Vincotech

V23990-P632-A-PM
datasheet

***flow*90PIM 1** — **600 V / 10 A**

Features

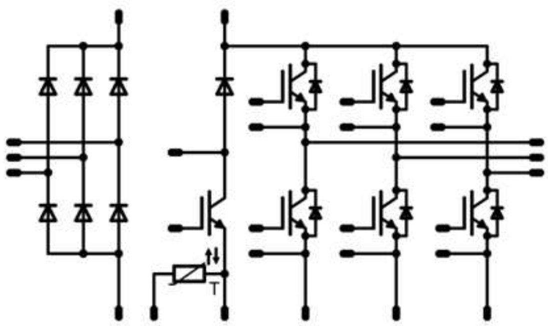
- Trench Fieldstop Technology IGBT3 for low saturation loss
- Supports design with 90° mounting angle between heatsink and PCB
- Clip-in PCB mounting
- Clip or screw on heatsink mounting

*flow*90 housing

Target applications

- Industrial drives

Schematic



Types

- V23990-P632-A-PM

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=$T_j$max	T_S=80°C	17	A
Repetitive peak collector current	I_{CRM}	t_p limited by $T_j$max		30	A
Turn off safe operating area		T_j ≤ 150°C, V_{CE} ≤ 600 V		30	A
Total power dissipation	P_{tot}	T_j=$T_j$max	T_S=80°C	44	W
Gate-emitter voltage	V_{GES}			±20	V
Short circuit ratings	t_{SC} V_{CC}	T_j ≤ 150°C V_{GE} = 15V		6 360	µs V
Maximum Junction Temperature	T_{jmax}			175	°C

Parameter	Symbol	Conditions		Value	Unit
Inverter Diode					
Peak Repetitive Reverse Voltage	V_{RRM}			600	V
Continuous (direct) forward current	I_F	$T_j=T_{jmax}$	$T_h=80°C$	17	A
Repetitive peak forward current	I_{FRM}			20	A
Total power dissipation	P_{tot}	$T_j=T_{jmax}$	$T_h=80°C$	34	W
Maximum Junction Temperature	T_{jmax}			175	°C

Parameter	Symbol	Condition		Value	Unit
Brake Switch					
Collector-emitter break down voltage	V_{CES}			600	V
DC collector current	I_C	$T_j=T_jmax$	$T_h=80°C$	12	A
Pulsed collector current	I_{Cpulse}	t_p limited by T_jmax		18	A
Turn off safe operating area		Tj≤ 175°C, VCE≤ 600V		18	A
Power dissipation	P_{tot}	$T_j=T_jmax$	$T_h=80°C$	36	W
Gate-emitter peak voltage	V_{GE}			±20	V
Short circuit ratings	t_{SC} V_{CC}	Tj≤ 150°C VGE= 15V		6 360	μs V
Maximum Junction Temperature	T_jmax			175	°C

Parameter	Symbol	Conditions		Value	Unit
Brake Diode					
Peak Repetitive Reverse Voltage	V_{RRM}			600	V
Continuous (direct) forward current	I_F	$T_j=T_{jmax}$	$T_h=80°C$	12	A
Repetitive peak forward current	I_{FRM}			12	A
Total power dissipation	P_{tot}	$T_j=T_{jmax}$	$T_h=80°C$	16	W
Maximum Junction Temperature	T_{jmax}			175	°C

Parameter	Symbol	Conditions		Value	Unit
Rectifier Diode					
Repetitive peak reverse voltage	V_{RRM}			1600	V
Mean forward current	I_{FAV}	$T_j = T_{jmax}$	T_s = 80 °C	33	A
Surge (non-repetitive) forward current	I_{FSM}	50 Hz Single Half Sine Wave		200	A
Surge current capability	I^2t	t_p = 10 ms 50 Hz sine	T_j = 150 °C	200	A^2s
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	43	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 11,84	mm
Comparative Tracking Index	CTI			>200	

Characteristic Values

Inverter 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}			0,00015	25 125	5	5,8	6,5	V
Collector-emitter saturation voltage	V_{CEsat}		15		10	25 125 150	1,1	1,50 - 1,79	1,9	V
Collector-emitter cut-off current	I_{CES}		0	600		25 125			0,06	µA
Gate-emitter leakage current	I_{GES}		20	0		25 125			300	nA
Internal gate resistance	r_g							none		Ω
Input capacitance	C_{ies}	f=1 MHz	0	25		25		551		pF
Output capacitance	C_{oes}							40		
Reverse transfer capacitance	C_{res}							17		
Gate charge	Q_g		15	480	10	25		62		nC
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	Phase-Change Material λ=3,4W/mK						2,16		K/W
IGBT Switching										
Turn-on delay time	$t_{d(on)}$	R_{goff} = 16 Ω R_{gon} = 32 Ω	15/0	300	10	25 125		15 14		ns
Rise time	t_r					25 125		11 14		
Turn-off delay time	$t_{d(off)}$					25 125		155 170		
Fall time	t_f					25 125		89 98		
Turn-on energy (per pulse)	E_{on}	Q_{rFWD} = 0,5 µC Q_{rFWD} = 0,8 µC				25 125		0,163 0,218		mWs
Turn-off energy (per pulse)	E_{off}					25 125		0,242 0,291		

Inverter 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		1,60 - 1,56	1,95	V
Reverse leakage current	I_r			600		25 150			27 -	µA
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	Phase-Change Material λ=3,4W/mK						2,79		K/W
FWD Switching										
Peak recovery current	I_{RRM}	di/dt = 866 A/µs di/dt = 907 A/µs	15/0	300	10	25 125		10 11		A
Reverse recovery time	t_{rr}					25 125		142 219		ns
Recovered charge	Q_r					25 125		0,461 0,800		µC
Reverse recovered energy	E_{rec}					25 125		0,091 0,167		mWs
Peak rate of fall of recovery current	$(di_{rf}/dt)_{ma}$					25 125		703 397		A/µs

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	$V_{GE(th)}$	$V_{GE}=V_{CE}$			0,00018	25 125	5	5,8	6,5	V
Collector-emitter saturation voltage	V_{CEsat}		15		6	25 125 150	1,1	1,49 1,68 -	1,9	V
Collector-emitter cut-off current	I_{CES}		0	600		25 125			0,04	µA
Gate-emitter leakage current	I_{GES}		20	0		25 125			300	nA
Internal gate resistance	r_g							none		Ω
Input capacitance	C_{ies}	f=1 MHz	0	25		25		368		pF
Output capacitance	C_{oes}							28		
Reverse transfer capacitance	C_{res}							11		
Gate charge	Q_g		15	480	6	25		42		nC

Thermal

Parameter	Symbol	Conditions	V_{GE} [V]	V_{CE} [V]	I_C [A]	T_j [°C]	Min	Typ	Max	Unit
Thermal resistance junction to sink	$R_{th(j-s)}$	Phase-Change Material λ=3,4W/mK						2,65		K/W

IGBT Switching

Parameter	Symbol	Conditions	V_{GE} [V]	V_{CE} [V]	I_C [A]	T_j [°C]	Min	Typ	Max	Unit
Turn-on delay time	$t_{d(on)}$	Rgoff=32Ω Rgon=64Ω	15/0	300	6	25 125		17 17		ns
Rise time	t_r					25 125		11 14		
Turn-off delay time	$t_{d(off)}$					25 125		155 173		
Fall time	t_f					25 125		88 86		
Turn-on energy (per pulse)	E_{on}	QrrFWD=0,2µC QrrFWD=0,4µC				25 125		0,099 0,132		mWs
Turn-off energy (per pulse)	E_{off}					25 125		0,133 0,169		

Brake Diode

Parameter	Symbol	Conditions					Value			Unit
				V_r [V]	I_F [A]	T_j [°C]	Min	Typ	Max	
Static										
Forward voltage	V_F				6	25 125 150		1,58 1,50 -	1,95	V
Reverse leakage current	I_r			600		25 150			27 -	µA
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	Phase-Change Material λ=3,4W/mK						3,64		K/W
FWD Switching										
Peak recovery current	I_{RRM}	di/dt=720A/µs di/dt=450A/µs	15/0	300	6	25 125		6 7		A
Reverse recovery time	t_{rr}					25 125		102 175		ns
Recovered charge	Q_r					25 125		0,223 0,425		µC
Reverse recovered energy	E_{rec}					25 125		0,039 0,083		mWs
Peak rate of fall of recovery current	$(di_{rf}/dt)_{ma}$					25 125		408 250		A/µs

Rectifier Diode

Parameter	Symbol	Conditions					Value			Unit
				V_r [V]	I_F [A]	T_j	Min	Typ	Max	
Static										
Forward voltage	V_F				25	25°C 125°C 150°C		1,22 1,21 -	1,9	V
Reverse leakage current	I_R			1600		25°C 150°C			50 1100	µA
Thermal										
Thermal resistance junction to case	$R_{th(j-c)}$	Phase-Change Material λ=3,4W/mK						1,61		K/W

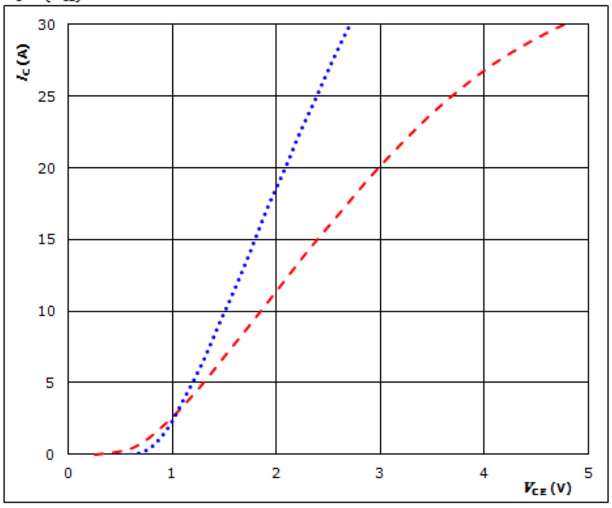
Thermistor

Parameter	Symbol	Conditions					Value			Unit
			V_{GE} [V]	V_{CE} [V]	I_C [A]	T_j [°C]	Min	Typ	Max	
Rated resistance	R					25		22		kΩ
Deviation of R100	$\Delta_{R/R}$	R100=1486 Ω				100	-12		+12	%
Power dissipation	P					25		200		mW
Power dissipation constant						25		2		mW/K
B-value	$B_{(25/50)}$	Tol. ±3%				25		3950		K
B-value	$B_{(25/100)}$	Tol. ±3%				25		3998		K
Vincotech NTC Reference									B	

