Vincotech

V23990-P546-A20-PM

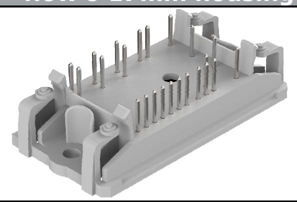
datasheet

***flow* PIM 0** — **600 V / 30 A**

Features

- Vincotech clip-in housing
- Trench Fieldstop IGBT's for low saturation losses

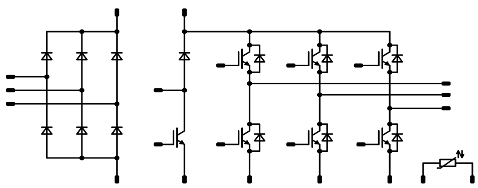
flow 0 17mm housing



Target Applications

- Industrial Drives
- Embedded Generation

Schematic



Types

- V23990-P546-A20-PM

Maximum Ratings

T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Condition	Value	Unit
Rectifier Diode				
Repetitive peak reverse voltage	V_{RRM}		1600	V
DC forward current	I_{FAV}	$T_j = T_{jmax}$ T_s = 80 °C	34	A
Surge (non-repetitive) forward current	I_{FSM}	t_p = 10 ms 50 Hz half sine wave T_j = 150 °C	200	A
I^2t-value	I^2t		200	A^2s
Power dissipation	P_{tot}	$T_j = T_{jmax}$ T_s = 80 °C	43	W
Maximum Junction Temperature	T_{jmax}		150	°C
Inverter Switch				
Collector-emitter breakdown voltage	V_{CE}		600	V
DC collector current	I_C	$T_j = T_{jmax}$ T_s = 80 °C	31	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}	90	A
Turn off safe operating area		V_{CE} ≤ 1200V, $T_j \le T_{op}$ max	90	A
Power dissipation	P_{tot}	$T_j = T_{jmax}$ T_s = 80 °C	64	W
Gate-emitter peak voltage	V_{GE}		±20	V
Short circuit ratings	t_{SC} V_{CC}	T_j ≤ 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
DC forward current	I_F	$T_j = T_{jmax}$	T_s = 80 °C	31	A
Repetitive peak forward current	I_{FRM}	t_p limited by T_{jmax}		60	A
Power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	53	W
Maximum Junction Temperature	T_{jmax}			175	°C
Brake Switch					
Collector-emitter breakdown voltage	V_{CE}			600	V
DC collector current	I_C	$T_j = T_{jmax}$	T_s = 80 °C	26	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}		60	A
Turn off safe operating area		V_{CE} ≤ 1200 V, $T_j \leq T_{op}$ max		60	A
Power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	56	W
Gate-emitter peak voltage	V_{GE}			±20	V
Short circuit ratings	t_{SC} V_{CC}	T_j ≤ 150 °C V_{GE} = 15 V		6 360	μs V
Maximum Junction Temperature	T_{jmax}			175	°C
Brake Diode					
Peak Repetitive Reverse Voltage	V_{RRM}			600	V
DC forward current	I_F	$T_j = T_{jmax}$	T_s = 80 °C	21	A
Repetitive peak forward current	I_{FRM}	t_p limited by T_{jmax}		40	A
Power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	37	W
Maximum Junction Temperature	T_{jmax}			175	°C
Thermal Properties					
Storage temperature	T_{stg}			-40…+125	°C
Operation temperature under switching condition	T_{op}			-40…+(T_{jmax} - 25)	°C
Isolation Properties					
Isolation voltage	V_{is}	t = 2 s	DC voltage	4000	V
Creepage distance				min 12,7	mm
Clearance				10,07	mm
Comparative tracking index	CTI			>200	

Characteristic Values

Parameter	Symbol	Conditions	V_{GE} [V] V_{GS} [V]	V_r [V] V_{CE} [V] V_{DS} [V]	I_C [A] I_F [A] I_D [A]	T_j [°C]	Min	Typ	Max	Unit
Rectifier Diode										
Forward voltage	V_F				30	25 125	0,8	1,20 1,17	1,8	V
Threshold voltage (for power loss calc. only)	V_{to}				30	25 125		0,93 0,80		V
Slope resistance (for power loss calc. only)	r_t				30	25 125		11 15		mΩ
Reverse current	I_r			1600		25			0,05	mA
Thermal resistance junction to sink	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						1,61		K/W
Inverter Switch										
Gate emitter threshold voltage	$V_{GE(th)}$	$V_{CE} = V_{GE}$			0,00043	25	5	5,8	6,5	V
Collector-emitter saturation voltage	V_{CEsat}		15		30	25 150	1,1	1,67 1,90	1,9	V
Collector-emitter cut-off current incl. Diode	I_{CES}		0	600		25			0,0016	mA
Gate-emitter leakage current	I_{GES}		20	0		25			300	nA
Integrated Gate resistor	R_{gint}							none		Ω
Turn-on delay time	$t_{d(on)}$	R_{goff} = 4 Ω R_{gon} = 8 Ω	15	300	30	25 150		17 18		ns
Rise time	t_r					25 150		16 18		
Turn-off delay time	$t_{d(off)}$					25 150		156 172		
Fall time	t_f					25 150		88 101		
Turn-on energy loss	E_{on}					25 150		0,52 0,71		mWs
Turn-off energy loss	E_{off}					25 150		0,72 0,90		
Input capacitance	C_{ies}	f = 1 MHz	0	25		25		1630		pF
Output capacitance	C_{oss}							108		
Reverse transfer capacitance	C_{rss}							50		
Gate charge	Q_G		±15	480	30	25		167		nC
Thermal resistance junction to sink	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						1,49		K/W
Inverter Diode										
Diode forward voltage	V_F				30	25 150	1,25	1,64 1,66	1,95	V
Peak reverse recovery current	I_{RRM}	R_{gon} = 8 Ω	15	300	30	25 150		25 28		A
Reverse recovery time	t_{rr}					25 150		176 256		ns
Reverse recovered charge	Q_{rr}					25 150		1,36 2,45		μC
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 150		1521 932		A/μs
Reverse recovered energy	E_{rec}					25 150		0,27 0,51		mWs
Thermal resistance junction to sink	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						1,81		K/W

Characteristic Values

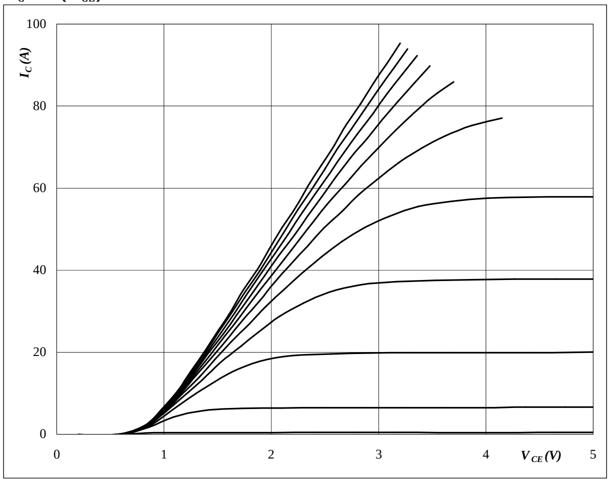
Parameter	Symbol	Conditions					Value			Unit
			V_{GE} [V] V_{GS} [V]	V_r [V] V_{CE} [V] V_{DS} [V]	I_C [A] I_F [A] I_D [A]	T_j [°C]	Min	Typ	Max	
Brake Switch										
Gate emitter threshold voltage	$V_{GE(th)}$	$V_{CE} = V_{GE}$			0,00029	25	5	5,8	6,5	V
Collector-emitter saturation voltage	V_{CEsat}		15		20	25 150	1	1,58 1,76	2,2	V
Collector-emitter cut-off incl diode	I_{CES}		0	600		25			0,0011	mA
Gate-emitter leakage current	I_{GES}		20	0		25			300	nA
Integrated Gate resistor	R_{gint}							none		Ω
Turn-on delay time	$t_{d(on)}$					25 150		15 14		
Rise time	t_r					25 150		12 15		ns
Turn-off delay time	$t_{d(off)}$	R_{goff} = 8 Ω R_{gon} = 16 Ω	±15	300	20	25 150		197 220		
Fall time	t_f					25 150		100 119		
Turn-on energy loss	E_{on}					25 150		0,31 0,43		mWs
Turn-off energy loss	E_{off}					25 150		0,53 0,67		
Input capacitance	C_{ies}							1100		
Output capacitance	C_{oss}	f = 1 MHz	0	25		25		71		pF
Reverse transfer capacitance	C_{rss}							32		
Gate charge	Q_G		±15	480	20	25		120		nC
Thermal resistance junction to sink	$R_{th(j-s)}$	$λ_{paste}$ = 3,4 W/mK (PSX)						1,70		K/W
Brake Diode										
Diode forward voltage	V_F				20	25 150	1,25	1,83 1,76	1,95	V
Reverse leakage current	I_r			600		25			27	μA
Peak reverse recovery current	I_{RRM}					25 150		18 21		A
Reverse recovery time	t_{rr}					25 150		31 197		ns
Reverse recovered charge	Q_{rr}	R_{gon} = 16 Ω	±15	300	20	25 150		0,39 0,39		μC
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 150		1762 927		A/μs
Reverse recovery energy	E_{rec}					25 150		0,05 0,25		mWs
Thermal resistance junction to sink	$R_{th(j-s)}$	$λ_{paste}$ = 3,4 W/mK (PSX)						2,60		K/W
Thermistor										
Rated resistance	R					25		22000		Ω
Deviation of R_{100}	$Δ_{R/R}$	R_{100} = 1486 Ω				100	-5		5	%
Power dissipation	P					25		210		mW
Power dissipation constant						25		3,5		mW/K
B-value	$B_{(25/50)}$	Tol. ±3%				25				K
B-value	$B_{(25/100)}$	Tol. ±3%				25		4000		K
Vincotech NTC Reference						25			A	

