10-0B066PA006SB-M992F09
datasheet

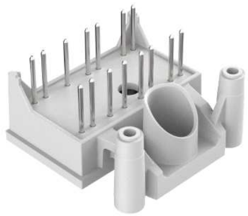
Vincotech

***flow*PACK 0 B** | **600 V / 6 A**

Features

- IGBT3 (600V) technology
- Open emitter topology
- New ultra-compact housing
- Single-screw heat sink mounting

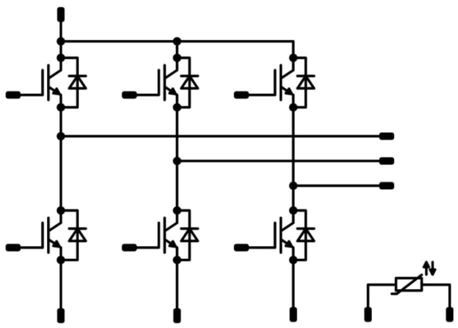
flow 0 B housing



Target applications

- Dedicated design for motor drive

Schematic



Types

- 10-0B066PA006SB-M992F09

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	8	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}	18	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ T_s = 80 °C	27	W
Gate-emitter voltage	V_{GES}		±20	V
Short circuit ratings	t_{SC} V_{CC}	$T_j \leq$ 150 °C V_{GE} = 15 V	6 360	μs V
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	8	A
Repetitive peak forward current	I_{FRM}			12	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	23	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 s	4000	V
Creepage distance				min. 12,7	mm
Clearance				min. 12,7	mm
Comparative Tracking Index	CTI			> 200	

Characteristic Values

Parameter	Symbol	Conditions	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	Unit
Inverter Switch										
Static										
Gate-emitter threshold voltage	$V_{GE(th)}$	$V_{GE} = V_{CE}$			0,00018	25	5	5,8	6,5	V
Collector-emitter saturation voltage	V_{CEsat}		15		6	25 125	1,1	1,49 1,68	1,9	V
Collector-emitter cut-off current	I_{CES}		0	600		25			0,04	µA
Gate-emitter leakage current	I_{GES}		20	0		25			300	nA
Internal gate resistance	r_g							none		Ω
Input capacitance	C_{ies}	f = 100 KHz	0	25		25		368		pF
Output capacitance	C_{oes}	f = 100 KHz	0	25		25		28		pF
Reverse transfer capacitance	C_{res}	f = 100 KHz	0	25		25		11		pF
Gate charge	Q_g		15	180	6	25		42		nC
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	Thermal grease thickness ≤ 50 µm λ = 1 W/mK						3,50		K/W
Dynamic										
Turn-on delay time	$t_{d(on)}$	R_{goff} = 64 Ω R_{gon} = 64 Ω	±15	300	6	25 150		105 102		ns
Rise time	t_r	R_{goff} = 64 Ω R_{gon} = 64 Ω	±15	300	6	25 150		22 28		ns
Turn-off delay time	$t_{d(off)}$	R_{goff} = 64 Ω R_{gon} = 64 Ω	±15	300	6	25 150		142 164		ns
Fall time	t_f	R_{goff} = 64 Ω R_{gon} = 64 Ω	±15	300	6	25 150		103 132		ns
Turn-on energy (per pulse)	E_{on}	Q_{rFWD} = 0,3 µC Q_{rFWD} = 0,8 µC	±15	300	6	25 150		0,150 0,225		mWs
Turn-off energy (per pulse)	E_{off}		±15	300	6	25 150		0,146 0,193		mWs

Characteristic Values

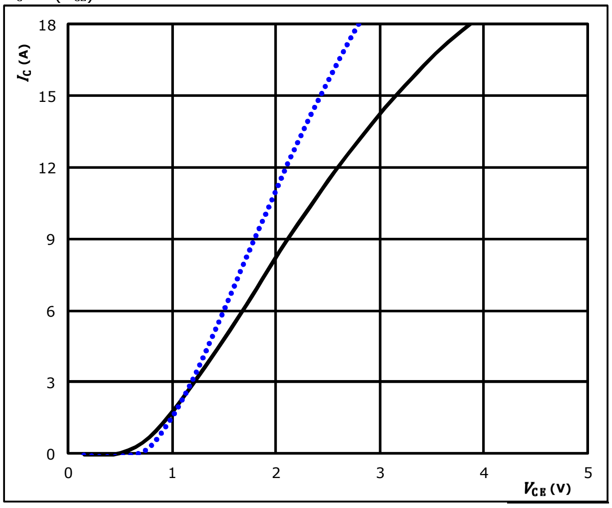
Parameter	Symbol	Conditions					Value			Unit
			V_{GE} [V] V_{GS} [V]	V_{CE} [V] V_{DS} [V] V_F [V]	I_C [A] I_D [A] I_F [A]	T_j [°C]	Min	Typ	Max	
Inverter Diode										
Static										
Forward voltage	V_F				6	25 125		1,58 1,50	1,95	V
Reverse leakage current	I_R			600		25			27	µA
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	Thermal grease thickness ≤ 50 µm λ = 1 W/mK						4,20		K/W
Dynamic										
Peak recovery current	I_{RRM}	di/dt = 219 A/µs di/dt = 191 A/µs	±15	300	6	25 150		4 6		A
Reverse recovery time	t_{rr}					25 150		183 288		ns
Recovered charge	Q_r					25 150		0,324 0,775		µC
Reverse recovered energy	E_{rec}					25 150		0,059 0,156		mWs
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 150		45 57		A/µs
Thermistor										
Rated resistance	R					25		21,5		kΩ
Deviation of R_{100}	$\Delta_{R/R}$	R_{100} = 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 Characteristics

