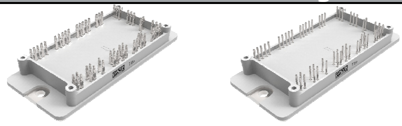
flow PIM 2 — **1200 V / 75 A**

Features

- Three-phase rectifier, BRC, Inverter, NTC
- Very Compact housing, easy to route
- IGBT4/ EmCon4 technology for low saturation losses and improved EMC behavior

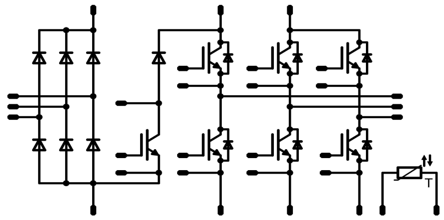
flow 2 17mm housing



Target Applications

- Motor Drives
- Power Generation

Schematic



Types

- V23990-P769-A
- V23990-P769-AY

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
I2t-value	I^2t			5000	A^2s
Power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	114	W
Maximum Junction Temperature	T_{jmax}			150	°C
Inverter Switch					
Collector-emitter breakdown voltage	V_{CE}			1200	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}		210	A
Power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	211	W
Gate-emitter peak voltage	V_{GE}			±20	V
Short circuit ratings	t_{SC} V_{CC}	T_j ≤ 150 °C V_{GE} = 15 V		10 800	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}			1200	V
DC forward current	I_F	$T_j = T_{jmax}$	T_s = 80 °C	73	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	135	W
Maximum Junction Temperature	T_{jmax}			175	°C
Brake Switch					
Collector-emitter breakdown voltage	V_{CE}			1200	V
DC collector current	I_C	$T_j = T_{jmax}$	T_s = 80 °C	58	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	155	W
Gate-emitter peak voltage	V_{GE}			±20	V
Short circuit ratings	t_{SC} V_{CC}	T_j ≤ 150 °C V_{GE} = 15 V		10 800	μs V
Maximum Junction Temperature	T_{jmax}			175	°C
Brake Inverse Diode					
Peak Repetitive Reverse Voltage	V_{RRM}			1200	V
DC forward current	I_F	$T_j = T_{jmax}$	T_s = 80 °C	16	A
Repetitive peak forward current	I_{FRM}	t_p limited by T_{jmax}		20	A
Brake Inverse Diode	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	50	W
Maximum Junction Temperature	T_{jmax}			175	°C
Brake Diode					
Peak Repetitive Reverse Voltage	V_{RRM}			1200	V
DC forward current	I_F	$T_j = T_{jmax}$	T_s = 80 °C	35	A
Repetitive peak forward current	I_{FRM}	t_p limited by T_{jmax}		50	A
Power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	75	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…+Tjmax-25	°C
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					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	
Input Rectifier Diode										
Forward voltage	V_F				100	25 125		1,18 1,16	1,9	V
Threshold voltage (for power loss calc. only)	V_{to}					25 125		0,87 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						0,61		K/W
Inverter Switch										
Gate emitter threshold voltage	$V_{GE(th)}$	$V_{CE} = V_{GE}$			0,0024	25	5	5,8	6,5	V
Collector-emitter saturation voltage	V_{CEsat}		15		75	25 150		1,96 2,47	2,1	V
Collector-emitter cut-off current incl. Diode	I_{CES}		0	1200		25			0,025	mA
Gate-emitter leakage current	I_{GES}		20	0		25			200	nA
Integrated Gate resistor	R_{gint}							none		Ω
Turn-on delay time	$t_{d(on)}$	$R_{goff} = 8\ \Omega$ $R_{gon} = 8\ \Omega$	±15	600	75	25 150		106 86		ns
Rise time	t_r	$R_{goff} = 8\ \Omega$ $R_{gon} = 8\ \Omega$	±15	600	75	25 150		24 23		ns
Turn-off delay time	$t_{d(off)}$	$R_{goff} = 8\ \Omega$ $R_{gon} = 8\ \Omega$	±15	600	75	25 150		188 270		ns
Fall time	t_f	$R_{goff} = 8\ \Omega$ $R_{gon} = 8\ \Omega$	±15	600	75	25 150		64,9 114		ns
Turn-on energy loss	E_{on}	$R_{goff} = 8\ \Omega$ $R_{gon} = 8\ \Omega$	±15	600	75	25 150		3,97 6,39		mWs
Turn-off energy loss	E_{off}	$R_{goff} = 8\ \Omega$ $R_{gon} = 8\ \Omega$	±15	600	75	25 150		3,63 6,39		mWs
Input capacitance	C_{ies}	f = 1 MHz	0	25		25		3900		pF
Output capacitance	C_{oss}	f = 1 MHz	0	25		25		310		pF
Reverse transfer capacitance	C_{rss}	f = 1 MHz	0	25		25		230		pF
Gate charge	Q_G		±15			25		400		nC
Thermal resistance junction to heatsink	$R_{th(j-s)}$	Thermal grease thickness ≤ 50um λ = 1 W/mK						0,45		K/W
Inverter Diode										
Diode forward voltage	V_F				75	25 150		1,81 1,83	2,4	V
Peak reverse recovery current	I_{RRM}	$R_{gon} = 8\ \Omega$	±15	600	75	25 150		46,6 117		A
Reverse recovery time	t_{rr}	$R_{gon} = 8\ \Omega$	±15	600	75	25 150		287 310		ns
Reverse recovered charge	Q_{rr}	$R_{gon} = 8\ \Omega$	±15	600	75	25 150		4,17 14,13		μC
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$	$R_{gon} = 8\ \Omega$	±15	600	75	25 150		2312 1378		A/μs
Reverse recovered energy	E_{rec}	$R_{gon} = 8\ \Omega$	±15	600	75	25 150		1,78 5,64		mWs
Thermal resistance junction to heatsink	$R_{th(j-s)}$	Thermal grease thickness ≤ 50um λ = 1 W/mK						0,70		K/W