Inverter Characteristics

figure 1. **IGBT**

Typical output characteristics

$I_C = f(V_{CE})$



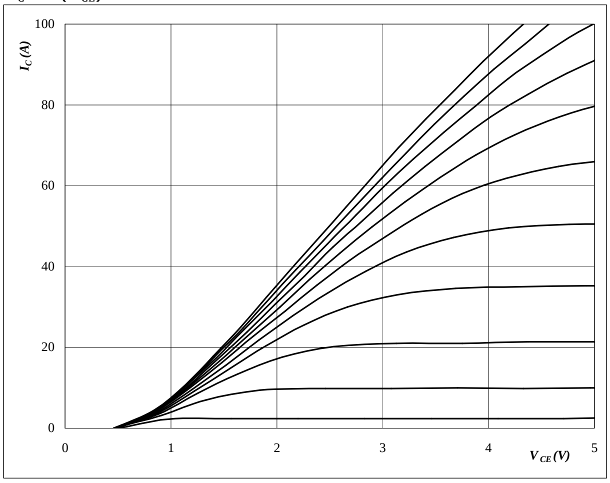
At

t_p =	250	µs
T_j =	25	°C
V_{GE} from	7 V to 17 V in steps of 1 V	

figure 2. **IGBT**

Typical output characteristics

$I_C = f(V_{CE})$



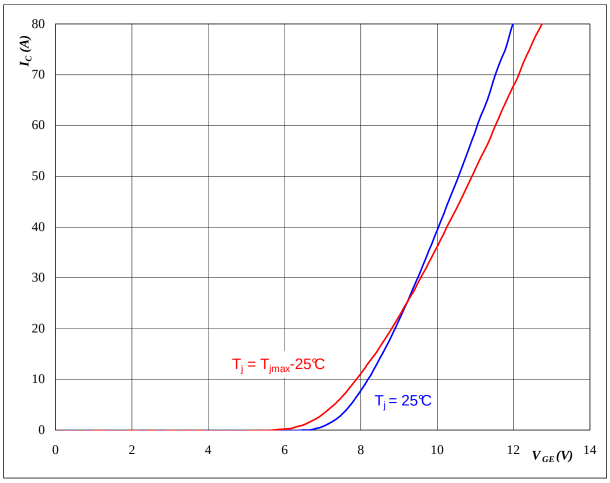
At

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

$I_C = f(V_{GE})$



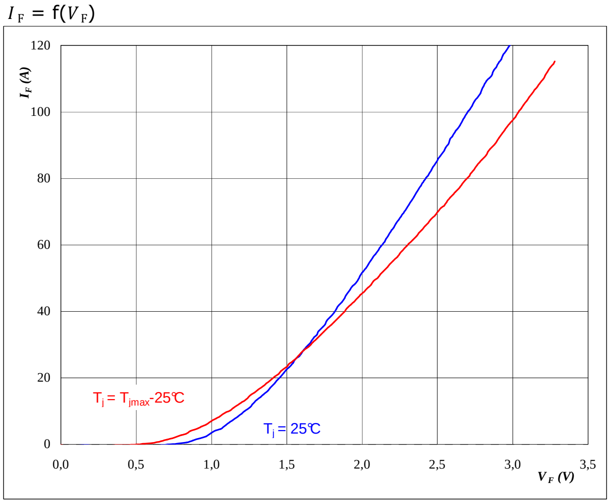
At

t_p =	250	µs
V_{CE} =	10	V

figure 4. **FWD**

Typical diode forward current as a function of forward voltage

$I_F = f(V_F)$



At

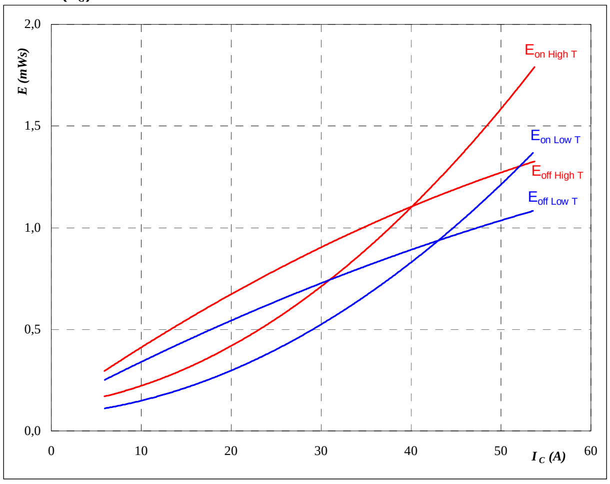
t_p =	250	µs

Inverter Characteristics

figure 5. **IGBT**

Typical switching energy losses
as a function of collector current

$E = f(I_C)$



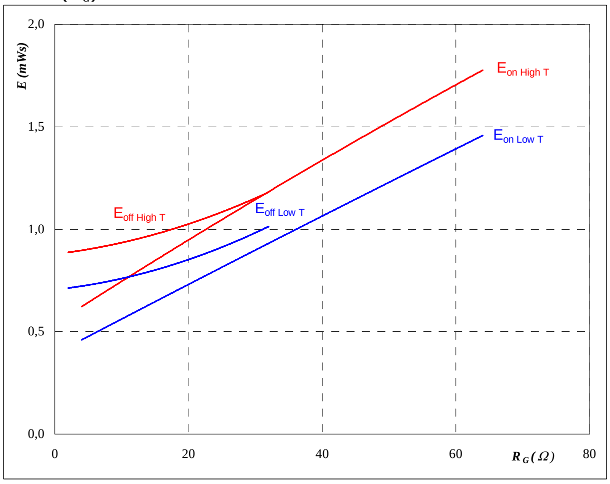
With an inductive load at

T_j =	25/125	°C
V_{CE} =	300	V
V_{GE} =	15	V
R_{gon} =	8	Ω
R_{goff} =	4	Ω

figure 6. **IGBT**

Typical switching energy losses
as a function of gate resistor

$E = f(R_G)$



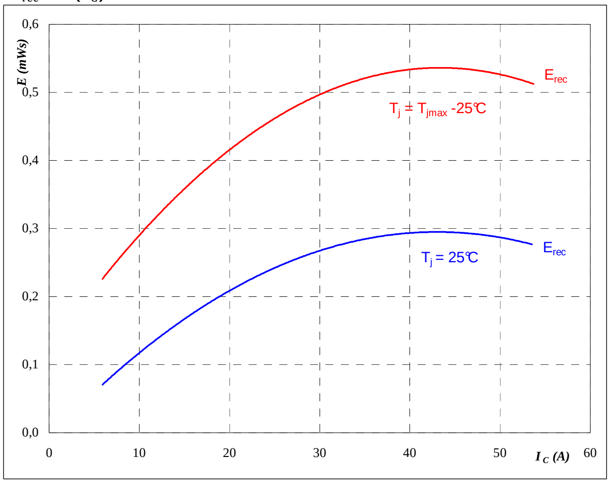
With an inductive load at

T_j =	25/125	°C
V_{CE} =	300	V
V_{GE} =	15	V
I_C =	30	A

figure 7. **FWD**

Typical reverse recovery energy loss
as a function of collector current

$E_{rec} = f(I_C)$



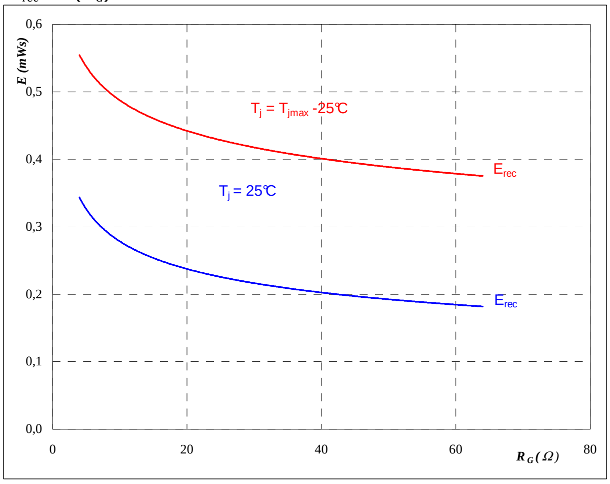
With an inductive load at

T_j =	25/125	°C
V_{CE} =	300	V
V_{GE} =	15	V
R_{gon} =	8	Ω

figure 8. **FWD**

Typical reverse recovery energy loss
as a function of gate resistor

$E_{rec} = f(R_G)$



With an inductive load at

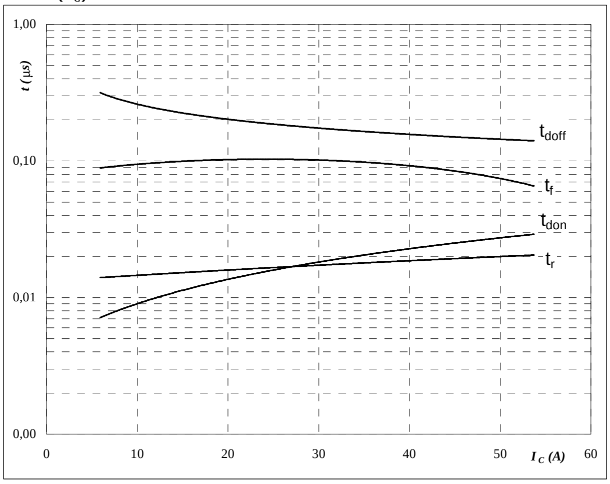
T_j =	25/125	°C
V_{CE} =	300	V
V_{GE} =	15	V
I_C =	30	A