Inverter Switch Characteristics

Typical output characteristics **IGBT**

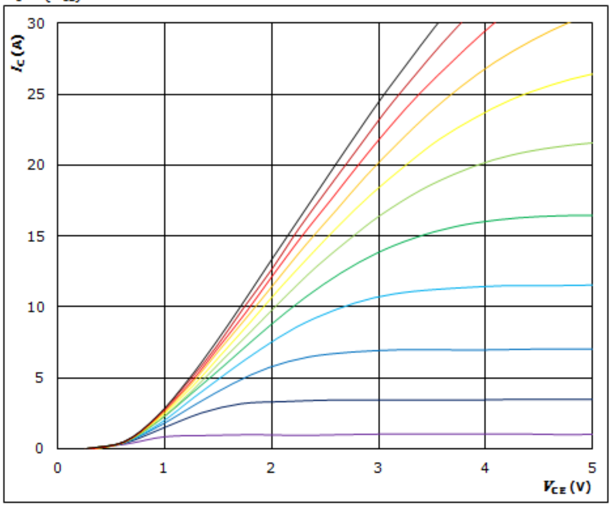
$I_C = f(V_{CE})$



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

Typical output characteristics **IGBT**

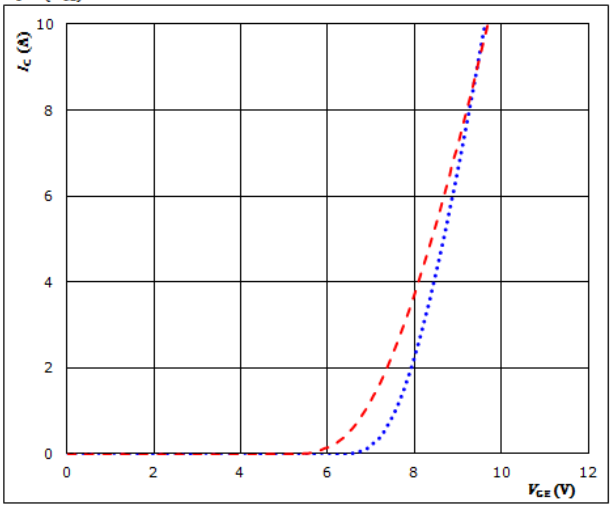
$I_C = f(V_{CE})$



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**

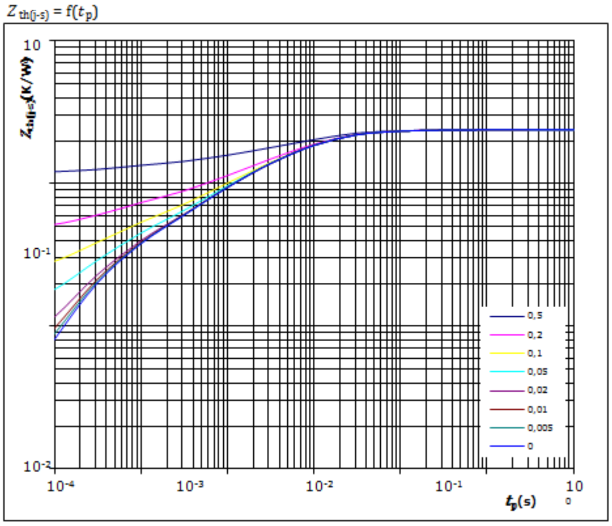
$I_C = f(V_{GE})$



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

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

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



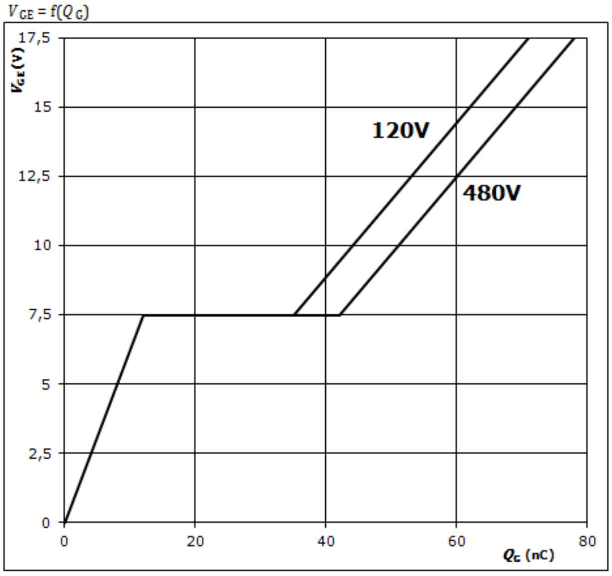
D = t_p / T
$R_{th(j-s)}$ = 2,38 K/W

IGBT thermal model values

R_{th} (K/W)	τ (s)
3,20E-02	6,52E+00
2,64E-01	4,98E-01
9,63E-01	8,83E-02
6,33E-01	1,64E-02
3,25E-01	2,98E-03
2,66E-01	3,39E-04

Inverter Switch Characteristics

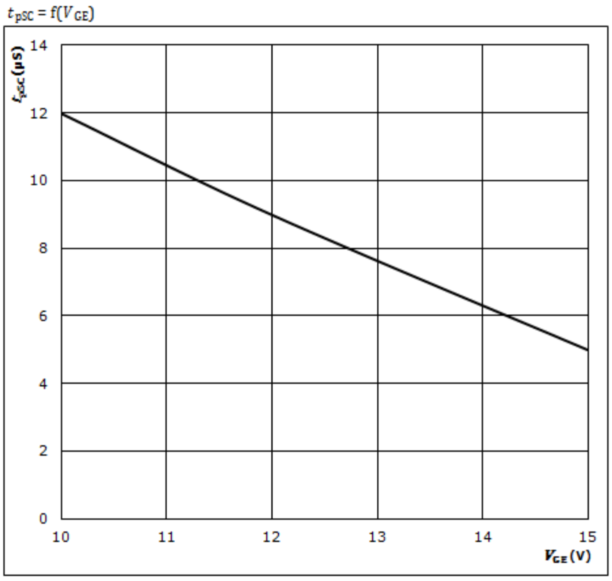
Gate voltage vs Gate charge IGBT



At

I_C= 10 A

Short circuit duration as a function of V_{GE} IGBT

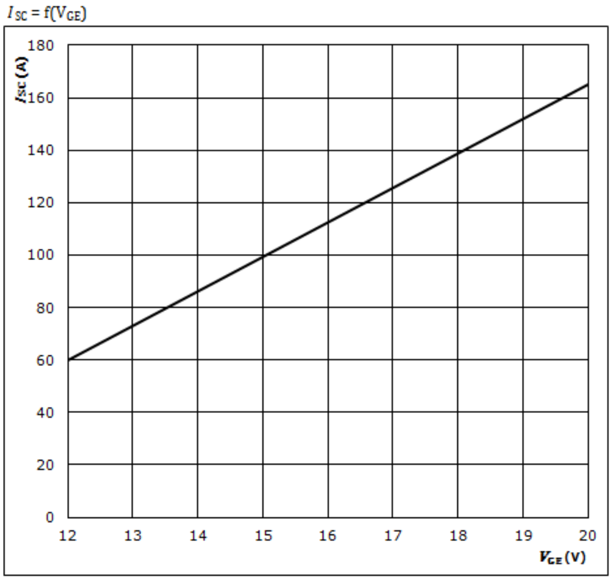


At

V_{CE} = 600 V

$T_j \leq$ 175 ºC

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



At

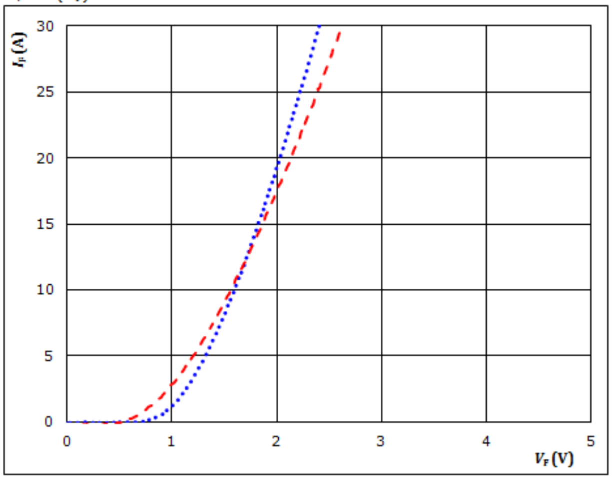
$V_{CE} \leq$ 600 V

$T_j \leq$ 175 ºC

Inverter Diode Characteristics

Typical forward characteristics **FWD**

$I_F = f(V_F)$

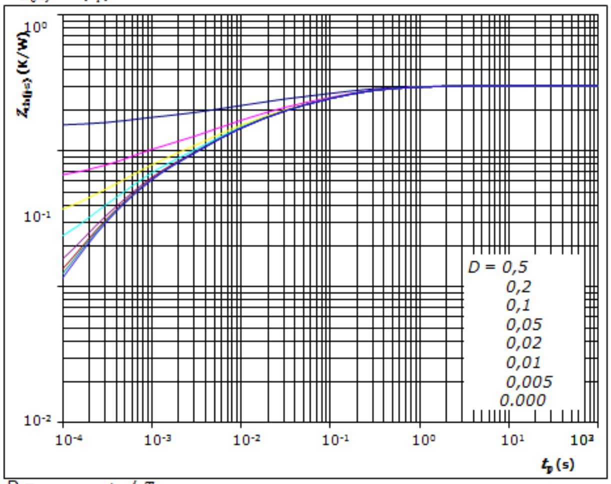


t_p = 250 µs

T_j: 25 °C, 125 °C, 150 °C

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

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



D = t_p / T

$R_{th(j\text{-}s)}$ = 3,07 K/W

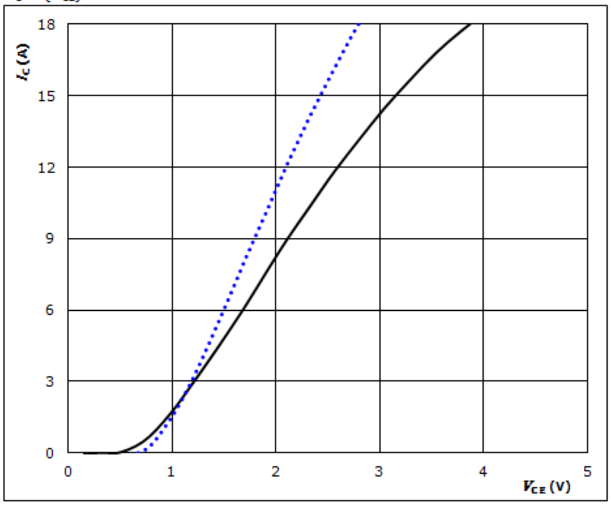
FWD thermal model values

R (K/W)	τ (s)
3,97E-02	8,54E+00
2,84E-01	5,80E-01
8,81E-01	1,03E-01
8,10E-01	1,63E-02
6,12E-01	3,27E-03
4,39E-01	4,24E-04

Brake Switch Characteristics

Typical output characteristics — IGBT

$I_C = f(V_{CE})$

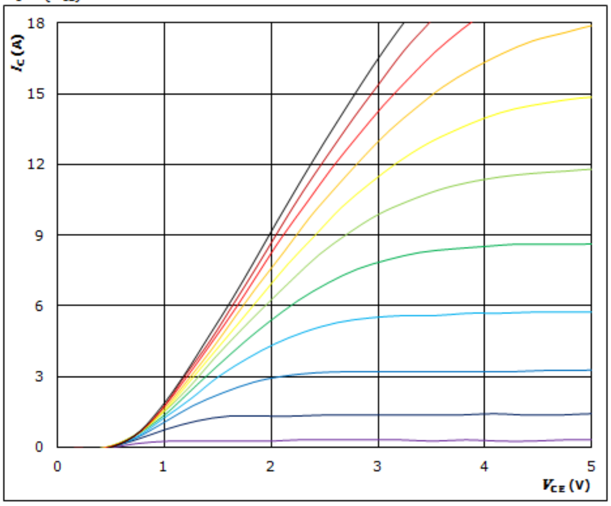


t_p =	250	µs
V_{GE} =	15	V

25 °C (dotted blue)
125 °C (solid black)
150 °C (dashed red)

Typical output characteristics — IGBT

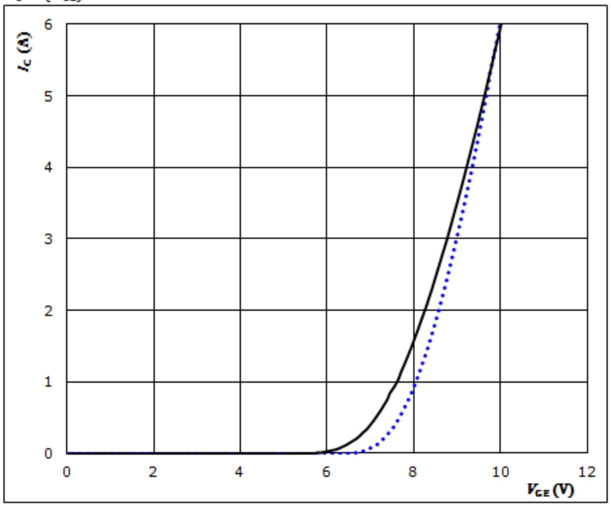
$I_C = f(V_{CE})$



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

Typical transfer characteristics — IGBT

$I_C = f(V_{GE})$

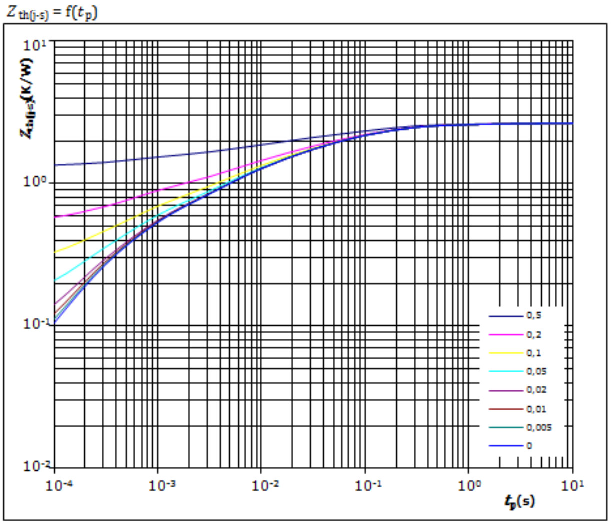


t_p =	100	µs
V_{CE} =	10	V

25 °C (dotted blue)
125 °C (solid black)
150 °C (dashed red)