Characteristic Values

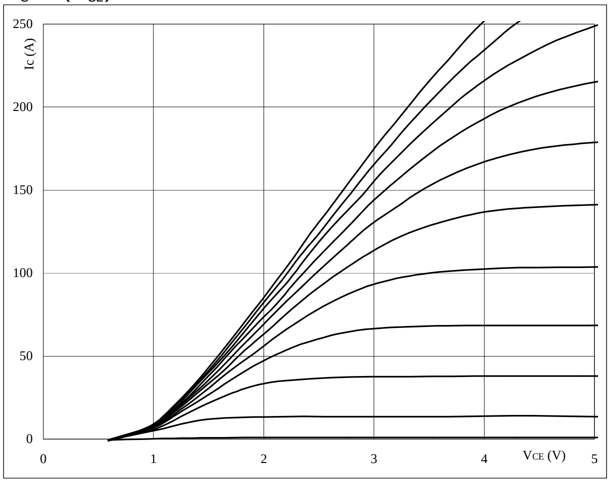
Parameter	Symbol	Conditions					Value			Unit
			V_{GE} [V] V_{GS} [V]	V_r [V] V_{CE} [V] V_{DS} [V]	I_C [A] I_F [A] I_D [A]	T_j [°C]	Min	Typ	Max	
Brake Switch										
Gate emitter threshold voltage	$V_{GE(th)}$	$V_{CE} = V_{GE}$			0,0017	25	5	5,8	6,5	V
Collector-emitter saturation voltage	V_{CEsat}		15		50	25 150		1,9 2,3	2,3	V
Collector-emitter cut-off incl diode	I_{CES}		0	1200		25			0,25	mA
Gate-emitter leakage current	I_{GES}		20	0		25			200	nA
Integrated Gate resistor	R_{gint}							4		Ω
Turn-on delay time	$t_{d(on)}$	R_{goff} = 8 Ω R_{gon} = 8 Ω	±15	600	50	25 150		98 103		ns
Rise time	t_r					25 150		18 25		
Turn-off delay time	$t_{d(off)}$					25 150		208 284		
Fall time	t_f					25 150		66 112		
Turn-on energy loss	E_{on}					25 150		2,43 3,46		mWs
Turn-off energy loss	E_{off}					25 150		2,45 4,23		
Input capacitance	C_{ies}	f = 1 MHz	0	25		25		2770		pF
Output capacitance	C_{oss}							205		
Reverse transfer capacitance	C_{rss}							160		
Gate charge	Q_G		±15	960		25		290		nC
Thermal resistance junction to heatsink	$R_{th(j-s)}$	Thermal grease thickness ≤ 50um λ = 1 W/mK						0,61		K/W
Brake Inverse Diode										
Diode forward voltage	V_F				10	25 150	1,1	1,81 1,81	2,1	V
Thermal resistance junction to heatsink	$R_{th(j-s)}$	Thermal grease thickness ≤ 50um λ = 1 W/mK						1,92		K/W
Brake Diode										
Diode forward voltage	V_F				25	25 150		1,82 1,82	2,2	V
Reverse leakage current	I_r			600		25			10	μA
Peak reverse recovery current	I_{RRM}	R_{gon} = 8 Ω	±15	600	50	25 150		51 51,67		A
Reverse recovery time	t_{rr}					25 150		152 328		ns
Reverse recovered charge	Q_{rr}					25 150		3,07 6,3		μC
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 150		3443 806		A/μs
Reverse recovery energy	E_{rec}					25 150		3,07 6,3		mWs
Thermal resistance junction to heatsink	$R_{th(j-s)}$	Thermal grease thickness ≤ 50um λ = 1 W/mK						1,27		K/W
Thermistor										
Rated resistance	R_{25}					25		22		kΩ
Deviation of R_{100}	$D_{R/R}$	R_{100}=1486Ω				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	