Inverter Characteristics

figure 9. **IGBT**

Typical switching times as a function of collector current

$t = f(I_C)$



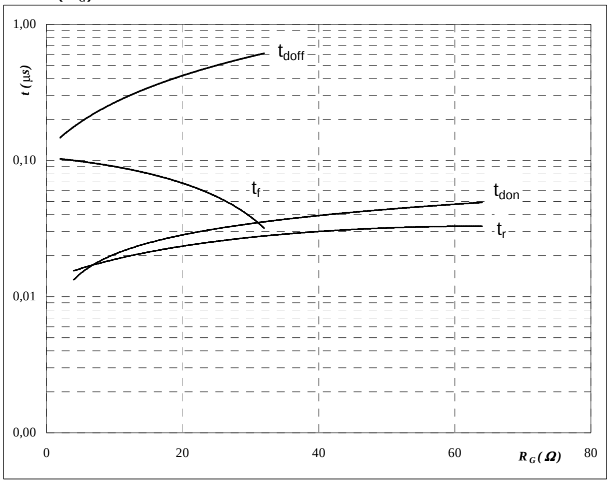
With an inductive load at

T_j =	125	°C
V_{CE} =	300	V
V_{GE} =	15	V
R_{gon} =	8	Ω
R_{goff} =	4	Ω

figure 10. **IGBT**

Typical switching times as a function of gate resistor

$t = f(R_G)$



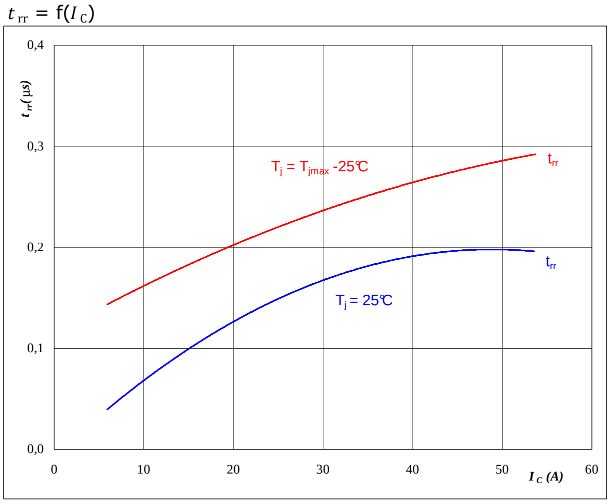
With an inductive load at

T_j =	125	°C
V_{CE} =	300	V
V_{GE} =	15	V
I_C =	30	A

figure 11. **FWD**

Typical reverse recovery time as a function of collector current

$t_{rr} = f(I_C)$



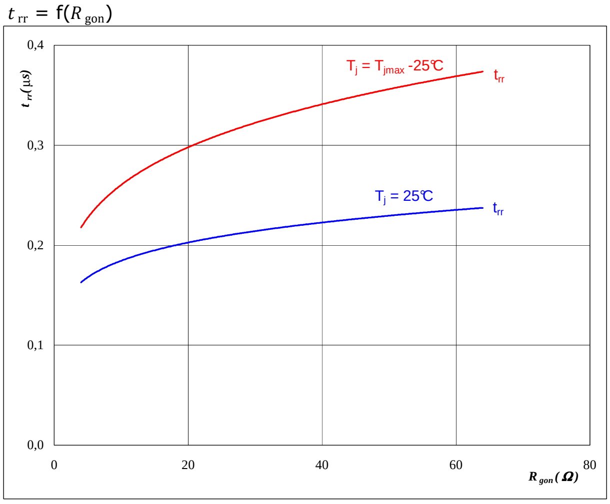
At

T_j =	25/125	°C
V_{CE} =	300	V
V_{GE} =	15	V
R_{gon} =	8	Ω

figure 12. **FWD**

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

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



At

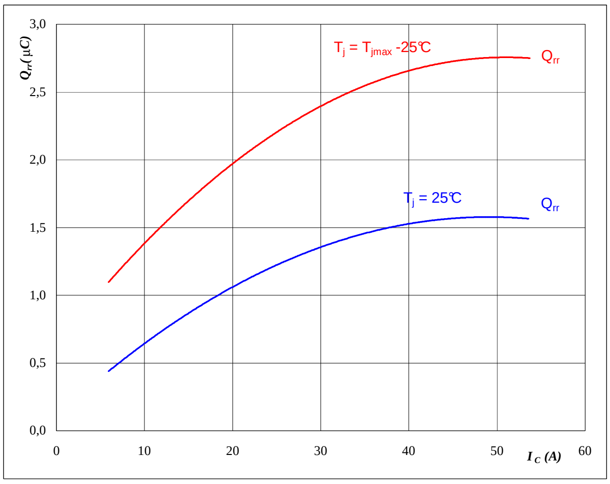
T_j =	25/125	°C
V_R =	300	V
I_F =	30	A
V_{GE} =	15	V

Inverter Characteristics

figure 13. **FWD**

Typical reverse recovery charge as a function of collector current

$Q_{rr} = f(I_C)$



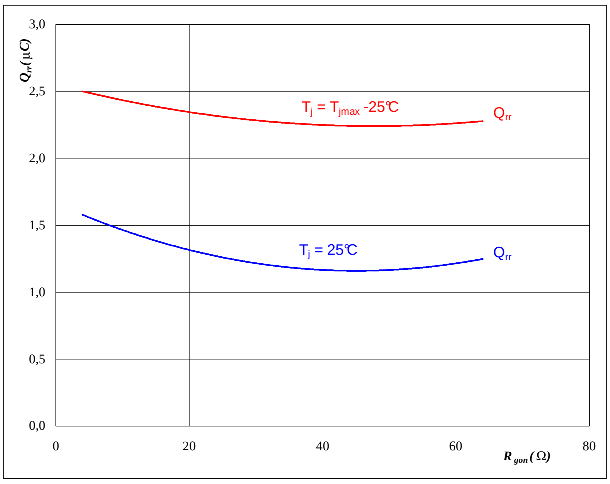
At

T_j =	25/125	°C
V_{CE} =	300	V
V_{GE} =	15	V
R_{gon} =	8	Ω

figure 14. **FWD**

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

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



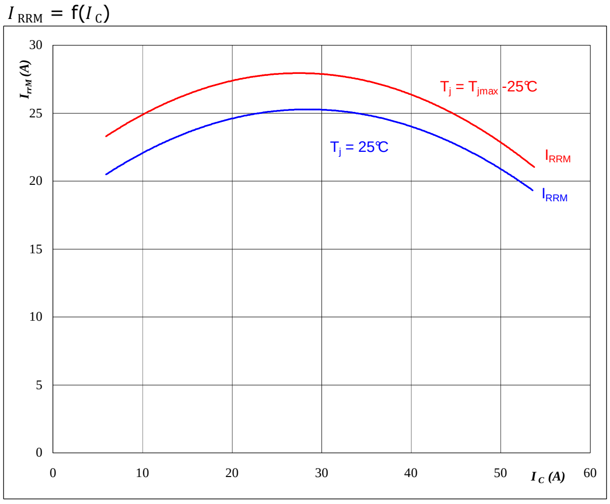
At

T_j =	25/125	°C
V_R =	300	V
I_F =	30	A
V_{GE} =	15	V

figure 15. **FWD**

Typical reverse recovery current as a function of collector current

$I_{RRM} = f(I_C)$



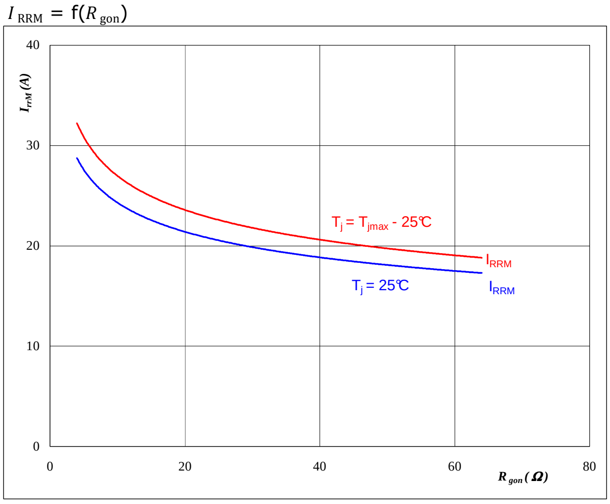
At

T_j =	25/125	°C
V_{CE} =	300	V
V_{GE} =	15	V
R_{gon} =	8	Ω

figure 16. **FWD**

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

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



At

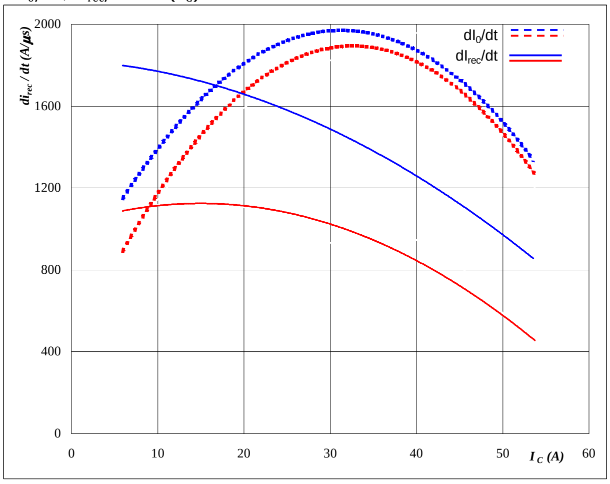
T_j =	25/125	°C
V_R =	300	V
I_F =	30	A
V_{GE} =	15	V

