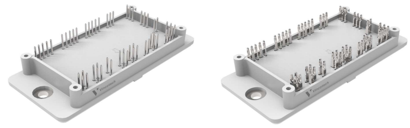
flow PIM 2 — 600 V / 50 A

Features

- Three-phase rectifier, BRC, Inverter, NTC
- Very Compact housing, easy to route
- IGBT3/ EmCon3 technology for low saturation losses and improved EMC behavior

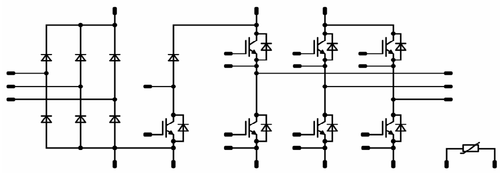
flow 2 17mm housing



Target Applications

- Motor Drives
- Power Generation

Schematic



Types

- V23990-P763-A-PM
- V23990-P763-AY-PM

Maximum Ratings

T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Condition	Value	Unit
Input Rectifier Diode				
Repetitive peak reverse voltage	V_{RRM}		1600	V
Forward current	I_{FAV}	DC current T_s = 80 °C	80	A
Surge (non-repetitive) forward current	I_{FSM}	t_p = 10 ms	700	A
I2t-value	I^2t	t_p = 10 ms	2450	A^2s
Power dissipation	P_{tot}	$T_j = T_{jmax}$ T_s = 80 °C	95	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	60	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}	100	A
Power dissipation	P_{tot}	$T_j = T_{jmax}$ T_s = 80 °C	115	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	52	A
Repetitive peak forward current	I_{FRM}	t_p limited by T_{jmax}		100	A
Power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	85	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	30	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}		90	A
Power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	84	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 Inverse Diode					
Peak Repetitive Reverse Voltage	V_{RRM}			600	V
DC forward current	I_F	$T_j = T_{jmax}$	T_s = 80 °C	15	A
Repetitive peak forward current	I_{FRM}	t_p limited by T_{jmax}		40	A
Brake Inverse Diode	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	54	W
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	28	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	51	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

Maximum Ratings

T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Condition	Value	Unit
Isolation Properties				
Isolation voltage	V_{is}	t = 2 sec DC Test Voltage*	4000	V
Creepage distance			min 12,7	mm
Clearance		with Press-fit pins / with Solder pins	11,96 / 12,03	mm
Comparative Tracking Index	CTI		>200	

*100% tested in production

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
Input Rectifier Diode										
Forward voltage	V_F				50	25 125		1,11 1,04	1,7	V
Threshold voltage (for power loss calc. only)	V_{to}					25 125		0,91 0,78		V
Slope resistance (for power loss calc. only)	r_t					25 125		0,004 0,005		Ω
Reverse current	I_r			1500		25 125			0,05 1,1	mA
Thermal resistance junction to heatsink	$R_{th(j-s)}$	λ_{paste} = 1 W/mK (P12)						0,74		K/W
Inverter Switch										
Gate emitter threshold voltage	$V_{GE(th)}$	$V_{CE} = V_{GE}$			0,0008	25 150	5	5,8	6,5	V
Collector-emitter saturation voltage	V_{CEsat}		15		50	25 150		1,5 1,7	2,1	V
Collector-emitter cut-off current incl. Diode	I_{CES}		0	600		25 150			0,35	mA
Gate-emitter leakage current	I_{GES}		20	0		25 150			700	nA
Integrated Gate resistor	R_{gint}							none		Ω
Turn-on delay time	$t_{d(on)}$	R_{goff} = 8 Ω R_{gon} = 8 Ω	±15	300	50	25 150		105 106		ns
Rise time	t_r					25 150		13 17		
Turn-off delay time	$t_{d(off)}$					25 150		161 188		
Fall time	t_f					25 150		105 126		
Turn-on energy loss	E_{on}					25 150		0,49 0,72		mWs
Turn-off energy loss	E_{off}					25 150		1,27 1,81		
Input capacitance	C_{ies}	f = 1 MHz	0	25		25		3140		pF
Output capacitance	C_{oss}							200		
Reverse transfer capacitance	C_{rss}							90		
Gate charge	Q_G		15	480	50	25		310		nC
Thermal resistance junction to heatsink	$R_{th(j-s)}$	λ_{paste} = 1 W/mK (P12)						0,82		K/W
Inverter Diode										
Diode forward voltage	V_F				50	25 150		1,42 1,29	2,1	V
Peak reverse recovery current	I_{RRM}	R_{gon} = 8 Ω	±15	300	50	25 150		52 76,8		A
Reverse recovery time	t_{rr}					25 150		118 146		ns
Reverse recovered charge	Q_{rr}					25 150		2,06 4,37		µC
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 150		3668 3903		A/µs
Reverse recovered energy	E_{rec}					25 150		0,53 0,99		mWs
Thermal resistance junction to heatsink	$R_{th(j-s)}$	λ_{paste} = 1 W/mK (P12)						1,12		K/W

Characteristic Values

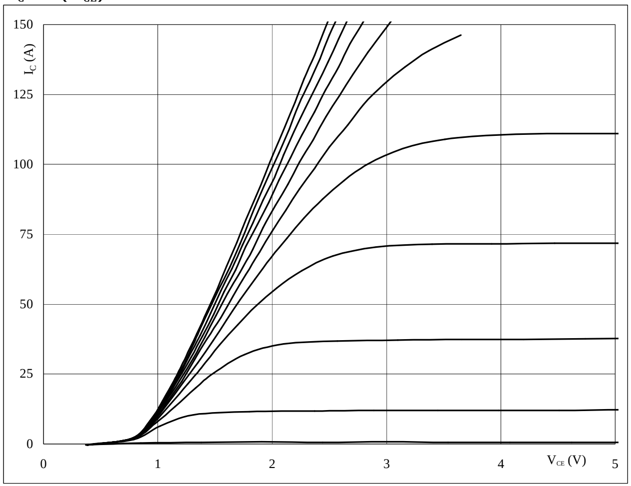
Parameter	Symbol	Conditions					Value			Unit
			V_{GE} [V] V_{GS} [V]	V_r [V] V_{CE} [V] V_{DS} [V]	I_C [A] I_F [A] I_D [A]	T_j [°C]	Min	Typ	Max	
Brake Switch										
Gate emitter threshold voltage	$V_{GE(th)}$	$V_{CE} = V_{GE}$			0,00043	25 150	5	5,8	6,5	V
Collector-emitter saturation voltage	V_{CEsat}		15		30	25 150		1,5 1,77	2	V
Collector-emitter cut-off incl diode	I_{CES}		0	600		25 150			0,14	mA
Gate-emitter leakage current	I_{GES}		20	0		25 150			400	nA
Integrated Gate resistor	R_{gint}							none		Ω
Turn-on delay time	$t_{d(on)}$	R_{goff} = 16 Ω R_{gon} = 16 Ω	±15	300	30	25 150		96 98		ns
Rise time	t_r					25 150		14 18		
Turn-off delay time	$t_{d(off)}$					25 150		141 170		
Fall time	t_f					25 150		103 121		
Turn-on energy loss	E_{on}					25 150		0,38 0,51		mWs
Turn-off energy loss	E_{off}					25 150		0,71 0,98		
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 heatsink	$R_{th(j\text{-}s)}$	λ_{paste} = 1 W/mK (P12)						1,13		K/W
Brake Inverse Diode										
Diode forward voltage	V_F				10	25 150	1,2	1,85 1,88	2,1	V
Thermal resistance junction to heatsink	$R_{th(j\text{-}s)}$	λ_{paste} = 1 W/mK (P12)						1,77		K/W
Brake Diode										
Diode forward voltage	V_F				20	25 150		1,66 1,6	2,1	V
Reverse leakage current	I_r		±15	300	30	25 150			140	µA
Peak reverse recovery current	I_{RRM}	R_{gon} = 16 Ω	±15	300	30	25 150		30 33		A
Reverse recovery time	t_{rr}					25 150		22 146		ns
Reverse recovered charge	Q_{rr}					25 150		0,47 1,81		µC
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 150		4805 2381		A/µs
Reverse recovery energy	E_{rec}					25 150		0,21 0,42		mWs
Thermal resistance junction to heatsink	$R_{th(j\text{-}s)}$	λ_{paste} = 1 W/mK (P12)						1,82		K/W
Thermistor										
Rated resistance	R_{25}	Tol. ±5%				25	20,9	22	23,1	kΩ
Deviation of R_{100}	$D_{R/R}$	R_{100} = 1486,1Ω				100		2,9		%/K
Power dissipation	P					25		210		mW
Power dissipation constant	$B_{(25/100)}$					25		2		K

