	0,14	µs

Figure 4. IGBT

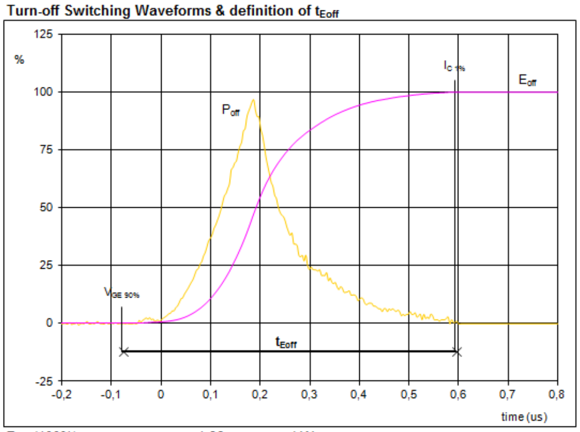
Turn-on Switching Waveforms & definition of t_r



V_C (100%) =	600	V
I_C (100%) =	8	A
t_r =	0,02	µs

Figure 5. IGBT

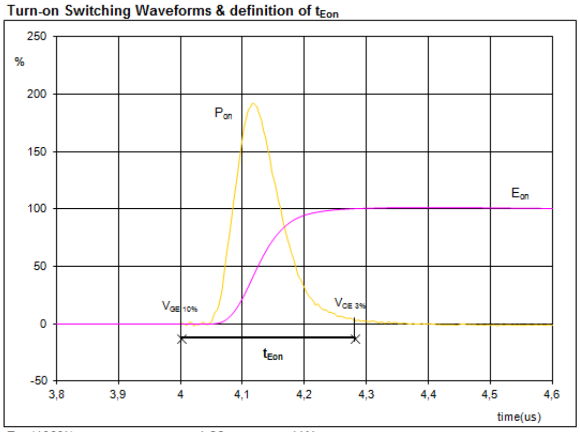
Turn-off Switching Waveforms & definition of t_{Eoff}



P_{off} (100%) =	4,86	kW
E_{off} (100%) =	0,78	mJ
t_{Eoff} =	0,67	µs

Figure 6. IGBT

Turn-on Switching Waveforms & definition of t_{Eon}

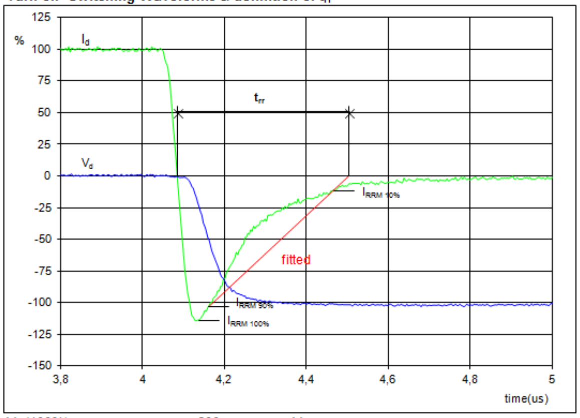


P_{on} (100%) =	4,86	kW
E_{on} (100%) =	0,83	mJ
t_{Eon} =	0,28	µs

Switching Definitions

Figure 7. FWD

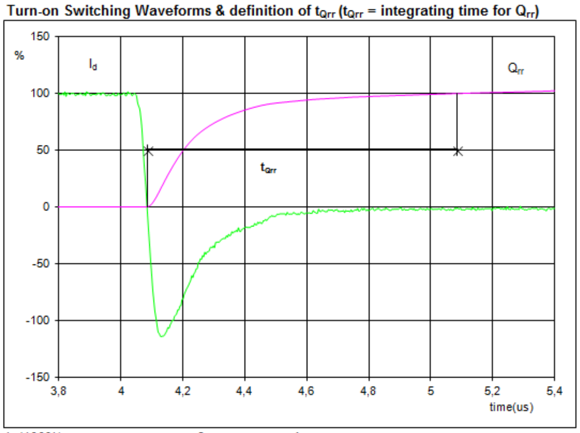
Turn-off Switching Waveforms & definition of t_{rr}