figure 1. **IGBT**

Typical output characteristics

$I_C = f(V_{CE})$

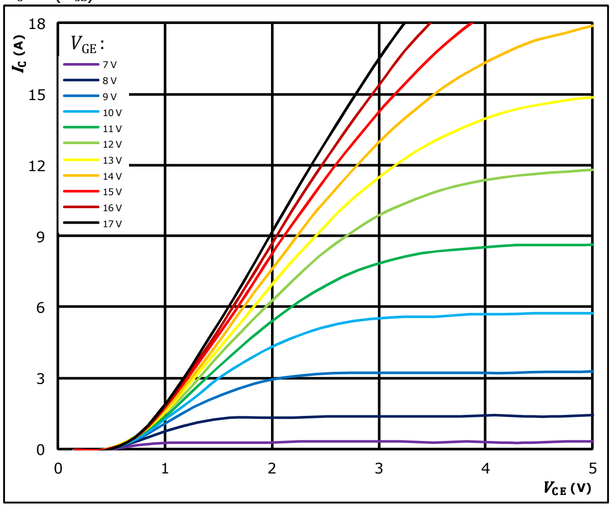


t_p =	250	µs	T_j:	25 °C	dotted
V_{GE} =	15	V		125 °C	solid

figure 2. **IGBT**

Typical output characteristics

$I_C = f(V_{CE})$

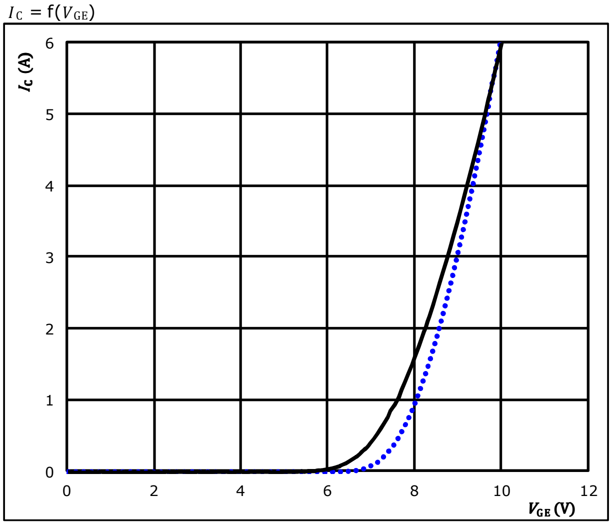


t_p = 250 µs
T_j = 125 °C
V_{GE} from 7 V to 17 V in steps of 1 V

figure 3. **IGBT**

Typical transfer characteristics

$I_C = f(V_{GE})$

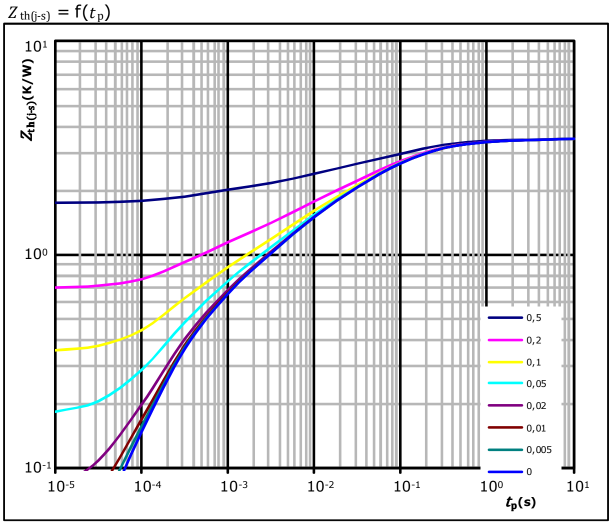


t_p =	100	µs	T_j:	25 °C	dotted
V_{CE} =	10	V		125 °C	solid

figure 4. **IGBT**

Transient thermal impedance as function of pulse duration

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



D = t_p / T
$R_{th(j-s)}$ = 3,50 K/W

IGBT thermal model values

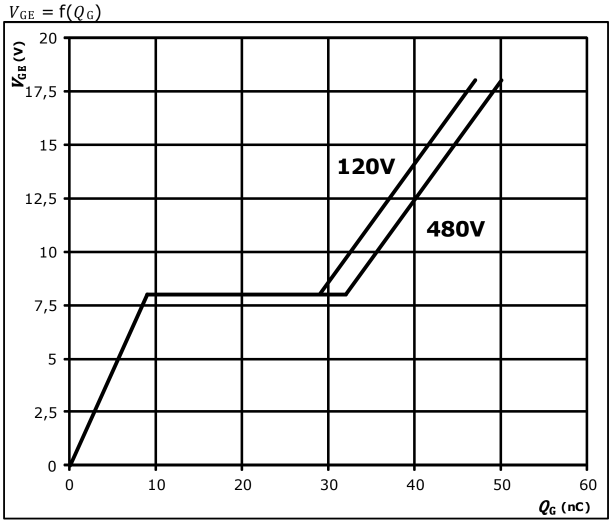
R (K/W)	τ (s)
1,46E-01	3,65E+00
5,40E-01	3,03E-01
1,16E+00	7,07E-02
7,43E-01	1,16E-02
4,93E-01	2,32E-03
4,22E-01	3,00E-04