Output Inverter

figure 1.	IGBT

Typical output characteristics

$I_C = f(V_{CE})$



At

t_p = 250 µs

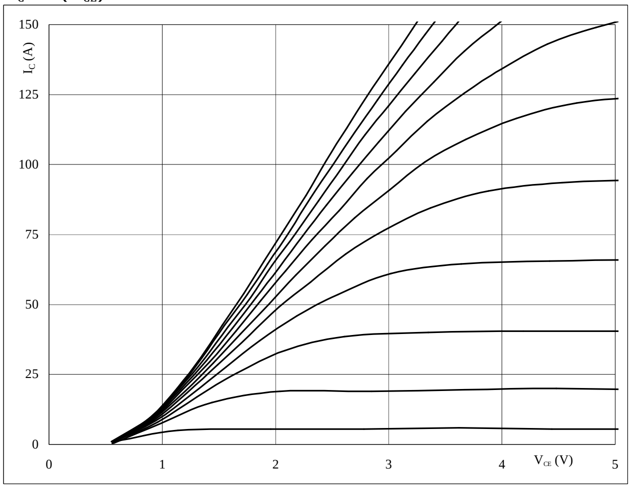
T_j = 25 °C

VGE 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

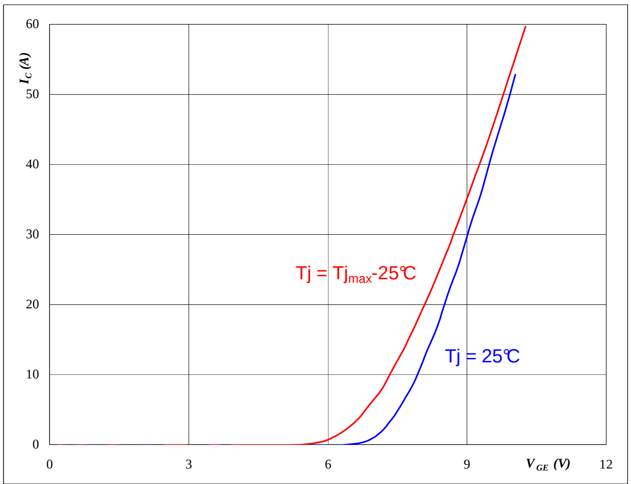
T_j = 150 °C

VGE from 7 V to 17 V in steps of 1 V

figure 3.	IGBT

Typical transfer characteristics

$I_c = f(V_{GE})$



At

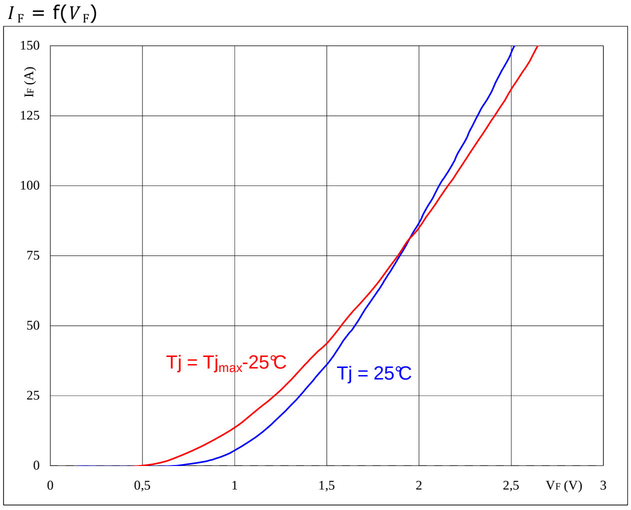
t_p = 250 µs

V_{CE} = 10 V

figure 4.	FWD

Typical diode forward current as a function of forward voltage

$I_F = f(V_F)$



At

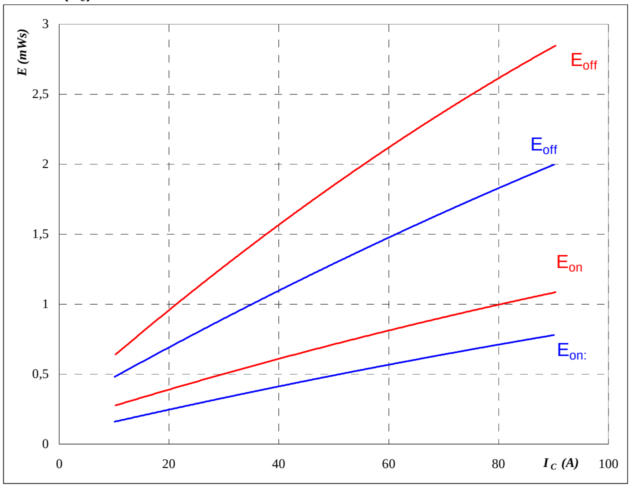
t_p = 250 µs

Output Inverter

figure 5.	IGBT

Typical switching energy losses as a function of collector current

$E = f(I_c)$



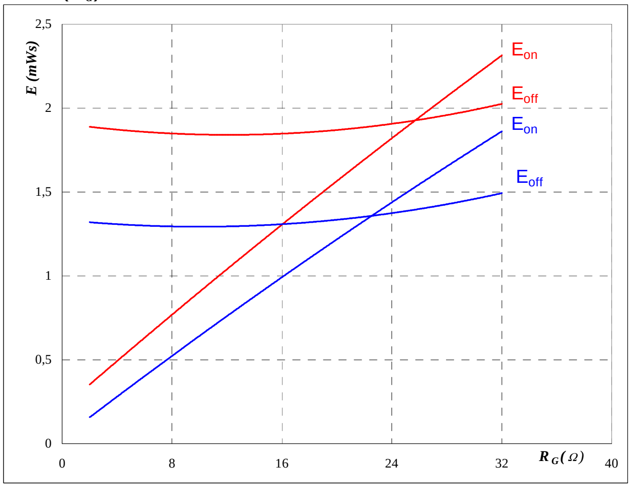
With an inductive load at

T_j =	25/150	°C
V_{CE} =	300	V
V_{GE} =	±15	V
R_{gon} =	8	Ω
R_{goff} =	8	Ω

figure 6.	IGBT

Typical switching energy losses as a function of gate resistor

$E = f(R_G)$



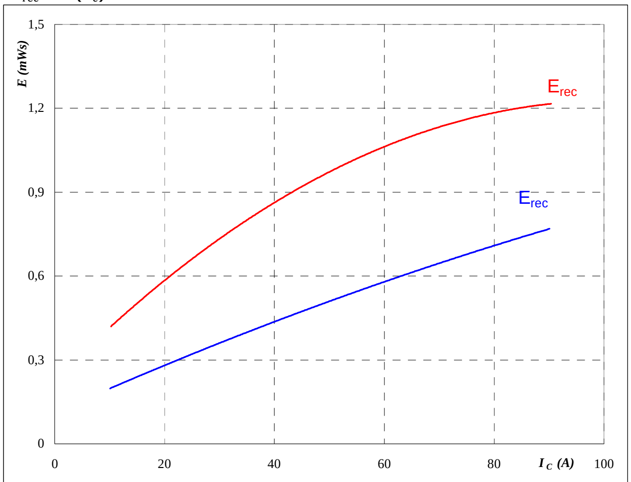
With an inductive load at

T_j =	25/150	°C
V_{CE} =	300	V
V_{GE} =	±15	V
I_C =	50	A

figure 7.	IGBT

Typical reverse recovery energy loss as a function of collector current

$E_{rec} = f(I_c)$



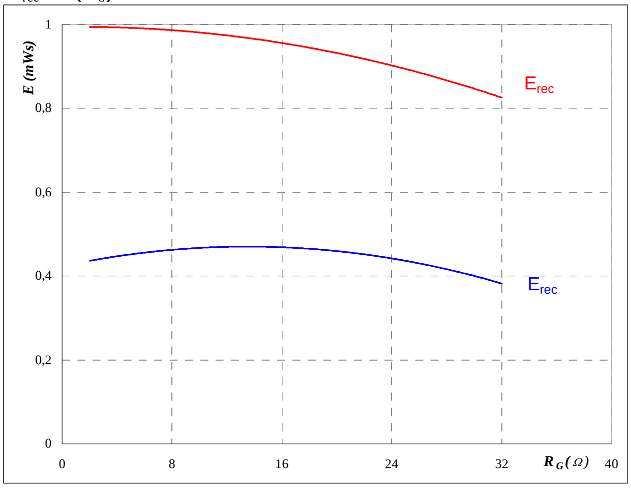
With an inductive load at

T_j =	25/150	°C
V_{CE} =	300	V
V_{GE} =	±15	V
R_{gon} =	8	Ω

figure 8.	IGBT

Typical reverse recovery energy loss as a function of gate resistor

$E_{rec} = f(R_G)$



With an inductive load at

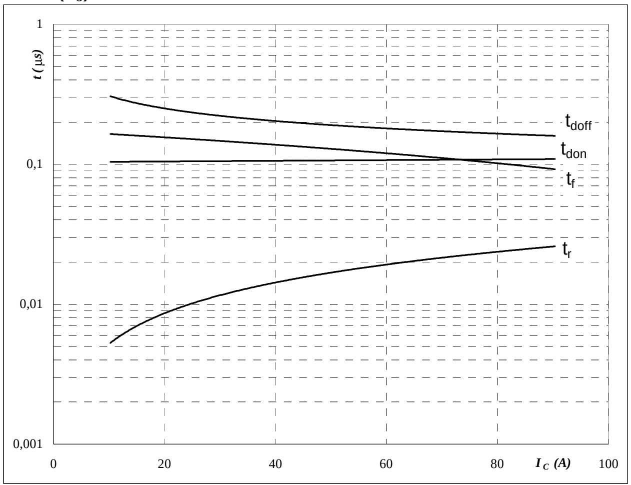
T_j =	25/150	°C
V_{CE} =	300	V
V_{GE} =	±15	V
I_C =	50	A

Output Inverter

figure 9. **IGBT**

Typical switching times as a function of collector current

$t = f(I_C)$



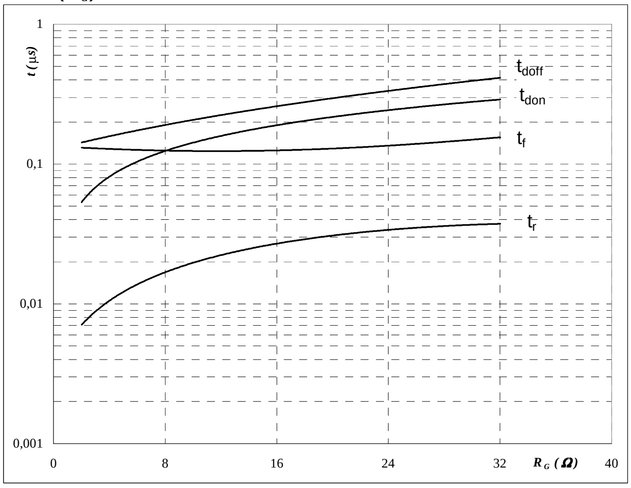
With an inductive load at

T_j =	150	°C
V_{CE} =	300	V
V_{GE} =	±15	V
R_{gon} =	8	Ω
R_{goff} =	8	Ω

figure 10. **IGBT**

Typical switching times as a function of gate resistor

$t = f(R_G)$



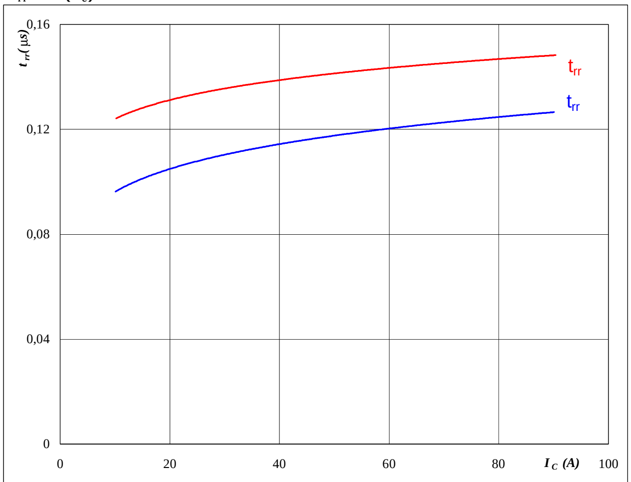
With an inductive load at

T_j =	150	°C
V_{CE} =	300	V
V_{GE} =	±15	V
I_C =	50	A

figure 11. **FWD**

Typical reverse recovery time as a function of collector current

$t_{rr} = f(I_c)$



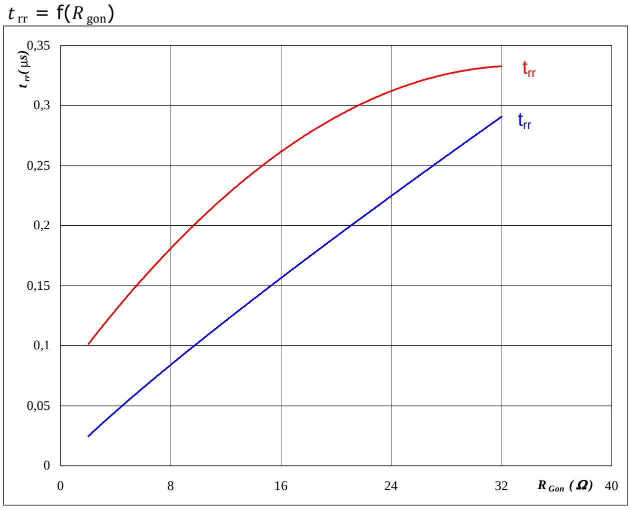
At

T_j =	25/150	°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

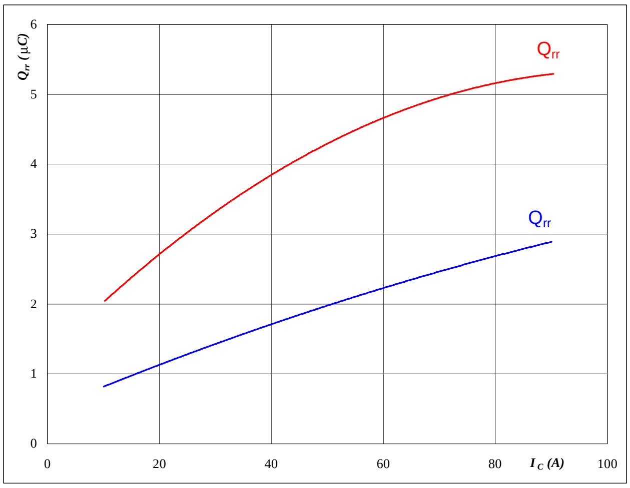
T_j =	25/150	°C
V_R =	300	V
I_F =	50	A
V_{GE} =	±15	V