Output Inverter

figure 1. **IGBT**

Typical output characteristics

$I_C = f(V_{CE})$



At

t_p = 250 µs

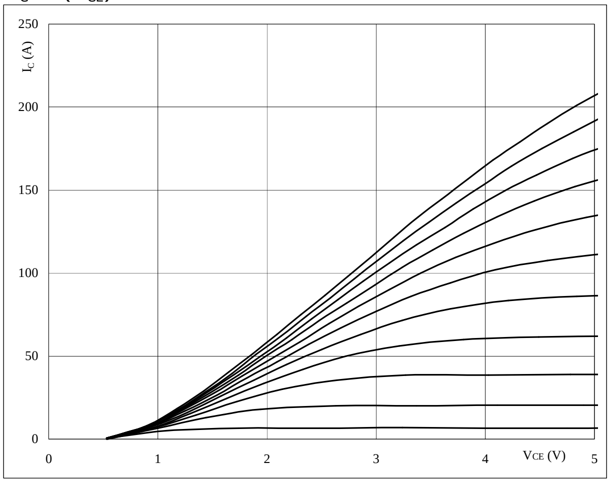
T_j = 25 °C

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

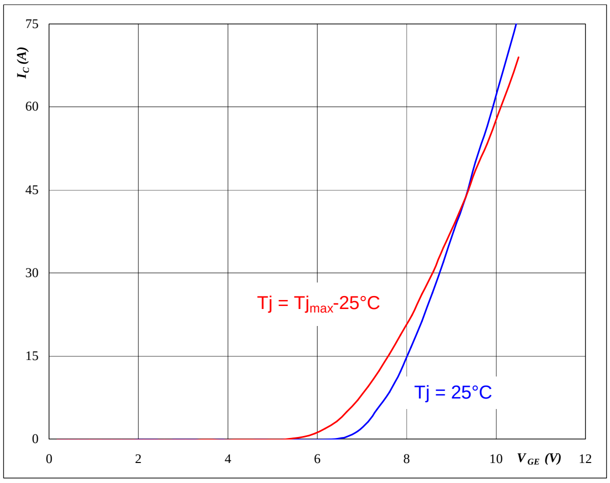
T_j = 150 °C

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

figure 3. **IGBT**

Typical transfer characteristics

$I_c = f(V_{GE})$



At

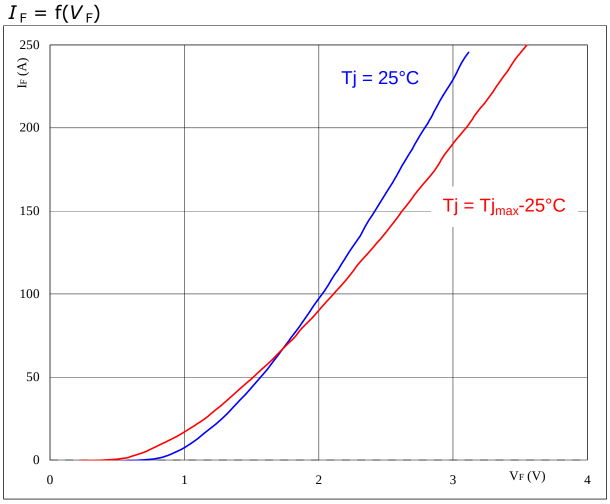
t_p = 250 µs

V_{CE} = 10 V

figure 4. **FWD**

Typical diode forward current as a function of forward voltage

$I_F = f(V_F)$



At

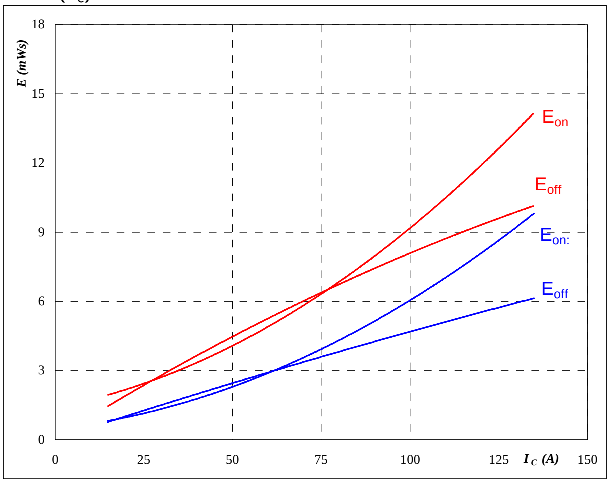
t_p = 250 µs

Output Inverter

figure 5. **IGBT**

Typical switching energy losses
as a function of collector current

$E = f(I_c)$



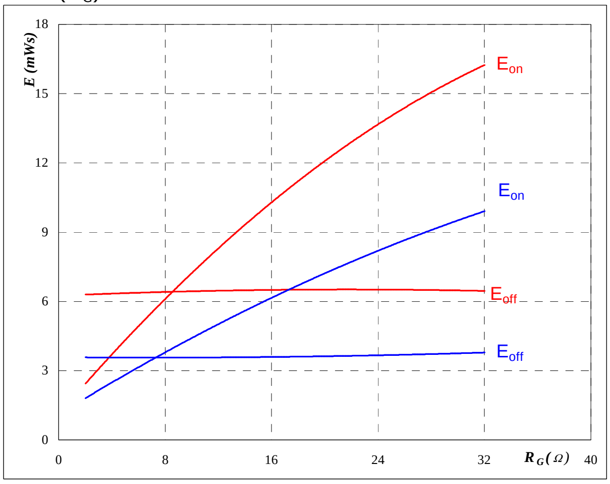
With an inductive load at

T_j =	25/150	°C
V_{CE} =	600	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