Inverter Switch Characteristics

figure 5. **IGBT**

Gate voltage vs gate charge

$V_{GE} = f(Q_G)$

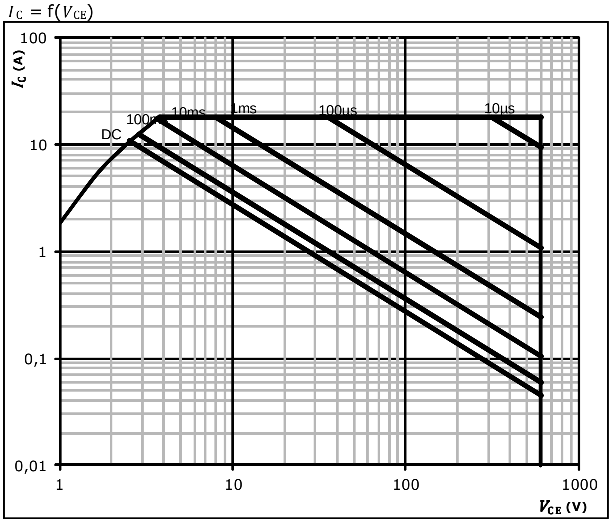


$I_C =$ 6 A

figure 6. **IGBT**

Safe operating area

$I_C = f(V_{CE})$

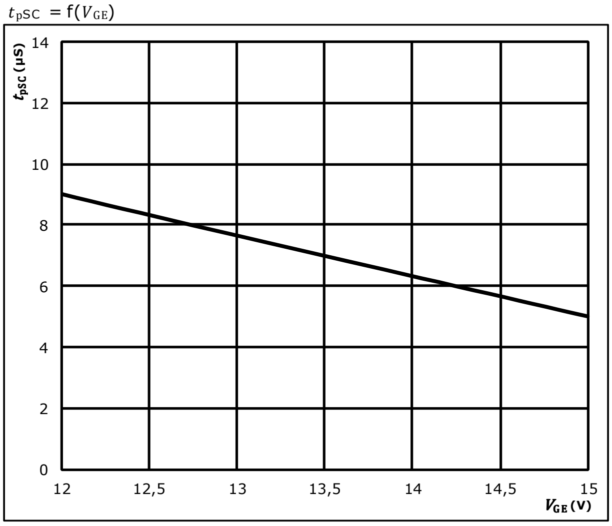


$D =$	single pulse	
$T_s =$	80	ºC
$V_{GE} =$	±15	V
$T_j =$	T_{jmax}	ºC

figure 7. **IGBT**

Short circuit duration as a function of V_{GE}

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

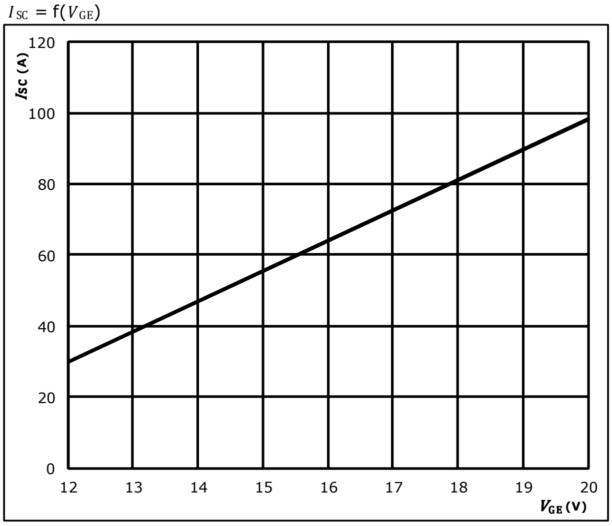


$V_{CE} =$	600	V
$T_j \leq$	175	ºC

figure 8. **IGBT**

Typical short circuit current as a function of V_{GE}

$I_{SC} = f(V_{GE})$



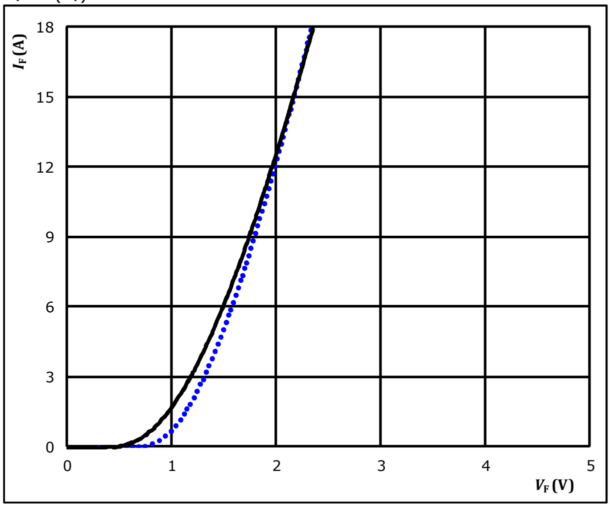
$V_{CE} \leq$	600	V
$T_j \leq$	175	ºC

Inverter Diode Characteristics

figure 1. **FWD**

Typical forward characteristics

$I_F = f(V_F)$



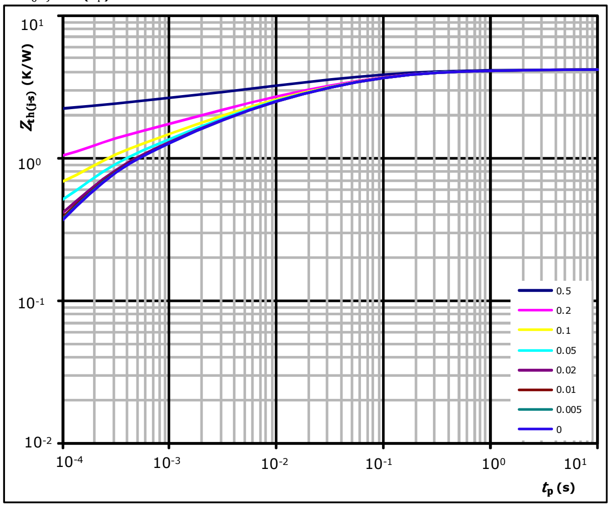
t_p = 250 μs

T_j: 25 °C ••••••••••
125 °C — — — ■

figure 2. **FWD**

Transient thermal impedance as a function of pulse width

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



$D = t_p / T$

$R_{th(j-s)}$ = 4,20 K/W

FWD thermal model values

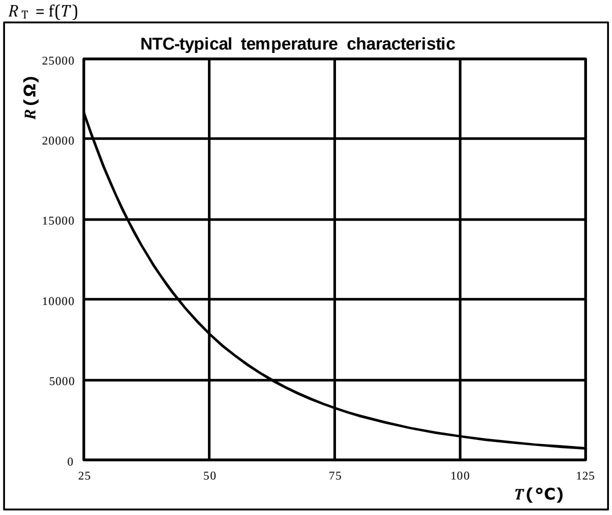
R (K/W)	τ (s)
1,59E-01	2,28E+00
6,49E-01	1,47E-01
9,61E-01	3,33E-02
9,96E-01	6,52E-03
7,19E-01	1,27E-03
7,17E-01	1,89E-04