V_d (100%) =	600	V
I_d (100%) =	8	A
I_{RRM} (100%) =	-9	A
t_{rr} =	0,42	μs

Figure 8. FWD

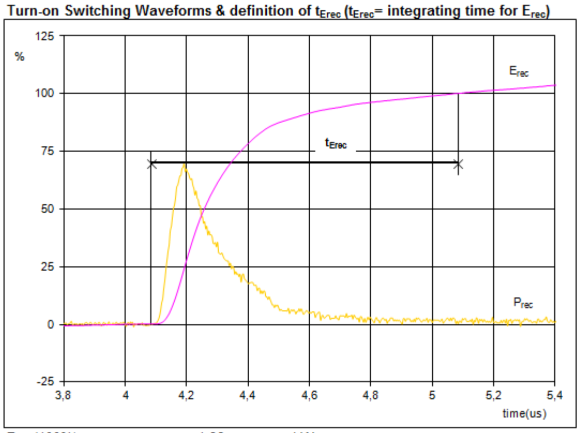
Turn-on Switching Waveforms & definition of t_{Qrr} (t_{Qrr} = integrating time for Q_{rr})



I_d (100%) =	8	A
Q_{rr} (100%) =	1,66	μC
t_{Qrr} =	1,00	μs

Figure 9. FWD

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



P_{rec} (100%) =	4,86	kW
E_{rec} (100%) =	0,66	mJ
t_{Erec} =	1,00	μs

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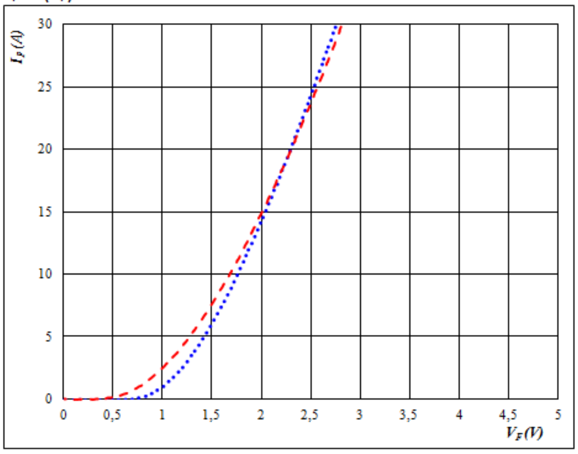
Inverter diode characteristics

Typical forward characteristics	FWD

$I_F = f(V_F)$

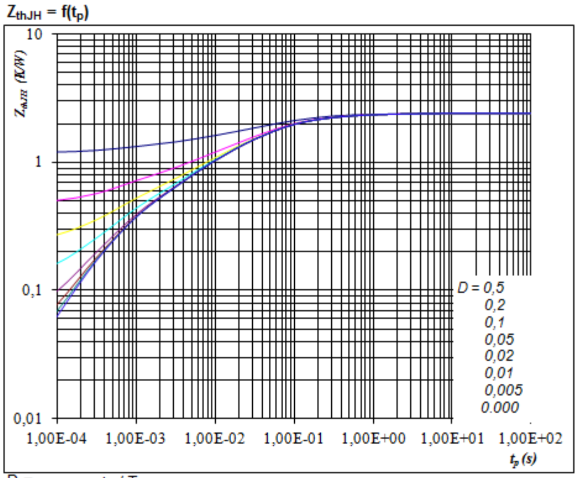


t_p = 250 µs

T_j: 25 °C; 125 °C; 150 °C

Transient thermal impedance as a function of pulse width	FWD

$Z_{thJH} = f(t_p)$



D = t_p / T

R_{thJH} = 2,4 K/W

FWD thermal model values

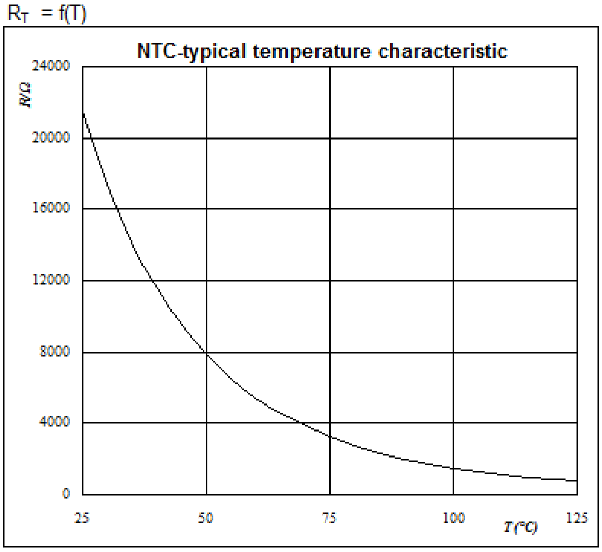
R (K/W)	Tau (s)
7,46E-02	3,12E+00
2,49E-01	3,62E-01
8,60E-01	6,40E-02
5,97E-01	1,50E-02
3,54E-01	3,27E-03
2,60E-01	5,11E-04