Output Inverter

figure 13. **FWD**

Typical reverse recovery charge as a function of collector current

$Q_{rr} = f(I_c)$



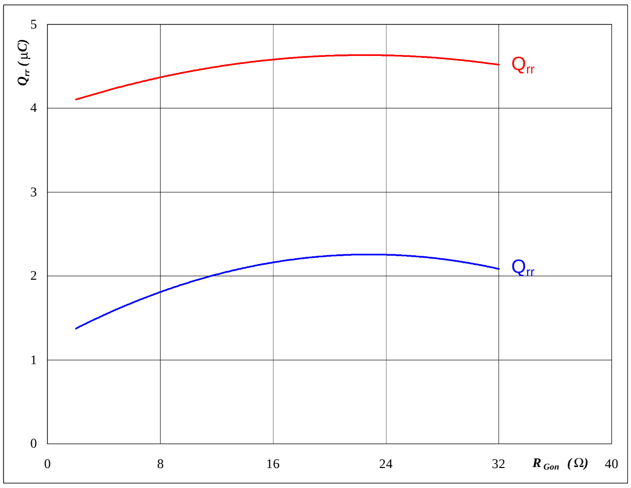
At

T_j =	25/150	°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

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



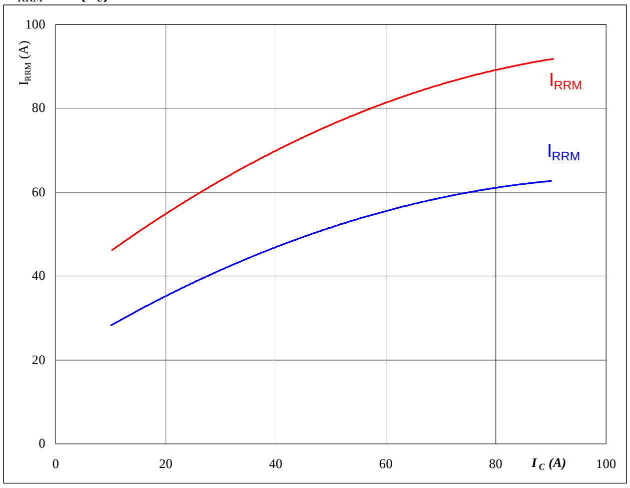
At

T_j =	25/150	°C
V_R =	300	V
I_F =	50	A
V_{GE} =	±15	V

figure 15. **FWD**

Typical reverse recovery current as a function of collector current

$I_{RRM} = f(I_c)$



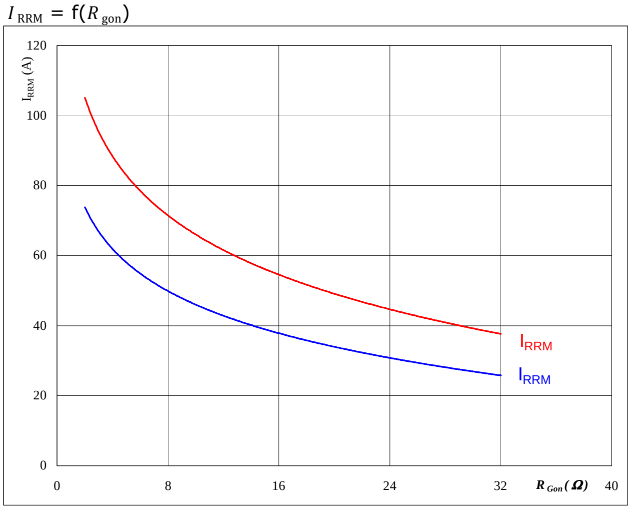
At

T_j =	25/150	°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

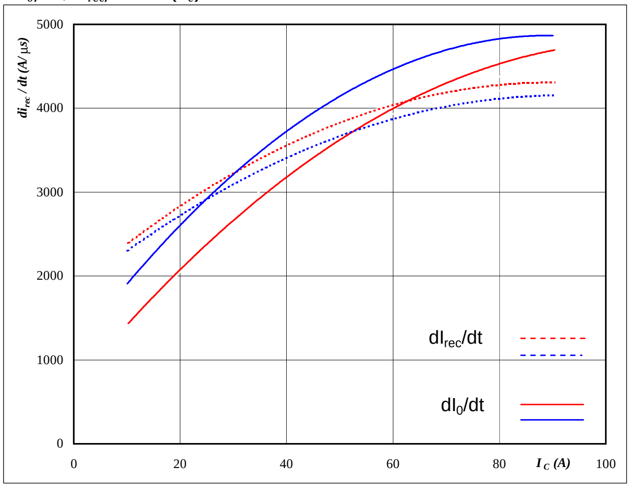
T_j =	25/150	°C
V_R =	300	V
I_F =	50	A
V_{GE} =	±15	V

Output Inverter

figure 17. **FWD**

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

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



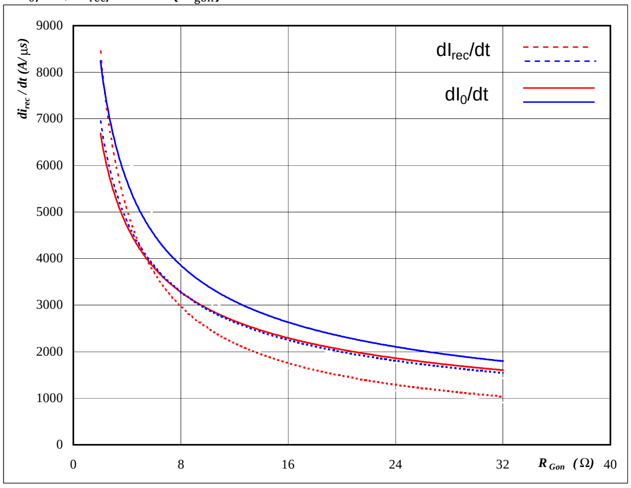
At

T_j =	25/150	°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

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



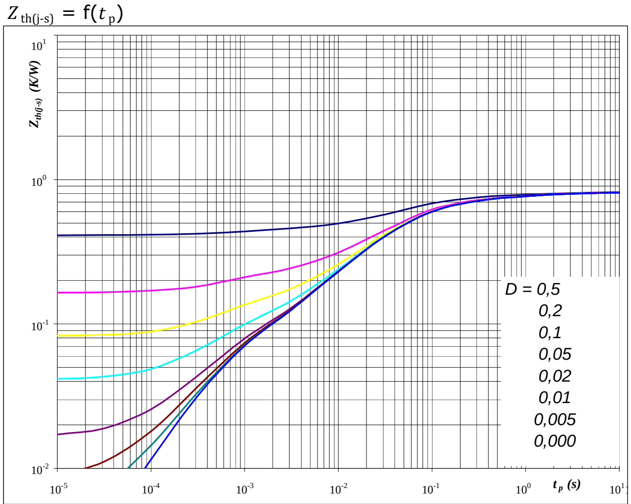
At

T_j =	25/150	°C
V_R =	300	V
I_F =	50	A
V_{GE} =	±15	V

figure 19. **IGBT**

IGBT transient thermal impedance as a function of pulse width

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



At

D = t_p / T

$R_{th(j-s)}$ = 0,823 K/W — Single device heated

$R_{th(j-s)}$ = 0,94 K/W — All devices heated

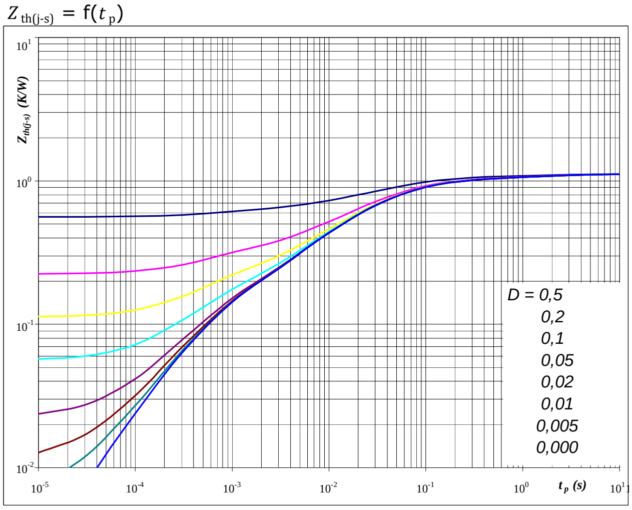
IGBT thermal model values

R (K/W)	Tau (s)	R (K/W)
2,49E-02	9,23E+00	1,41E-01
7,94E-02	1,22E+00	7,94E-02
1,88E-01	1,60E-01	1,88E-01
3,80E-01	3,71E-02	3,80E-01
9,45E-02	7,14E-03	9,45E-02
5,71E-02	5,78E-04	5,71E-02

figure 20. **FWD**

FWD transient thermal impedance as a function of pulse width

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



At

D = t_p / T

$R_{th(j-s)}$ = 1,12 K/W — Single device heated

$R_{th(j-s)}$ = 1,12 K/W — All devices heated

FWD thermal model values

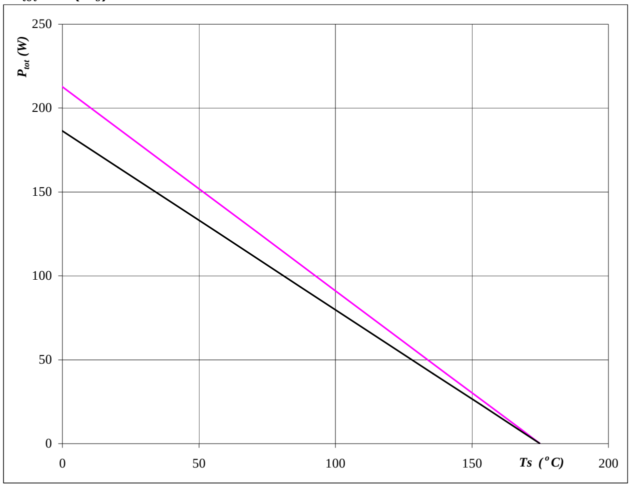
R (K/W)	Tau (s)	R (K/W)
2,36E-02	9,25E+00	2,36E-02
8,00E-02	1,22E+00	8,00E-02
2,18E-01	1,34E-01	2,18E-01
4,88E-01	2,84E-02	4,88E-01
1,98E-01	5,90E-03	1,98E-01
1,11E-01	5,45E-04	1,11E-01

