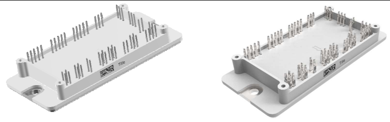
***flow* PIM 2** **600 V / 75 A**

Features

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

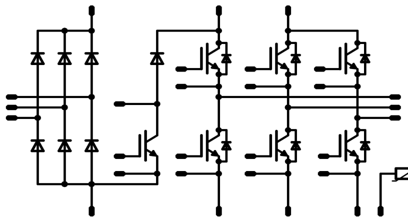
flow 2 17mm housing



Target Applications

- Motor Drives
- Power Generation

Schematic



Types

- V23990-P764-A-PM
- V23990-P764-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	100	A
Surge (non-repetitive) forward current	I_{FSM}	t_p = 10 ms	1000	A
I^2t-value	I^2t		5000	A^2s
Power dissipation	P_{tot}	$T_j = T_{jmax}$ T_s = 80 °C	123	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	80	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}	150	A
Power dissipation	P_{tot}	$T_j = T_{jmax}$ T_s = 80 °C	144	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	68	A
Repetitive peak forward current	I_{FRM}	t_p limited by T_{jmax}		150	A
Power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	106	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	50	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}		150	A
Power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	118	W
Gate-emitter peak voltage	V_{GE}			±20	V
Short circuit ratings	t_{SC} V_{CC}	$T_j \leq$ 150 °C V_{GE} = 15 V		6 360	μs V
Maximum Junction Temperature	T_{jmax}			175	°C
Brake Inverse Diode					
Peak Repetitive Reverse Voltage	V_{RRM}			600	V
DC forward current	I_F	$T_j = T_{jmax}$	T_s = 80 °C	20	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	53	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_{isol}	DC Test Voltage*	t_p = 2 s	4000	V
		AC Voltage	t_p = 1 min	2500	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				100	25 125		1,19 1,16	1,9	V
Threshold voltage (for power loss calc. only)	V_{to}					25 125		0,9 0,79		V
Slope resistance (for power loss calc. only)	r_t					25 125		0,003 0,004		Ω
Reverse current	I_r			1500		25 125			0,05 1,1	mA
Thermal resistance junction to heatsink	$R_{th(j-s)}$	Thermal grease thickness ≤ 50um λ = 1 W/mK						0,57		K/W
Inverter Switch										
Gate emitter threshold voltage	$V_{GE(th)}$	$V_{CE} = V_{GE}$			0,0012	25	5	5,8	6,5	V
Collector-emitter saturation voltage	V_{CEsat}		15		75	25 150		1,44 1,64	2,1	V
Collector-emitter cut-off current incl. Diode	I_{CES}		0	600		25			0,25	mA
Gate-emitter leakage current	I_{GES}		20	0		25			700	nA
Integrated Gate resistor	R_{gint}							none		Ω
Turn-on delay time	$t_{d(on)}$	R_{goff} = 4 Ω R_{gon} = 4 Ω	±15	300	75	25 150		103 100		ns
Rise time	t_r					25 150		12 15		
Turn-off delay time	$t_{d(off)}$					25 150		161 184		
Fall time	t_f					25 150		60 88		
Turn-on energy loss	E_{on}					25 150		0,4 0,69		mWs
Turn-off energy loss	E_{off}					25 150		1,55 2,09		
Input capacitance	C_{ies}	f = 1 MHz	0	25		25		4620		pF
Output capacitance	C_{oss}							288		
Reverse transfer capacitance	C_{rss}							137		
Gate charge	Q_G		±15	480	75	25		470		nC
Thermal resistance junction to heatsink	$R_{th(j-s)}$	Thermal grease thickness ≤ 50um λ = 1 W/mK						0,66		K/W
Inverter Diode										
Diode forward voltage	V_F				75	25 150		1,64 1,62	2,2	V
Peak reverse recovery current	I_{RRM}	R_{gon} = 4 Ω	±15	300	75	25 150		91 126		A
Reverse recovery time	t_{rr}					25 150		107 134		ns
Reverse recovered charge	Q_{rr}					25 150		3,1 6,53		μC
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 150		6092 5621		A/μs
Reverse recovered energy	E_{rec}					25 150		0,91 1,6		mWs
Thermal resistance junction to heatsink	R_{thJH}	Thermal grease thickness ≤ 50um λ = 1 W/mK						0,90		K/W

Characteristic Values

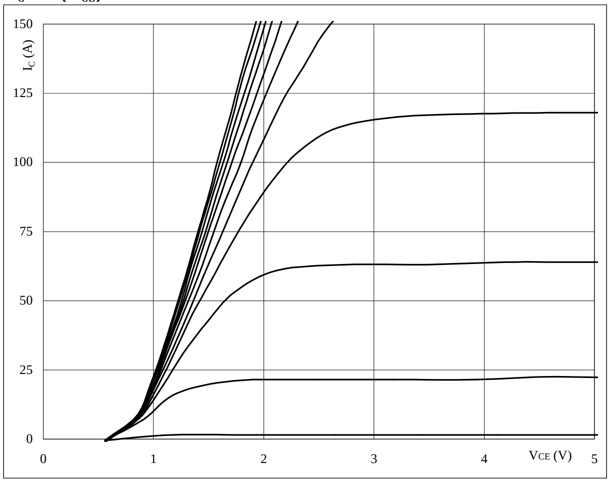
Parameter	Symbol	Conditions					Value			Unit
			V_{GE} [V] V_{GS} [V]	V_r [V] V_{CE} [V] V_{DS} [V]	I_C [A] I_F [A] I_D [A]	T_j [°C]	Min	Typ	Max	
Brake Switch										
Gate emitter threshold voltage	$V_{GE(th)}$	$V_{CE} = V_{GE}$			0,0008	25	5	5,8	6,5	V
Collector-emitter saturation voltage	V_{CEsat}		15		50	25 150		1,58 1,82	2,1	V
Collector-emitter cut-off incl diode	I_{CES}		0	600		25			0,5	mA
Gate-emitter leakage current	I_{GES}		20	0		25			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		100 102		ns
Rise time	t_r					25 150		14 18,6		ns
Turn-off delay time	$t_{d(off)}$					25 150		158 185		ns
Fall time	t_f					25 150		108 125		ns
Turn-on energy loss	E_{on}					25 150		0,43 0,63		mWs
Turn-off energy loss	E_{off}					25 150		1,42 1,97		mWs
Input capacitance	C_{ies}	f = 1 MHz	0	25		25		3140		pF
Output capacitance	C_{oss}							200		pF
Reverse transfer capacitance	C_{rss}							90		pF
Gate charge	Q_G		±15	480	50	25		310		nC
Thermal resistance junction to heatsink	$R_{th(j-s)}$	Thermal grease thickness ≤ 50um λ = 1 W/mK						0,8		K/W
Brake Inverse Diode										
Diode forward voltage	V_F				10	25 150	1,2	1,78 1,77	2,1	V
Thermal resistance junction to heatsink	$R_{th(j-s)}$	Thermal grease thickness ≤ 50um λ = 1 W/mK						1,81		K/W
Brake Diode										
Diode forward voltage	V_F				20	25 150		1,65 1,56	2,1	V
Reverse leakage current	I_r			300		25			140	µA
Peak reverse recovery current	I_{RRM}	R_{gon} = 8 Ω	±15	300	50	25 150		40 47		A
Reverse recovery time	t_{rr}					25 150		22 141		ns
Reverse recovered charge	Q_{rr}					25 150		1 2,37		µC
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 150		6000 3416		A/µs
Reverse recovery energy	E_{rec}					25 150		0,35 0,58		mWs
Thermal resistance junction to heatsink	$R_{th(j-s)}$	Thermal grease thickness ≤ 50um λ = 1 W/mK						1,85		K/W
Thermistor										
Rated resistance	R_{25}					25	20,9	22	23,1	kΩ
Deviation of R_{100}	$D_{R/R}$	R_{100}=1486 Ω				100		2,9		%
Power dissipation	P					25		210		mW
Power dissipation constant	$B_{(25/100)}$	Tol. ±3%				25		2		K