Transient Thermal Impedance as function of Pulse duration — IGBT

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



D = t_p / T

$R_{th(j-s)}$ = 2,65 K/W

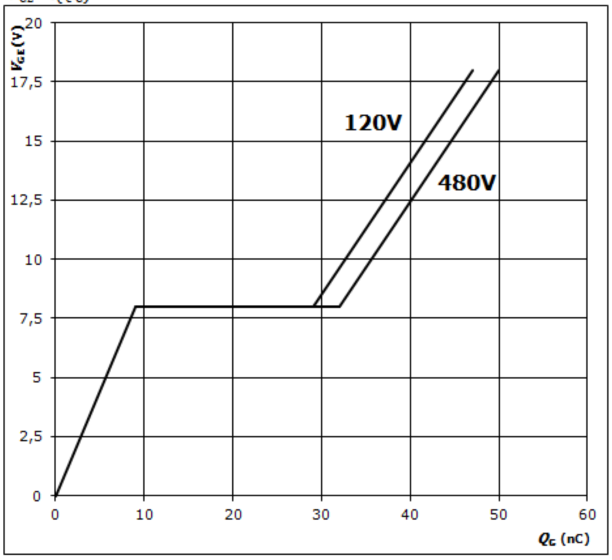
IGBT thermal model values

R_{th} (K/W)	τ (s)
4,08E-02	6,43E+00
1,93E-01	5,70E-01
8,18E-01	8,70E-02
6,50E-01	1,56E-02
4,72E-01	3,26E-03
3,65E-01	4,01E-04

Brake Switch Characteristics

Gate voltage vs Gate charge IGBT

$V_{GE} = f(Q_G)$

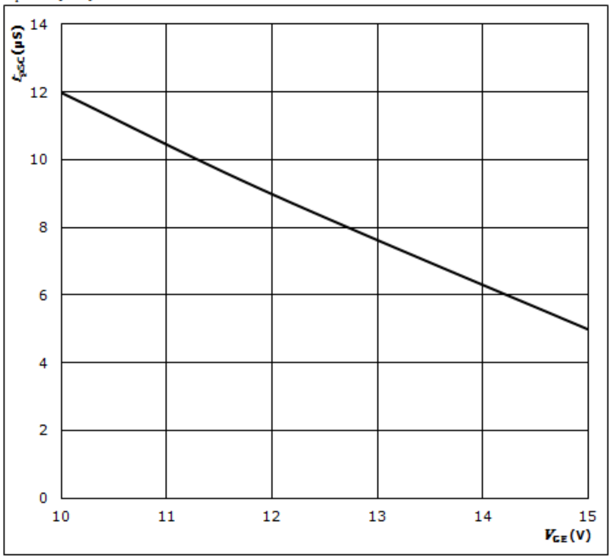


At

I_C=	6	A

Short circuit duration as a function of V_{GE} IGBT

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

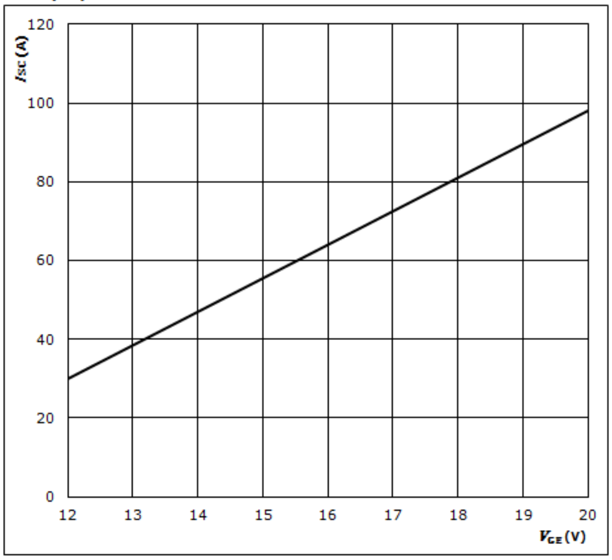


At

V_{CE} =	600	V
T_j ≤	175	ºC

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

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



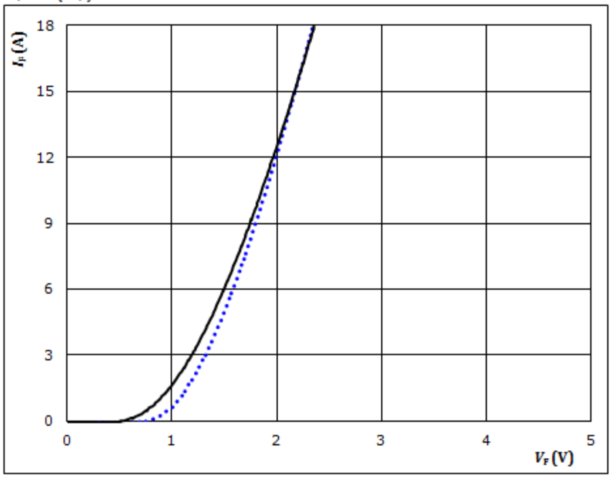
At

V_{CE} ≤	600	V
T_j ≤	175	ºC

Brake Diode Characteristics

Typical forward characteristics	FWD

$I_F = f(V_F)$

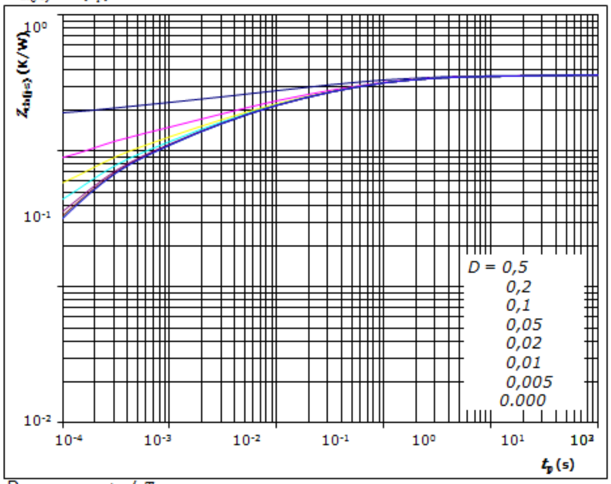


t_p = 250 µs

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

$R_{th(j-s)}$ = 3,64 K/W

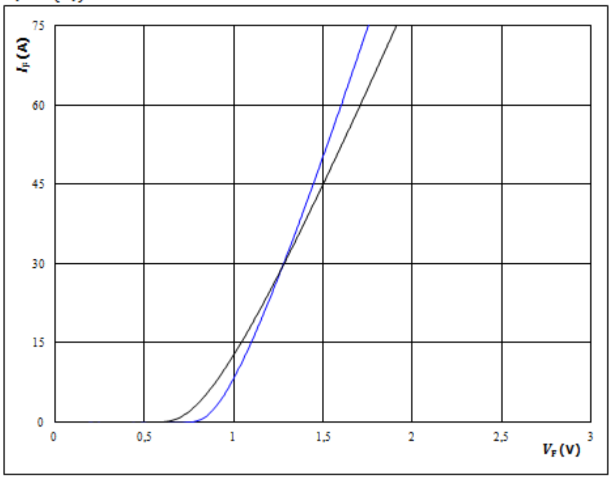
FWD thermal model values

R (K/W)	τ (s)
1,37E-01	2,28E+00
5,63E-01	1,47E-01
8,33E-01	3,33E-02
8,63E-01	6,52E-03
6,23E-01	1,27E-03
6,21E-01	1,89E-04

Rectifier Diode Characteristics

Typical forward characteristics	Rectifier Diode

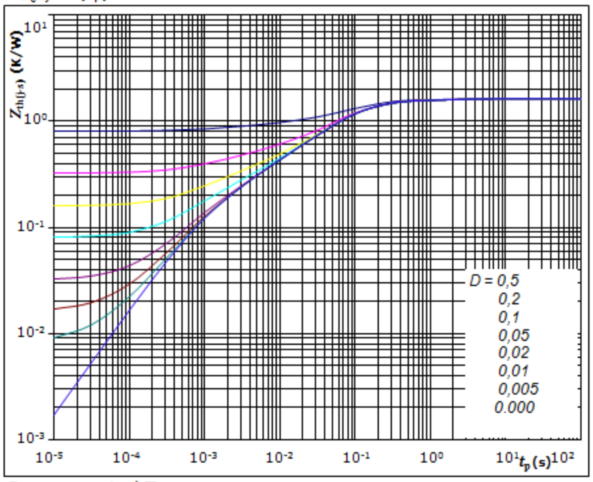
$I_F = f(V_F)$



t_p = 250 µs
T_j = 25, 125, 150 °C

Transient thermal impedance as a function of pulse width	Rectifier Diode

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



D = t_p / T
$R_{th(j-s)}$ = 1,61 K/W

Rectifier Diode thermal model values

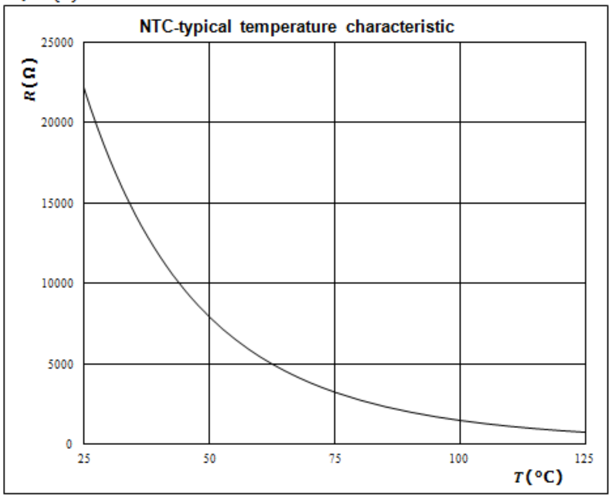
R (K/W)	τ (s)
6,72E-02	2,72E+00
1,48E-01	4,14E-01
8,68E-01	8,33E-02
2,53E-01	2,89E-02
1,69E-01	5,15E-03
1,06E-01	9,10E-04

Thermistor Characteristics

Thermistor typical temperature characteristic

Typical NTC characteristic
as a function of temperature

$R_T = f(T)$

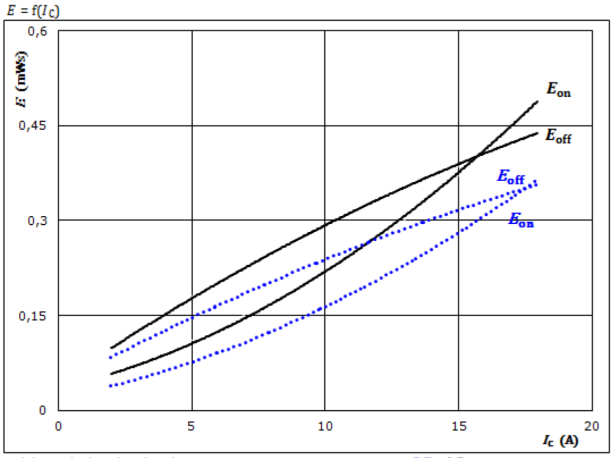


Inverter Switching Characteristics

Figure 1. **IGBT**

Typical switching energy losses as a function of collector current

$E = f(I_C)$



With an inductive load at

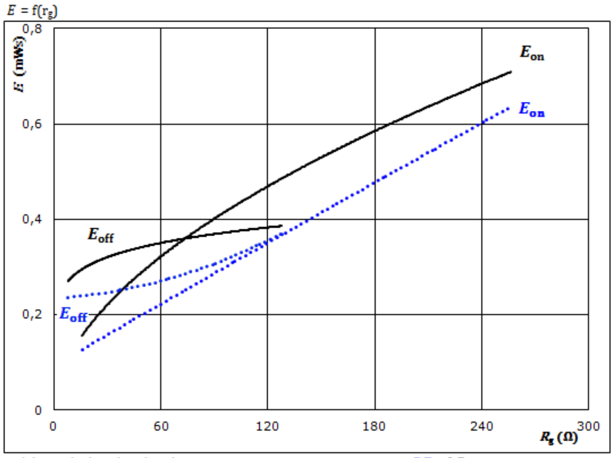
V_{CE} = 300 V
V_{GE} = 15/0 V
R_{gon} = 32 Ω
R_{goff} = 16 Ω