$E = f(R_G)$



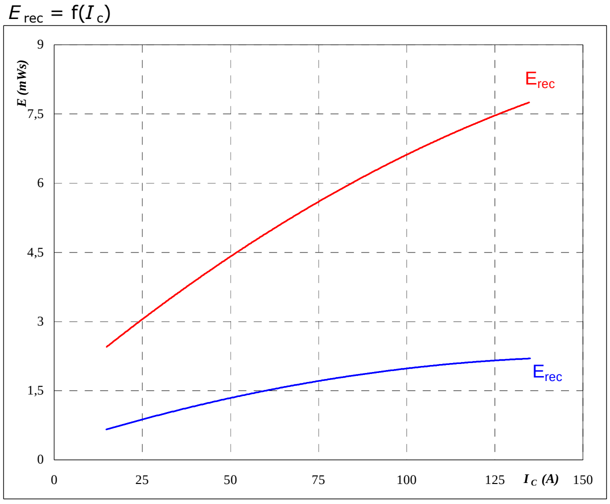
With an inductive load at

T_j =	25/150	°C
V_{CE} =	600	V
V_{GE} =	±15	V
I_C =	75	A

figure 7. **IGBT**

Typical reverse recovery energy loss
as a function of collector current

$E_{rec} = f(I_c)$



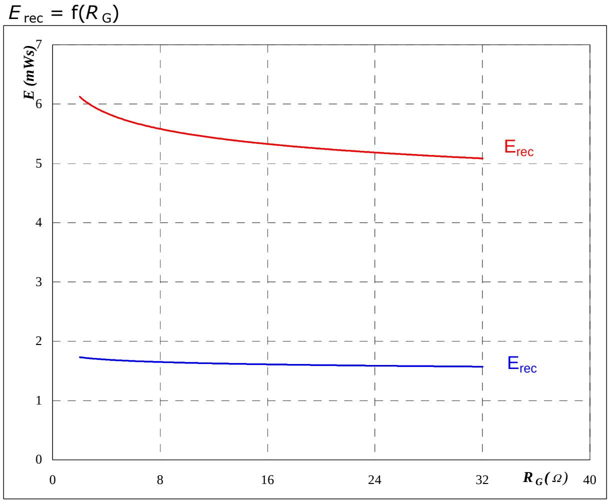
With an inductive load at

T_j =	25/150	°C
V_{CE} =	600	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

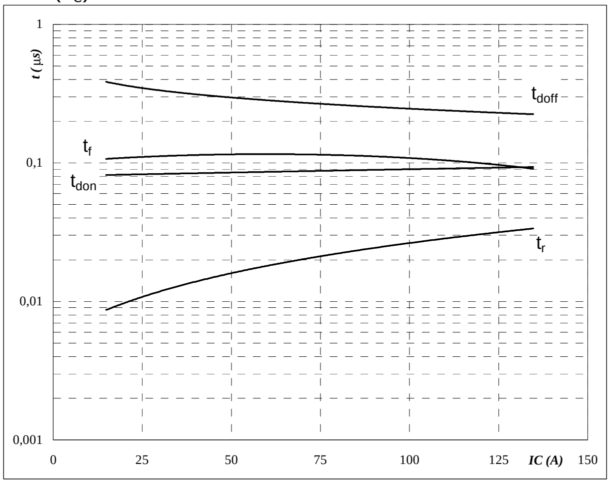
T_j =	25/150	°C
V_{CE} =	600	V
V_{GE} =	±15	V
I_C =	75	A