Output Inverter

figure 21. **IGBT**

Power dissipation as a function of heatsink temperature

$P_{tot} = f(T_s)$



At

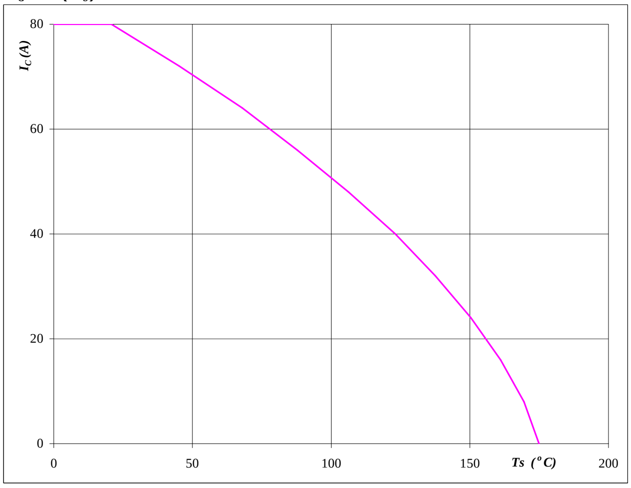
T_j = 175 °C

single heating
overall heating

figure 22. **IGBT**

Collector current as a function of heatsink temperature

$I_C = f(T_s)$



At

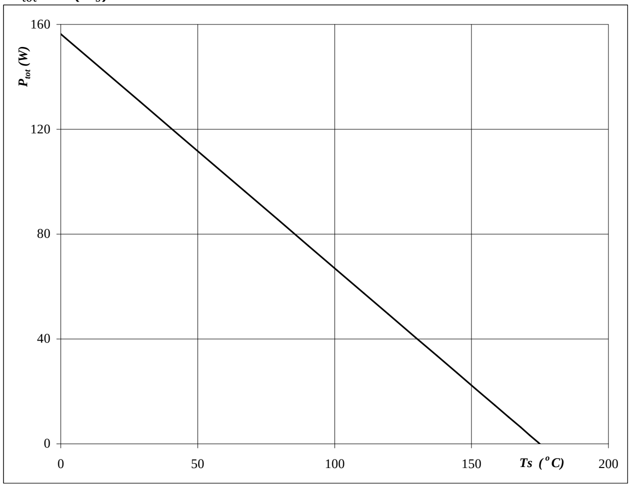
T_j = 175 °C

V_{GE} = 15 V

figure 23. **FWD**

Power dissipation as a function of heatsink temperature

$P_{tot} = f(T_s)$



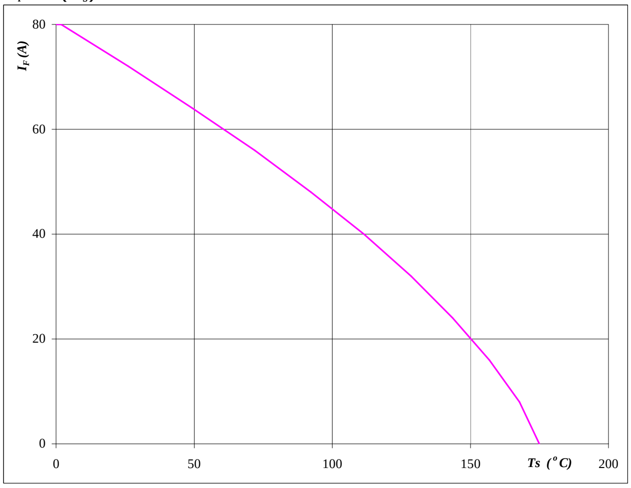
At

T_j = 175 °C

figure 24. **FWD**

Forward current as a function of heatsink temperature

$I_F = f(T_s)$



At

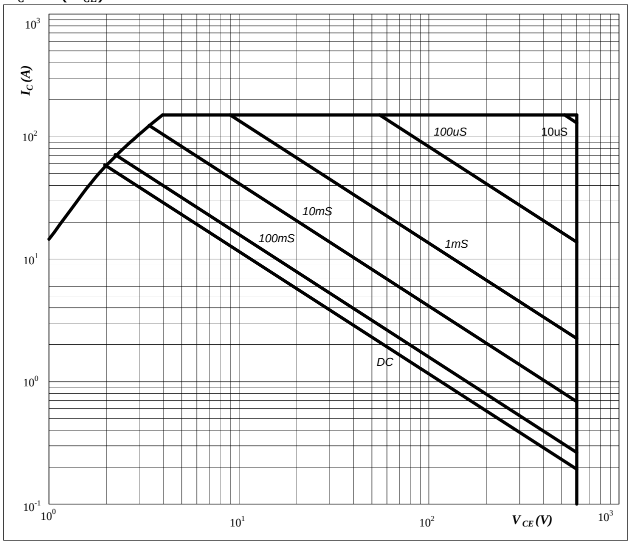
T_j = 175 °C

Output Inverter

figure 25. **IGBT**

Safe operating area as a function of collector-emitter voltage

$I_C = f(V_{CE})$



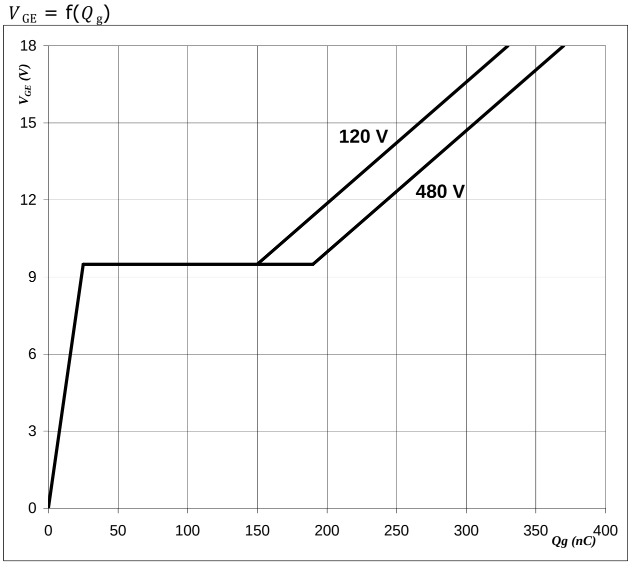
At

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

figure 26. **IGBT**

Gate voltage vs Gate charge

$V_{GE} = f(Q_g)$



At

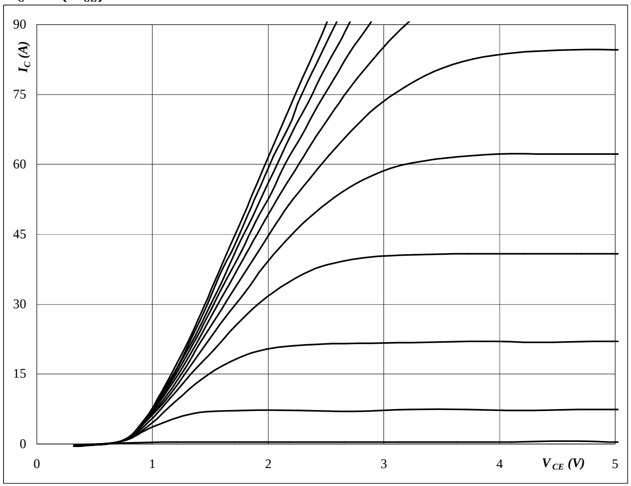
I_C =	50	A

Brake

figure 1. **IGBT**

Typical output characteristics

$I_C = f(V_{CE})$



At

t_p = 250 µs

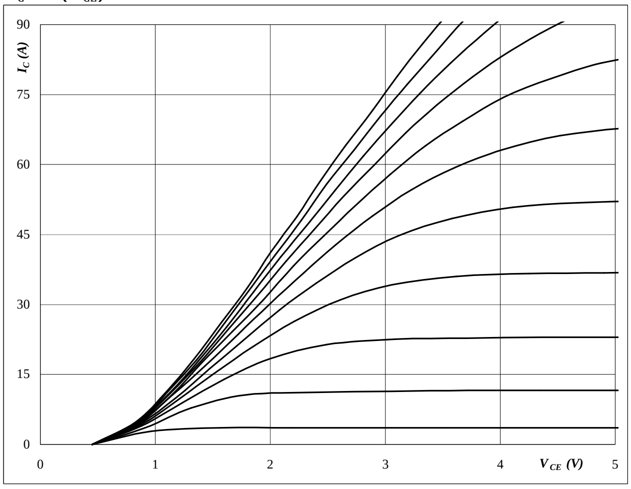
T_j = 25 °C

VGE 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

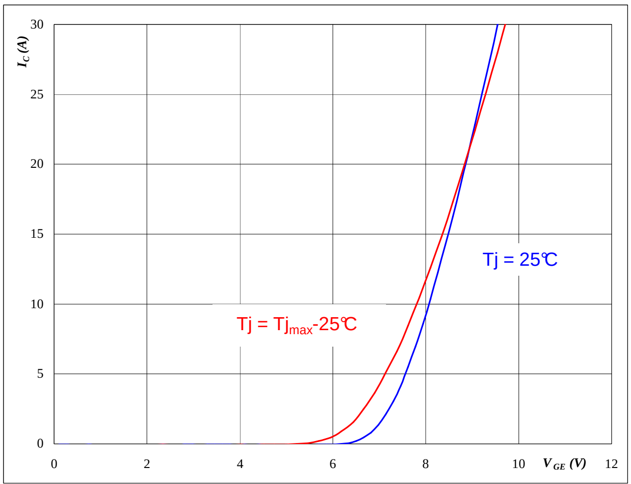
T_j = 150 °C