Output Inverter

figure 1. **IGBT**

Typical output characteristics

$I_C = f(V_{CE})$



At

t_p = 250 µs

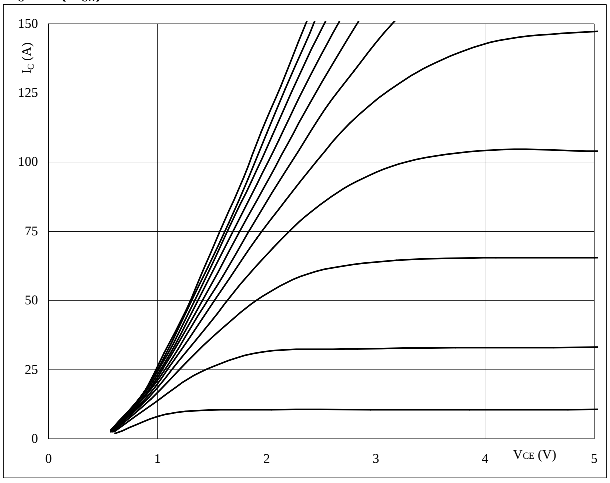
T_j = 25 °C

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

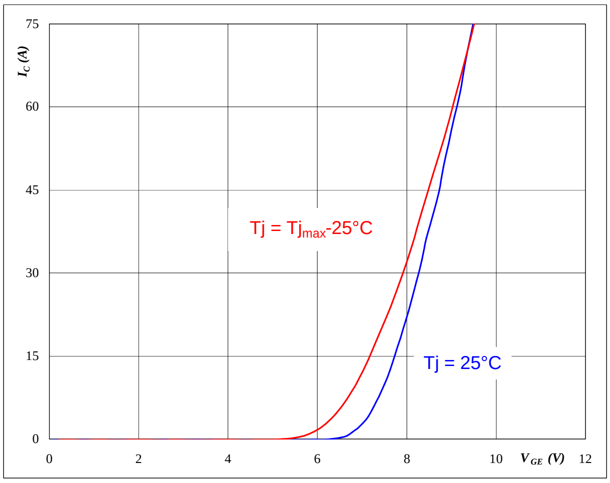
T_j = 150 °C

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

figure 3. **IGBT**

Typical transfer characteristics

$I_c = f(V_{GE})$



At

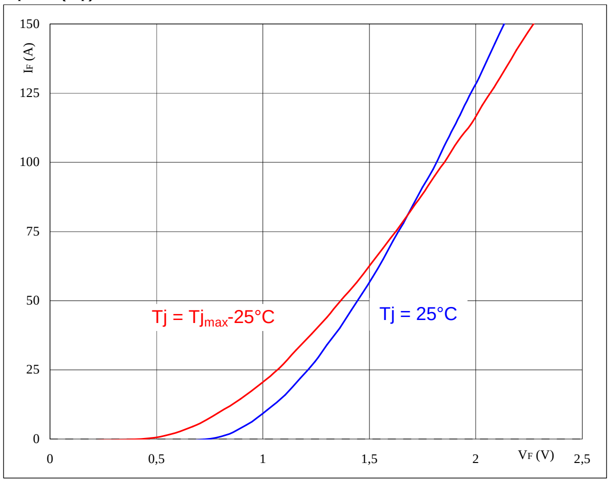
t_p = 250 µs

V_{CE} = 10 V

figure 4. **FWD**

Typical diode forward current as a function of forward voltage

$I_F = f(V_F)$



At

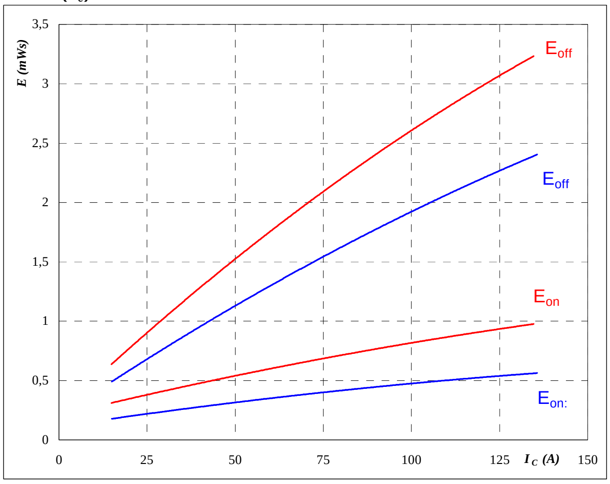
t_p = 250 µs

Output Inverter

figure 5.	IGBT

Typical switching energy losses as a function of collector current

$E = f(I_c)$



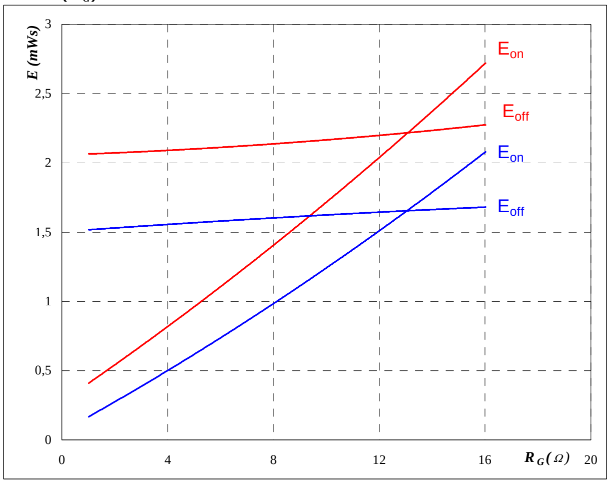
With an inductive load at

T_j =	25/150	°C
V_{CE} =	300	V
V_{GE} =	±15	V
R_{gon} =	4	Ω
R_{goff} =	4	Ω

figure 6.	IGBT

Typical switching energy losses as a function of gate resistor

$E = f(R_G)$



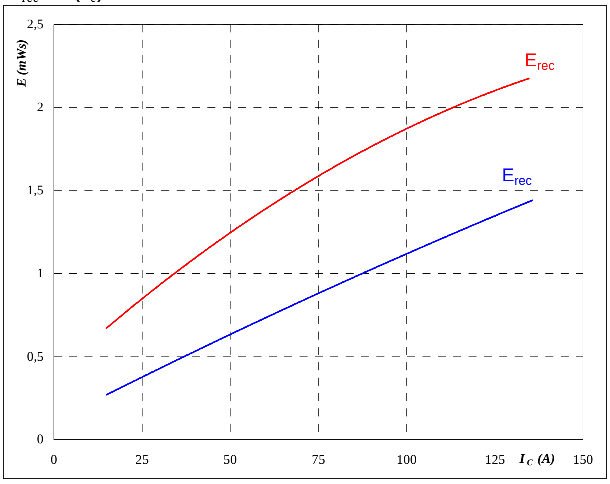
With an inductive load at

T_j =	25/150	°C
V_{CE} =	300	V
V_{GE} =	±15	V
I_C =	75	A

figure 7.	IGBT

Typical reverse recovery energy loss as a function of collector current

$E_{rec} = f(I_c)$



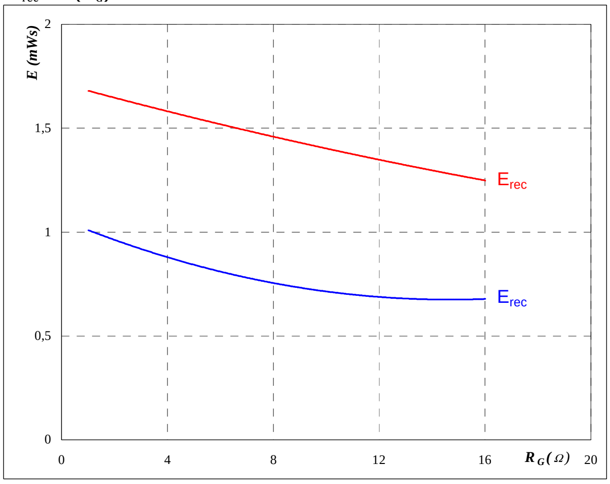
With an inductive load at

T_j =	25/150	°C
V_{CE} =	300	V
V_{GE} =	±15	V
R_{gon} =	4	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

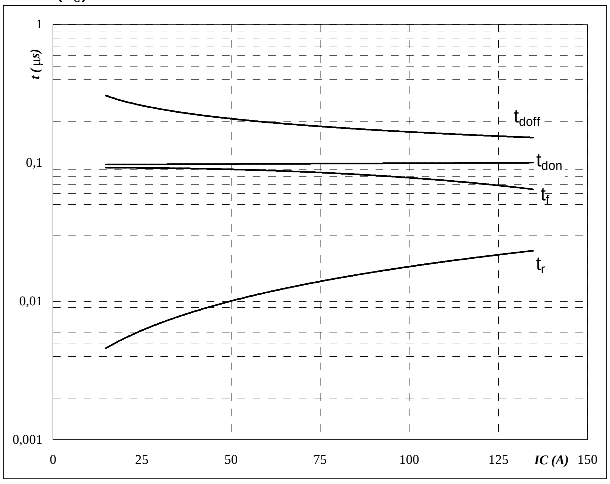
T_j =	25/150	°C
V_{CE} =	300	V
V_{GE} =	±15	V
I_C =	75	A