T_j: 25 °C (dotted) · 125 °C (solid) · 150 °C (dashed)

Figure 2. **IGBT**

Typical switching energy losses as a function of gate resistor

$E = f(r_g)$



With an inductive load at

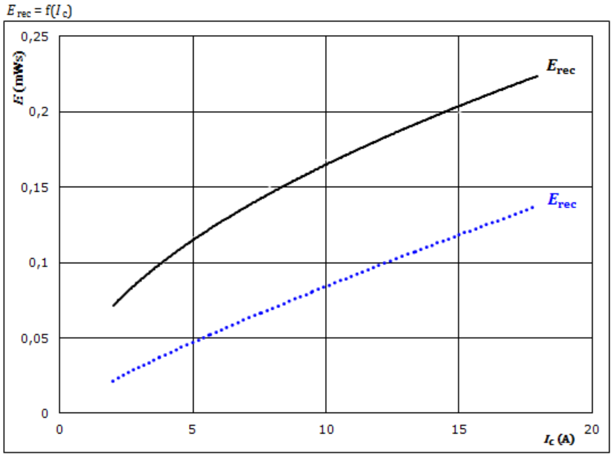
V_{CE} = 300 V
V_{GE} = 15/0 V
I_C = 10 A

T_j: 25 °C (dotted) · 125 °C (solid) · 150 °C (dashed)

Figure 3. **FWD**

Typical reverse recovered energy loss as a function of collector current

$E_{rec} = f(I_C)$



With an inductive load at

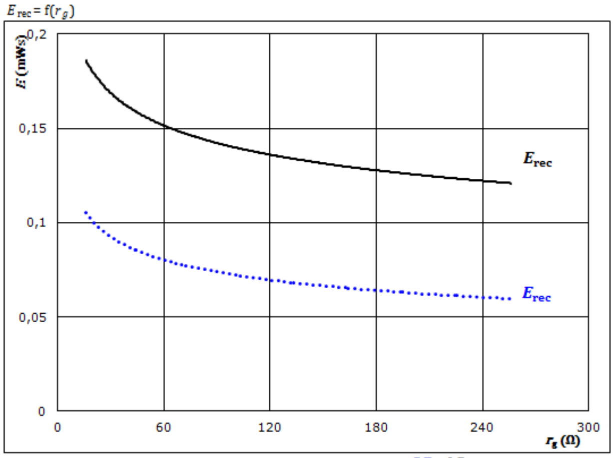
V_{CE} = 300 V
V_{GE} = 15/0 V
R_{gon} = 32 Ω

T_j: 25 °C (dotted) · 125 °C (solid) · 150 °C (dashed)

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} = 15/0 V
I_C = 10 A

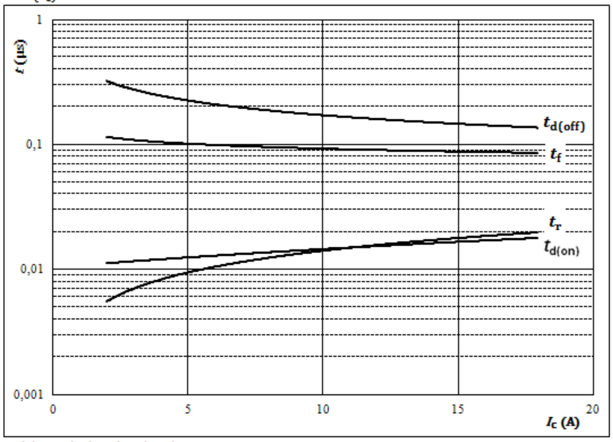
T_j: 25 °C (dotted) · 125 °C (solid) · 150 °C (dashed)

Inverter Switching Characteristics

Figure 5. IGBT

Typical switching times as a function of collector current

$t = f(I_C)$



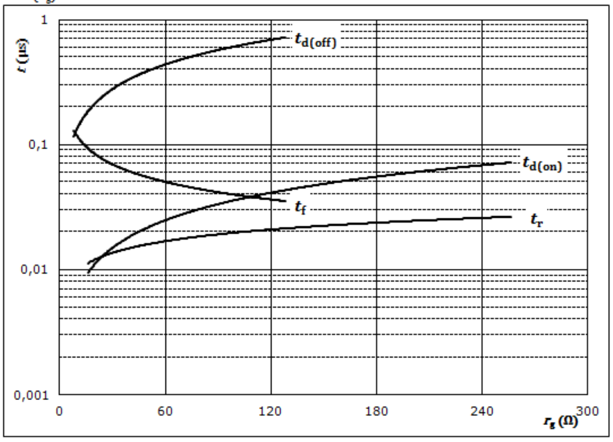
With an inductive load at

T_j =	125	°C
V_{CE} =	300	V
V_{GE} =	15/0	V
R_{gon} =	32	Ω
R_{goff} =	16	Ω

Figure 6. IGBT

Typical switching times as a function of gate resistor

$t = f(r_g)$



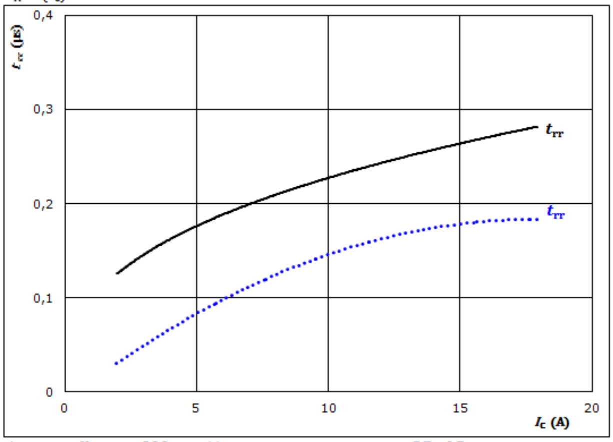
With an inductive load at

T_j =	125	°C
V_{CE} =	300	V
V_{GE} =	15/0	V
I_C =	10	A

Figure 7. FWD

Typical reverse recovery time as a function of collector current

$t_{rr} = f(I_C)$

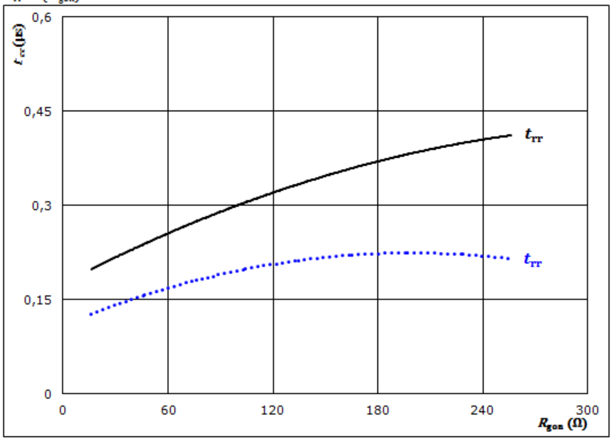


At				T_j:	
V_{CE}=	300	V		25 °C	···········
V_{GE} =	15/0	V		125 °C	———
R_{gon} =	32	Ω		150 °C	– – – –

Figure 8. FWD

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

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



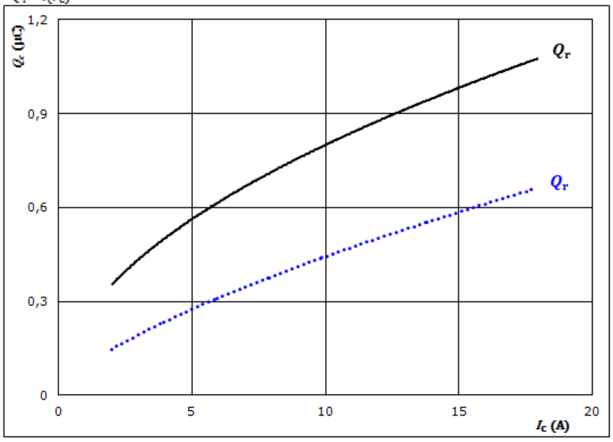
At				T_j:	
V_{CE} =	300	V		25 °C	···········
V_{GE} =	15/0	V		125 °C	———
I_C =	10	A		150 °C	– – – –

Inverter Switching Characteristics

Figure 9. FWD

Typical recovered charge as a function of collector current

$Q_r = f(I_C)$

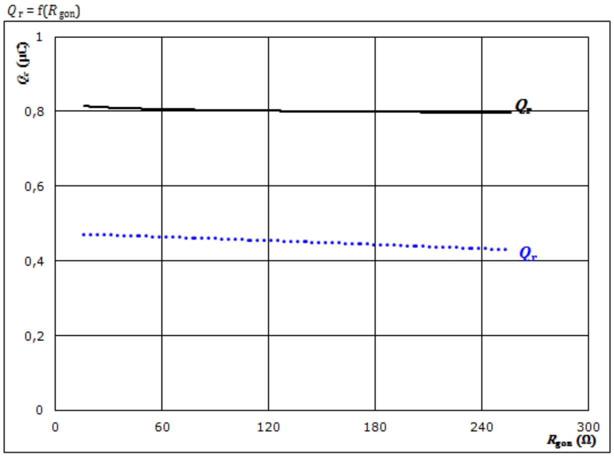


At						
	V_{CE} =	300	V		25 °C	··············
	V_{GE} =	15/0	V	T_j:	125 °C	———
	R_{gon} =	32	Ω		150 °C	– – – –

Figure 10. FWD

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

$Q_r = f(R_{gon})$

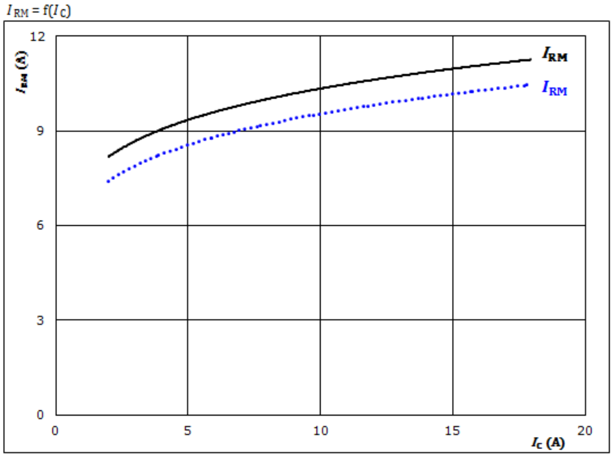


At						
	V_{CE}=	300	V		25 °C	··············
	V_{GE} =	15/0	V	T_j:	125 °C	———
	I_C=	10	A		150 °C	– – – –

Figure 11. FWD

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

$I_{RM} = f(I_C)$

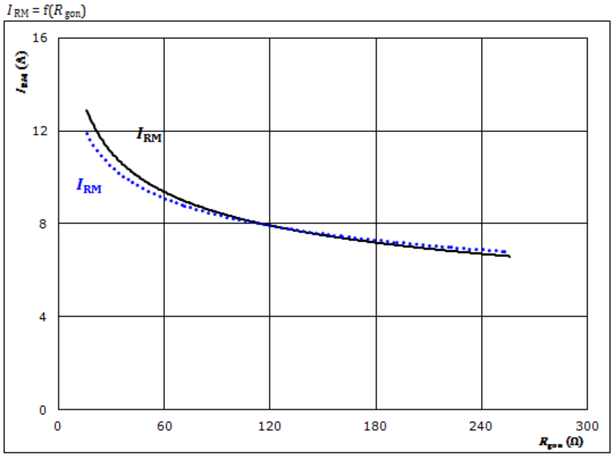


At						
	V_{CE}	300	V		25 °C	··············
	V_{GE} =	15/0	V	T_j:	125 °C	———
	R_{gon} =	32	Ω		150 °C	– – – –