Thermistor

Figure 1	Thermistor

Typical NTC characteristic
as a function of temperature

$R_T = f(T)$



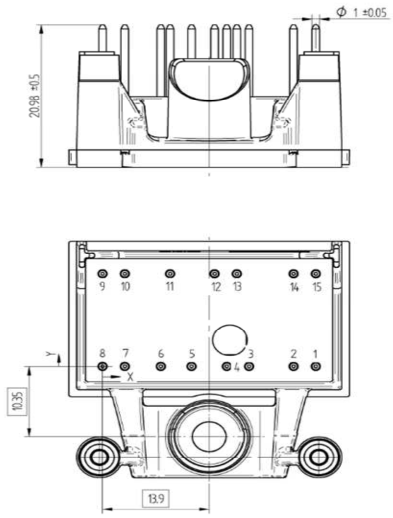
Ordering Code & Marking

Version	Ordering Code
without thermal paste 17mm housing with solder pins	10-0B126PA008SC-M998F09

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

Outline

Pin table [mm]			
Pin	X	Y	Pos
1	27,8	0	G6
2	24,9	0	E6
3	19,1	0	G6
4	16,2	0	E5
5	11,6	0	NTC2
6	7,6	0	NTC1
7	2,9	0	E4
8	0	0	G4
9	0	13,7	U
10	2,9	13,7	G1
11	8,8	13,7	DC+
12	14,6	13,7	V
13	17,5	13,7	G2
14	24,9	13,7	G3
15	27,8	13,7	W



Tolerance of pinpositions: ±0,5mm at the end of pins
Dimension of coordinate axis is only offset without tolerance
PCB cutouts and holes see in handling instruction document

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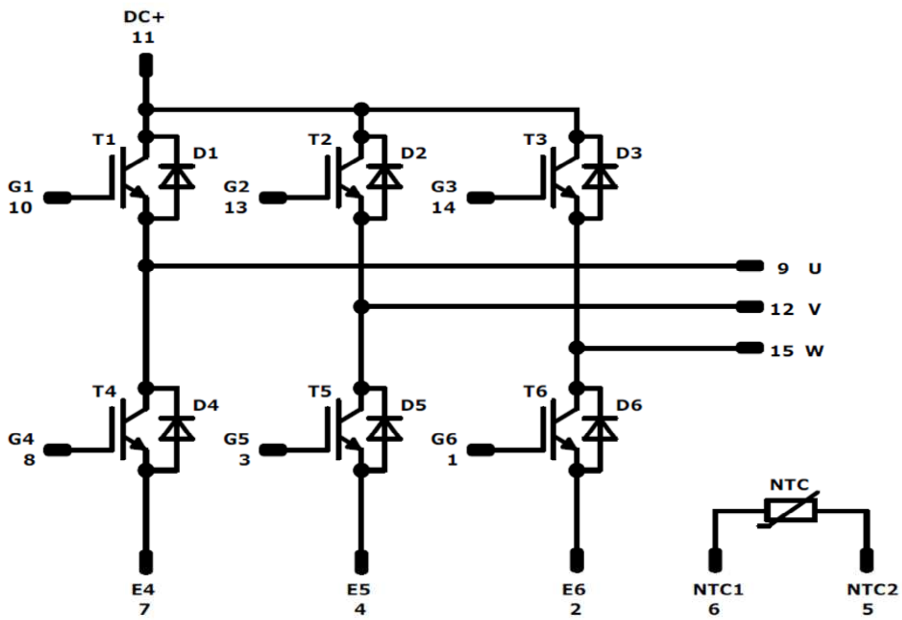
Pinout



Identification

ID	Component	Voltage	Current	Function	Comment
T1-T6	IGBT	1200 V	8 A	Inverter switch	
D1-D6	FWD	1200 V	10 A	Inverter diode	
NTC	NTC			Thermistor	

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Packaging instruction					
Standard packaging quantity (SPQ)	160	>SPQ	Standard	<SPQ	Sample

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

Document No.:	Date:	Modification:	Pages
10-0B126PA008SC-M998F09-T2-14	26 Jun 2017	Updated packaging quantity	14