Output Inverter

figure 9. **IGBT**

Typical switching times as a function of collector current

$t = f(I_C)$



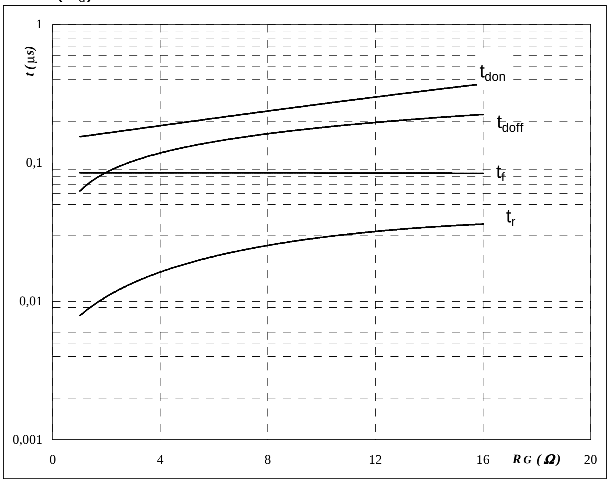
With an inductive load at

T_j =	150	°C
V_{CE} =	300	V
V_{GE} =	±15	V
R_{gon} =	4	Ω
R_{goff} =	4	Ω

figure 10. **IGBT**

Typical switching times as a function of gate resistor

$t = f(R_G)$



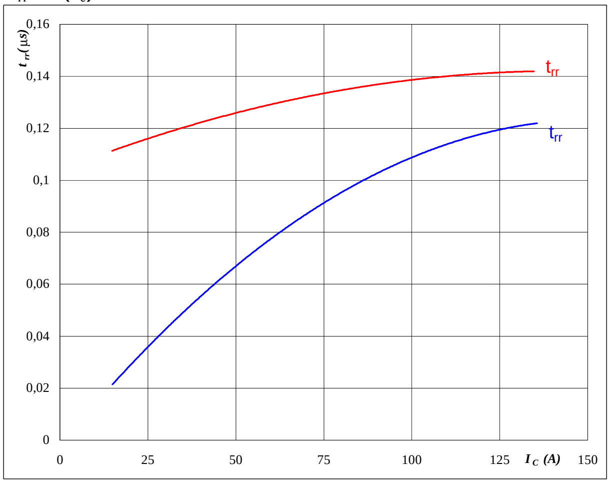
With an inductive load at

T_j =	150	°C
V_{CE} =	300	V
V_{GE} =	±15	V
I_C =	75	A

figure 11. **FWD**

Typical reverse recovery time as a function of collector current

$t_{rr} = f(I_C)$



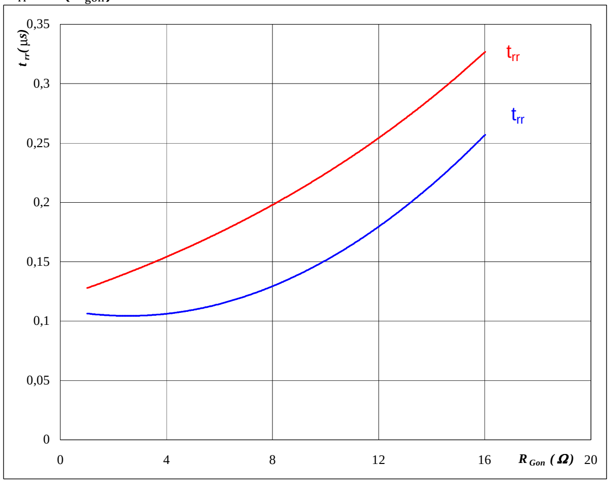
At

T_j =	25/150	°C
V_{CE} =	300	V
V_{GE} =	±15	V
R_{gon} =	4	Ω

figure 12. **FWD**

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

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



At

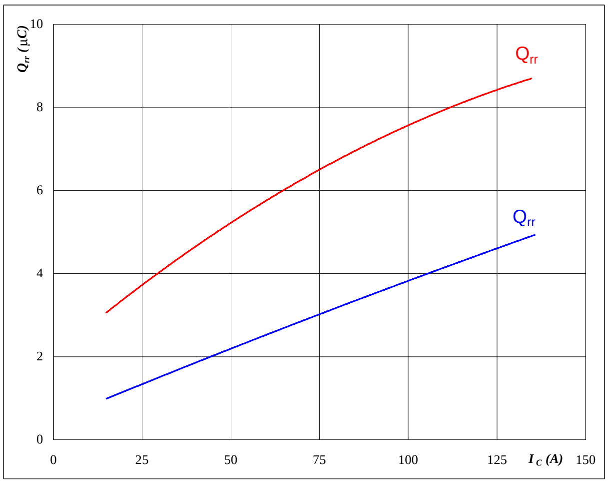
T_j =	25/150	°C
V_R =	300	V
I_F =	75	A
V_{GE} =	±15	V

Output Inverter

figure 13. **FWD**

Typical reverse recovery charge as a function of collector current

$Q_{rr} = f(I_c)$



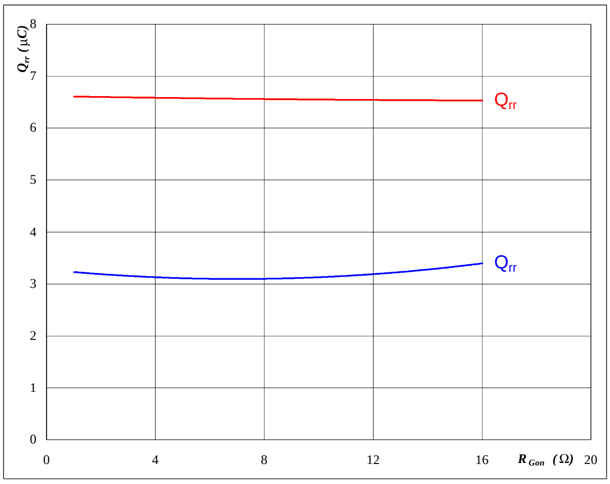
At

T_j =	25/150	°C
V_{CE} =	300	V
V_{GE} =	±15	V
R_{gon} =	4	Ω

figure 14. **FWD**

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

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



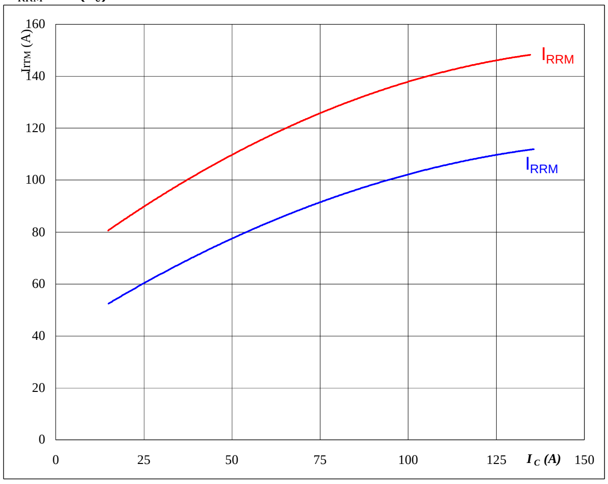
At

T_j =	25/150	°C
V_R =	300	V
I_F =	75	A
V_{GE} =	±15	V

figure 15. **FWD**

Typical reverse recovery current as a function of collector current

$I_{RRM} = f(I_c)$



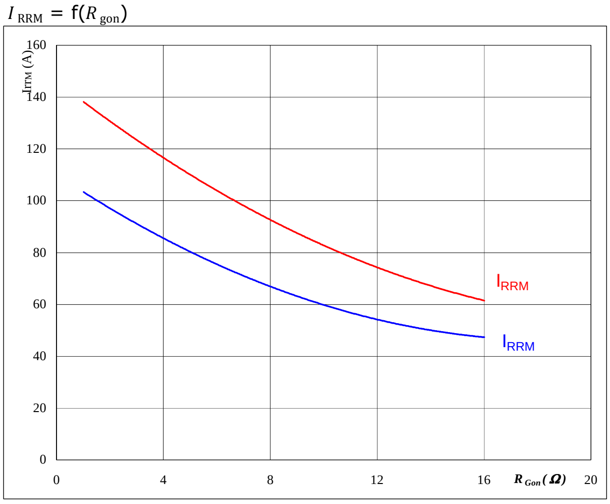
At

T_j =	25/150	°C
V_{CE} =	300	V
V_{GE} =	±15	V
R_{gon} =	4	Ω

figure 16. **FWD**

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

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



At

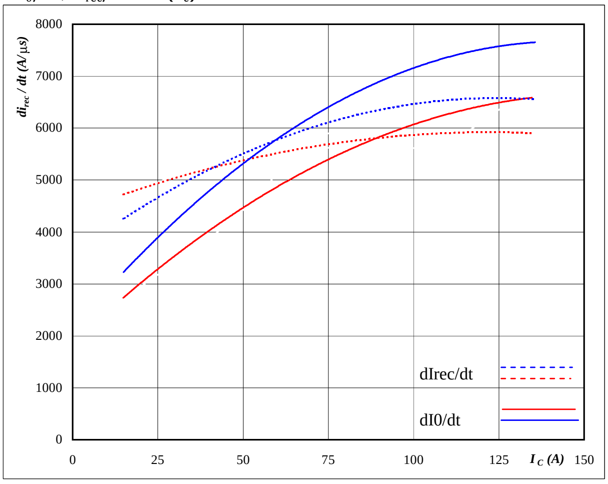
T_j =	25/150	°C
V_R =	300	V
I_F =	75	A
V_{GE} =	±15	V

Output Inverter

figure 17. **FWD**

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

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



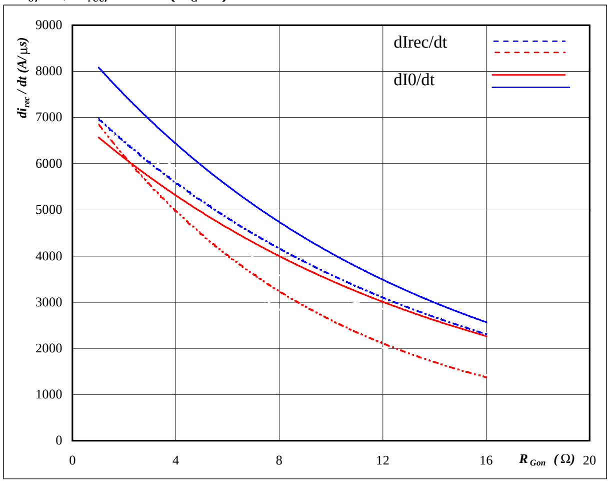
At

T_j = 25/150 °C
V_{CE} = 300 V
V_{GE} = ±15 V
R_{gon} = 4 Ω

figure 18. **FWD**

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

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



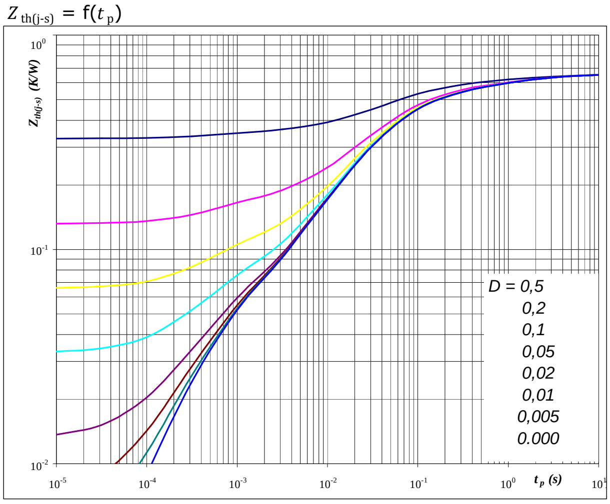
At

T_j = 25/150 °C
V_R = 300 V
I_F = 75 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
$R_{th(j\text{-}s)}$ = 0,658 K/W
Single device heated

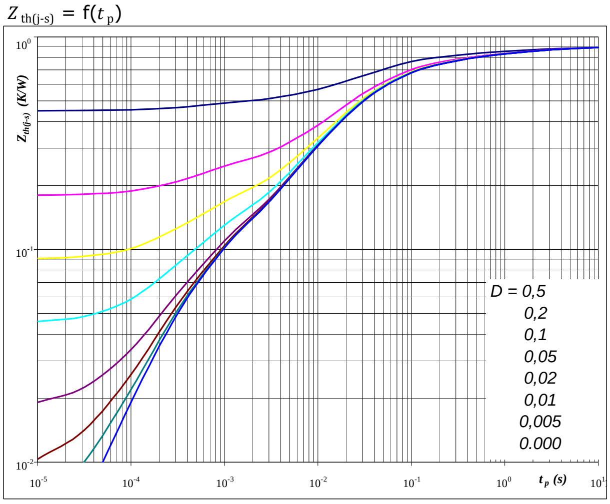
IGBT thermal model values

R (K/W)	Tau (s)
1,74E-02	1,13E+01
8,55E-02	1,52E+00
1,63E-01	1,80E-01
2,78E-01	3,55E-02
7,35E-02	7,86E-03
4,07E-02	5,24E-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
$R_{th(j\text{-}s)}$ = 0,90 K/W
Single device heated