Figure 12. FWD

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

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



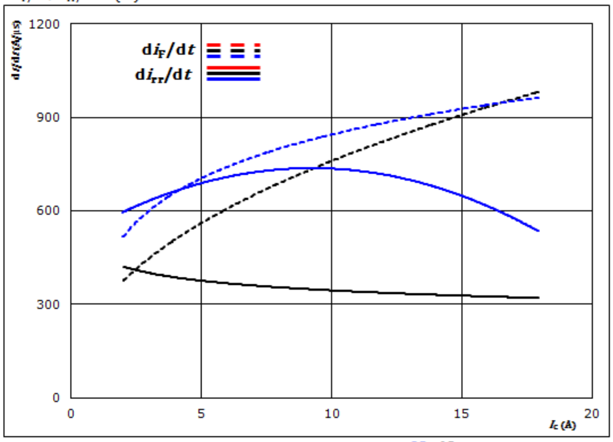
At						
	V_{CE} =	300	V		25 °C	··············
	V_{GE} =	15/0	V	T_j:	125 °C	———
	I_C=	10	A		150 °C	– – – –

Inverter Switching Characteristics

Figure 13.	**FWD**

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

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

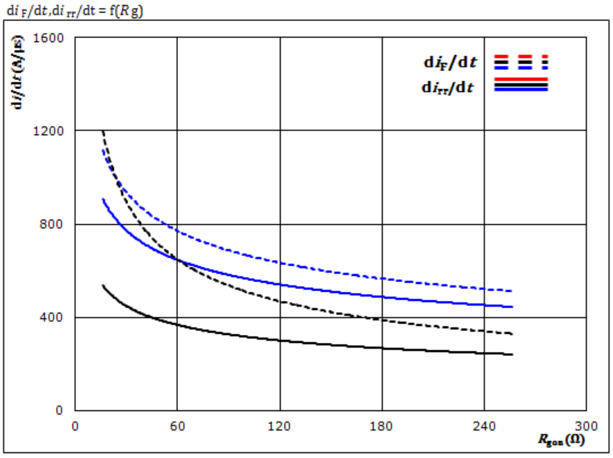


At						
V_{CE} =	300	V		25	°C	··············
V_{GE} =	15/0	V	T_j:	125	°C	————
R_{gon} =	32	Ω		150	°C	— — — —

Figure 14.	**FWD**

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

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

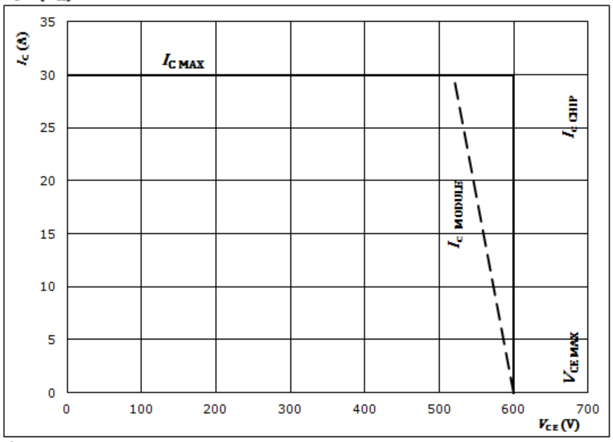


At		
V_{CE} =	300	V
V_{GE} =	15/0	V
I_C =	10	A

Figure 15.	**IGBT**

Reverse bias safe operating area

$I_C = f(V_{CE})$



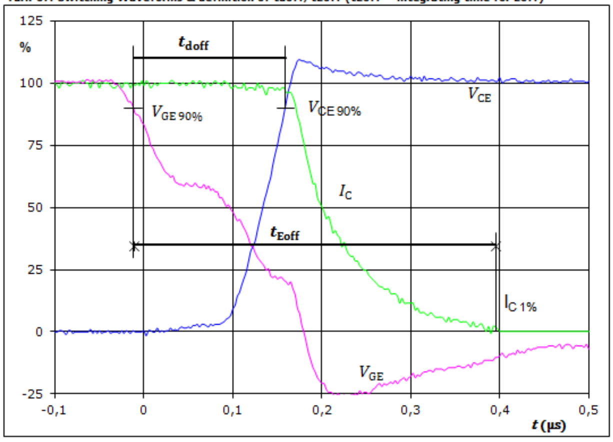
At		
T_j =	175	°C
R_{gon} =	32	Ω
R_{goff} =	16	Ω

Inverter Switching Characteristics

General conditions		
T_j	=	125 °C
R_{gon}	=	32 Ω
R_{goff}	=	16 Ω

Figure 1. IGBT

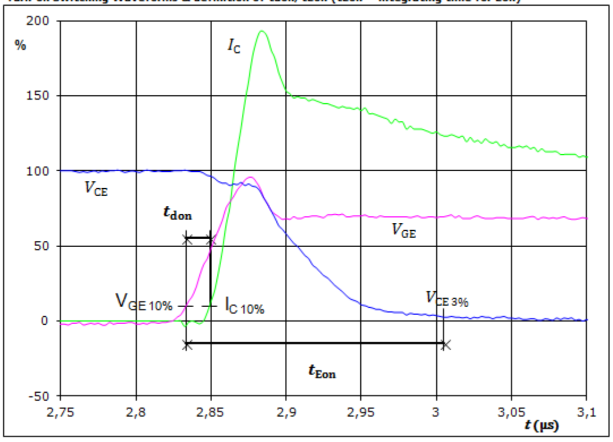
Turn-off Switching Waveforms & definition of tdoff, tEoff (tEoff = integrating time for Eoff)



V_{GE} (0%) =	0	V
V_{GE} (100%) =	15	V
V_C (100%) =	300	V
I_C (100%) =	10	A
t_{doff} =	0,171	µs
t_{Eoff} =	0,407	µs

Figure 2. IGBT

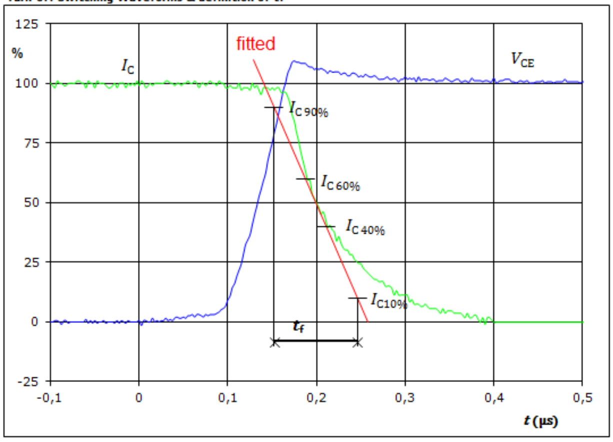
Turn-on Switching Waveforms & definition of tdon, tEon (tEon = integrating time for Eon)



V_{GE} (0%) =	0	V
V_{GE} (100%) =	15	V
V_C (100%) =	300	V
I_C (100%) =	10	A
t_{don} =	0,015	µs
t_{Eon} =	0,172	µs

Figure 3. IGBT

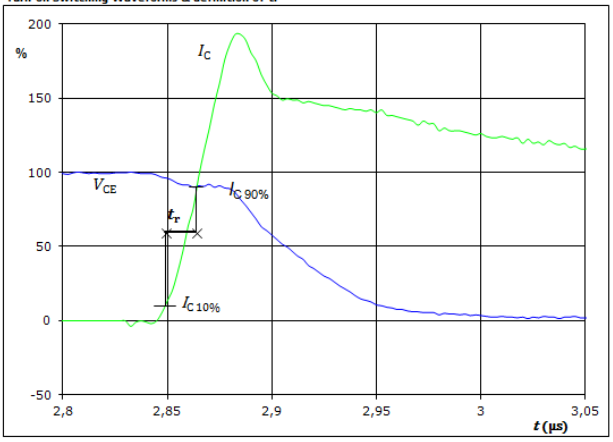
Turn-off Switching Waveforms & definition of tf



V_C (100%) =	300	V
I_C (100%) =	10	A
t_f =	0,092	µs

Figure 4. IGBT

Turn-on Switching Waveforms & definition of tr

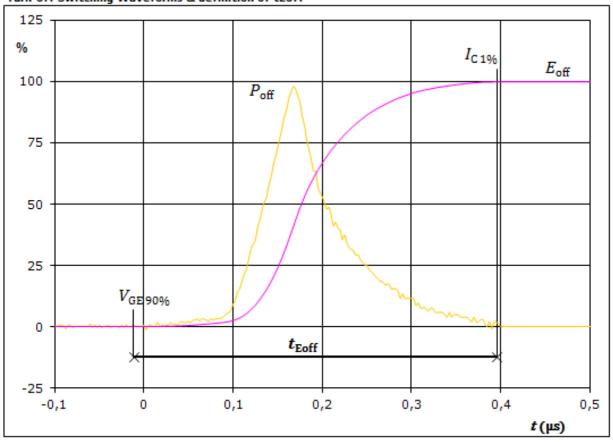


V_C (100%) =	300	V
I_C (100%) =	10	A
t_r =	0,015	µs

Inverter Switching Characteristics

Figure 5.	IGBT

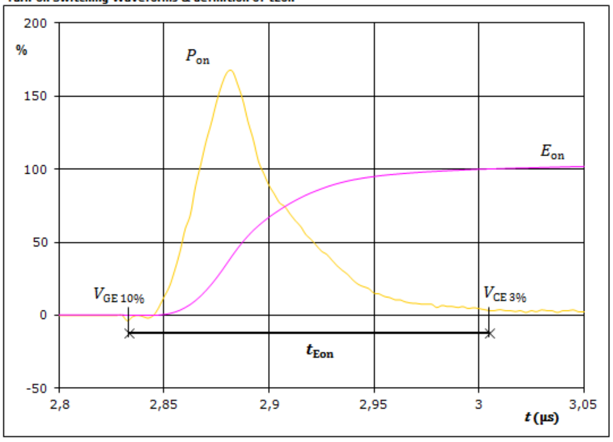
Turn-off Switching Waveforms & definition of tEoff



P_{off} (100%) =	2,99	kW
E_{off} (100%) =	0,28	mJ
t_{Eoff} =	0,407	µs

Figure 6.	IGBT

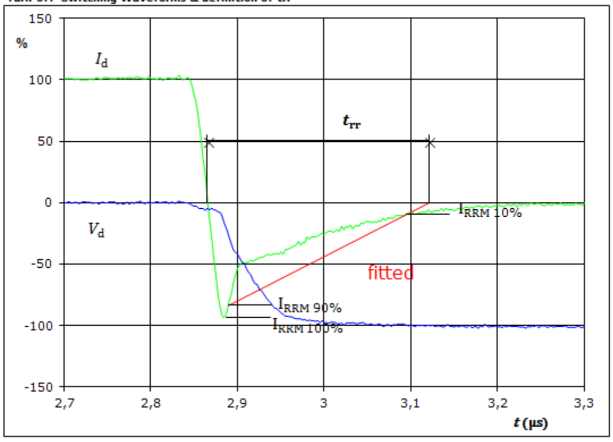
Turn-on Switching Waveforms & definition of tEon