Inverter Characteristics

figure 17. **FWD**

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

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



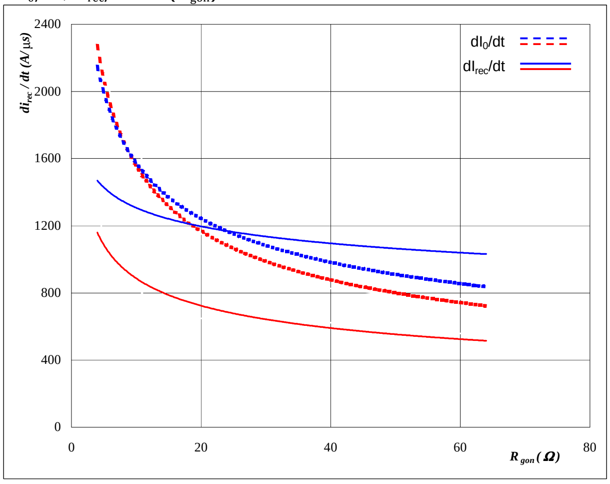
At

T_j =	25/125	°C
V_{CE} =	300	V
V_{GE} =	15	V
R_{gon} =	8	Ω

figure 18. **FWD**

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

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



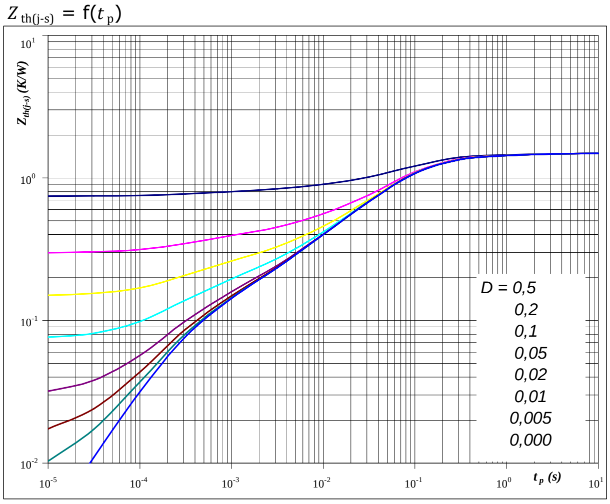
At

T_j =	25/125	°C
V_R =	300	V
I_F =	30	A
V_{GE} =	15	V

figure 19. **IGBT**

IGBT transient thermal impedance as a function of pulse width

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



At

D =	t_p / T	
$R_{th(j\text{-}s)}$ =	1,49	K/W

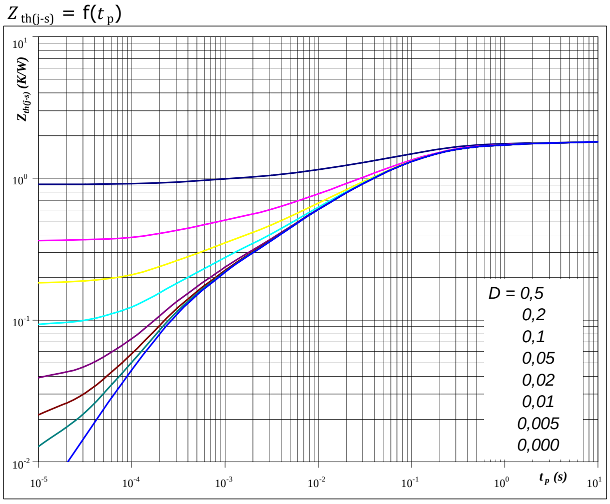
IGBT thermal model values

R (K/W)	Tau (s)
7,25E-02	2,02E+00
1,02E-01	4,53E-01
6,96E-01	8,91E-02
3,56E-01	3,19E-02
1,42E-01	5,59E-03
4,77E-02	9,74E-04
7,51E-02	2,56E-04

figure 20. **FWD**

FWD transient thermal impedance as a function of pulse width

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



At

D =	t_p / T	
$R_{th(j\text{-}s)}$ =	1,81	K/W

FWD thermal model values

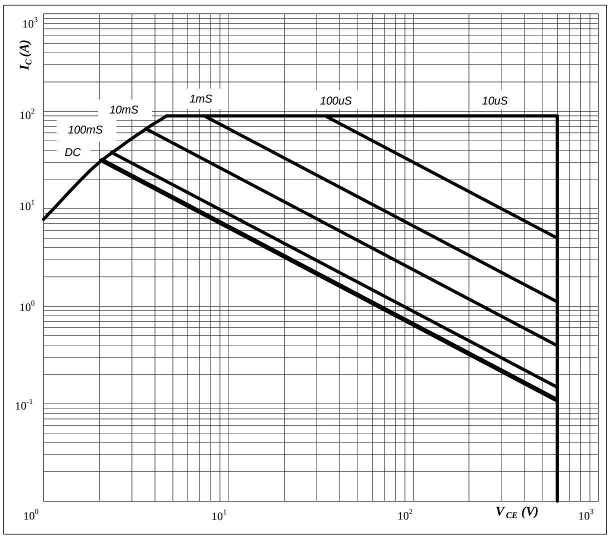
R (K/W)	Tau (s)
8,32E-02	4,59E+00
2,00E-01	4,81E-01
7,57E-01	9,25E-02
4,20E-01	1,80E-02
2,12E-01	3,31E-03
1,39E-01	3,46E-04