VGE from 7 V to 17 V in steps of 1 V

figure 3. **IGBT**

Typical transfer characteristics

$I_C = f(V_{GE})$



At

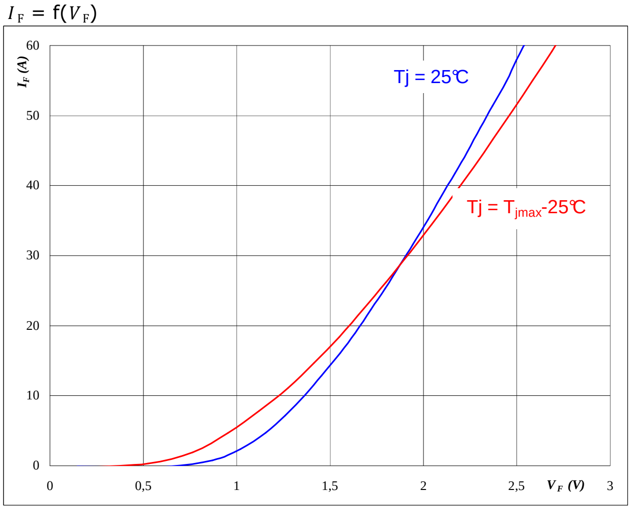
t_p = 250 µs

V_{CE} = 10 V

figure 4. **FWD**

Typical diode forward current as a function of forward voltage

$I_F = f(V_F)$



At

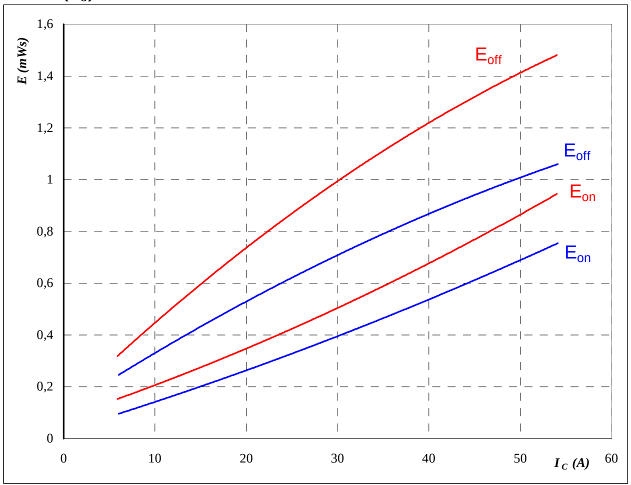
t_p = 250 µs

Brake

figure 5. **IGBT**

Typical switching energy losses
as a function of collector current

$E = f(I_C)$



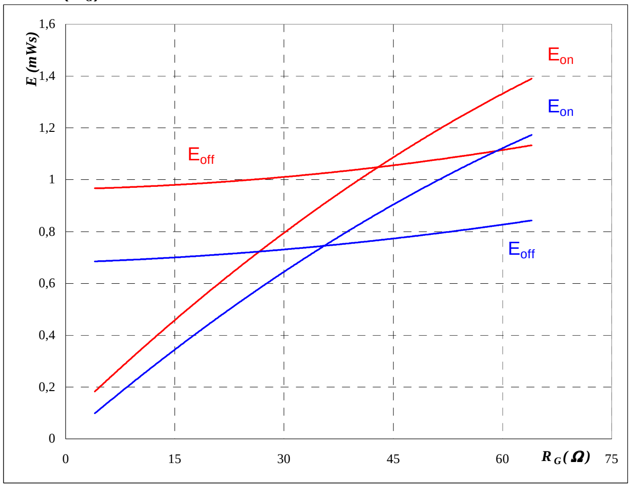
With an inductive load at

T_j =	25/150	°C
V_{CE} =	300	V
V_{GE} =	±15	V
R_{gon} =	16	Ω
R_{goff} =	16	Ω

figure 6. **IGBT**

Typical switching energy losses
as a function of gate resistor

$E = f(R_G)$



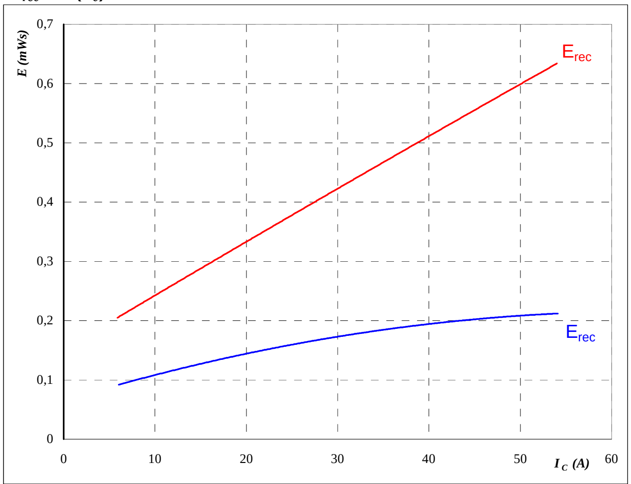
With an inductive load at

T_j =	25/150	°C
V_{CE} =	300	V
V_{GE} =	±15	V
I_C =	30	A

figure 7. **IGBT**

Typical reverse recovery energy loss
as a function of collector current

$E_{rec} = f(I_c)$



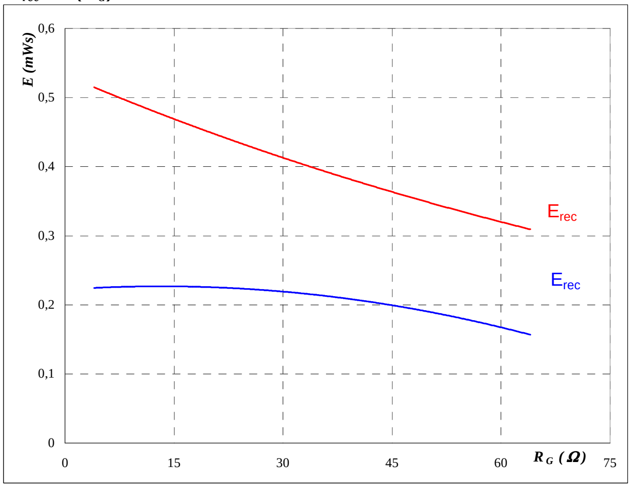
With an inductive load at

T_j =	25/150	°C
V_{CE} =	300	V
V_{GE} =	±15	V
R_{gon} =	16	Ω

figure 8. **IGBT**

Typical reverse recovery energy loss
as a function of gate resistor

$E_{rec} = f(R_G)$



With an inductive load at

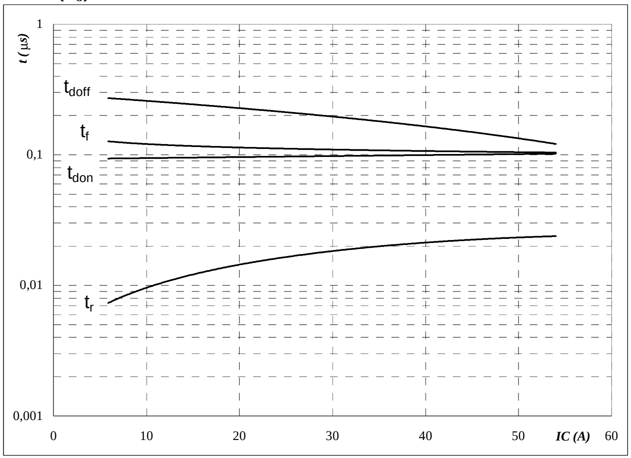
T_j =	25/150	°C
V_{CE} =	300	V
V_{GE} =	±15	V
I_C =	30	A