FWD thermal model values

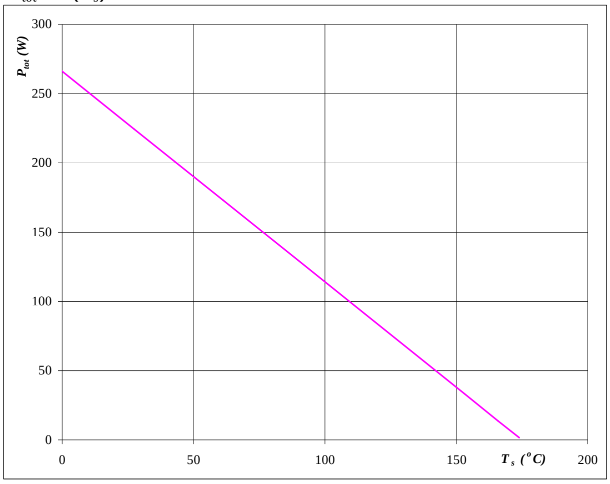
R (K/W)	Tau (s)
3,62E-02	5,56E+00
8,99E-02	1,06E+00
1,77E-01	1,50E-01
3,96E-01	2,74E-02
1,23E-01	6,05E-03
7,48E-02	4,30E-04

Output Inverter

figure 21. **IGBT**

Power dissipation as a function of heatsink temperature

$P_{tot} = f(T_s)$



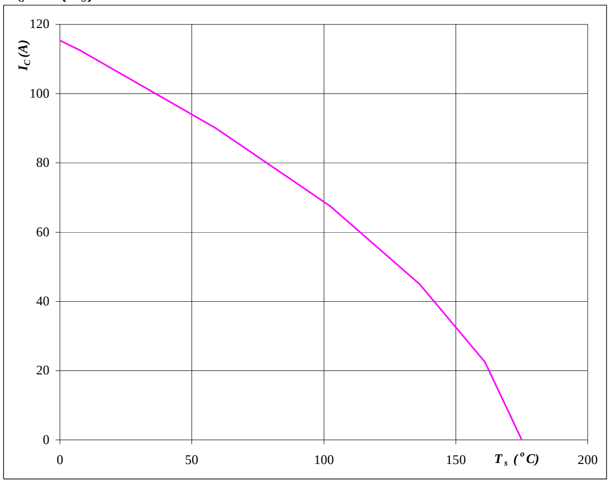
At

T_j = 175 °C

figure 22. **IGBT**

Collector current as a function of heatsink temperature

$I_C = f(T_s)$



At

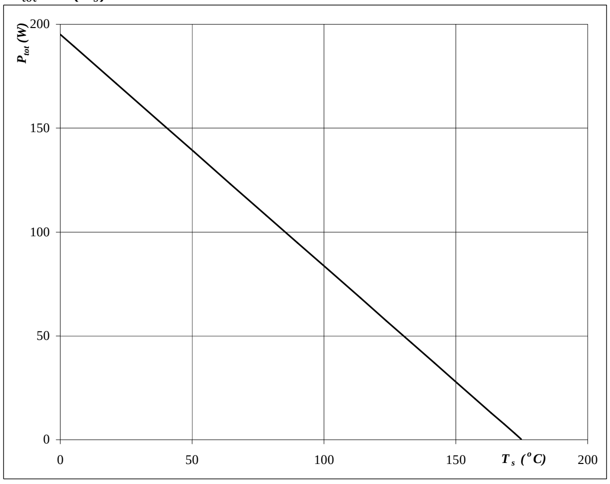
T_j = 175 °C

V_{GE} = 15 V

figure 23. **FWD**

Power dissipation as a function of heatsink temperature

$P_{tot} = f(T_s)$



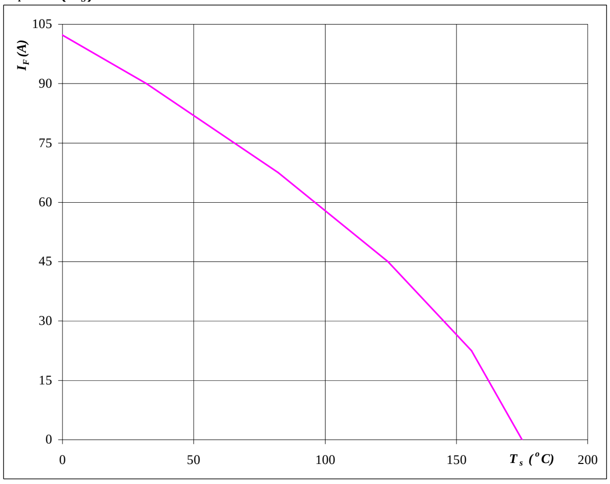
At

T_j = 175 °C

figure 24. **FWD**

Forward current as a function of heatsink temperature

$I_F = f(T_s)$



At

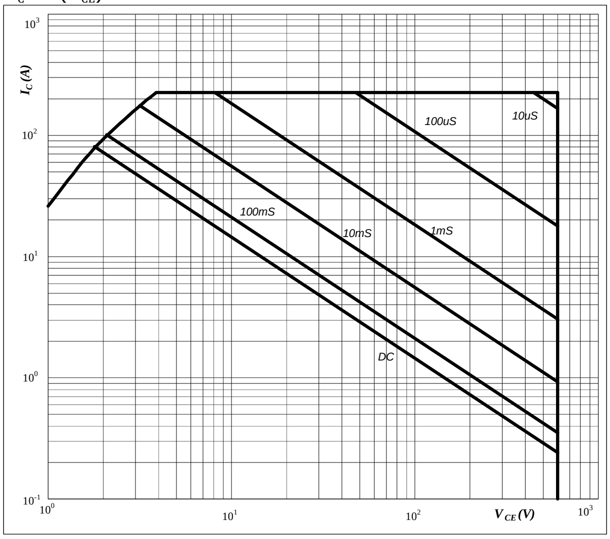
T_j = 175 °C

Output Inverter

figure 25. **IGBT**

Safe operating area as a function of collector-emitter voltage

$I_C = f(V_{CE})$



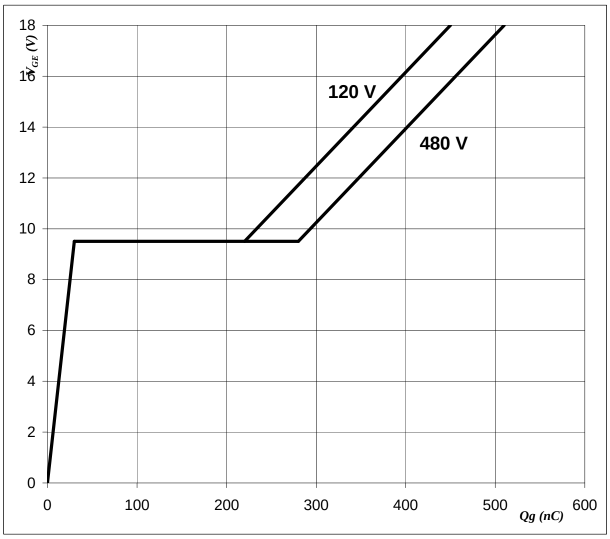
At

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

figure 26. **IGBT**

Gate voltage vs Gate charge

$V_{GE} = f(Q_g)$



At

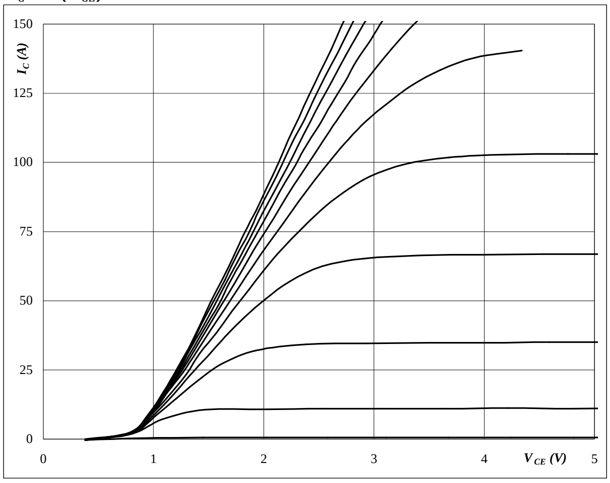
I_C =	75	A

Brake

figure 1. **IGBT**

Typical output characteristics