Thermistor Characteristics

Thermistor typical temperature characteristic

Typical NTC characteristic
as a function of temperature

$R_T = f(T)$

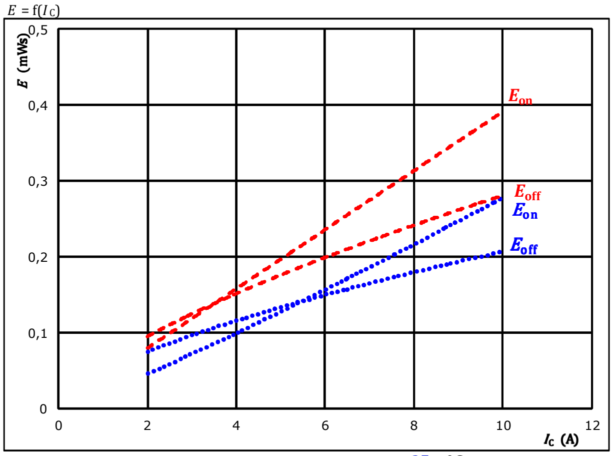


Inverter Switching Characteristics

figure 1. IGBT

Typical switching energy losses as a function of collector current

$E = f(I_C)$



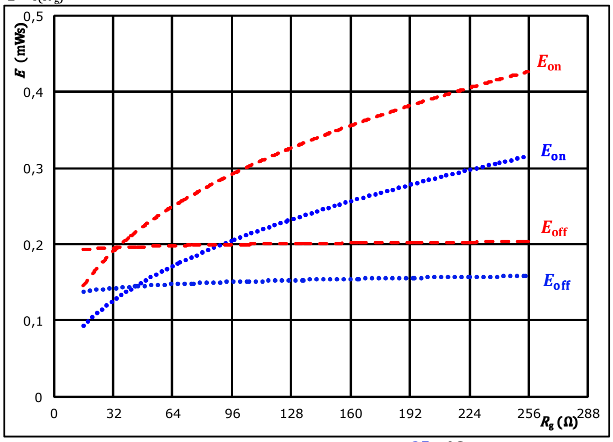
With an inductive load at

V_{CE} =	300	V	T_j:	25 °C	••••••••••••
V_{GE} =	±15	V		150 °C	— — — —
R_{gon} =	64	Ω			
R_{goff} =	64	Ω			

figure 2. IGBT

Typical switching energy losses as a function of gate resistor

$E = f(R_g)$



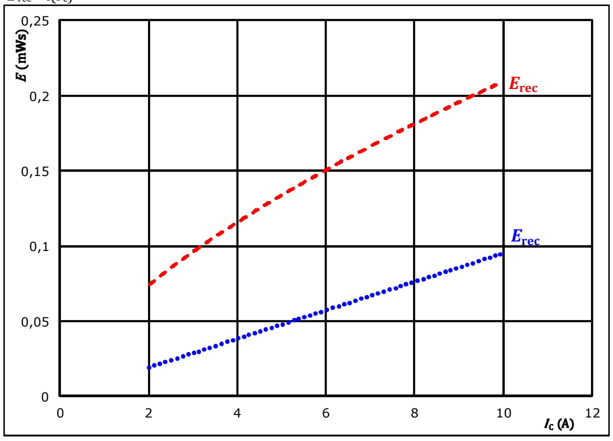
With an inductive load at

V_{CE} =	300	V	T_j:	25 °C	••••••••••••
V_{GE} =	±15	V		150 °C	— — — —
I_C =	6	A			

figure 3. FWD

Typical reverse recovered energy loss as a function of collector current

$E_{rec} = f(I_C)$



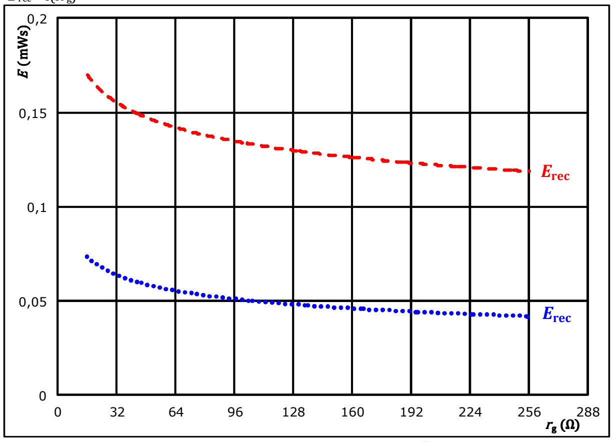
With an inductive load at

V_{CE} =	300	V	T_j:	25 °C	••••••••••••
V_{GE} =	±15	V		150 °C	— — — —
R_{gon} =	64	Ω			

figure 4. FWD

Typical reverse recovered energy loss as a function of gate resistor

$E_{rec} = f(R_g)$



With an inductive load at

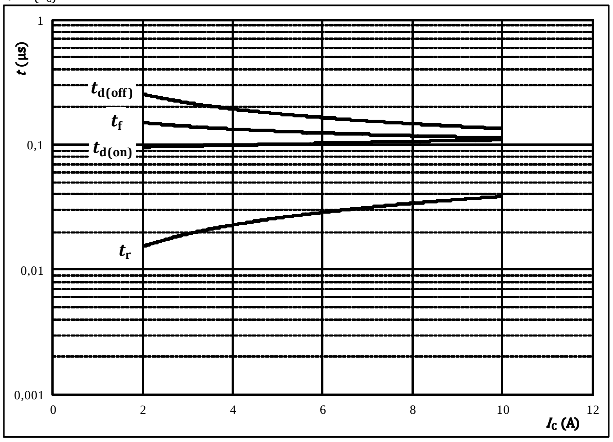
V_{CE} =	300	V	T_j:	25 °C	••••••••••••
V_{GE} =	±15	V		150 °C	— — — —
I_C =	6	A			