P_{on} (100%) =	2,99	kW
E_{on} (100%) =	0,25	mJ
t_{Eon} =	0,172	µs

Figure 7.	FWD

Turn-off Switching Waveforms & definition of trr

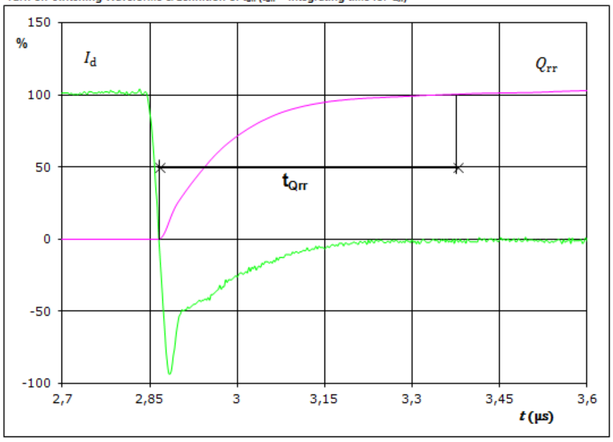


V_d (100%) =	300	V
I_d (100%) =	10	A
I_{RRM} (100%) =	9	A
t_{rr} =	0,256	µs

Inverter Switching Characteristics

Figure 8. **FWD**

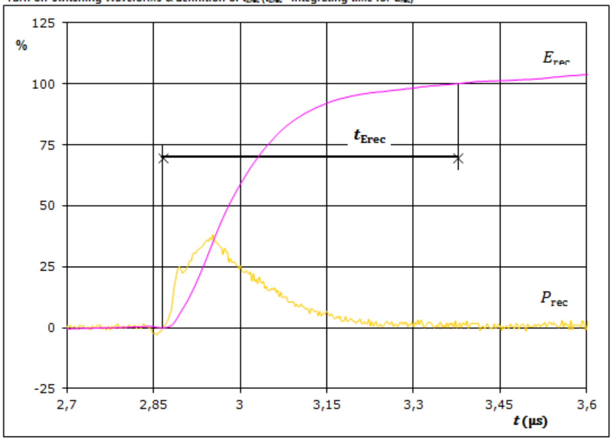
Turn-on Switching Waveforms & definition of t_{Qrr} (t_{Qrr} = integrating time for Q_{rr})



I_d (100%) =	10	A
Q_{rr} (100%) =	0,85	µC
t_{Qrr} =	0,511	µs

Figure 9. **FWD**

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



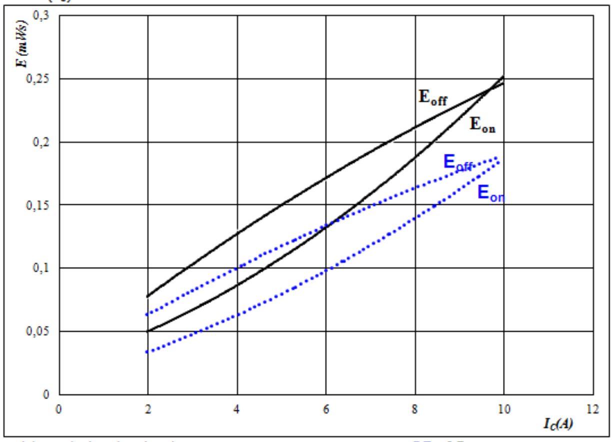
P_{rec} (100%) =	2,99	kW
E_{rec} (100%) =	0,18	mJ
t_{Erec} =	0,511	µs

Brake Switching Characteristics

Figure 1. IGBT

Typical switching energy losses as a function of collector current

$E = f(I_C)$



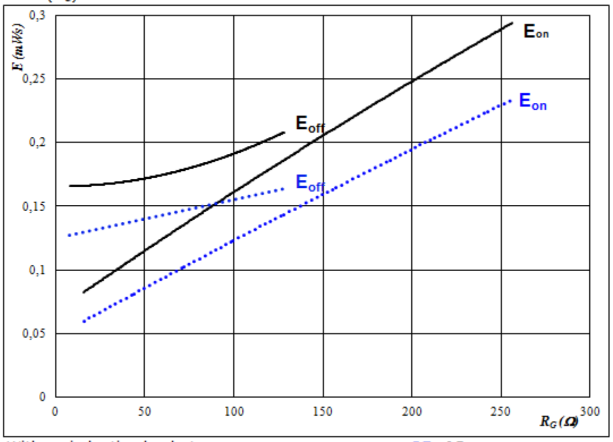
With an inductive load at

V_{CE} =	300	V	T_j:	25 °C	··············
V_{GE} =	15/0	V		125 °C	————
R_{gon} =	64	Ω		150 °C	– – – –
R_{goff} =	32	Ω			

Figure 2. IGBT

Typical switching energy losses as a function of gate resistor

$E = f(R_G)$



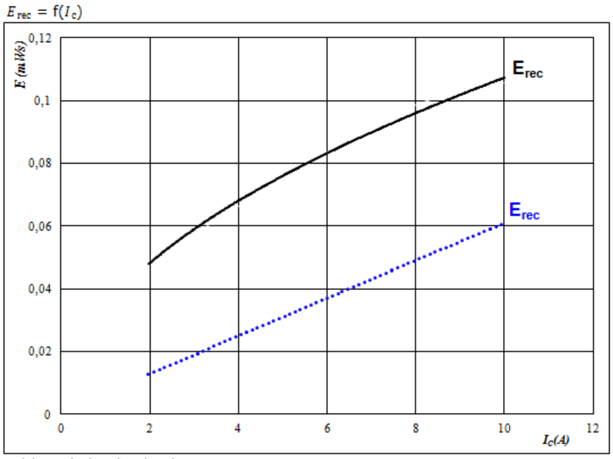
With an inductive load at

V_{CE} =	300	V	T_j:	25 °C	··············
V_{GE} =	15/0	V		125 °C	————
I_C =	6	A		150 °C	– – – –

Figure 3. FWD

Typical reverse recovery energy loss as a function of collector current

$E_{rec} = f(I_C)$



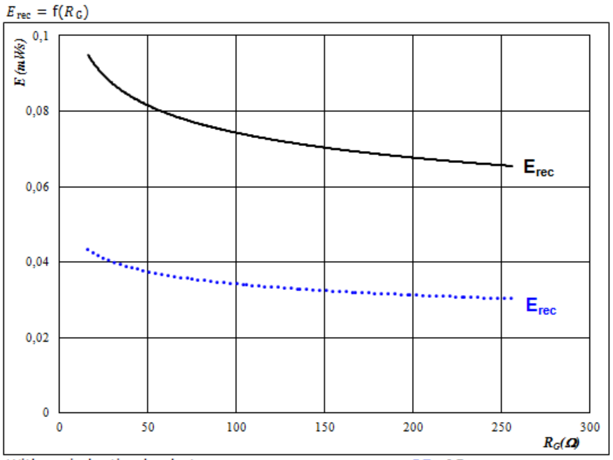
With an inductive load at

V_{CE} =	300	V	T_j:	25 °C	··············
V_{GE} =	15/0	V		125 °C	————
R_{gon} =	64	Ω		150 °C	– – – –

Figure 4. FWD

Typical reverse recovery energy loss as a function of gate resistor

$E_{rec} = f(R_G)$



With an inductive load at

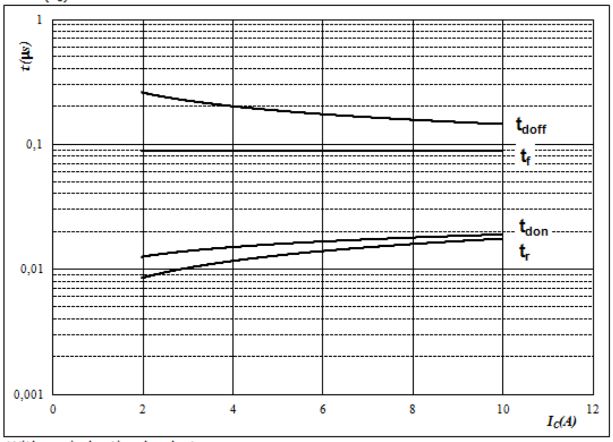
V_{CE}=	300	V	T_j:	25 °C	··············
V_{GE}=	15/0	V		125 °C	————
I_C=	6	A		150 °C	– – – –

Brake Switching Characteristics

Figure 5. IGBT

Typical switching times as a function of collector current

$t = f(I_C)$



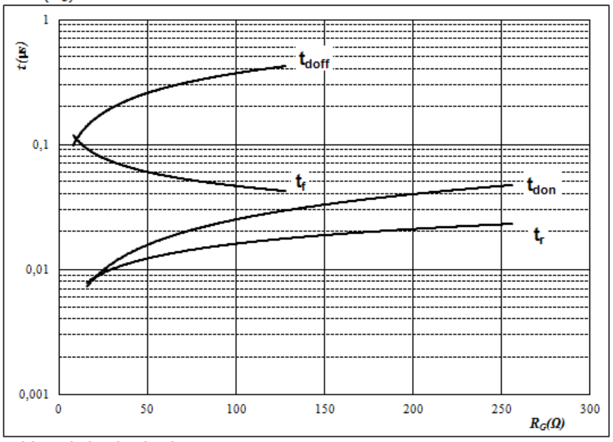
With an inductive load at

T_j =	125	°C
V_{CE} =	300	V
V_{GE} =	15/0	V
R_{gon} =	64	Ω
R_{goff} =	32	Ω

Figure 6. IGBT

Typical switching times as a function of gate resistor

$t = f(R_G)$



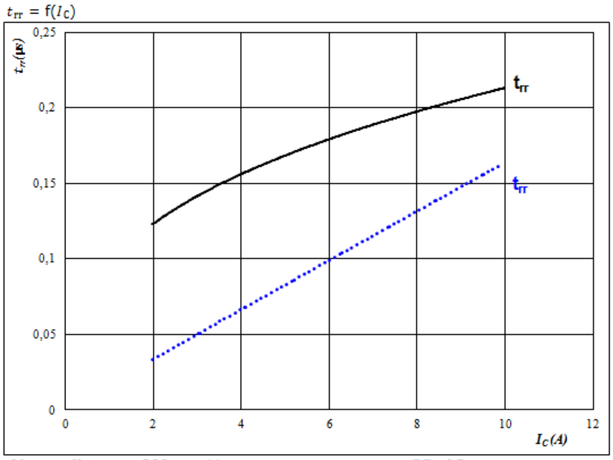
With an inductive load at

T_j =	125	°C
V_{CE} =	300	V
V_{GE} =	15/0	V
I_C =	6	A

Figure 7. FWD

Typical reverse recovery time as a function of collector current

$t_{rr} = f(I_C)$

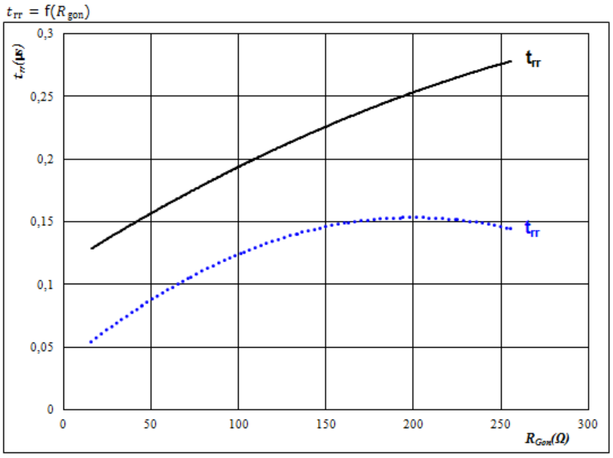


At	V_{CE}=	300	V		**25 °C**	············
	V_{GE} =	15/0	V	T_j:	**125 °C**	———
	R_{gon} =	64	Ω		**150 °C**	– – – –

Figure 8. FWD

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

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



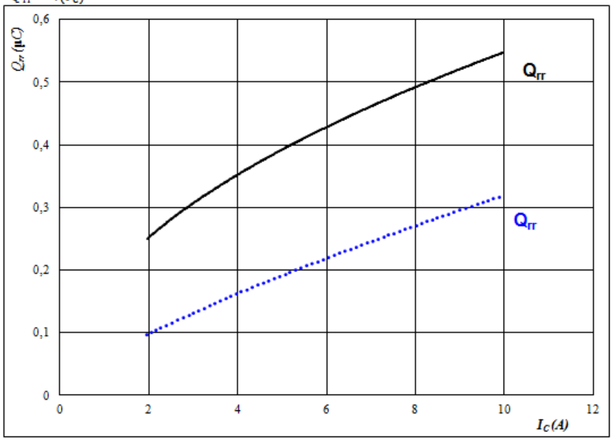
At	V_{CE}=	300	V		**25 °C**	············
	V_{GE} =	15/0	V	T_j:	**125 °C**	———
	I_C=	6	A		**150 °C**	– – – –