Inverter Characteristics

figure 25. **IGBT**

Safe operating area as a function of collector-emitter voltage

$I_C = f(V_{CE})$



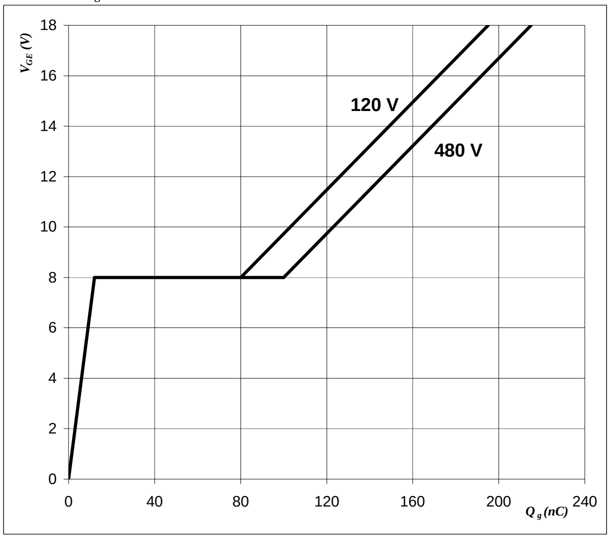
At

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

figure 26. **IGBT**

Gate voltage vs Gate charge

$V_{GE} = f(Q_g)$



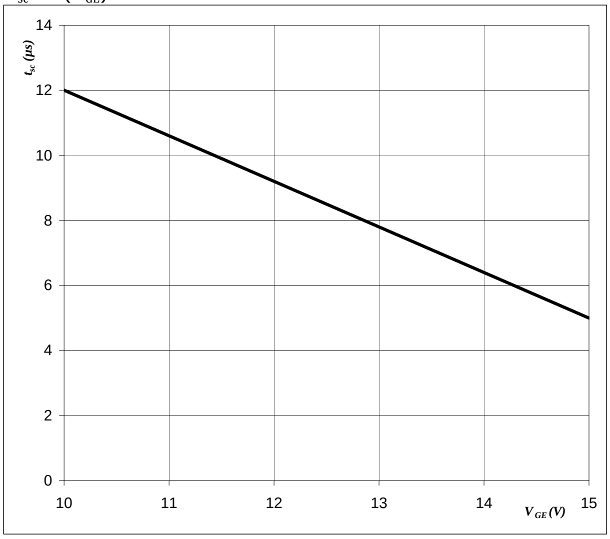
At

I_C =	30	A

figure 27. **IGBT**

Short circuit withstand time as a function of gate-emitter voltage

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



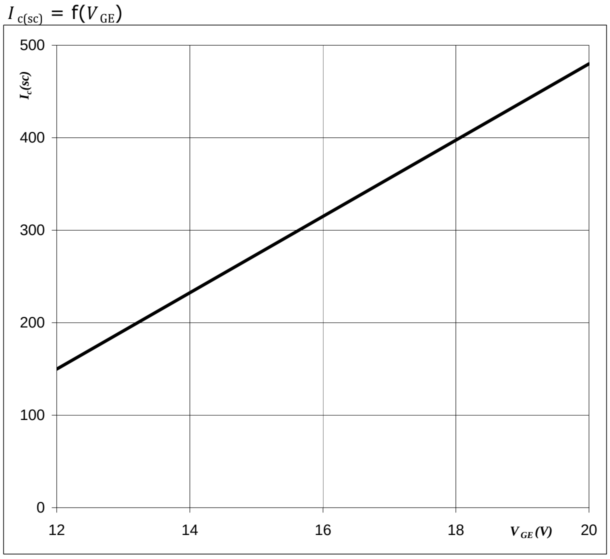
At

V_{CE} =	600	V
T_j ≤	175	ºC

figure 28. **IGBT**

Typical short circuit collector current as a function of gate-emitter voltage

$I_{c(sc)} = f(V_{GE})$



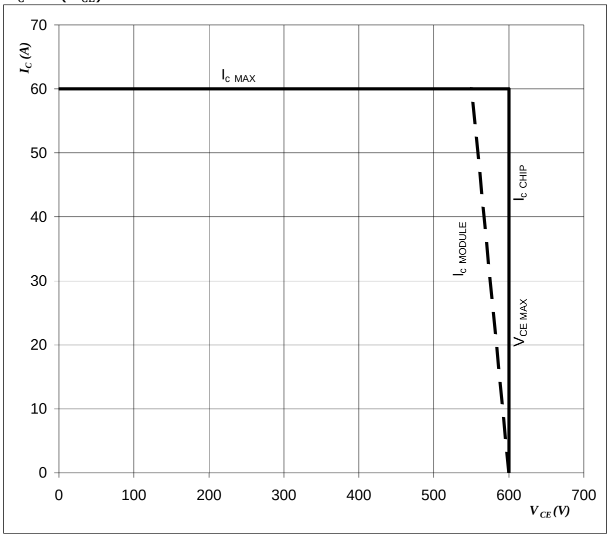
At

V_{CE} ≤	600	V
T_j =	175	ºC

figure 29.	IGBT

Reverse bias safe operating area

$I_C = f(V_{CE})$



At

T_j = T_{jmax}-25 ºC

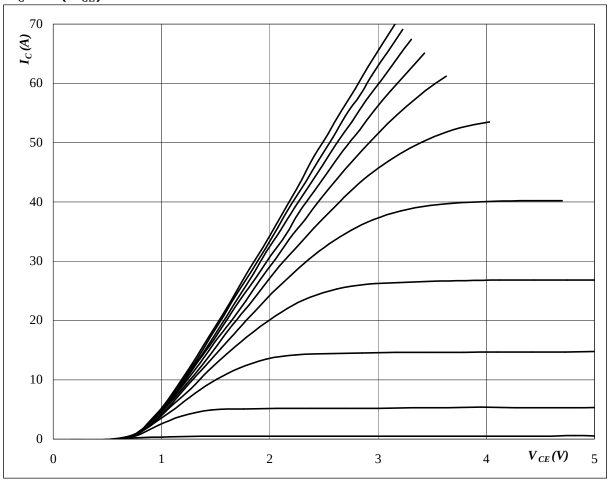
Switching mode : 3phase SPWM

Brake Characteristics

figure 1. **IGBT**

Typical output characteristics

$I_C = f(V_{CE})$



At

t_p = 250 µs

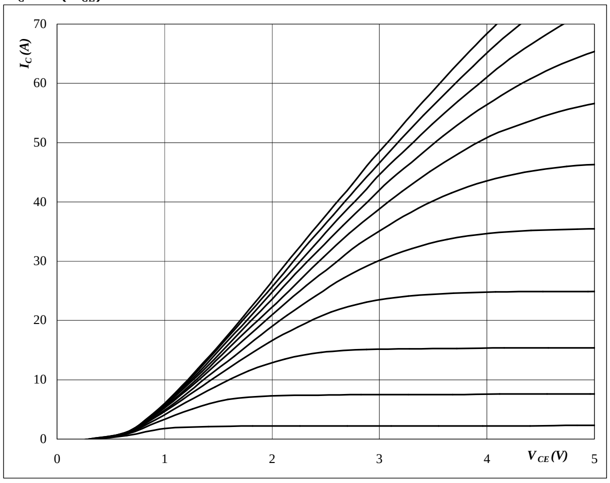
T_j = 25 °C

V_{GE} from 7 V to 17 V in steps of 1 V

figure 2. **IGBT**

Typical output characteristics

$I_C = f(V_{CE})$



At

t_p = 250 µs

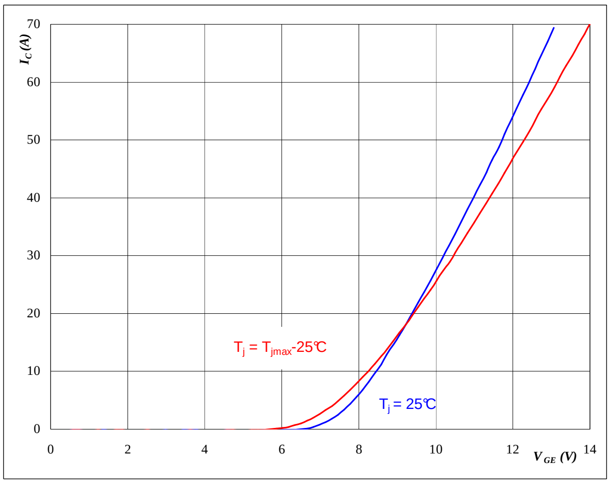
T_j = 125 °C