$I_C = f(V_{CE})$



At

t_p = 250 µs

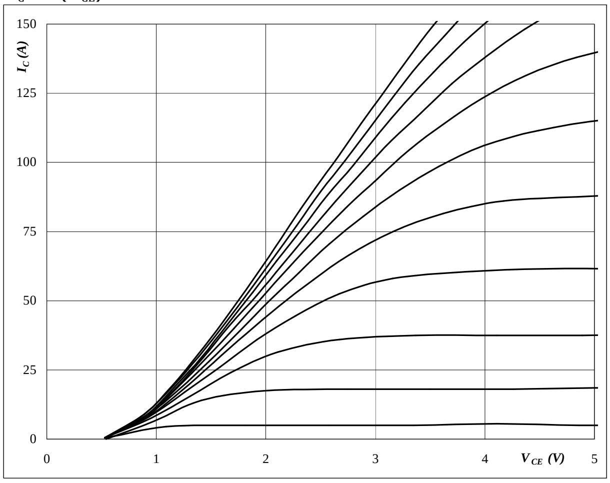
T_j = 25 °C

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

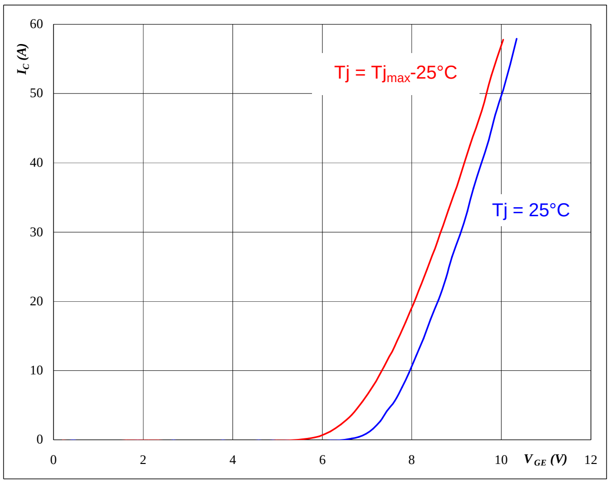
T_j = 150 °C

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

figure 3. **IGBT**

Typical transfer characteristics

$I_C = f(V_{GE})$



At

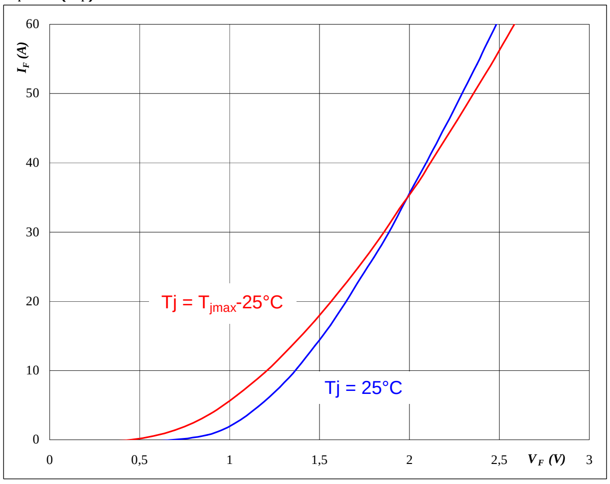
t_p = 250 µs

V_{CE} = 10 V

figure 4. **FWD**

Typical diode forward current as a function of forward voltage

$I_F = f(V_F)$



At

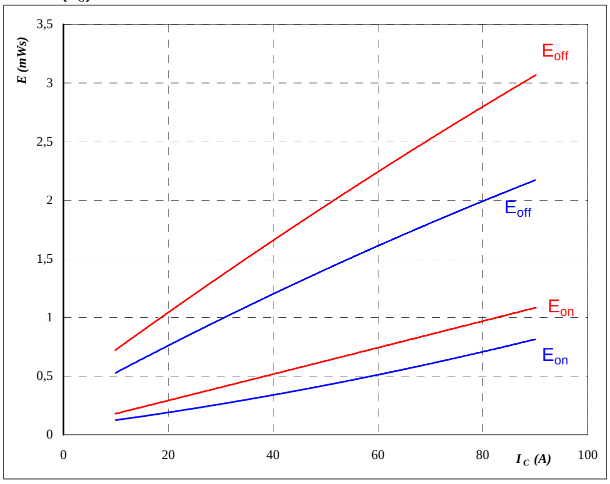
t_p = 250 µs

Brake

figure 5. **IGBT**

Typical switching energy losses as a function of collector current

$E = f(I_C)$



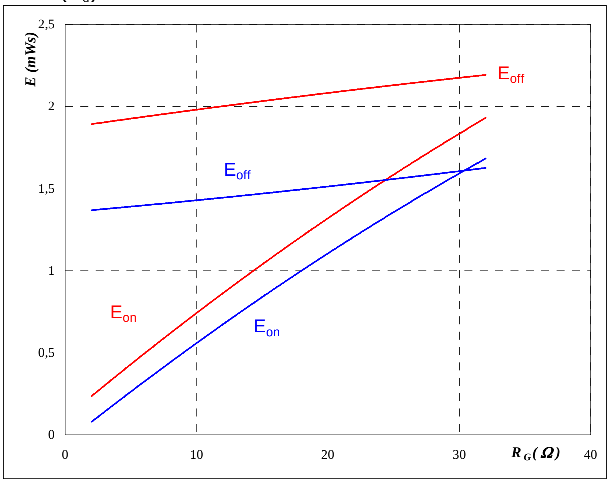
With an inductive load at

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

figure 6. **IGBT**

Typical switching energy losses as a function of gate resistor

$E = f(R_G)$



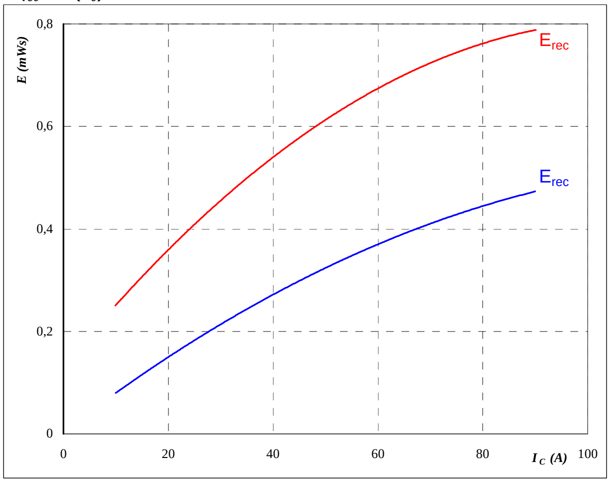
With an inductive load at

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

$E_{rec} = f(I_c)$



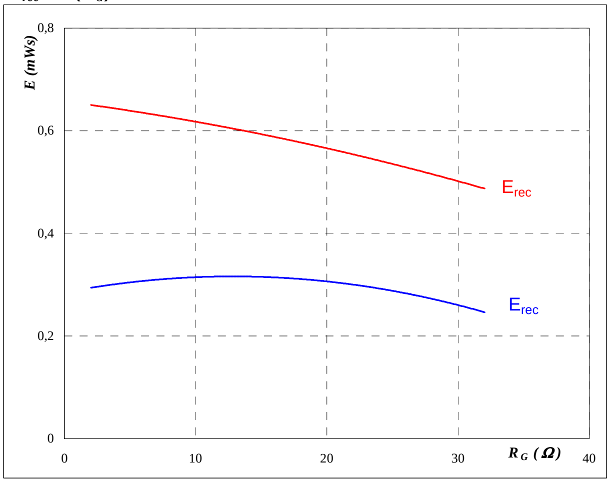
With an inductive load at

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

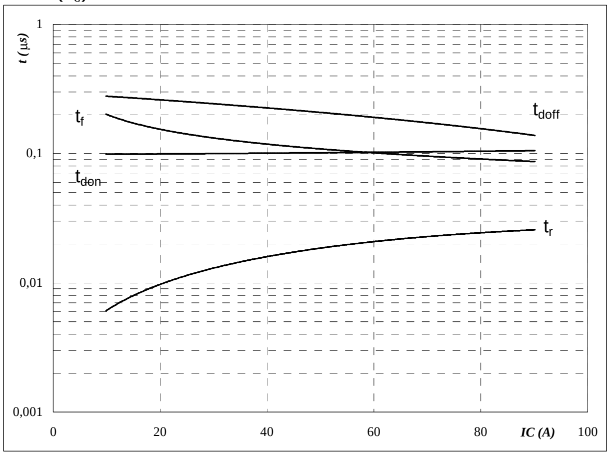
T_j =	25/150	°C
V_{CE} =	300	V
V_{GE} =	±15	V
I_C =	50	A