Output Inverter

figure 9.	**IGBT**

Typical switching times as a function of collector current

$t = f(I_C)$



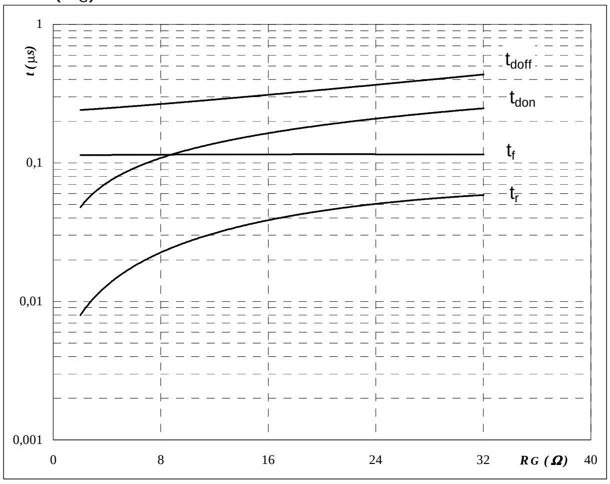
With an inductive load at

T_j =	150	°C
V_{CE} =	600	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

$t = f(R_G)$



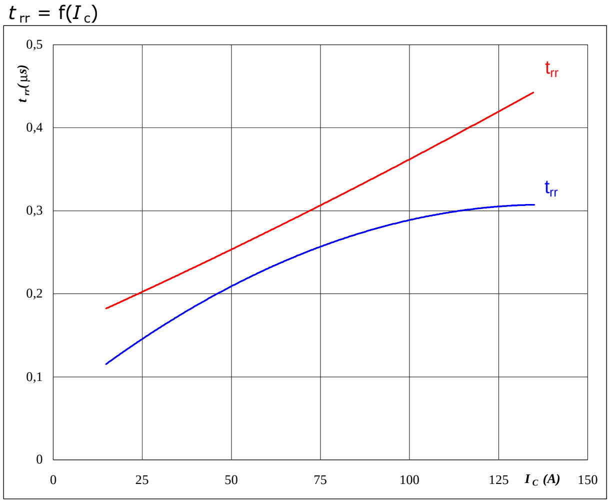
With an inductive load at

T_j =	150	°C
V_{CE} =	600	V
V_{GE} =	±15	V
I_C =	75	A

figure 11.	**FWD**

Typical reverse recovery time as a function of collector current

$t_{rr} = f(I_c)$



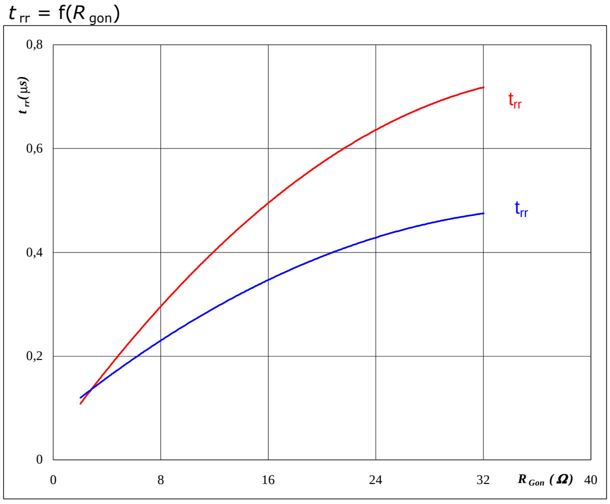
At

T_j =	25/150	°C
V_{CE} =	600	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

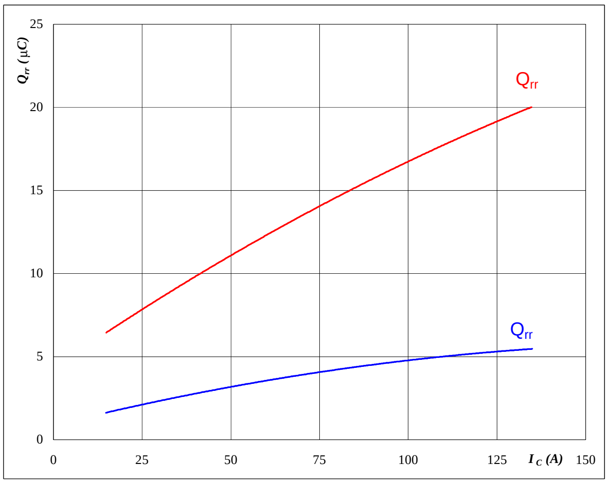
T_j =	25/150	°C
V_R =	600	V
I_F =	75	A
V_{GE} =	±15	V

Output Inverter

figure 13. **FWD**

Typical reverse recovery charge as a function of collector current

$Q_{rr} = f(I_c)$



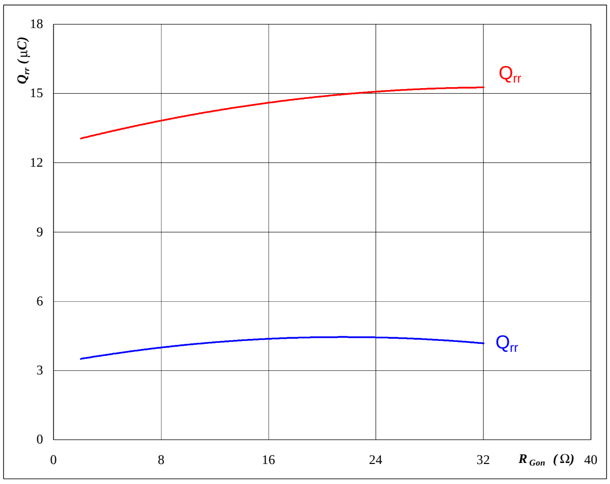
At

T_j =	25/150	°C
V_{CE} =	600	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