Inverter Switching Characteristics

figure 5. IGBT

Typical switching times as a function of collector current

$t = f(I_C)$



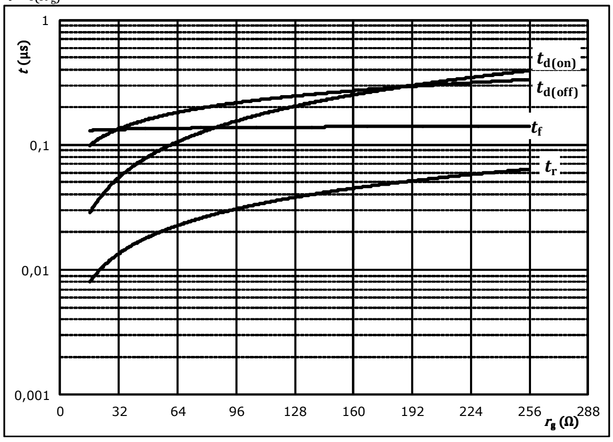
With an inductive load at

T_j =	150	°C
V_{CE} =	300	V
V_{GE} =	±15	V
R_{gon} =	64	Ω
R_{goff} =	64	Ω

figure 6. IGBT

Typical switching times as a function of gate resistor

$t = f(R_g)$



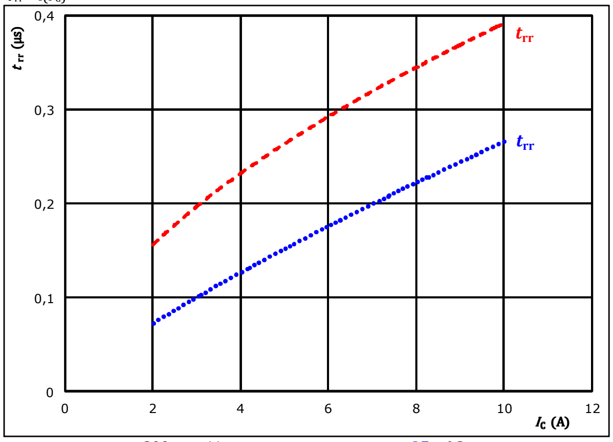
With an inductive load at

T_j =	150	°C
V_{CE} =	300	V
V_{GE} =	±15	V
I_C =	6	A

figure 7. FWD

Typical reverse recovery time as a function of collector current

$t_{rr} = f(I_C)$

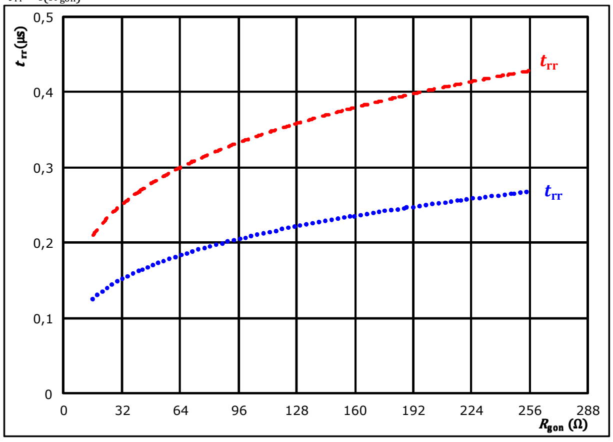


At						
V_{CE} =	300	V		25	°C	···········
V_{GE} =	±15	V	T_j:	150	°C	– – – –
R_{gon} =	64	Ω				

figure 8. FWD

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

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



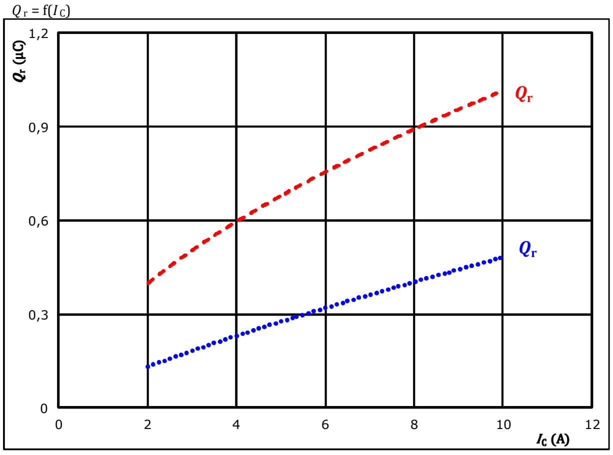
At						
V_{CE} =	300	V		25	°C	···········
V_{GE} =	±15	V	T_j:	150	°C	– – – –
I_C =	6	A				

Inverter Switching Characteristics

figure 9. FWD

Typical recovered charge as a function of collector current

$Q_r = f(I_C)$

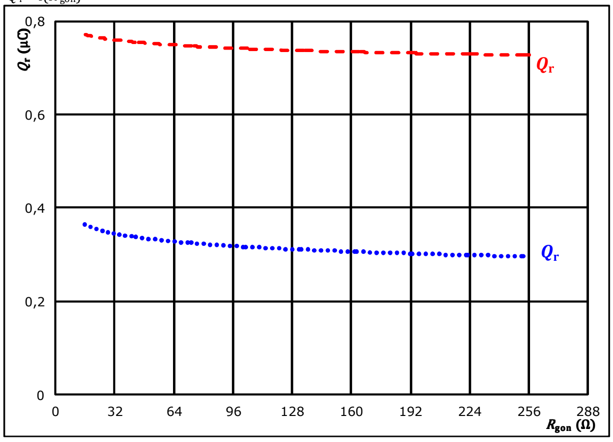


At						
	V_{CE} =	300	V		25	°C
	V_{GE} =	±15	V	T_j:	150	°C
	R_{gon} =	64	Ω			

figure 10. FWD

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

$Q_r = f(R_{gon})$

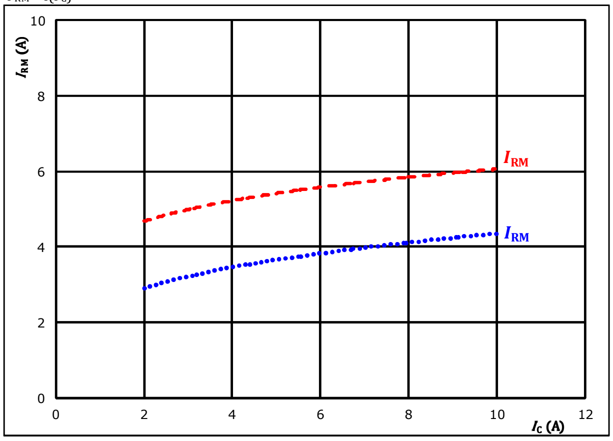


At						
	V_{CE}=	300	V		25	°C
	V_{GE} =	±15	V	T_j:	150	°C
	I_C=	6	A			

figure 11. FWD

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

$I_{RM} = f(I_C)$

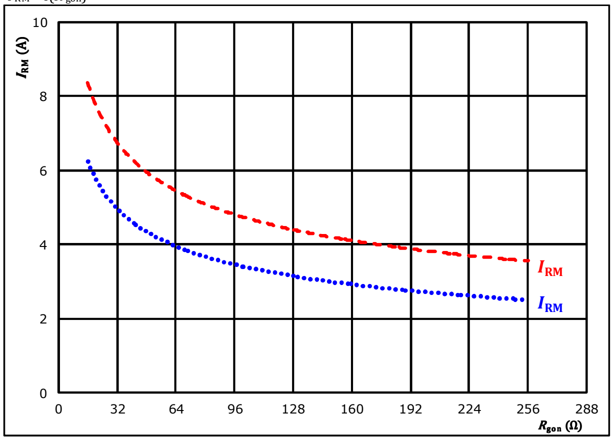


At						
	V_{CE}:	300	V		25	°C
	V_{GE} =	±15	V	T_j:	150	°C
	R_{gon} =	64	Ω			

figure 12. FWD

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

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



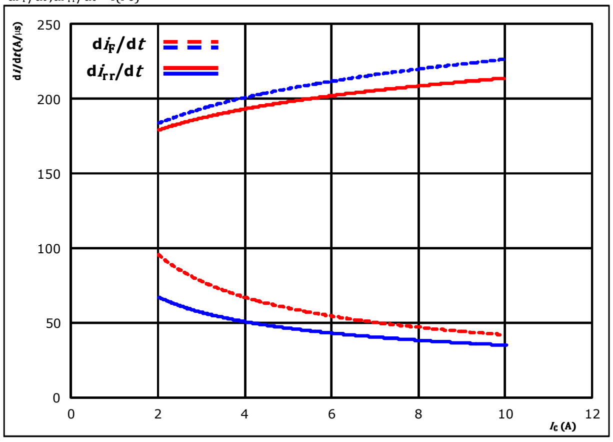
At						
	V_{CE} =	300	V		25	°C
	V_{GE} =	±15	V	T_j:	150	°C
	I_C =	6	A			