Brake

figure 9. **IGBT**

Typical switching times as a function of collector current

$t = f(I_C)$



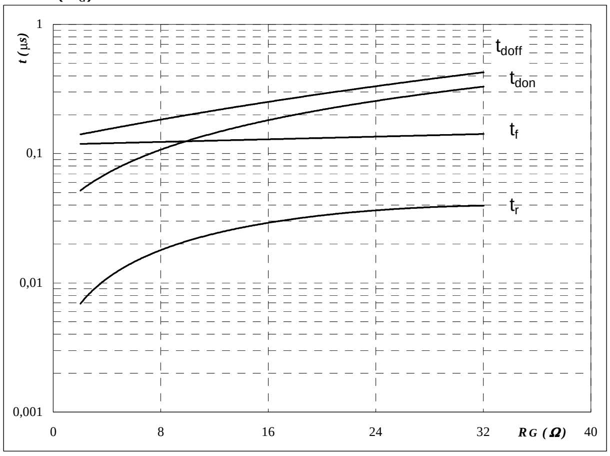
With an inductive load at

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

figure 10. **IGBT**

Typical switching times as a function of gate resistor

$t = f(R_G)$



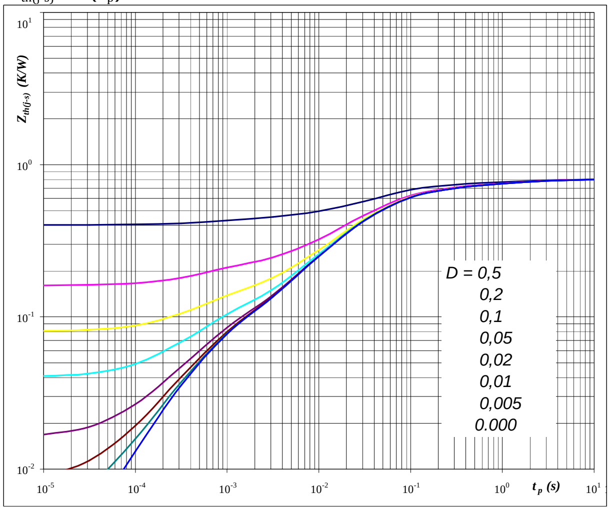
With an inductive load at

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

figure 11. **IGBT**

IGBT transient thermal impedance as a function of pulse width

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



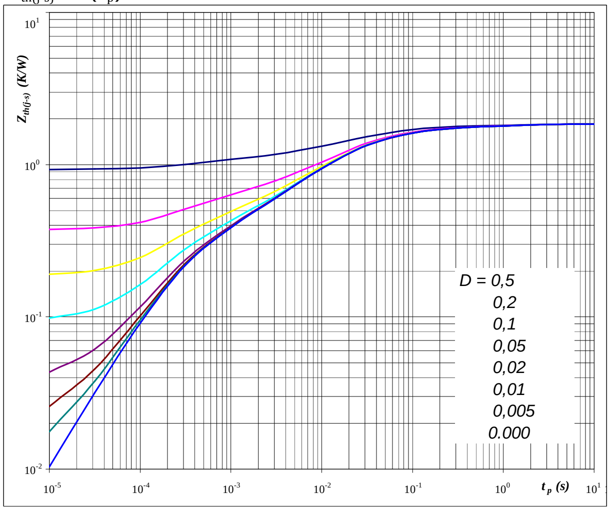
At

D =	t_p / T	
$R_{th(j-s)}$ =	0,80	K/W

figure 12. **IGBT**

FWD transient thermal impedance as a function of pulse width

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



At

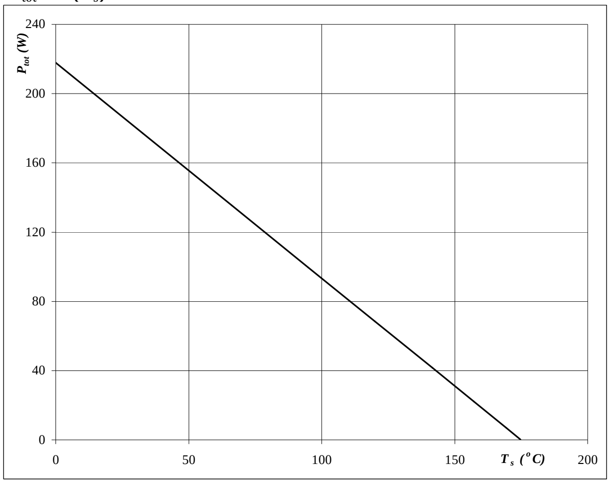
D =	t_p / T	
$R_{th(j-s)}$ =	1,85	K/W

Brake

figure 13. **IGBT**

Power dissipation as a function of heatsink temperature

$P_{tot} = f(T_s)$



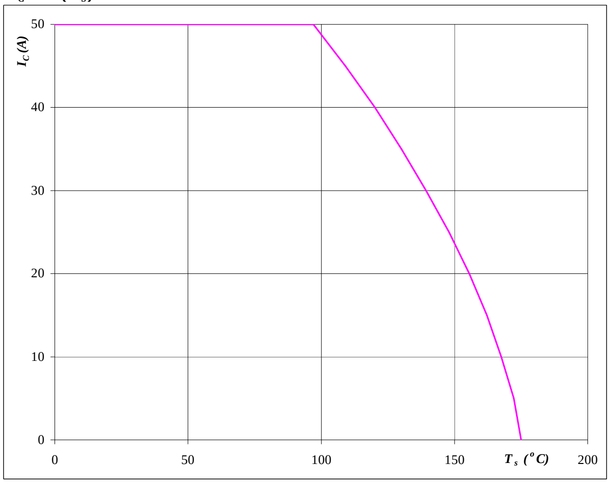
At

T_j = 175 ºC

figure 14. **IGBT**

Collector current as a function of heatsink temperature

$I_C = f(T_s)$



At

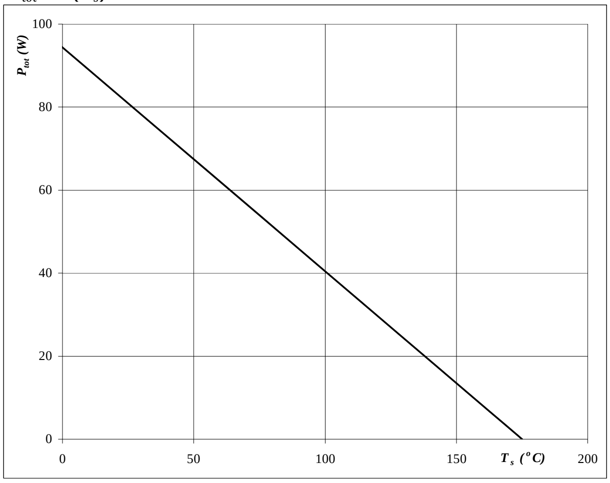
T_j = 175 ºC

V_{GE} = 15 V

figure 15. **FWD**

Power dissipation as a function of heatsink temperature

$P_{tot} = f(T_s)$



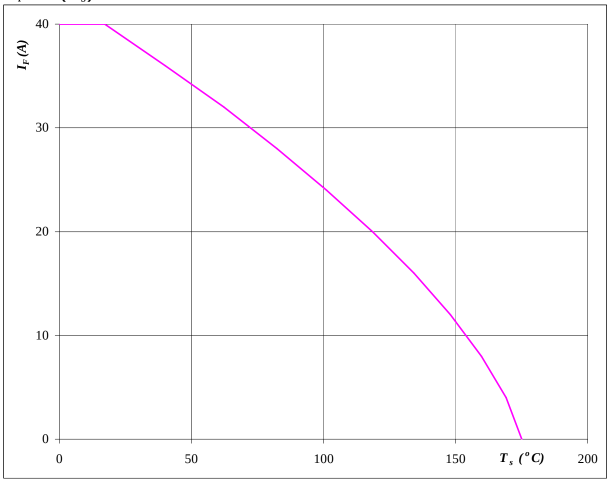
At

T_j = 175 ºC

figure 16. **FWD**

Forward current as a function of heatsink temperature

$I_F = f(T_s)$



At

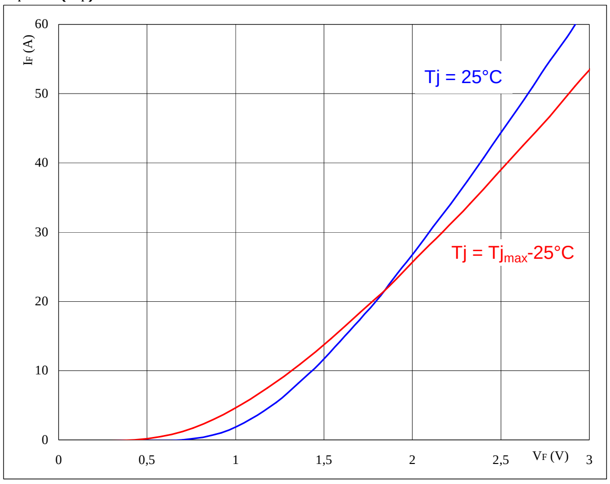
T_j = 175 ºC

Brake Inverse Diode

figure 1.	**Brake inverse diode**

Typical diode forward current as a function of forward voltage

$I_F = f(V_F)$



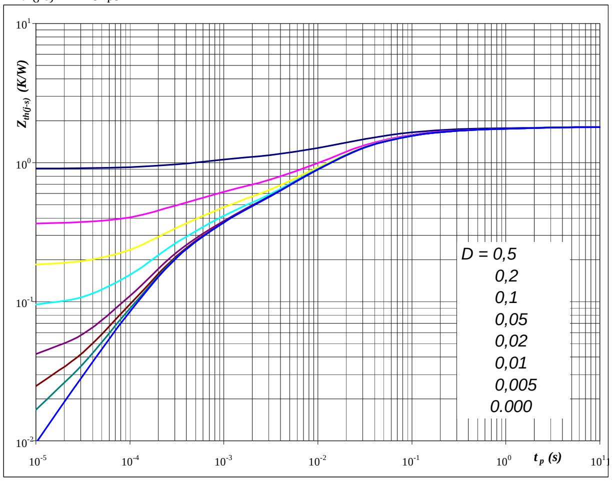
At

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

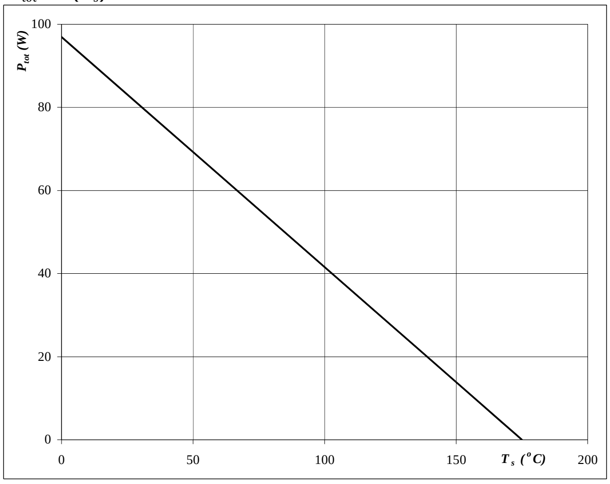
D = t_p / T

$R_{th(j-s)}$ = 1,81 K/W

figure 3.	**Brake inverse diode**

Power dissipation as a function of heatsink temperature

$P_{tot} = f(T_s)$



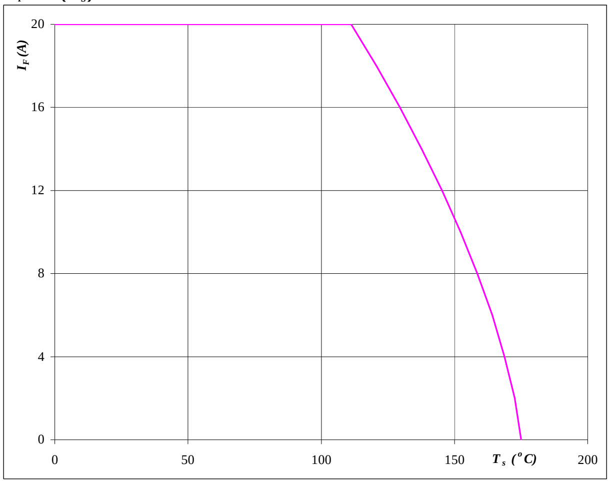
At

T_j = 175 ºC

figure 4.	**Brake inverse diode**

Forward current as a function of heatsink temperature

$I_F = f(T_s)$



At

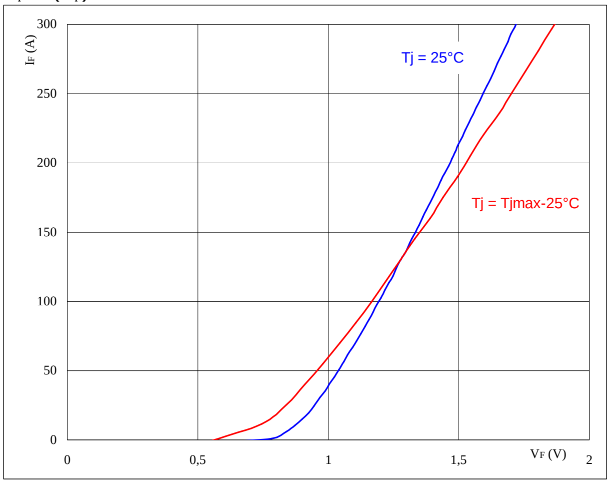
T_j = 175 ºC

Input Rectifier Bridge

figure 1. **Rectifier Diode**

Typical diode forward current as a function of forward voltage

I_F= f(V_F)