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



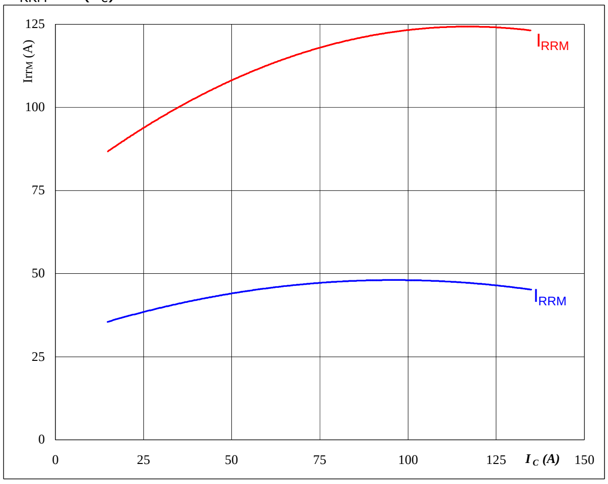
At

T_j =	25/150	°C
V_R =	600	V
I_F =	75	A
V_{GE} =	±15	V

figure 15. **FWD**

Typical reverse recovery current as a function of collector current

$I_{RRM} = f(I_c)$



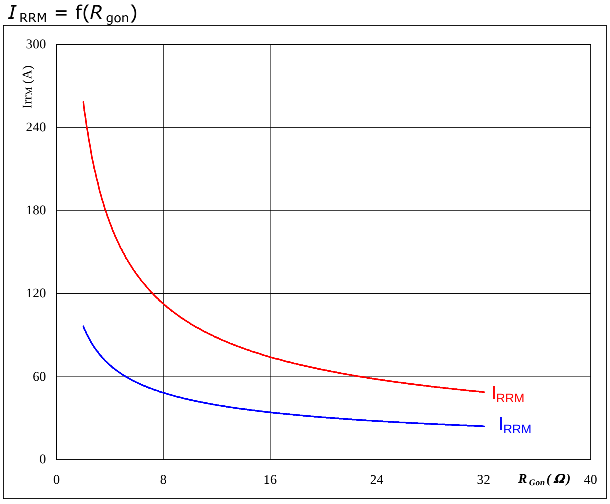
At

T_j =	25/150	°C
V_{CE} =	600	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

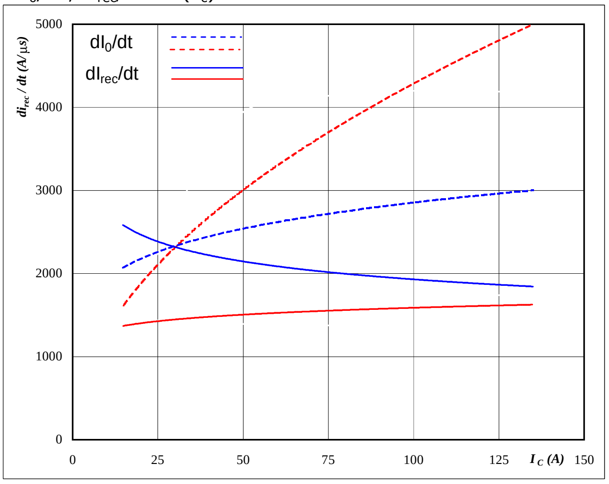
T_j =	25/150	°C
V_R =	600	V
I_F =	75	A
V_{GE} =	±15	V

Output Inverter

figure 17. **FWD**

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

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



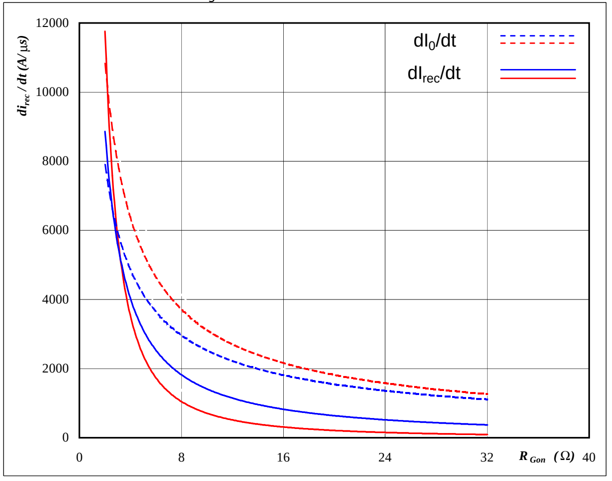
At

T_j =	25/150	°C
V_{CE} =	600	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