Inverter Switching Characteristics

figure 13. **FWD**

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

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

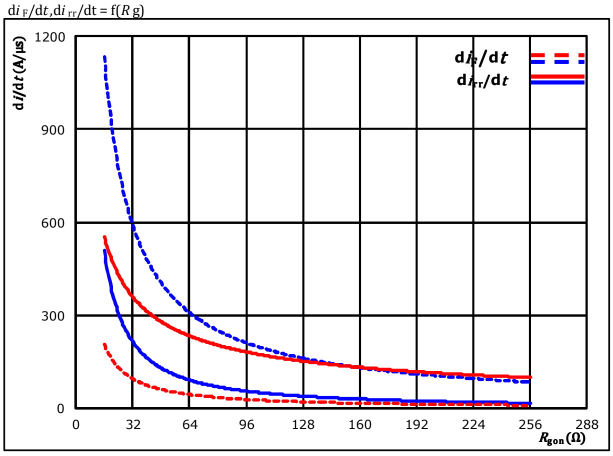


At						
V_{CE} =	300	V		25	°C	·············
V_{GE} =	±15	V	T_j:	150	°C	– – – –
R_{gon} =	64	Ω				

figure 14. **FWD**

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

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

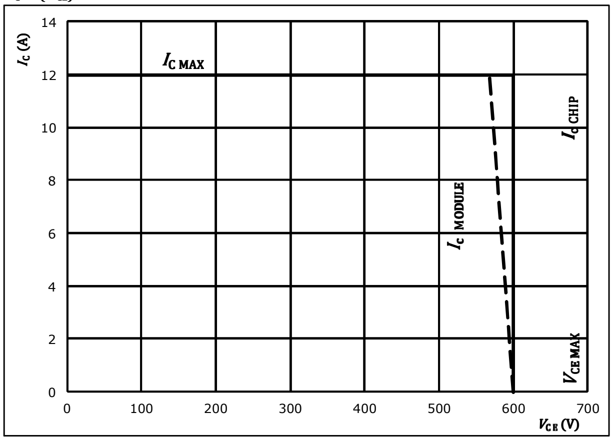


At						
V_{CE} =	300	V		25	°C	·············
V_{GE} =	±15	V	T_j:	150	°C	– – – –
I_C =	6	A				

figure 15. **IGBT**

Reverse bias safe operating area

$I_C = f(V_{CE})$



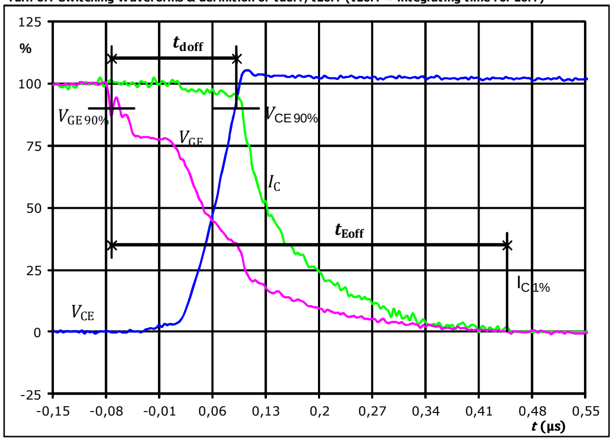
At		
T_j =	175	°C
R_{gon} =	64	Ω
R_{goff} =	64	Ω

Inverter Switching Characteristics

T_j	=	150 °C
R_{gon}	=	64 Ω
R_{goff}	=	64 Ω

figure 1. **IGBT**

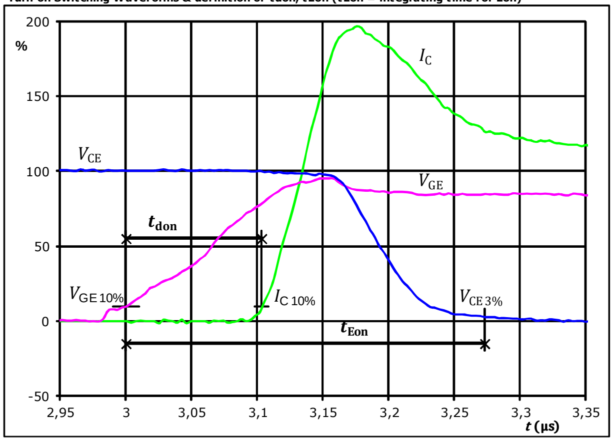
Turn-off Switching Waveforms & definition of tdoff, tEoff (tEoff = integrating time for Eoff)



$V_{GE}(0\%)$ =	-15	V
$V_{GE}(100\%)$ =	15	V
$V_C(100\%)$ =	310	V
$I_C(100\%)$ =	6	A
t_{doff} =	0,164	µs
t_{Eoff} =	0,519	µs

figure 2. **IGBT**

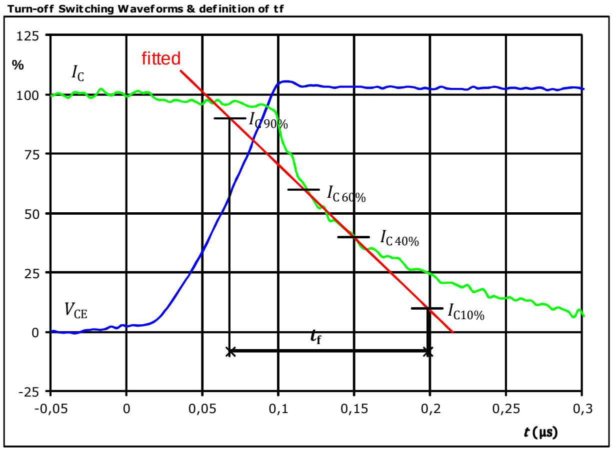
Turn-on Switching Waveforms & definition of tdon, tEon (tEon = integrating time for Eon)