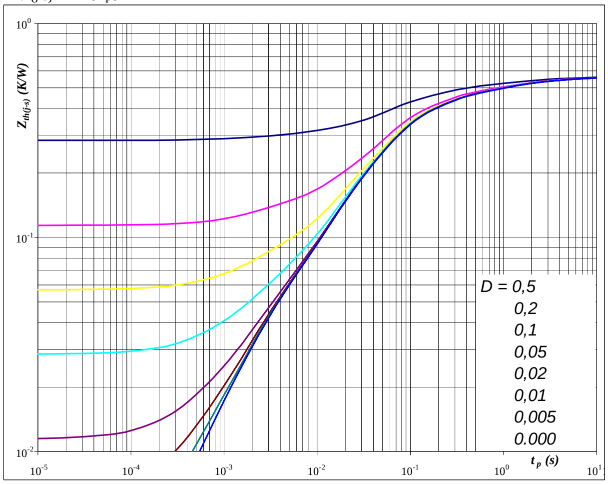
At

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

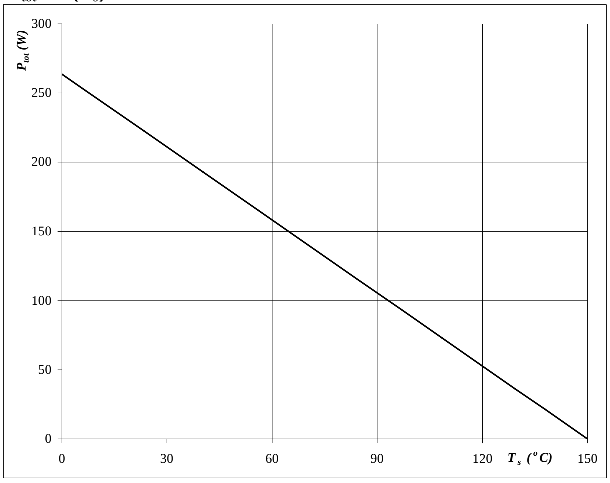
D = t_p / T

$R_{th(j-s)}$ = 0,57 K/W

figure 3. **Rectifier Diode**

Power dissipation as a function of heatsink temperature

P_{tot} = f(T_s)



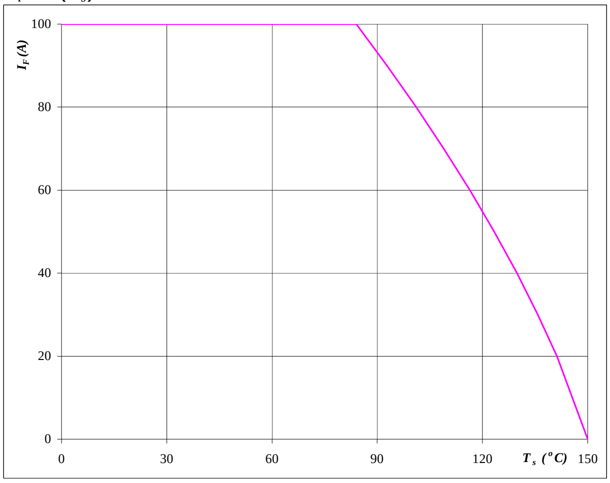
At

T_j = 150 ºC

figure 4. **Rectifier Diode**

Forward current as a function of heatsink temperature

I_F = f(T_s)



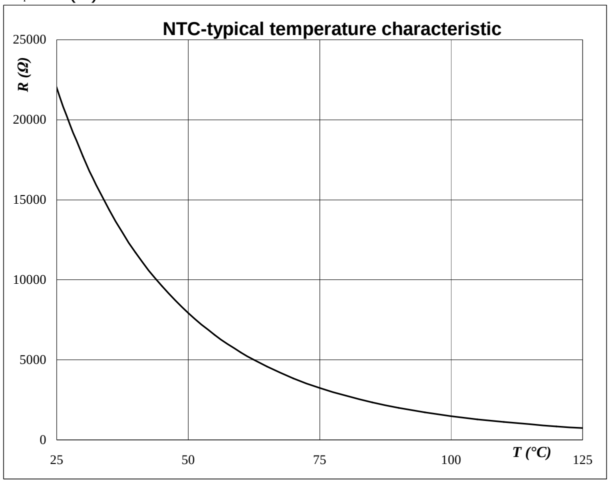
At

T_j = 150 ºC

Thermistor

figure 1.	Thermistor

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



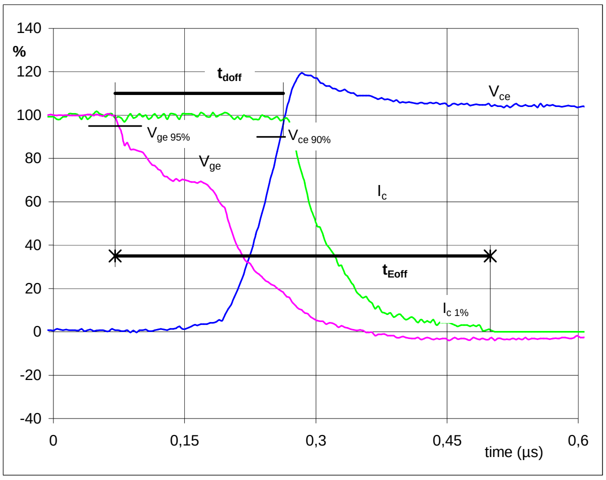
Switching Definitions Output Inverter

General conditions

T_j	=	**150 °C**
R_{gon}	=	**4 Ω**
R_{goff}	=	**4 Ω**

figure 1. **IGBT**

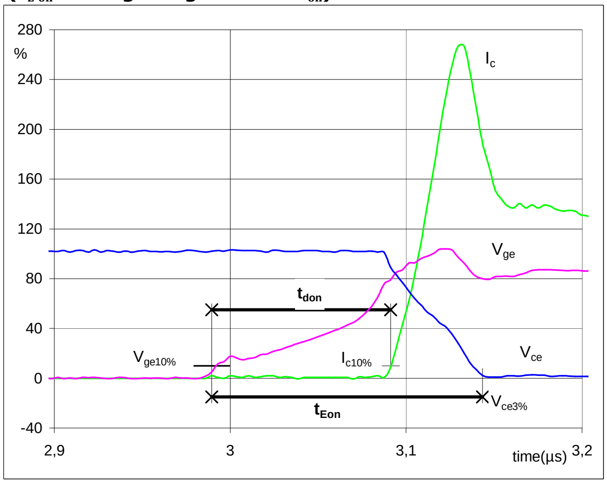
Turn-off Switching Waveforms & definition of t_{doff}, t_{Eoff}
($t_{E\,off}$ = integrating time for E_{off})



V_{GE} (0%) =	-15	V
V_{GE} (100%) =	15	V
V_C (100%) =	300	V
I_C (100%) =	75	A
t_{doff} =	0,18	µs
$t_{E\,off}$ =	0,43	µs

figure 2. **IGBT**

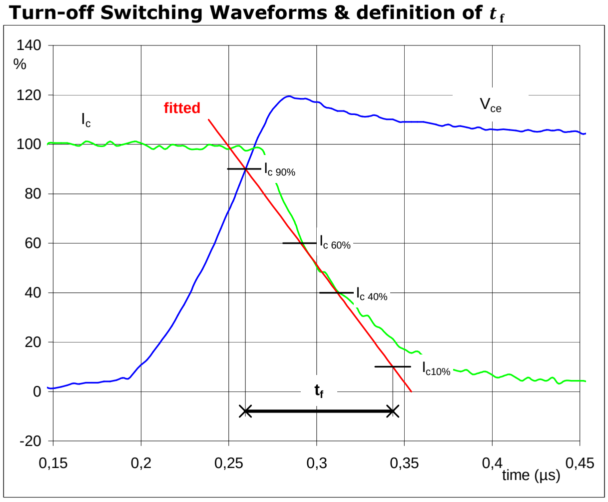
Turn-on Switching Waveforms & definition of t_{don}, t_{Eon}
($t_{E\,on}$ = integrating time for E_{on})



V_{GE} (0%) =	-15	V
V_{GE} (100%) =	15	V
V_C (100%) =	300	V
I_C (100%) =	75	A
t_{don} =	0,10	µs
$t_{E\,on}$ =	0,15	µs

figure 3. **IGBT**

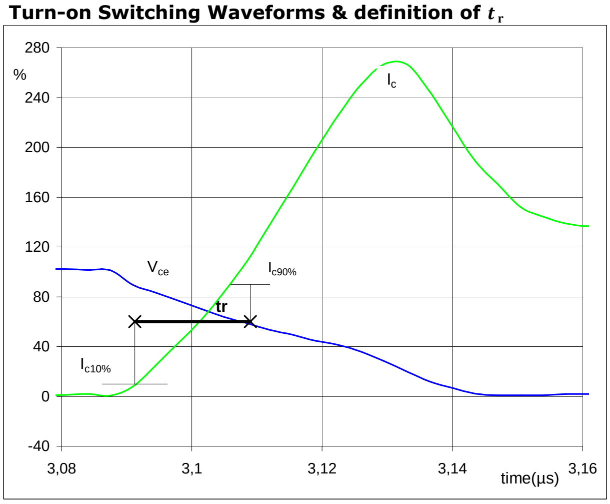
Turn-off Switching Waveforms & definition of t_f