V_{GE} from 7 V to 17 V in steps of 1 V

figure 3. **IGBT**

Typical transfer characteristics

$I_C = f(V_{GE})$



At

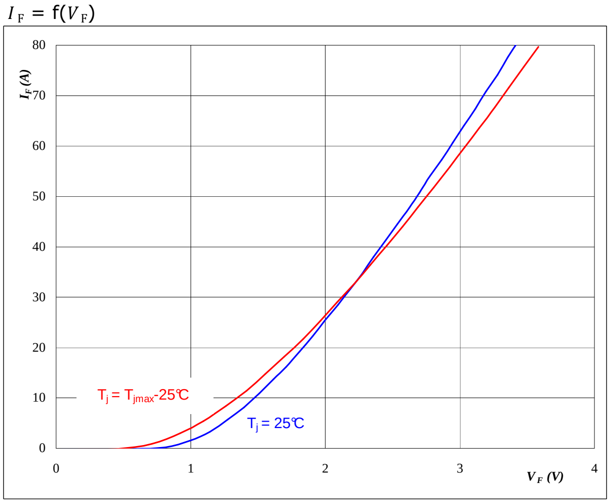
t_p = 250 µs

V_{CE} = 10 V

figure 4. **FWD**

Typical diode forward current as a function of forward voltage

$I_F = f(V_F)$



At

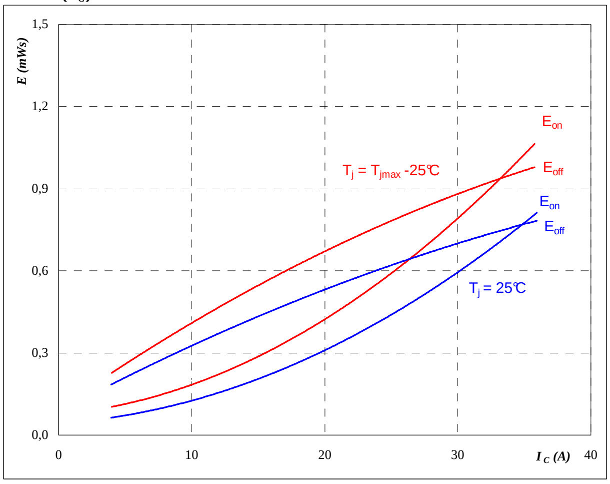
t_p = 250 µs

Brake Characteristics

figure 5. **IGBT**

Typical switching energy losses as a function of collector current

$E = f(I_C)$



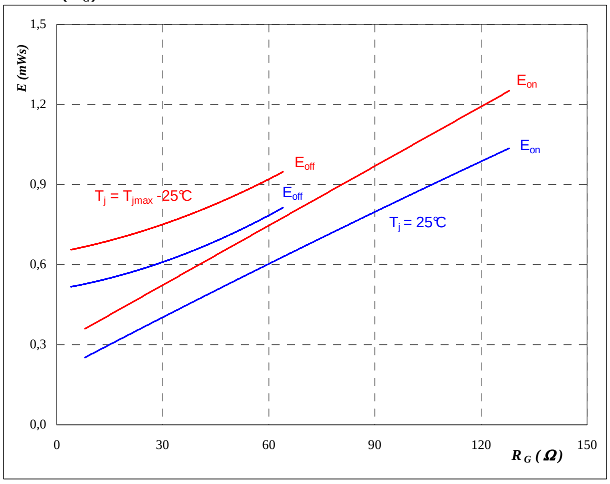
With an inductive load at

T_j =	25/125	°C
V_{CE} =	300	V
V_{GE} =	15	V
R_{gon} =	16	Ω
R_{goff} =	8	Ω

figure 6. **IGBT**

Typical switching energy losses as a function of gate resistor

$E = f(R_G)$



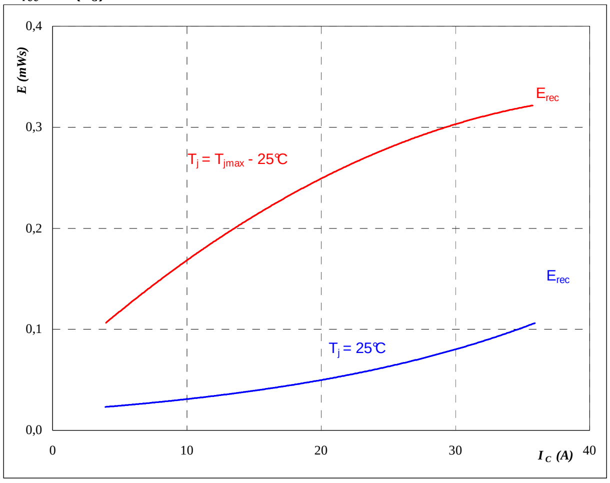
With an inductive load at

T_j =	25/125	°C
V_{CE} =	300	V
V_{GE} =	15	V
I_C =	20	A

figure 7. **FWD**

Typical reverse recovery energy loss as a function of collector current

$E_{rec} = f(I_C)$



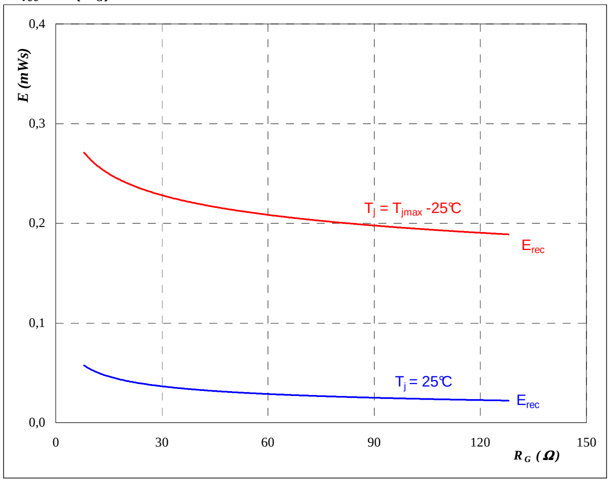
With an inductive load at

T_j =	25/125	°C
V_{CE} =	300	V
V_{GE} =	15	V
R_{gon} =	16	Ω

figure 8. **FWD**

Typical reverse recovery energy loss as a function of gate resistor

$E_{rec} = f(R_G)$



With an inductive load at

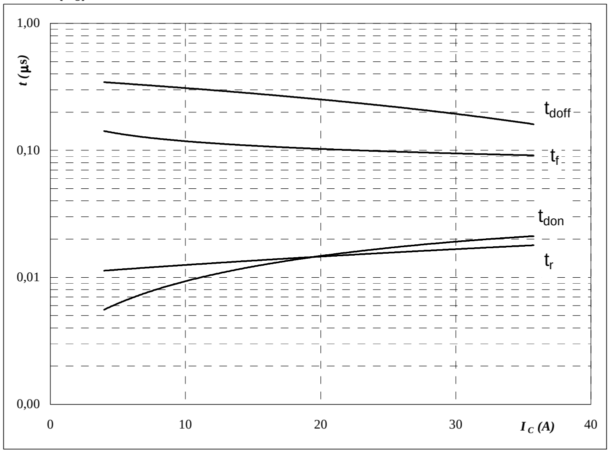
T_j =	25/125	°C
V_{CE} =	300	V
V_{GE} =	15	V
I_C =	20	A