$V_{GE}(0\%)$ =	-15	V
$V_{GE}(100\%)$ =	15	V
$V_C(100\%)$ =	310	V
$I_C(100\%)$ =	6	A
t_{don} =	0,102	µs
t_{Eon} =	0,273	µs

figure 3. **IGBT**

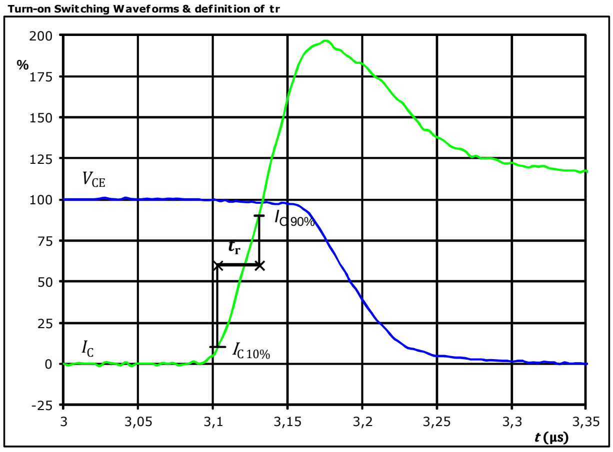
Turn-off Switching Waveforms & definition of tf



$V_C(100\%)$ =	310	V
$I_C(100\%)$ =	6	A
t_f =	0,132	µs

figure 4. **IGBT**

Turn-on Switching Waveforms & definition of tr

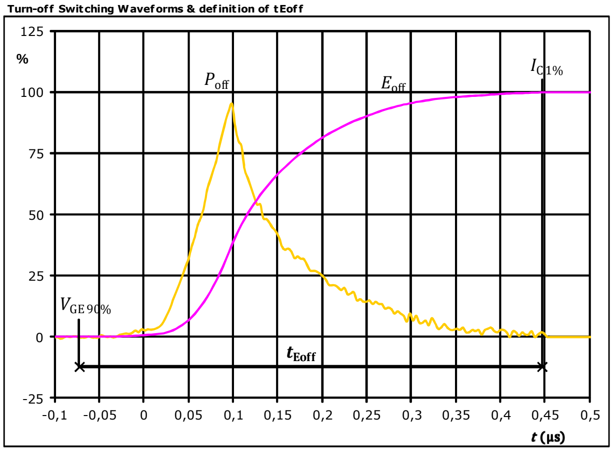


$V_C(100\%)$ =	310	V
$I_C(100\%)$ =	6	A
t_r =	0,028	µs

Inverter Switching Characteristics

figure 5. **IGBT**

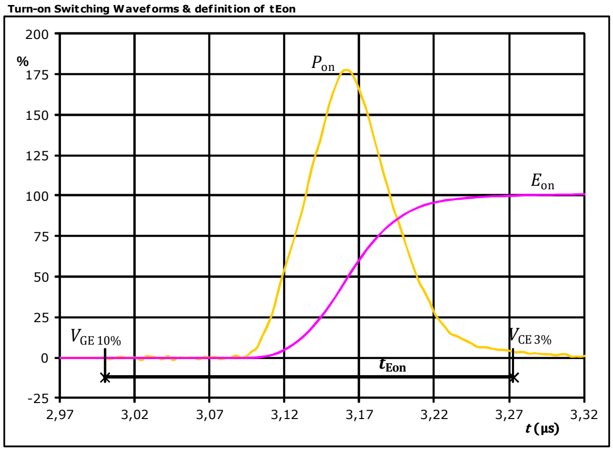
Turn-off Switching Waveforms & definition of tEoff



P_{off} (100%) =	1,86	kW
E_{off} (100%) =	0,19	mJ
t_{Eoff} =	0,519	μs

figure 6. **IGBT**

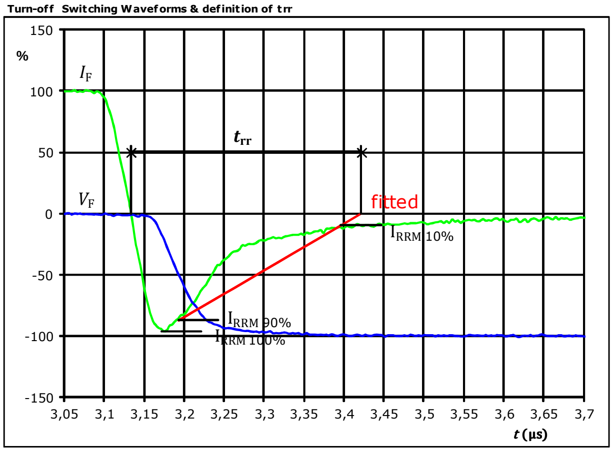
Turn-on Switching Waveforms & definition of tEon



P_{on} (100%) =	1,86	kW
E_{on} (100%) =	0,23	mJ
t_{Eon} =	0,27	μs

figure 7. **FWD**

Turn-off Switching Waveforms & definition of trr

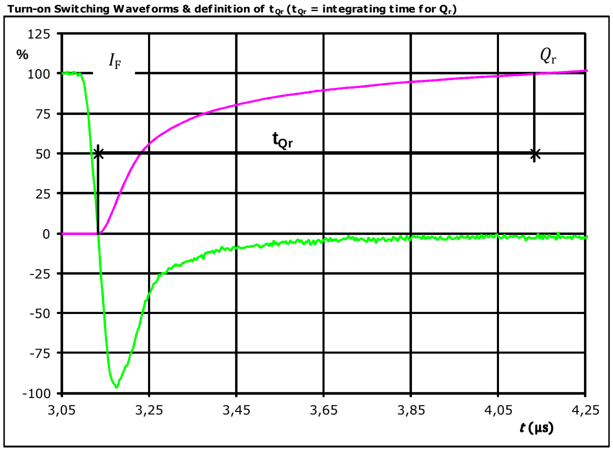


V_F (100%) =	310	V
I_F (100%) =	6	A
I_{RRM} (100%) =	-6	A
t_{rr} =	0,288	μs

Inverter Switching Characteristics

figure 8. **FWD**

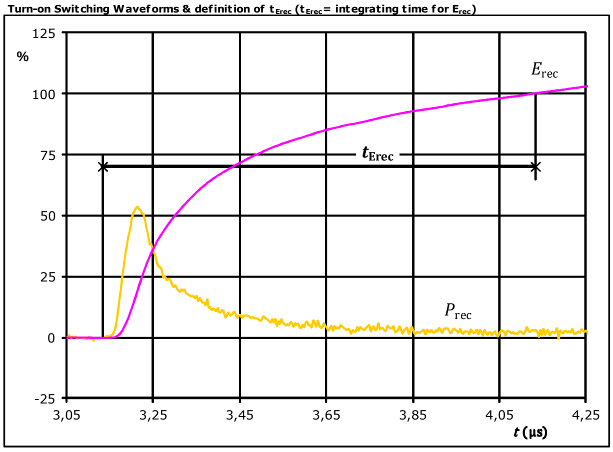
Turn-on Switching Waveforms & definition of t_{Qr} (t_{Qr} = integrating time for Q_r)