Brake

figure 9. **IGBT**

Typical switching times as a function of collector current

$t = f(I_C)$



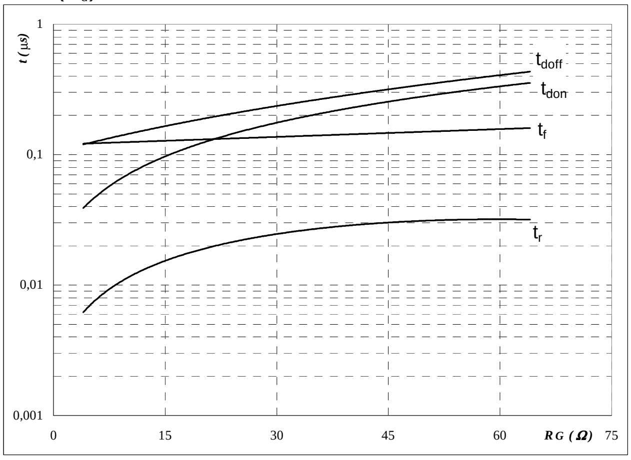
With an inductive load at

T_j =	150	°C
V_{CE} =	300	V
V_{GE} =	±15	V
R_{gon} =	16	Ω
R_{goff} =	16	Ω

figure 10. **IGBT**

Typical switching times as a function of gate resistor

$t = f(R_G)$



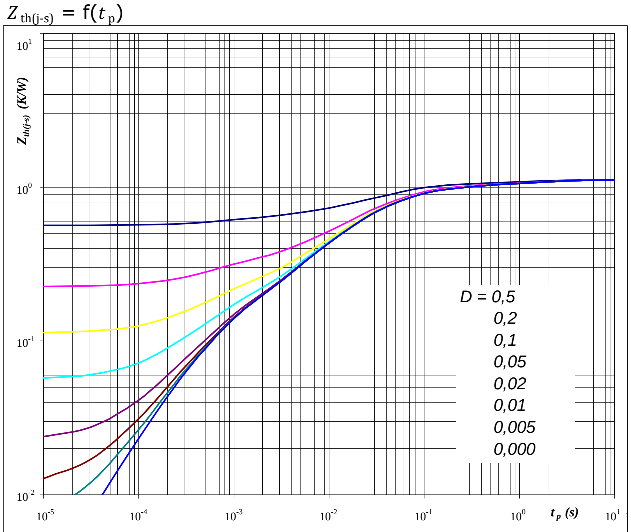
With an inductive load at

T_j =	150	°C
V_{CE} =	300	V
V_{GE} =	±15	V
I_C =	30	A

figure 11. **IGBT**

IGBT transient thermal impedance as a function of pulse width

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



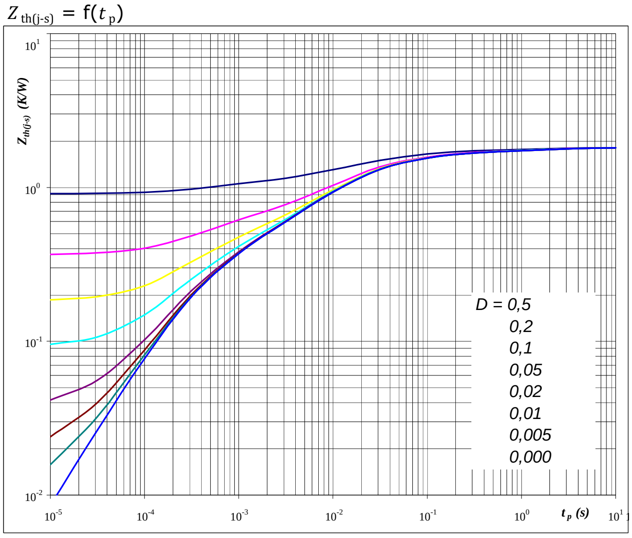
At

D =	t_p / T	
$R_{th(j-s)}$ =	1,13	K/W

figure 12. **IGBT**

FWD transient thermal impedance as a function of pulse width

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



At

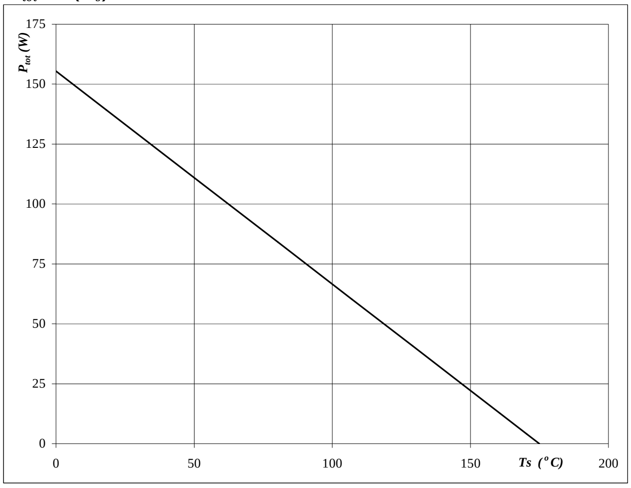
D =	t_p / T	
$R_{th(j-s)}$ =	1,82	K/W

Brake

figure 13. **IGBT**

Power dissipation as a function of heatsink temperature

$P_{tot} = f(T_s)$



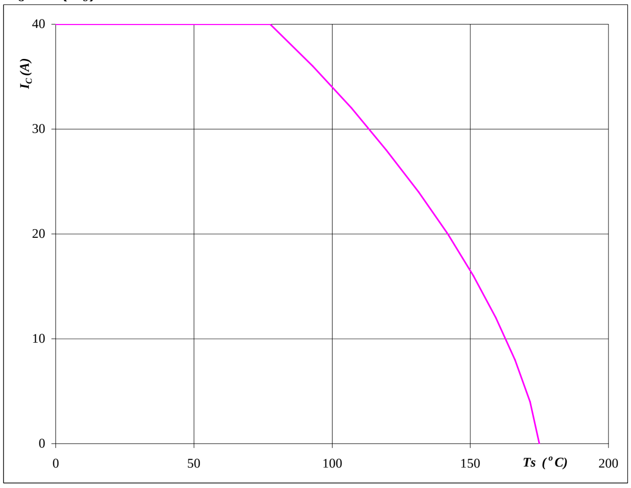
At

T_j = 175 ºC

figure 14. **IGBT**

Collector current as a function of heatsink temperature

$I_C = f(T_s)$



At

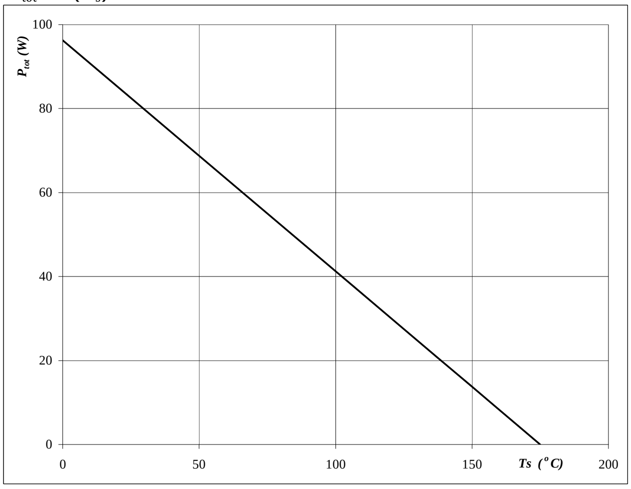
T_j = 175 ºC

V_{GE} = 15 V

figure 15. **FWD**

Power dissipation as a function of heatsink temperature

$P_{tot} = f(T_s)$



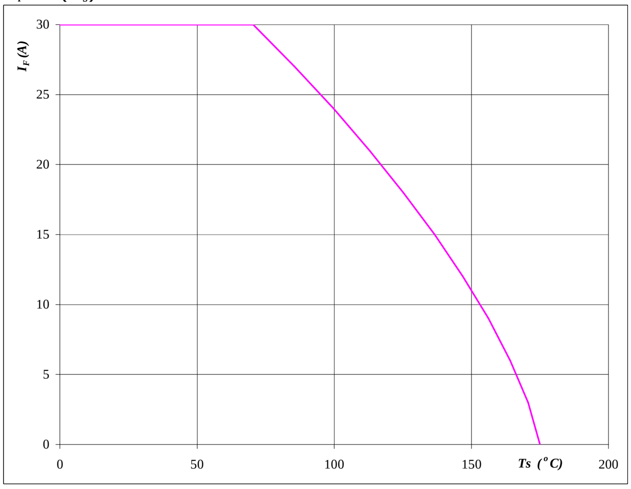
At

T_j = 175 ºC

figure 16. **FWD**

Forward current as a function of heatsink temperature

$I_F = f(T_s)$



At

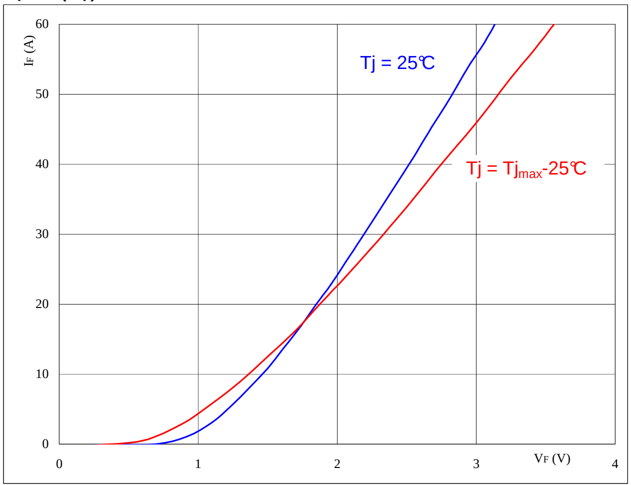
T_j = 175 ºC

Brake Inverse Diode

figure 1. **Brake inverse diode**

Typical diode forward current as a function of forward voltage

$I_F = f(V_F)$



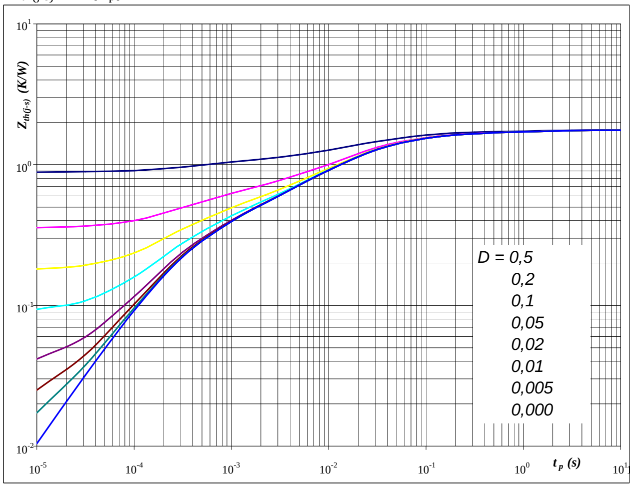
At

t_p = 250 µs

figure 2. **Brake inverse diode**

Diode transient thermal impedance as a function of pulse width

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



At

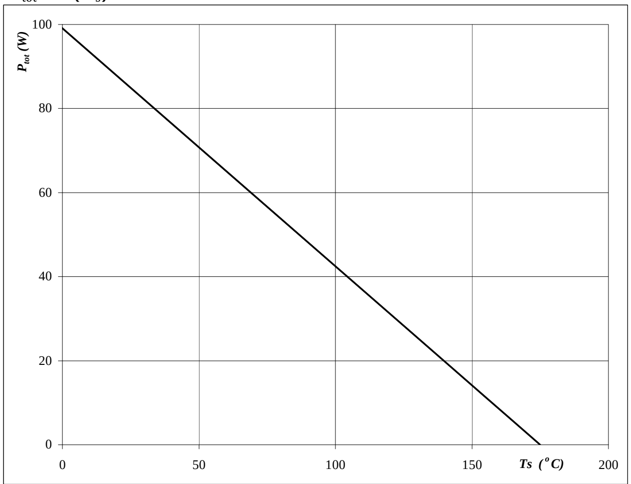
D = t_p / T

$R_{th(j-s)}$ = 1,77 K/W

figure 3. **Brake inverse diode**

Power dissipation as a function of heatsink temperature

$P_{tot} = f(T_s)$



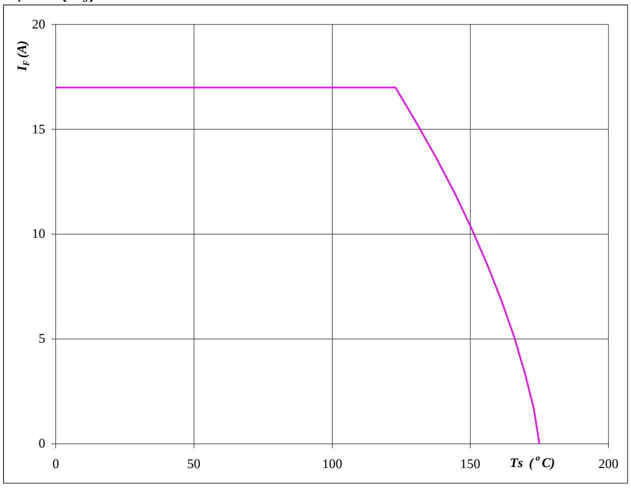
At

T_j = 175 ºC

figure 4. **Brake inverse diode**