Brake Characteristics

figure 9. **IGBT**

Typical switching times as a function of collector current

$t = f(I_C)$



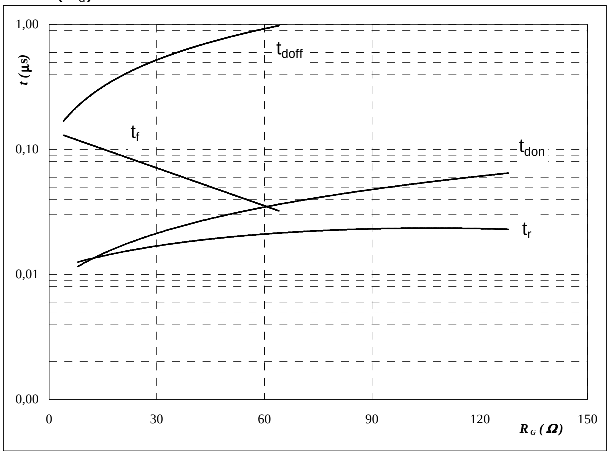
With an inductive load at

T_j =	25/125	°C
V_{CE} =	300	V
V_{GE} =	15	V
R_{gon} =	16	Ω
R_{goff} =	8	Ω

figure 10. **IGBT**

Typical switching times as a function of gate resistor

$t = f(R_G)$



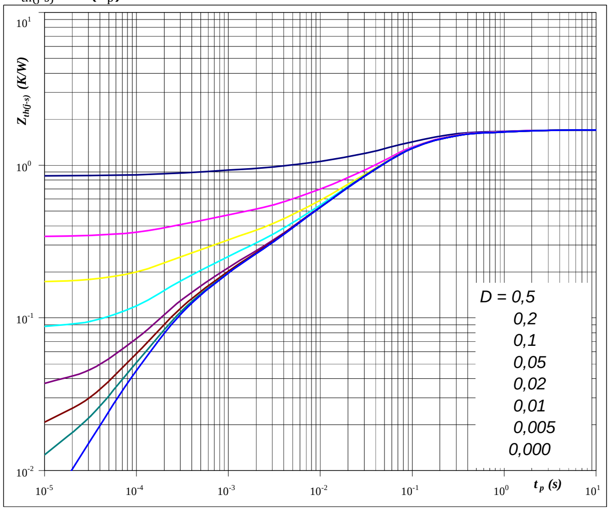
With an inductive load at

T_j =	25/125	°C
V_{CE} =	300	V
V_{GE} =	15	V
I_C =	20	A

figure 11. **IGBT**

IGBT transient thermal impedance as a function of pulse width

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



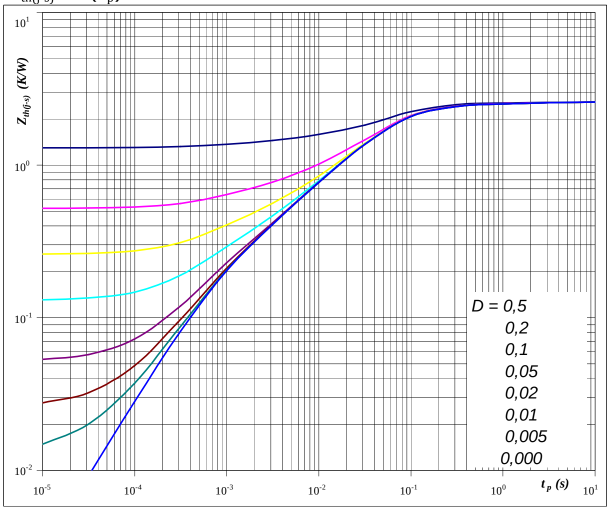
At

D =	t_p / T	
$R_{th(j-s)}$ =	1,70	K/W

figure 12. **FWD**

FWD transient thermal impedance as a function of pulse width

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



At

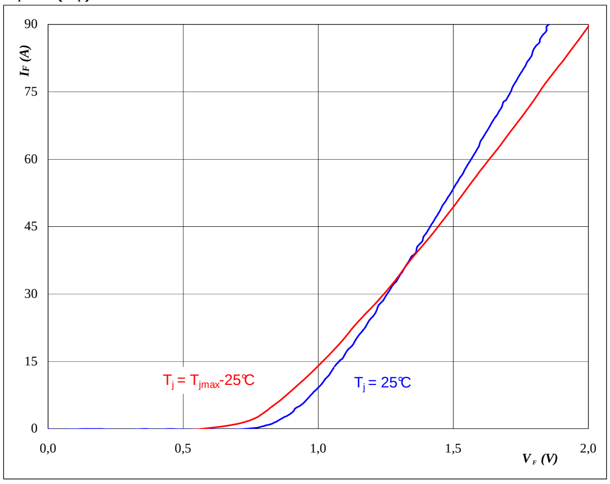
D =	t_p / T	
$R_{th(j-s)}$ =	2,60	K/W

Rectifier Diode

figure 1.	Rectifier Diode

Typical diode forward current as a function of forward voltage

$I_F = f(V_F)$



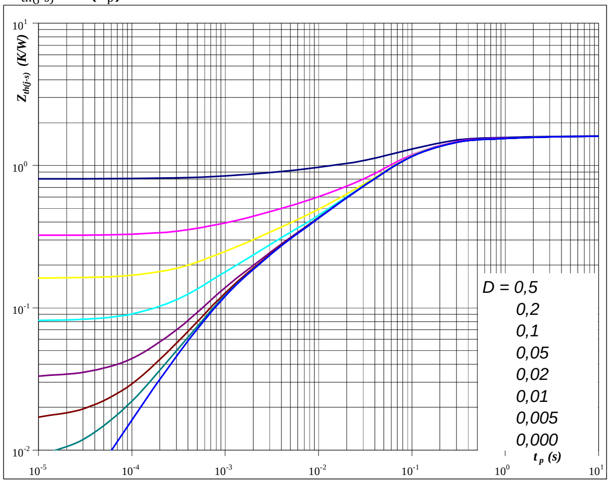
At

t_p = 250 µs

figure 2.	Rectifier Diode

Diode transient thermal impedance as a function of pulse width

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



At

D = t_p / T

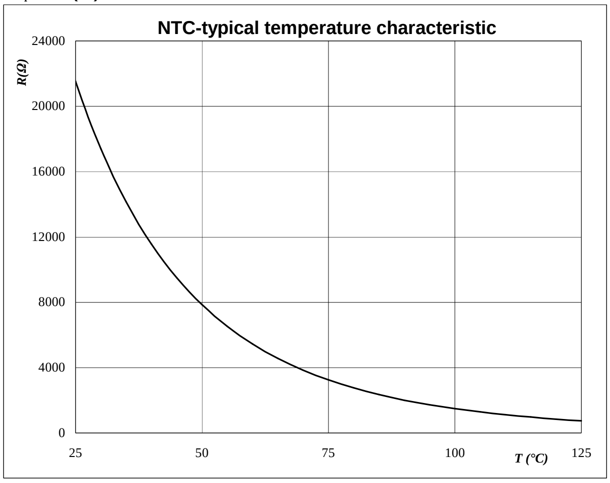
$R_{th(j\text{-}s)}$ = 1,61 K/W

Thermistor

figure 1.	Thermistor

Typical NTC characteristic as a function of temperature

$R_T = f(T)$



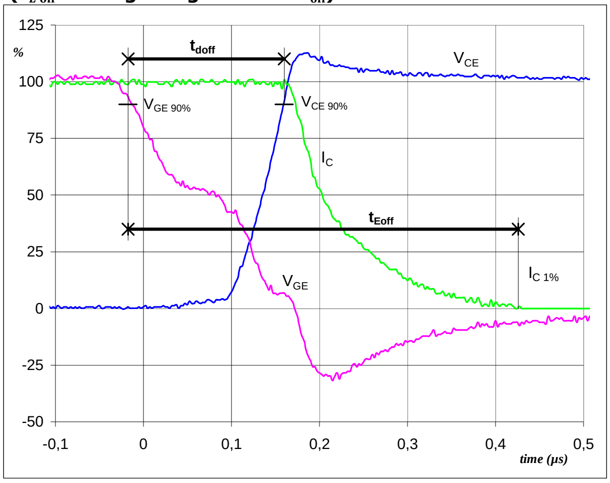
Switching Definitions Inverter

General conditions

T_j	=	125 °C
R_{gon}	=	8 Ω
R_{goff}	=	4 Ω

figure 1. **IGBT**

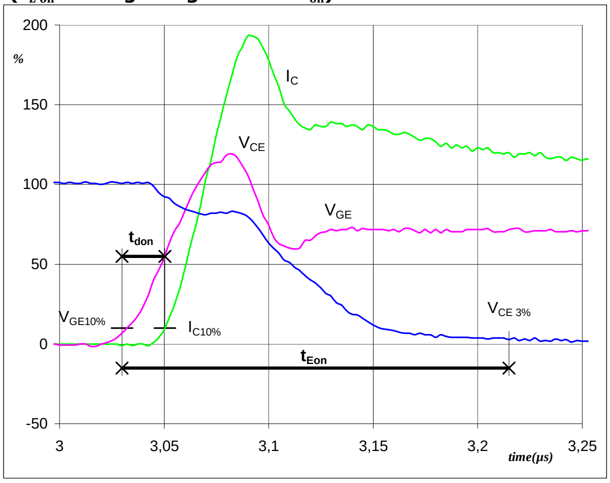
Turn-off Switching Waveforms & definition of t_{doff}, t_{Eoff}
($t_{E\,off}$ = integrating time for E_{off})



V_{GE} (0%) = 0 V
V_{GE} (100%) = 15 V
V_C (100%) = 300 V
I_C (100%) = 30 A µ
t_{doff} = 0,17 µs
$t_{E\,off}$ = 0,44 µs

figure 2. **IGBT**

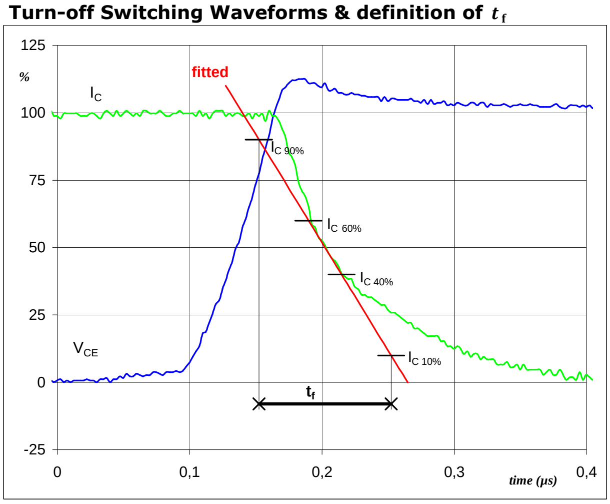
Turn-on Switching Waveforms & definition of t_{don}, t_{Eon}
($t_{E\,on}$ = integrating time for E_{on})



V_{GE} (0%) = 0 V
V_{GE} (100%) = 15 V
V_C (100%) = 300 V
I_C (100%) = 30 A
t_{don} = 0,02 µs
$t_{E\,on}$ = 0,18 µs

figure 3. **IGBT**

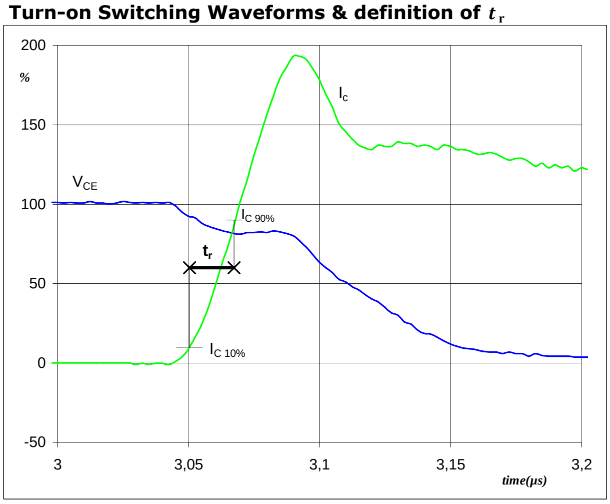
Turn-off Switching Waveforms & definition of t_f



V_C (100%) = 300 V
I_C (100%) = 30 A
t_f = 0,10 µs

figure 4. **IGBT**

Turn-on Switching Waveforms & definition of t_r

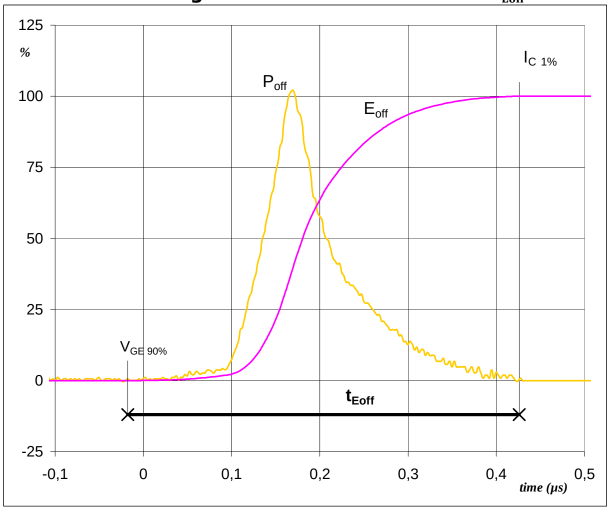


V_C (100%) = 300 V
I_C (100%) = 30 A
t_r = 0,02 µs

Switching Definitions Inverter

figure 5.	**IGBT**

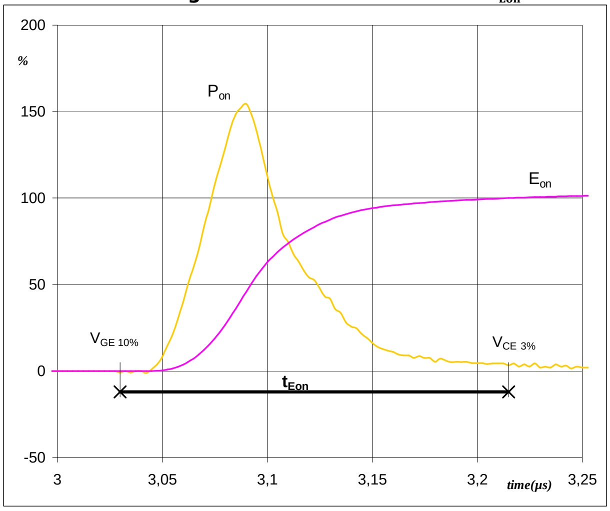
Turn-off Switching Waveforms & definition of t_{Eoff}