Brake Switching Characteristics

Figure 9. FWD

Typical reverse recovery charge as a function of collector current

$Q_{rr} = f(I_C)$

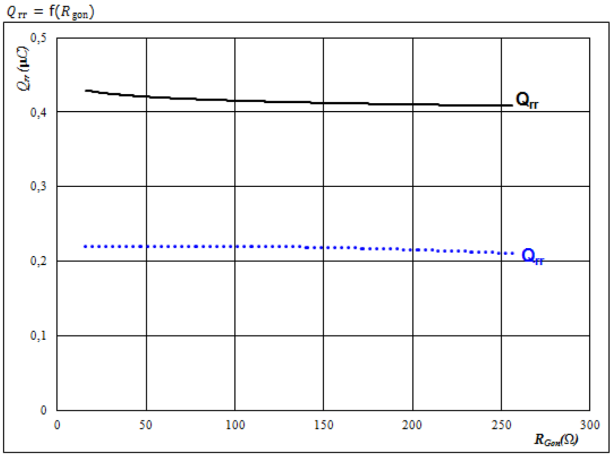


At					
V_{CE} =	300	V		25 °C	············
V_{GE} =	15/0	V	T_j:	125 °C	———
R_{gon} =	64	Ω		150 °C	– – – –

Figure 10. FWD

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

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

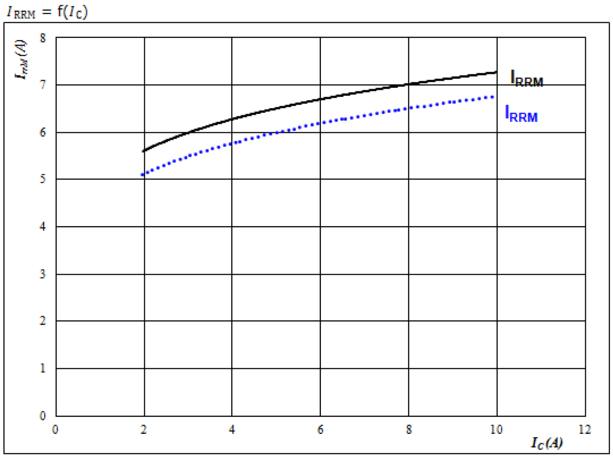


At					
V_{CE} =	300	V		25 °C	············
V_{GE} =	15/0	V	T_j:	125 °C	———
I_C=	6	A		150 °C	– – – –

Figure 11. FWD

Typical reverse recovery current as a function of collector current

$I_{RRM} = f(I_C)$

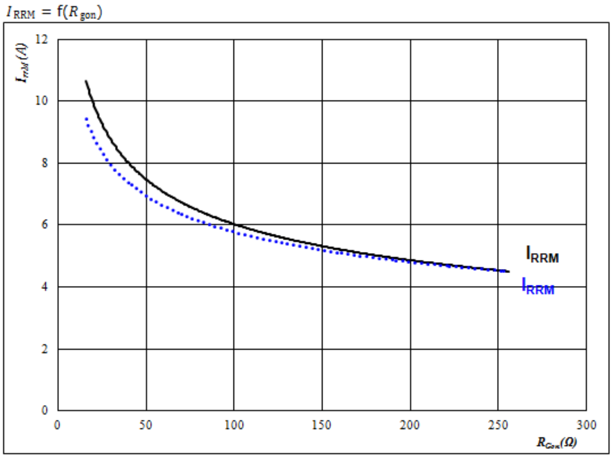


At					
V_{CE}=	300	V		25 °C	············
V_{GE} =	15/0	V	T_j:	125 °C	———
R_{gon} =	64	Ω		150 °C	– – – –

Figure 12. FWD

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

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



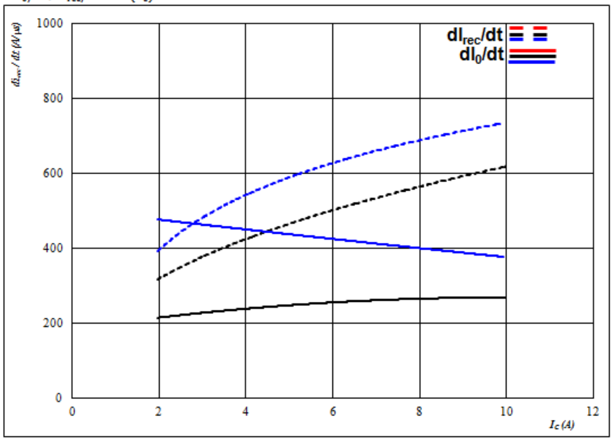
At					
V_{CE}=	300	V		25 °C	············
V_{GE} =	15/0	V	T_j:	125 °C	———
I_C=	6	A		150 °C	– – – –

Brake Switching Characteristics

Figure 13. FWD

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

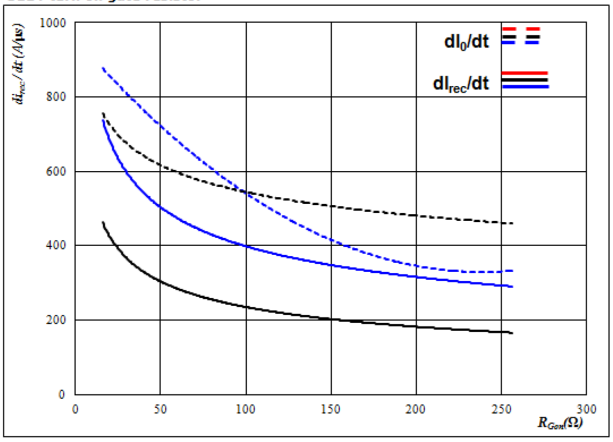
$dI_0/dt, dI_{rec}/dt = f(I_C)$



At			
	V_{CE} =	300	V
	V_{GE} =	15/0	V
	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

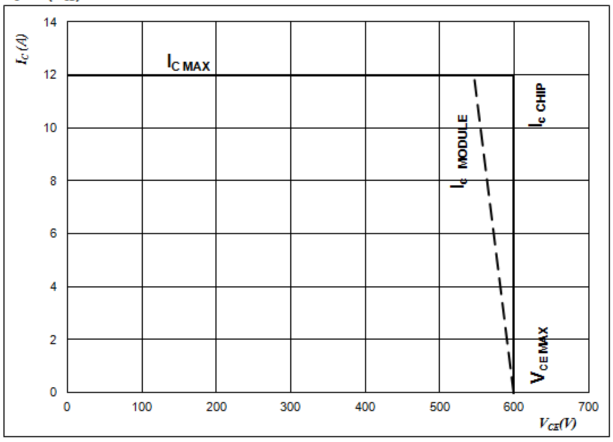


At			
	V_{CE} =	300	V
	V_{GE} =	15/0	V
	I_C =	6	A

Figure 15. IGBT

Reverse bias safe operating area

$I_C = f(V_{CE})$



At			
	T_j =	175	°C
	R_{gon} =	64	Ω
	R_{goff} =	32	Ω

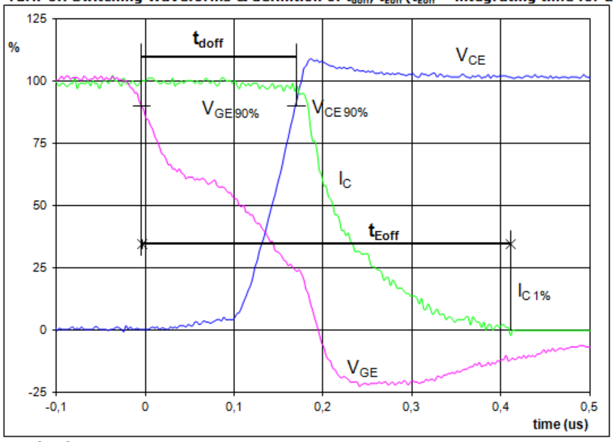
Brake Switching Characteristics

General conditions

T_j	=	125 °C
R_{gon}	=	64 Ω
R_{goff}	=	32 Ω

Figure 1. IGBT

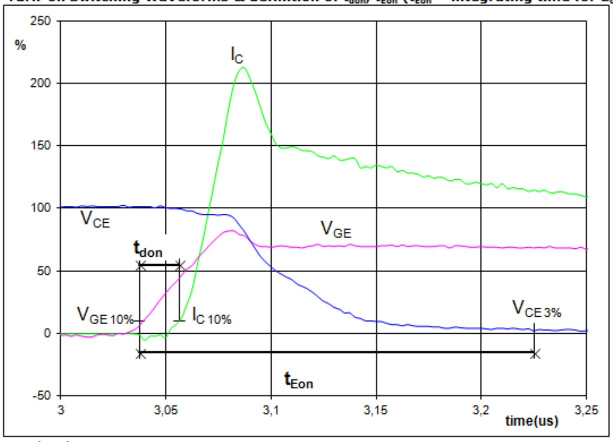
Turn-off Switching Waveforms & definition of t_{doff}, t_{Eoff} (t_{Eoff} = integrating time for E_{off})



V_{GE} (0%) =	0	V
V_{GE} (100%) =	15	V
V_C (100%) =	300	V
I_C (100%) =	6	A
t_{doff} =	0,173	μs
t_{Eoff} =	0,415	μs

Figure 2. IGBT

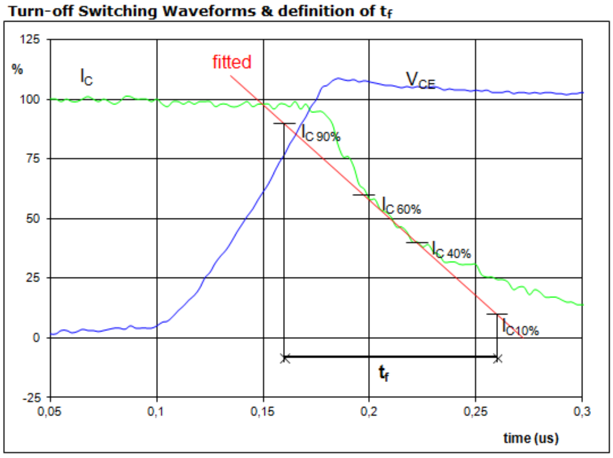
Turn-on Switching Waveforms & definition of t_{don}, t_{Eon} (t_{Eon} = integrating time for E_{on})



V_{GE} (0%) =	0	V
V_{GE} (100%) =	15	V
V_C (100%) =	300	V
I_C (100%) =	6	A
t_{don} =	0,017	μs
t_{Eon} =	0,188	μs

Figure 3. IGBT

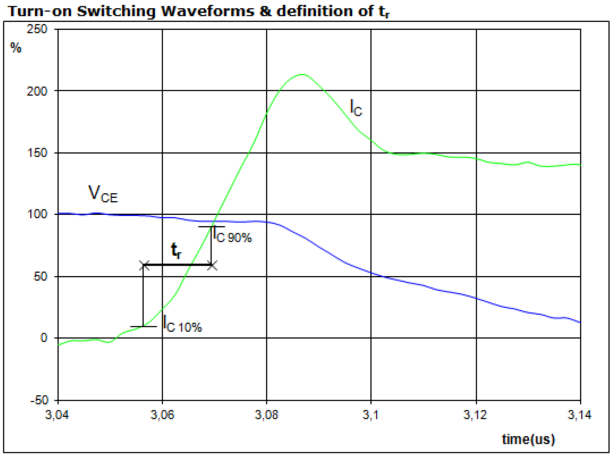
Turn-off Switching Waveforms & definition of t_f