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



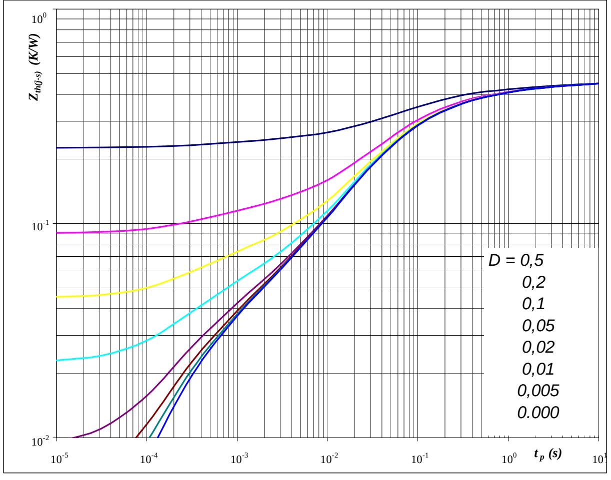
At

T_j =	25/150	°C
V_R =	600	V
I_F =	75	A
V_{GE} =	±15	V

figure 19. **IGBT**

IGBT transient thermal impedance as a function of pulse width

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



At

D =	t_p / T	
$R_{th(j-s)}$ =	0,45	K/W

Single device heated

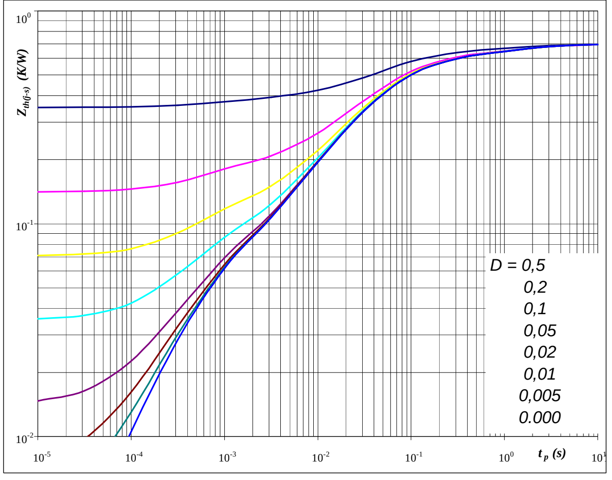
IGBT thermal model values

R (K/W)	Tau (s)
4,69E-02	2,97E+00
8,43E-02	4,53E-01
1,89E-01	7,59E-02
8,82E-02	1,66E-02
2,19E-02	1,69E-03
2,01E-02	2,94E-04

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	
$R_{th(j-s)}$ =	0,70	K/W

Single device heated

FWD thermal model values

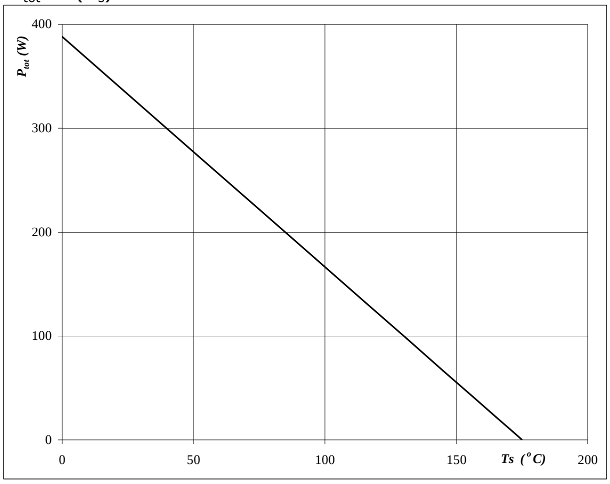
R (K/W)	Tau (s)
1,98E-02	9,93E+00
8,07E-02	1,40E+00
1,69E-01	1,59E-01
3,05E-01	3,55E-02
7,96E-02	7,11E-03
4,91E-02	5,30E-04