P_{off} (100%) =	8,98	kW
E_{off} (100%) =	0,90	mJ
$t_{E\ off}$ =	0,44	μs

figure 6.	**IGBT**

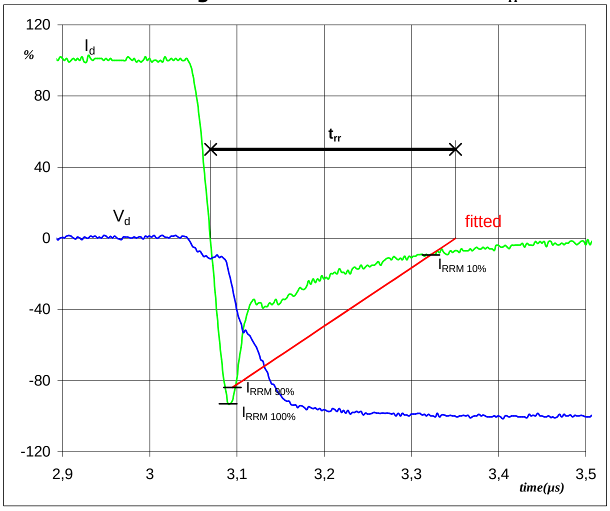
Turn-on Switching Waveforms & definition of t_{Eon}



P_{on} (100%) =	8,98	kW
E_{on} (100%) =	0,71	mJ
$t_{E\ on}$ =	0,18	μs

figure 7.	**IGBT**

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

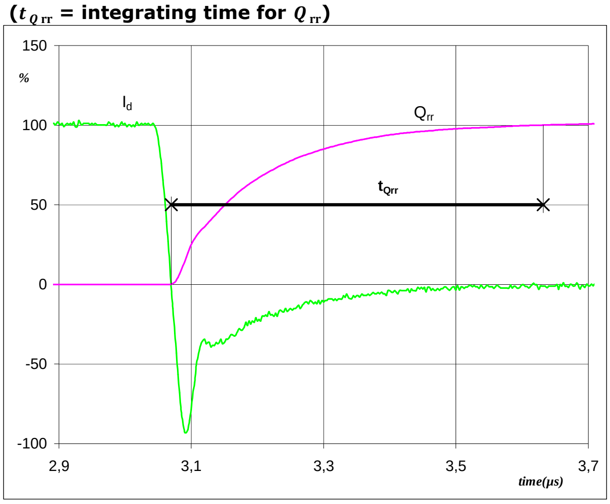


V_d (100%) =	300	V
I_d (100%) =	30	A
I_{RRM} (100%) =	28	A
t_{rr} =	0,26	μs

Switching Definitions Inverter

figure 8. **FWD**

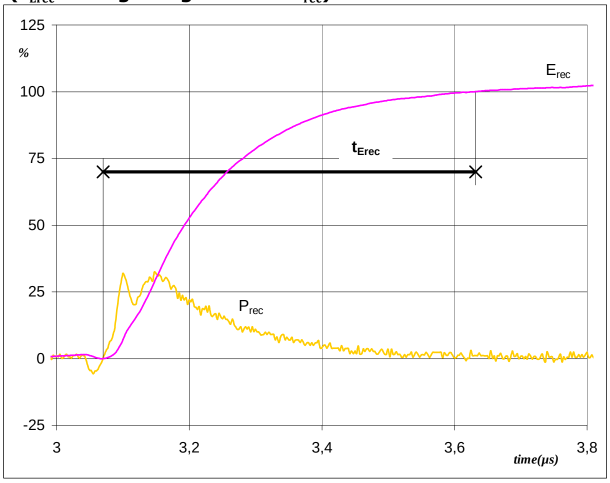
Turn-on Switching Waveforms & definition of t_{Qrr}
($t_{Q rr}$ = integrating time for Q_{rr})



I_d (100%) =	30	A
Q_{rr} (100%) =	2,45	μC
$t_{Q rr}$ =	0,56	μs

figure 9. **FWD**

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



P_{rec} (100%) =	8,98	kW
E_{rec} (100%) =	0,51	mJ
$t_{E rec}$ =	0,56	μs

Ordering Code and Marking - Outline - Pinout

Ordering Code & Marking

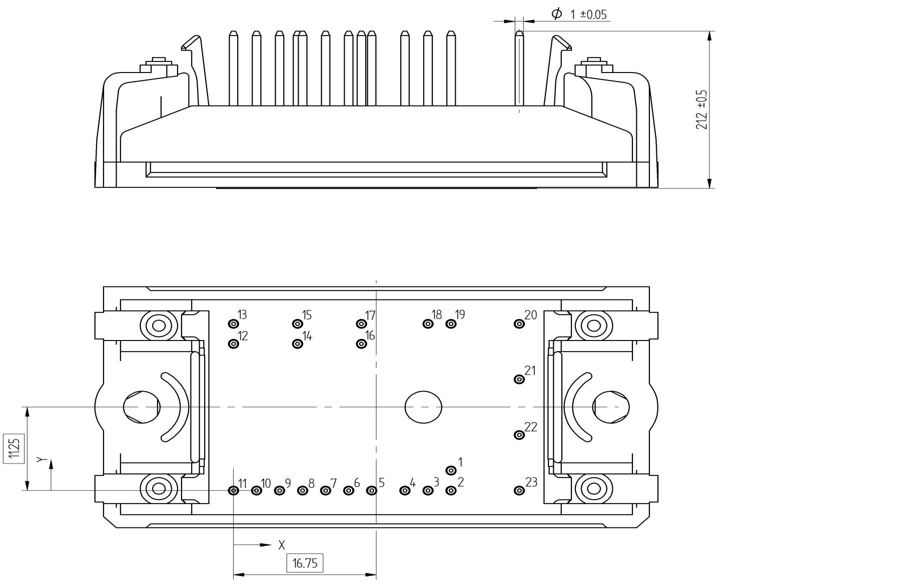
Version	Ordering Code
without thermal paste 17mm housing with solder pins	V23990-P546-A20-PM

	VIN	Date code	Name&Ver	UL	Lot	Serial
Text	VIN	WWYY	NNNNNNNNVV	UL	LLLLL	SSSS
	Name&Ver	**Lot number**	**Serial**	**Date code**		
Datamatrix	NNNNNNNNVV	LLLLL	SSSS	WWYY		

Outline

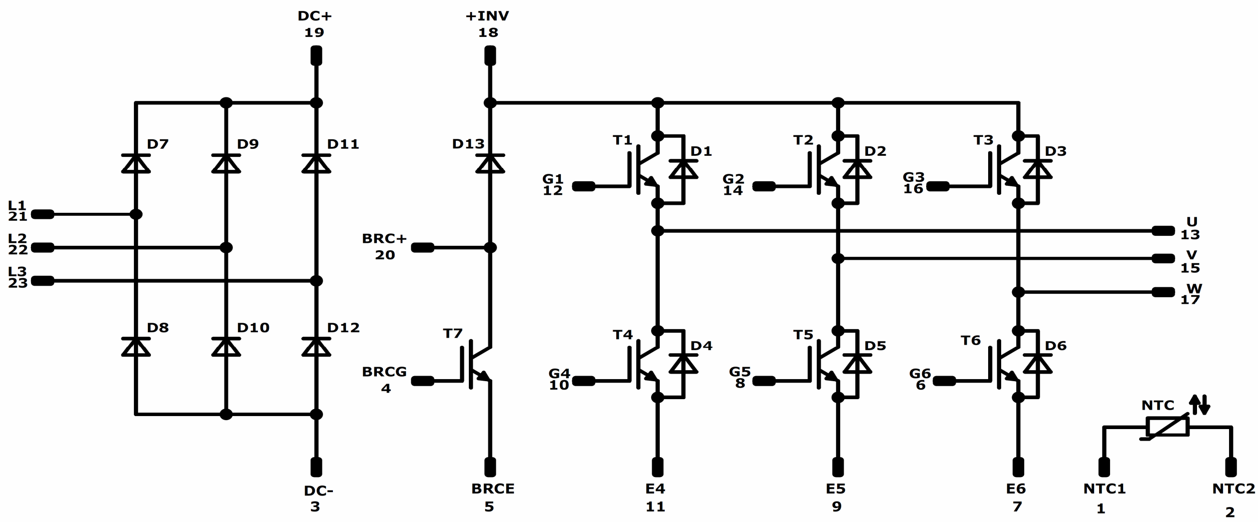
Pin table

Pin	X	Y	Function
1	25,5	2,7	NTC1
2	25,5	0	NTC2
3	22,8	0	-DC
4	20,1	0	BRCG
5	16,2	0	BRCE
6	13,5	0	G6
7	10,8	0	E6
8	8,1	0	G5
9	5,4	0	E5
10	2,7	0	G4
11	0	0	E4
12	0	19,8	G1
13	0	22,5	U
14	7,5	19,8	G2
15	7,5	22,5	V
16	15	19,8	G3
17	15	22,5	W
18	22,8	22,5	+INV
19	25,5	22,5	+DC
20	33,5	22,5	BRC+
21	33,5	15	L1
22	33,5	7,5	L2
23	33,5	0	L3



Tolerance of pinpositions: ±0,5mm at the end of pins
Dimension of coordinate axis is only offset without tolerance

Pinout



Identification

ID	Component	Voltage	Current	Function	Comment
T1-T6	IGBT	600V	30A	Inverter Switch	
D1-D6	FWD	600V	30A	Inverter Diode	
T7	IGBT	600V	20A	Brake Switch	
D13	FWD	600V	20A	Brake Diode	
D7-D12	FWD	1600V	25A	Rectifier 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.

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
V23990-P546-A20-D6-14	15 Apr. 2019	R_{th}, I_{max}, P_{tot} celarance values corrected	All