Forward current as a function of heatsink temperature

$I_F = f(T_s)$



At

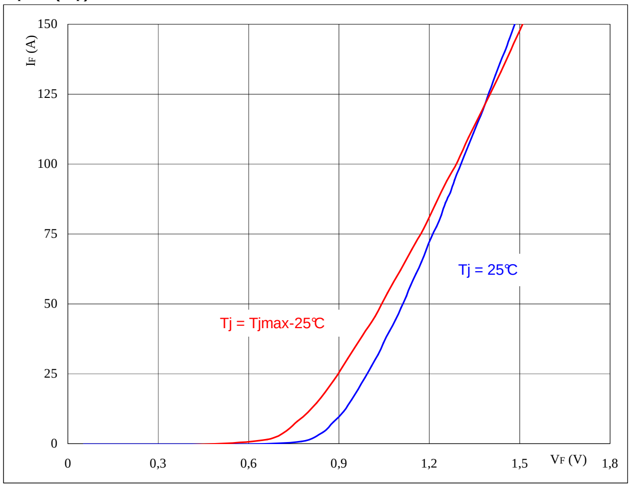
T_j = 175 ºC

Input Rectifier Bridge

figure 1. **Rectifier Diode**

Typical diode forward current as a function of forward voltage

$I_F = f(V_F)$



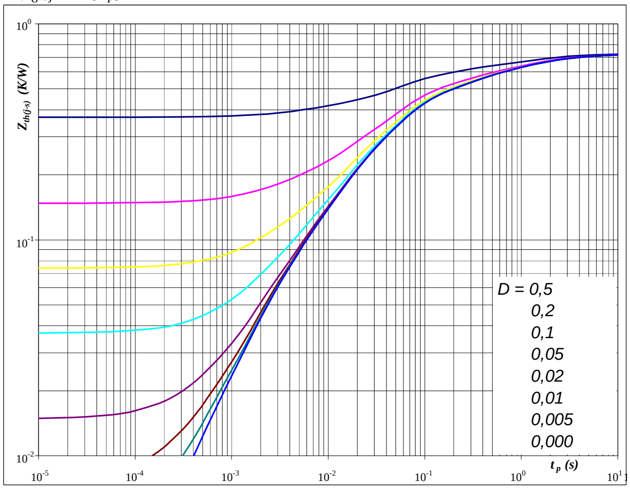
At

t_p = 250 µs

figure 2. **Rectifier Diode**

Diode transient thermal impedance as a function of pulse width

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



At

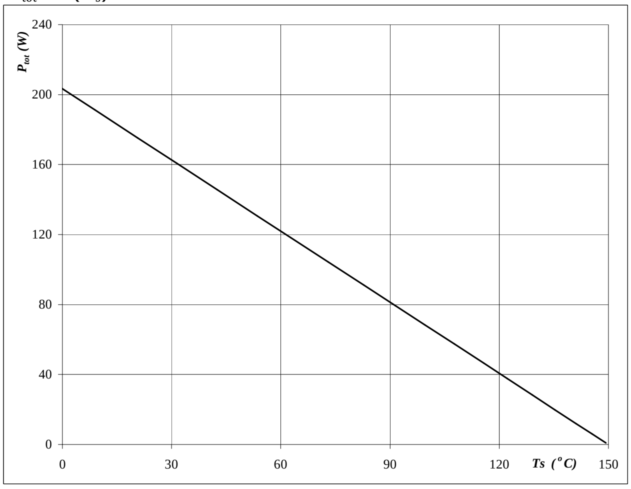
$D = t_p / T$

$R_{th(j-s)}$ = 0,74 K/W

figure 3. **Rectifier Diode**

Power dissipation as a function of heatsink temperature

$P_{tot} = f(T_s)$



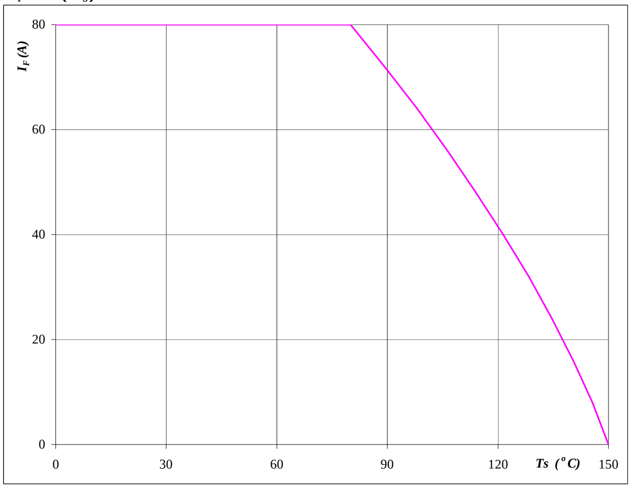
At

T_j = 150 ºC

figure 4. **Rectifier Diode**

Forward current as a function of heatsink temperature

$I_F = f(T_s)$



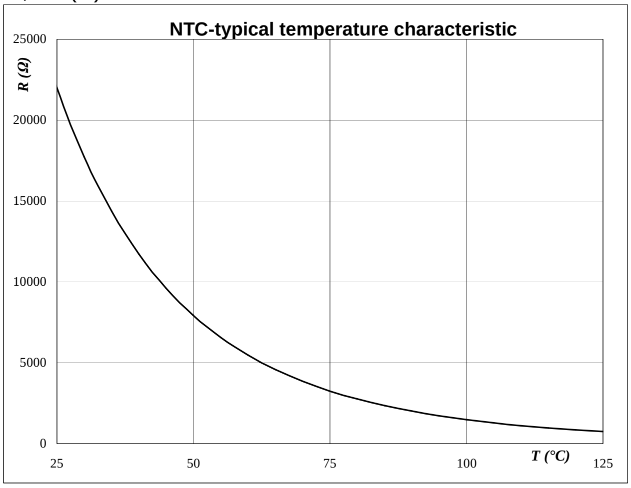
At

T_j = 150 ºC

Thermistor

figure 1.	Thermistor

Typical NTC characteristic
as a function of temperature
$R_T = f(T)$



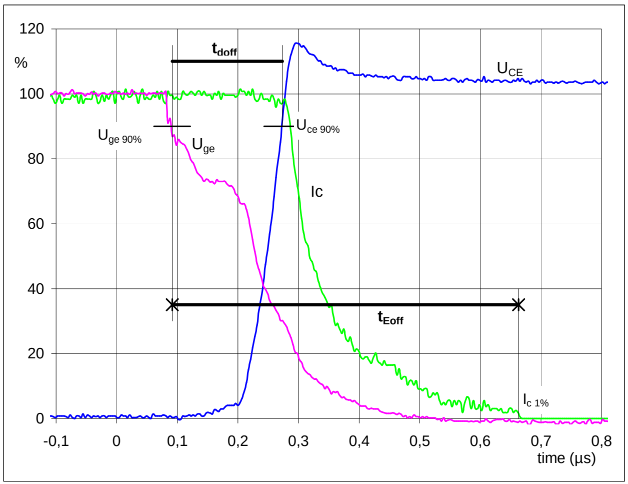
Switching Definitions Output Inverter

General conditions

T_j	=	150 °C
R_{gon}	=	8 Ω
R_{goff}	=	8 Ω

figure 1. IGBT

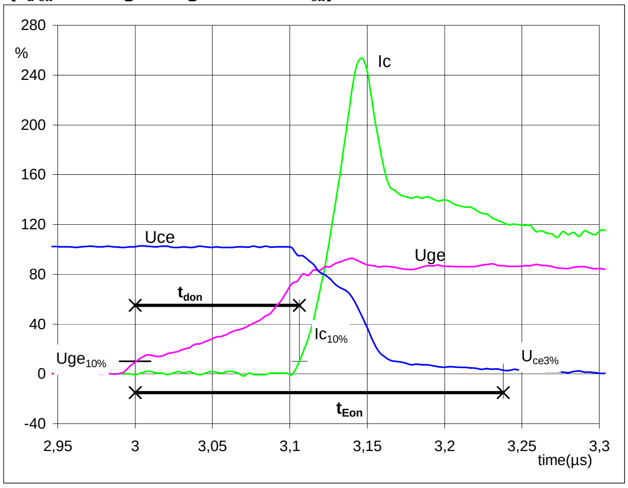
Turn-off Switching Waveforms & definition of t_{doff}, t_{Eoff}
($t_{E\,off}$ = integrating time for E_{off})



V_{GE} (0%) =	-15	V
V_{GE} (100%) =	15	V
V_C (100%) =	300	V
I_C (100%) =	50	A
t_{doff} =	0,19	µs
$t_{E\,off}$ =	0,57	µs

figure 2. IGBT

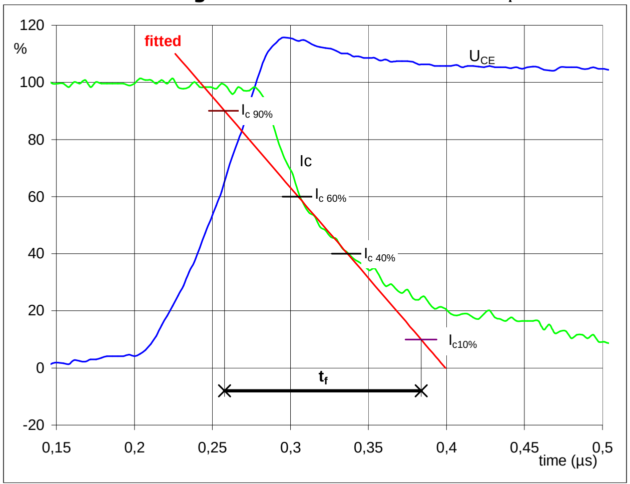
Turn-on Switching Waveforms & definition of t_{don}, t_{Eon}
($t_{E\,on}$ = integrating time for E_{on})



V_{GE} (0%) =	-15	V
V_{GE} (100%) =	15	V
V_C (100%) =	300	V
I_C (100%) =	50	A
t_{don} =	0,11	µs
$t_{E\,on}$ =	0,24	µs

figure 3. IGBT

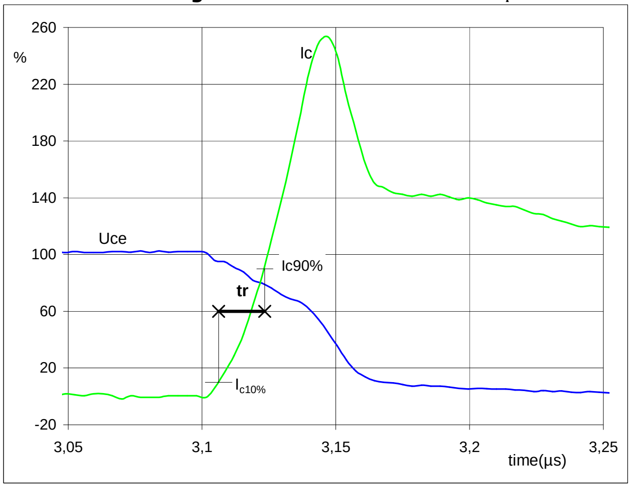
Turn-off Switching Waveforms & definition of t_f



V_C (100%) =	300	V
I_C (100%) =	50	A
t_f =	0,13	µs

figure 4. IGBT

Turn-on Switching Waveforms & definition of t_r

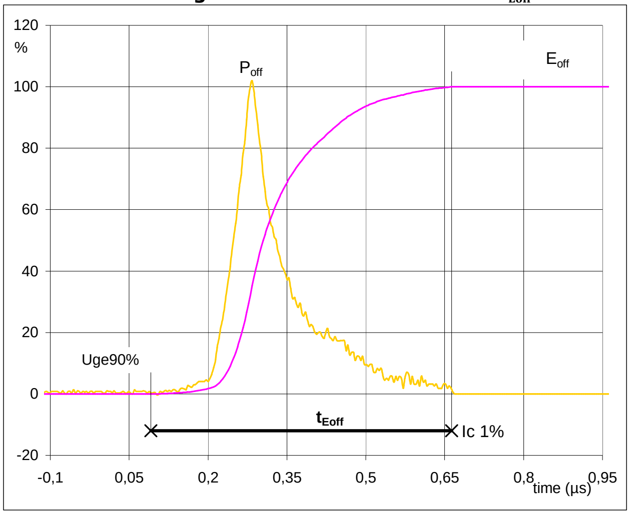


V_C (100%) =	300	V
I_C (100%) =	50	A
t_r =	0,02	µs

Switching Definitions Output Inverter

figure 5. **IGBT**

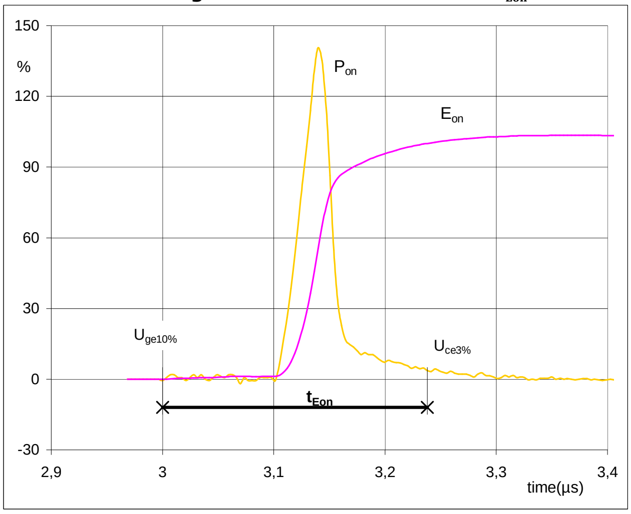
Turn-off Switching Waveforms & definition of t_{Eoff}