V_C (100%) =	300	V
I_C (100%) =	6	A
t_f =	0,086	μs

Figure 4. IGBT

Turn-on Switching Waveforms & definition of t_r

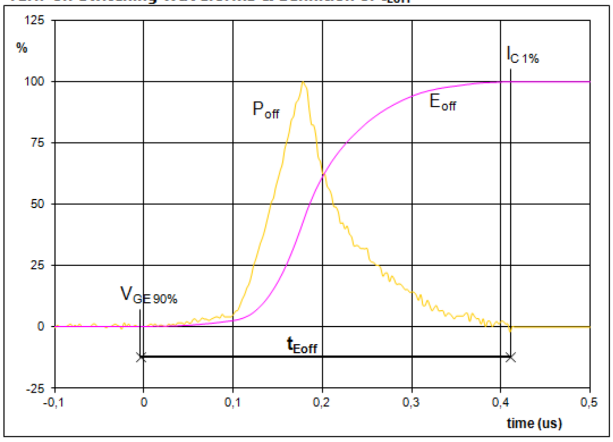


V_C (100%) =	300	V
I_C (100%) =	6	A
t_r =	0,014	μs

Brake Switching Characteristics

Figure 5. IGBT

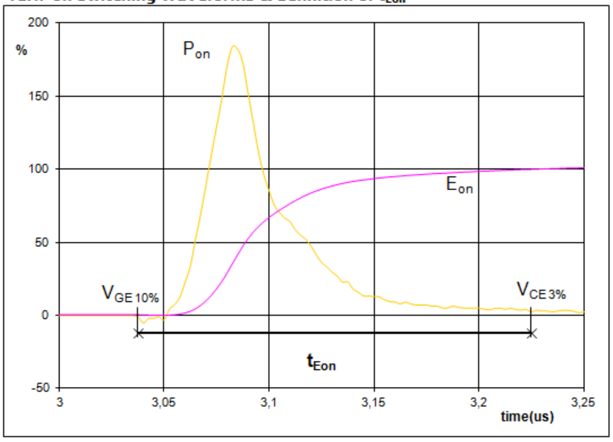
Turn-off Switching Waveforms & definition of t_{Eoff}



P_{off} (100%) =	1,78	kW
E_{off} (100%) =	0,17	mJ
t_{Eoff} =	0,41	µs

Figure 6. IGBT

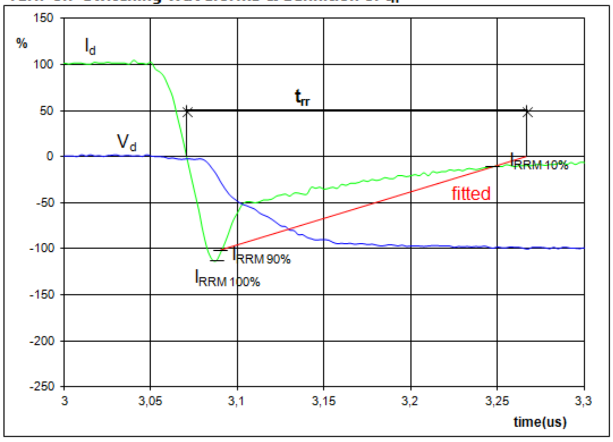
Turn-on Switching Waveforms & definition of t_{Eon}



P_{on} (100%) =	1,78	kW
E_{on} (100%) =	0,13	mJ
t_{Eon} =	0,19	µs

Figure 7. FWD

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

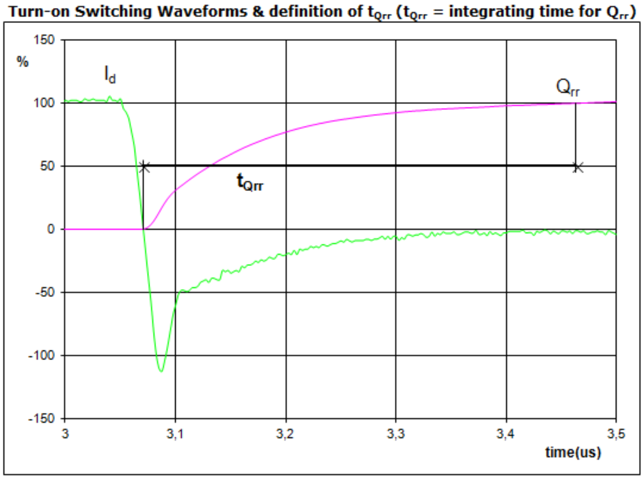


V_d (100%) =	300	V
I_d (100%) =	6	A
I_{RRM} (100%) =	7	A
t_{rr} =	0,175	µs

Brake Switching Characteristics

Figure 8. FWD

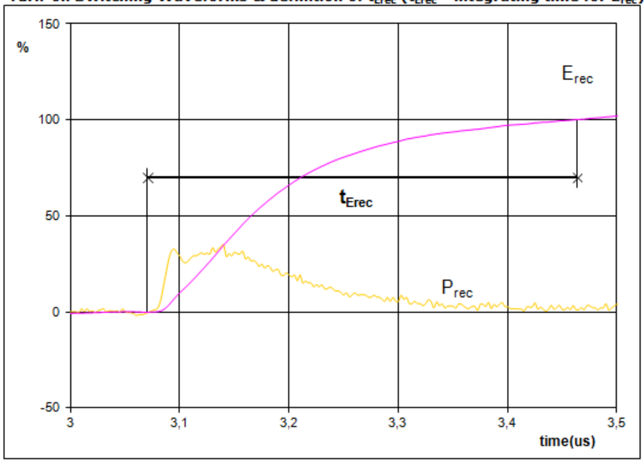
Turn-on Switching Waveforms & definition of t_{Qrr} (t_{Qrr} = integrating time for Q_{rr})



I_d (100%) =	6	A
Q_{rr} (100%) =	0,42	µC
t_{Qrr} =	0,39	µs

Figure 9. FWD

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



P_{rec} (100%) =	1,78	kW
E_{rec} (100%) =	0,08	mJ
t_{Erec} =	0,39	µs

Ordering Code & Marking

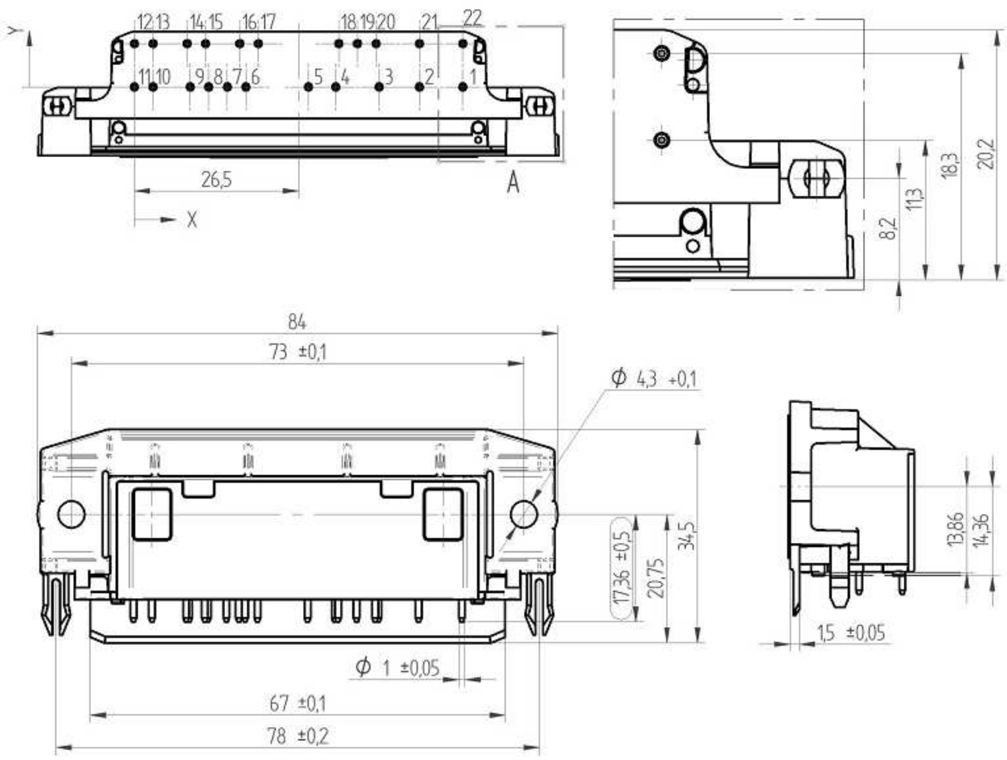
Version	Ordering Code	in DataMatrix as	in packaging barcode as
without thermal paste with solder pins	V23990-P632-A-PM	P632-A	P632-A

Text	**Vinco**	**Date code**	**Name&Ver**	**UL**	**Lot**	**Serial**
	Vinco	WWYY	NNNNNNNVV	UL	LLLLL	SSSS
Datamatrix	**Type&Ver**	**Lot number**	**Serial**	**Date code**		
	TTTTTTTVV	LLLLL	SSSS	WWYY		

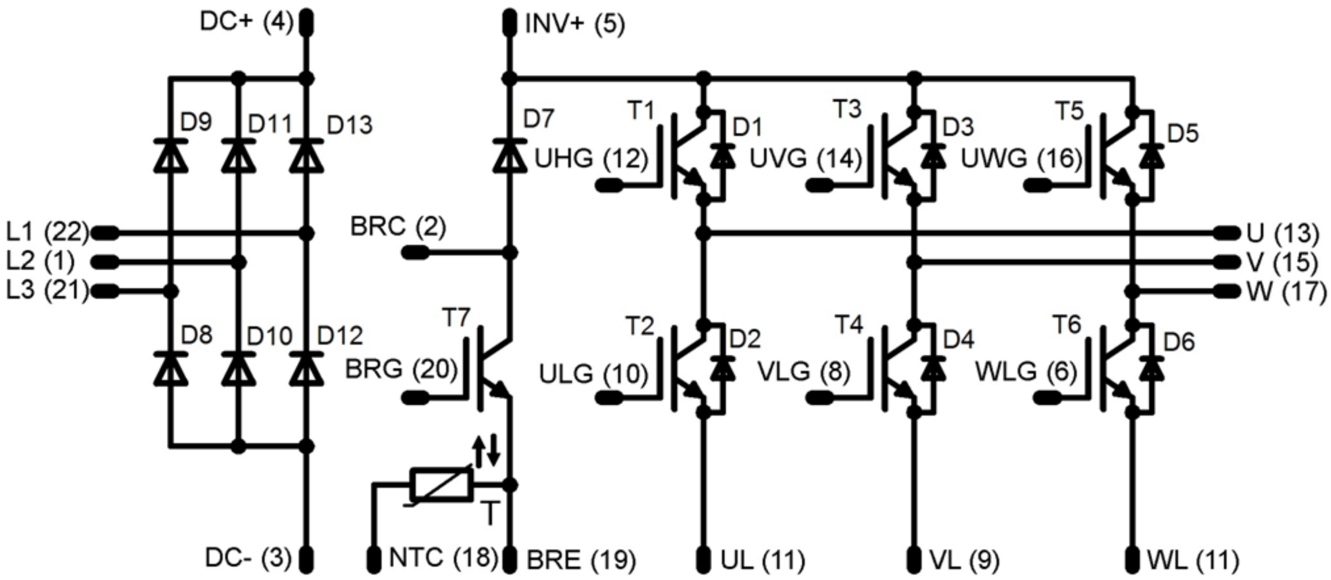
Outline

Pin table [mm]

Pin	X	Y	Function
1	53	0	L2
2	46	0	BrC
3	39,5	0	DC-
4	32,5	0	DC+
5	28,1	0	Inv+
6	18	0	WLG
7	15	0	WL
8	12	0	VLG
9	9	0	VL
10	3	0	ULG
11	0	0	UL
12	0	7	UHG
13	3	7	U
14	8,5	7	VHG
15	11,5	7	V
16	17	7	WHG
17	20	7	W
18	33	7	NTC
19	36	7	BrE
20	39	7	BrG
21	46	7	L3
22	53	7	L1



Pinout



Identification

ID	Component	Voltage	Current	Function	Comment
T1,T2,T3,T4,T5,T6	IGBT	600V	10A	Inverter Switch	
D1,D2,D3,D4,D5,D6	FWD	600V	10A	Inverter Diode	
T7	IGBT	600V	6A	Brake Switch	
D7	FWD	600V	6A	Brake Diode	
D8,D9,D10, D11,D12,D13	Rectifier	1600V	25A	Rectifier Diode	
T	NTC	-	-	Thermistor	

Packaging instruction					
Standard packaging quantity (SPQ)	80	>SPQ	Standard	<SPQ	Sample

Handling instruction
Handling instructions for *flow* 90 1 packages see vincotech.com website.

Document No.:	Date:	Modification:	Pages
V23990-P632-A-D3-14	20 Mar. 2015		

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2. A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.