V_C (100%) =	300	V
I_C (100%) =	75	A
t_f =	0,09	µs

figure 4. **IGBT**

Turn-on Switching Waveforms & definition of t_r

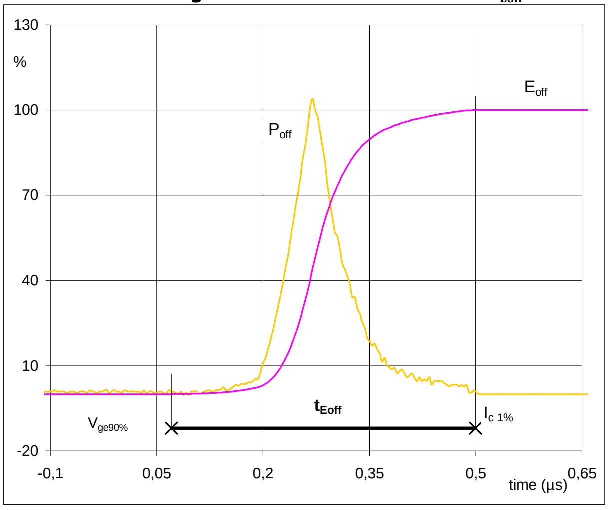


V_C (100%) =	300	V
I_C (100%) =	75	A
t_r =	0,02	µs

Switching Definitions Output Inverter

figure 5.	IGBT

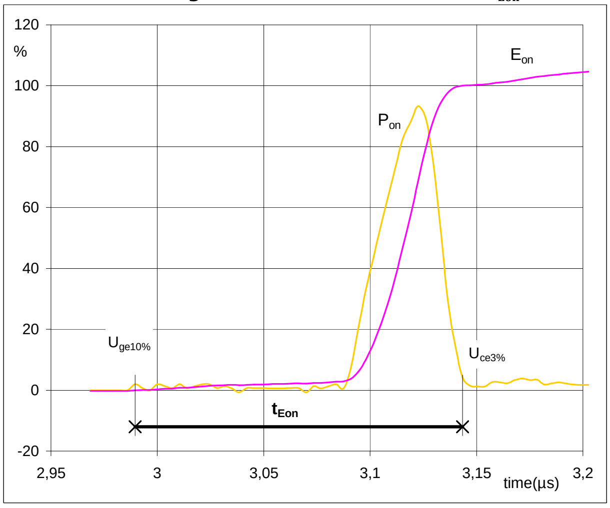
Turn-off Switching Waveforms & definition of t_{Eoff}



P_{off} (100%) =	22,48	kW
E_{off} (100%) =	2,09	mJ
$t_{E\,off}$ =	0,43	µs

figure 6.	IGBT

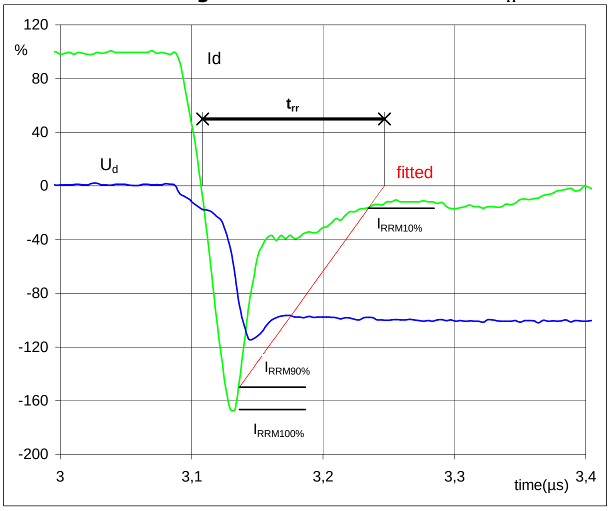
Turn-on Switching Waveforms & definition of t_{Eon}



P_{on} (100%) =	22,48	kW
E_{on} (100%) =	0,69	mJ
$t_{E\,on}$ =	0,15	µs

figure 7.	FWD

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

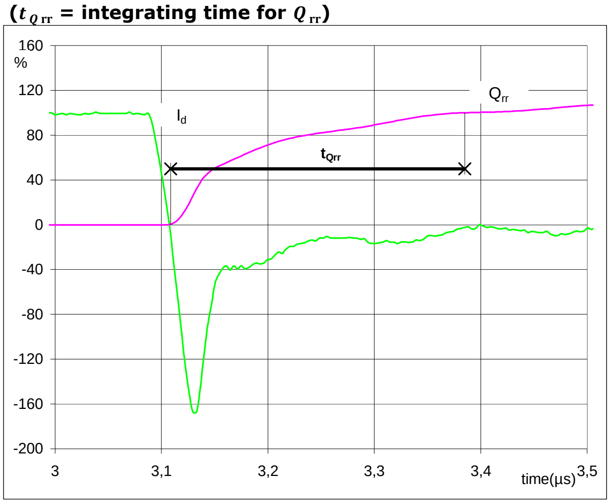


V_d (100%) =	300	V
I_d (100%) =	75	A
I_{RRM} (100%) =	-126	A
t_{rr} =	0,13	µs

Switching Definitions Output Inverter

figure 8.	FWD

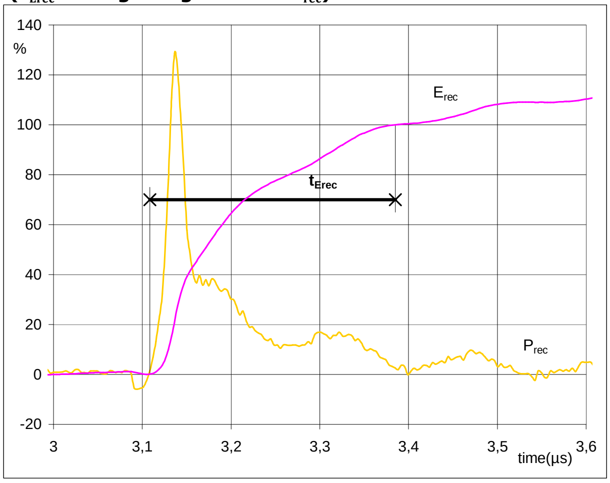
Turn-on Switching Waveforms & definition of t_{Qrr}
($t_{Q\,rr}$ = integrating time for Q_{rr})



I_d (100%) =	75	A
Q_{rr} (100%) =	6,53	µC
t_{Qint} =	0,28	µs

figure 9.	FWD

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



P_{rec} (100%) =	22,48	kW
E_{rec} (100%) =	1,60	mJ
$t_{E\,rec}$ =	0,28	µs

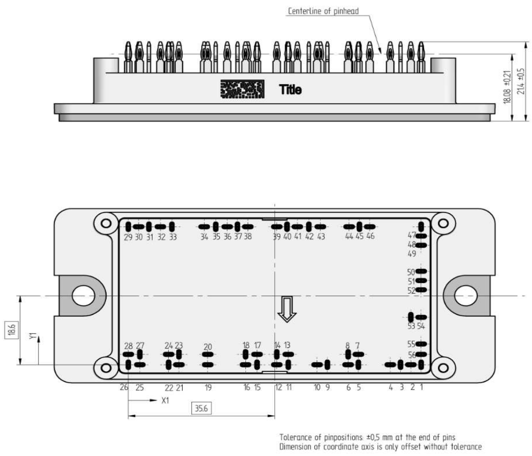
Ordering Code & Marking

Version	Ordering Code
without thermal paste with solder pins	V23990-P764-A-PM
without thermal paste with Press-fit pins	V23990-P764-AY-PM
with thermal paste with solder pins	V23990-P764-A-/3/-PM
with thermal paste with Press-fit pins	V23990-P764-AY-/3/-PM

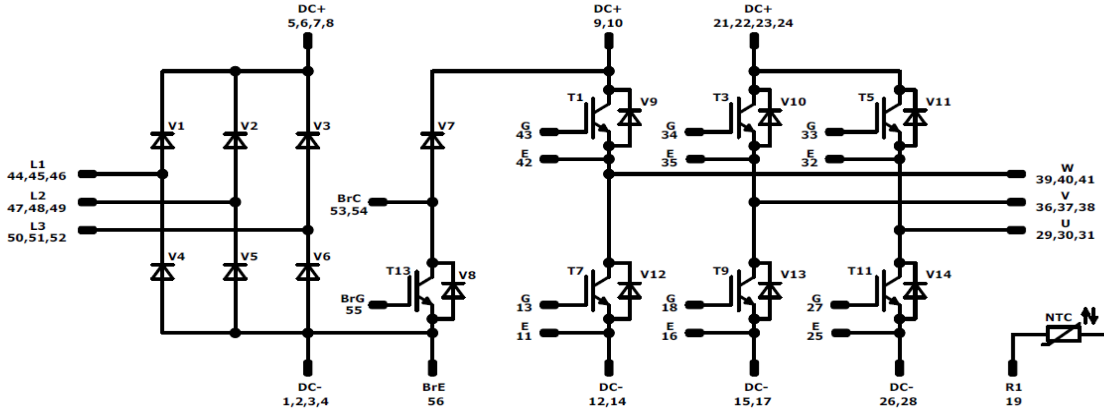
	VIN	Date code	Name&Ver	UL	Lot	Serial
Text	VIN	WWYY	NNNNNNVV	UL	LLLLL	SSSS
	Type&Ver	Lot number	Serial	Date code		
Datamatrix	TTTTTTVV	LLLLL	SSSS	WWYY		

Outline

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



Pinout



Identification

ID	Component	Voltage	Current	Function	Comment
T1,T3,T5,T7,T9,T11	IGBT	600 V	75 A	Inverter Switch	
V9-V14	FWD	600 V	75 A	Inverter Diode	
V1-V6	Rectifier	1600 V	75 A	Rectifier Diode	
T13	IGBT	600 V	50 A	Brake Switch	
V7	FWD	600 V	20 A	Brake Diode	
V8	FWD	600 V	20 A	Brake Inverse Diode	
NTC	Thermistor			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-P764-Ax-D6-14	27 Apr. 2017	New design, packing unit number	All