P_{off} (100%) =	15,03	kW
E_{off} (100%) =	1,81	mJ
$t_{E\,off}$ =	0,57	µs

figure 6. **IGBT**

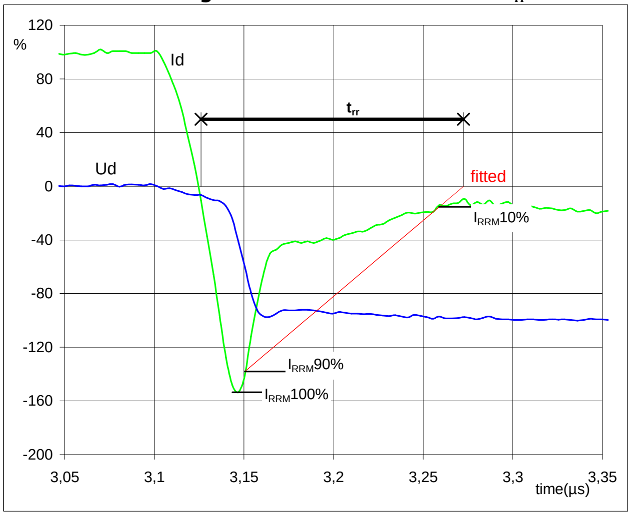
Turn-on Switching Waveforms & definition of t_{Eon}



P_{on} (100%) =	15,03	kW
E_{on} (100%) =	0,72	mJ
$t_{E\,on}$ =	0,24	µs

figure 7. **FWD**

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

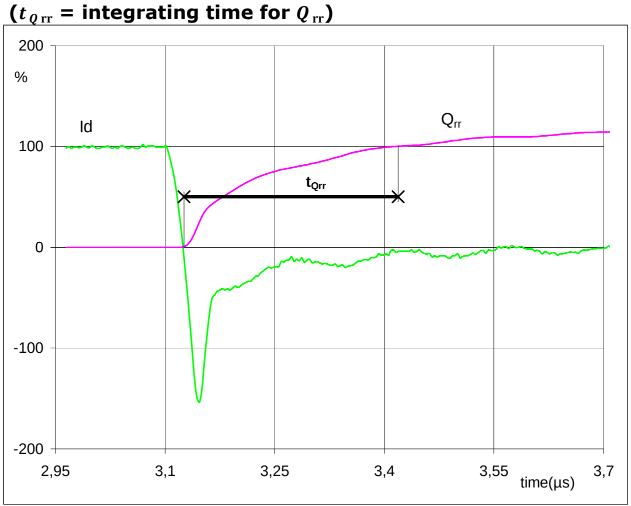


V_d (100%) =	300	V
I_d (100%) =	50	A
I_{RRM} (100%) =	-77	A
t_{rr} =	0,15	µs

Switching Definitions Output Inverter

figure 8.	FWD

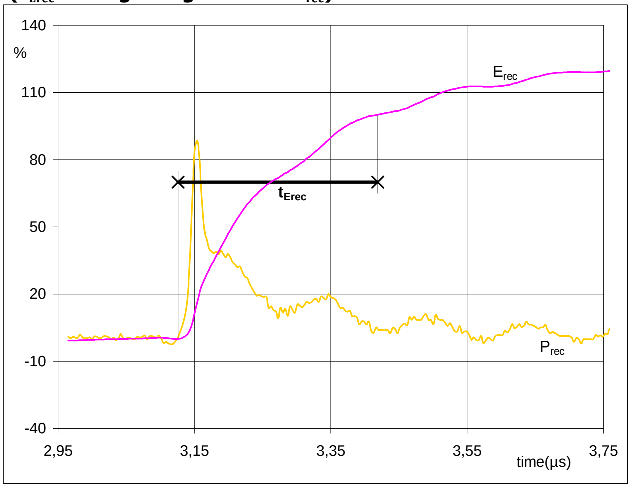
Turn-on Switching Waveforms & definition of t_{Qrr}
($t_{Q\,rr}$ = integrating time for Q_{rr})



I_d (100%) =	50	A
Q_{rr} (100%) =	4,37	µC
t_{Qint} =	0,29	µs

figure 9.	FWD

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



P_{rec} (100%) =	15,03	kW
E_{rec} (100%) =	0,99	mJ
$t_{E\,rec}$ =	0,29	µs

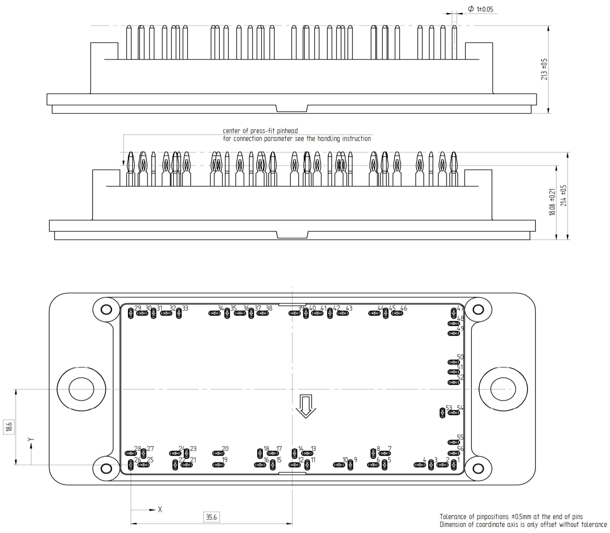
Ordering Code & Marking

Version	Ordering Code
without thermal paste 17 mm housing with solder pins	V23990-P763-A-PM
with thermal paste 17 mm housing with solder pins	V23990-P763-A-/3/-PM
without thermal paste 17 mm housing with press-fit pins	V23990-P763-AY-PM
with thermal paste 17 mm housing with press-fit pins	V23990-P763-AY-/3/-PM

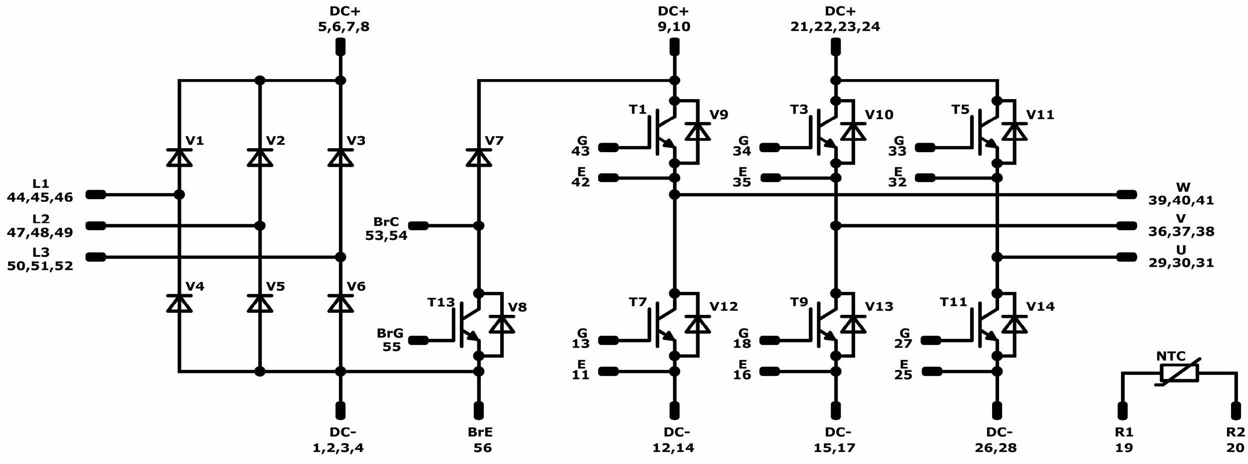
Text	**VIN**	**Date code**	**Name&Ver**	**UL**	**Lot**	**Serial**
	VIN	WWYY	NNNNNNVV	UL	LLLLL	SSSS
Datamatrix	**Type&Ver**	**Lot number**	**Serial**	**Date code**		
	TTTTTTTVV	LLLLL	SSSS	WWYY		

Outline

Pin table [mm]				Pin table [mm]			
Pin	X	Y	Function	Pin	X	Y	Function
1	71,2	0	DC-	29	0	37,2	U
2	68,7	0	DC-	30	2,5	37,2	U
3	66,2	0	DC-	31	5	37,2	U
4	63,7	0	DC-	32	7,8	37,2	E
5	55,95	0	DC+	33	10,6	37,2	G
6	53,45	0	DC+	34	18,45	37,2	G
7	55,95	2,8	DC+	35	21,25	37,2	E
8	53,45	2,8	DC+	36	24,05	37,2	V
9	48,4	0	DC+	37	26,55	37,2	V
10	45,9	0	DC+	38	29,05	37,2	V
11	38,9	0	E	39	36,1	37,2	W
12	36,1	0	DC-	40	38,6	37,2	W
13	38,9	2,8	G	41	41,1	37,2	W
14	36,1	2,8	DC-	42	43,9	37,2	E
15	31,3	0	DC-	43	46,7	37,2	G
16	28,5	0	E	44	53,7	37,2	L1
17	31,3	2,8	DC-	45	56,2	37,2	L1
18	28,5	2,8	G	46	58,7	37,2	L1
19	19,3	0	R2	47	71,2	37,2	L2
20	19,3	2,8	R1	48	71,2	34,7	L2
21	12,3	0	DC+	49	71,2	32,2	L2
22	9,8	0	DC+	50	71,2	25,2	L3
23	12,3	2,8	DC+	51	71,2	22,7	L3
24	9,8	2,8	DC+	52	71,2	20,2	L3
25	2,8	0	E	53	71,2	12,8	BrC
26	0	0	DC-	54	68,7	12,8	BrC
27	2,8	2,8	G	55	71,2	5,6	BrG
28	0	2,8	DC-	56	71,2	2,8	BrE



Pinout



Identification

ID	Component	Voltage	Current	Function	Comment
T1,T3,T5,T7,T9,T11	IGBT	600 V	50 A	Inverter Switch	
D9-D14	FWD	600 V	50 A	Inverter Diode	
D1-D6	Rectifier	1600 V	50 A	Rectifier Diode	
D7	FWD	600 V	20 A	Brake Diode	
T13	IGBT	600 V	30 A	Brake Switch	
D8	FWD	600 V	20 A	Brake Inverse Diode	
NTC	NTC			Thermistor	

Packaging instruction					
Standard packaging quantity (SPQ)	**36**	>SPQ	Standard	<SPQ	Sample

Handling instruction
Handling instructions for *flow* 2 packages see vincotech.com website.

Package data
Package data for *flow* 2 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-P763-Ax-D6-14	31 Jan. 2019	flow2 frame modification	1 , 23

Product status definition

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LIFE SUPPORT POLICY

Vincotech products are not authorised for use as critical components in life support devices or systems without the express written approval of Vincotech.

As used herein:

1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, or (c) whose failure to perform when properly used in accordance with instructions for use provided in labelling can be reasonably expected to result in significant injury to the user.

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.