I_F (100%) =	6	A
Q_r (100%) =	0,78	µC
t_{Qr} =	1,00	µs

figure 9. **FWD**

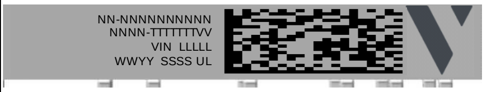
Turn-on Switching Waveforms & definition of t_{Erec} (t_{Erec} = integrating time for E_{rec})



P_{rec} (100%) =	1,86	kW
E_{rec} (100%) =	0,16	mJ
t_{Erec} =	1,00	µs

Ordering Code & Marking

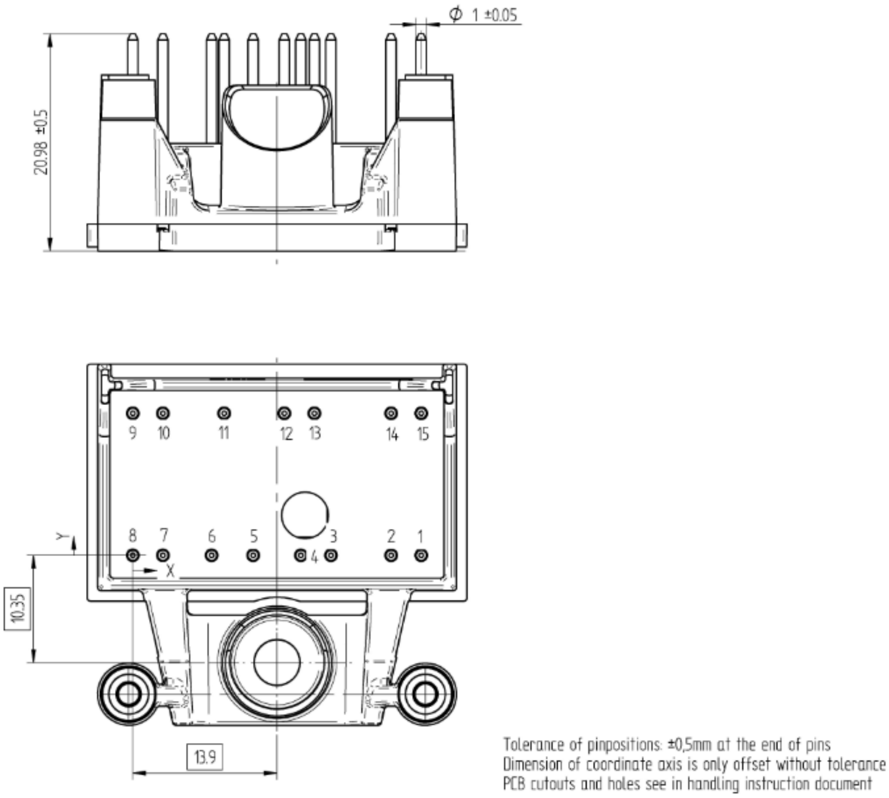
Version	Ordering Code
without thermal paste 17mm housing with solder pins	10-0B066PA006SB-M992F09



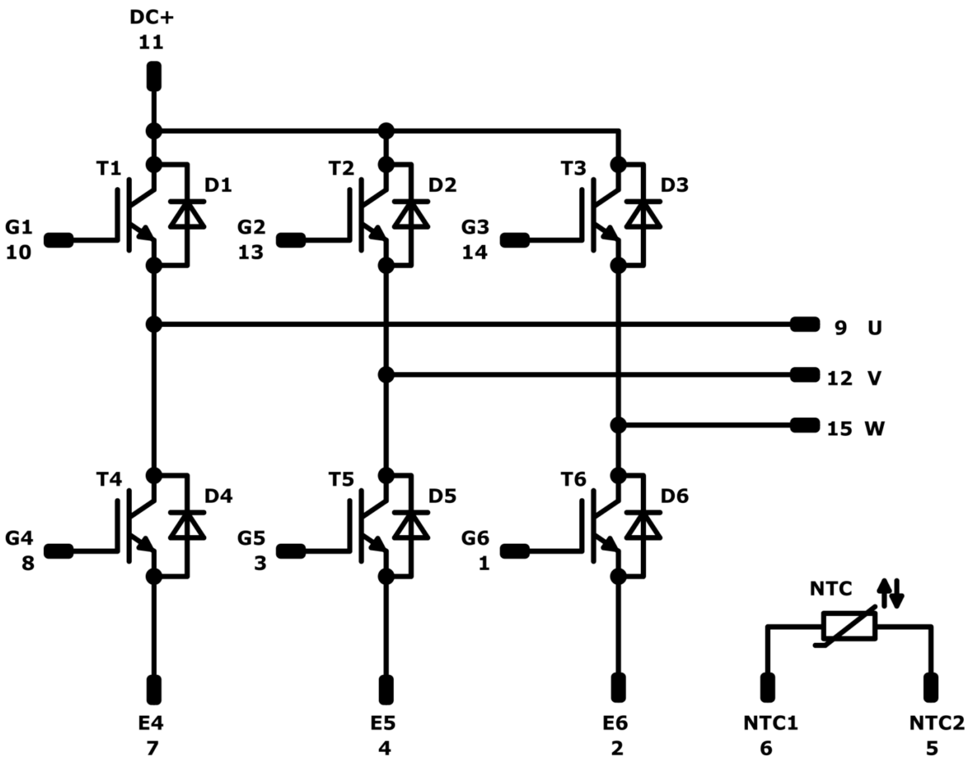
Text	**Name**		**Type&Ver**	**Date code**	**VIN & Lot**	**Serial&UL**
	NN-NNNNNNNNNNNNNN		TTTTTTTVV	WWYY	VIN LLLLL	SSSS UL
Datamatrix	**Type&Ver**	**Lot number**	**Serial**	**Date code**		
	TTTTTTTVV	LLLLL	SSSS	WWYY		

Outline

Pin table [mm]			
Pin	X	Y	Function
1	27,8	0	G6
2	24,9	0	E6
3	19,1	0	G5
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



Pinout



Identification

ID	Component	Voltage	Current	Function	Comment
T1,T2,T3,T4,T5,T6	IGBT	600 V	6 A	Inverter Switch	
D1,D2,D3,D4,D5,D6	FWD	600 V	6 A	Inverter Diode	
NTC	Thermistor			Thermistor	

Vincotech

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

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

Package data
Package data for *flow*0 B 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
10-0B066PA006SB-M992F09-D3-14	23 Jun. 2017		