Output Inverter

figure 21. **IGBT**

Power dissipation as a function of heatsink temperature

$P_{tot} = f(T_s)$



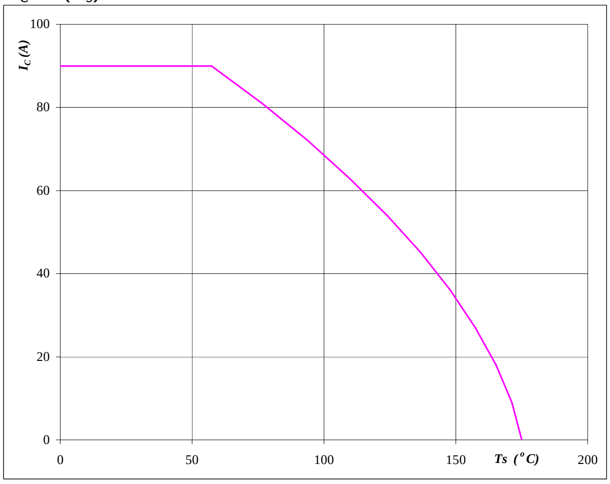
At

T_j = 175 °C

figure 22. **IGBT**

Collector current as a function of heatsink temperature

$I_C = f(T_s)$



At

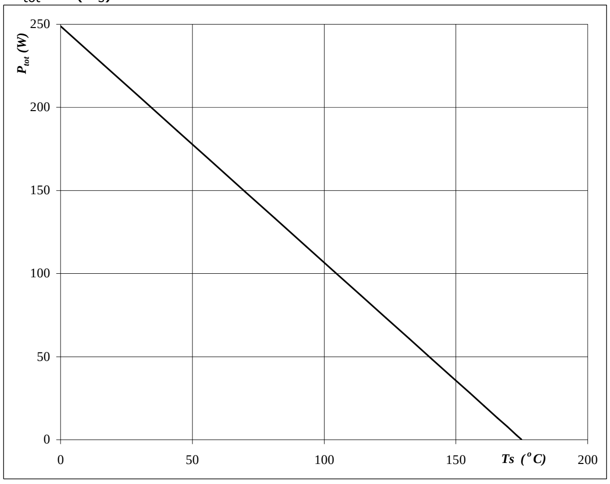
T_j = 175 °C

V_{GE} = 15 V

figure 23. **FWD**

Power dissipation as a function of heatsink temperature

$P_{tot} = f(T_s)$



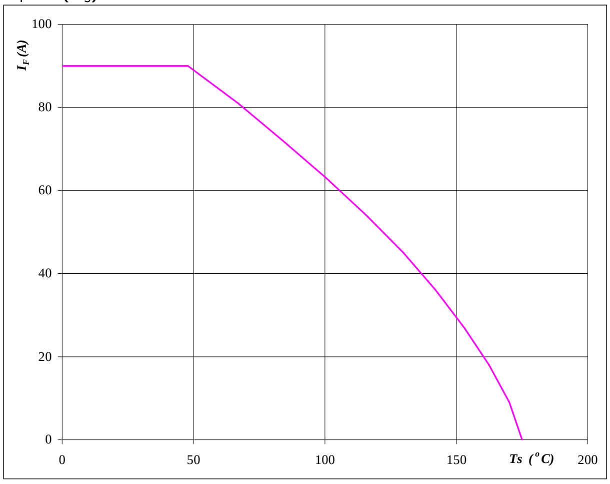
At

T_j = 175 °C

figure 24. **FWD**

Forward current as a function of heatsink temperature

$I_F = f(T_s)$



At

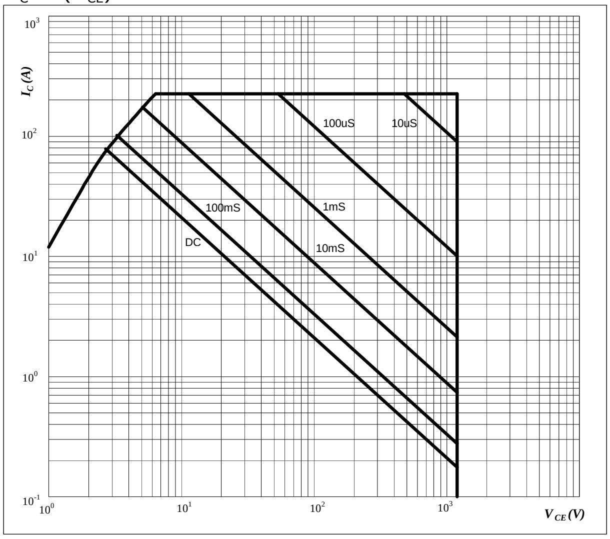
T_j = 175 °C

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

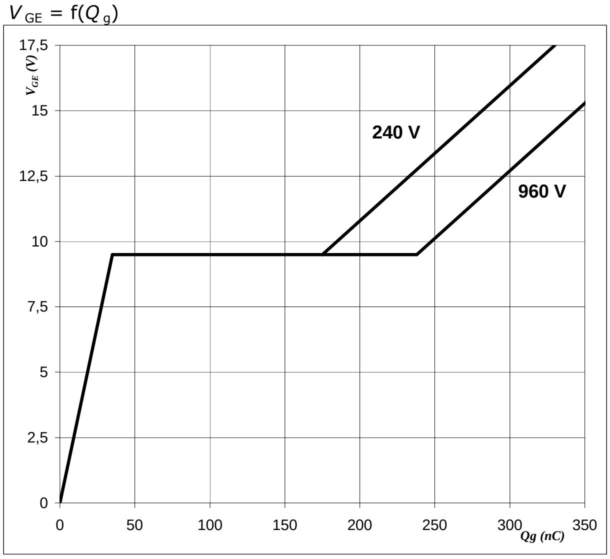
V_{GE} = ±15 V

T_j = T_{jmax}

figure 26. **IGBT**

Gate voltage vs Gate charge

$V_{GE} = f(Q_g)$



At

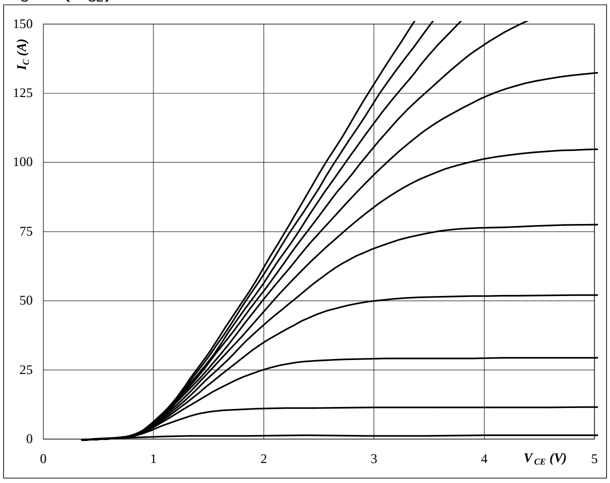
I_C = 75 A

Brake

figure 1.	IGBT

Typical output characteristics

$I_C = f(V_{CE})$



At

t_p = 250 µs

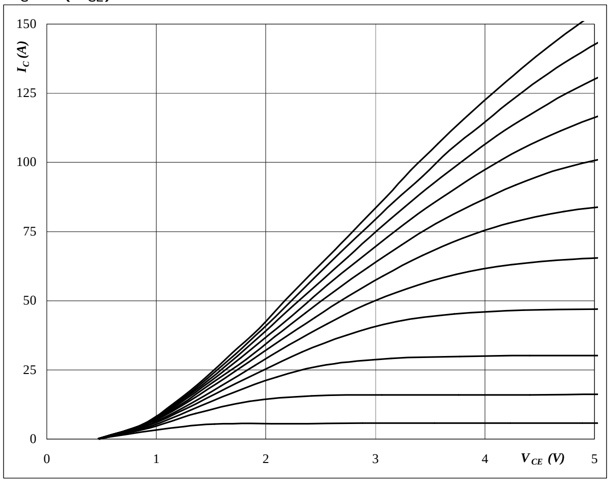
T_j = 25 °C

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

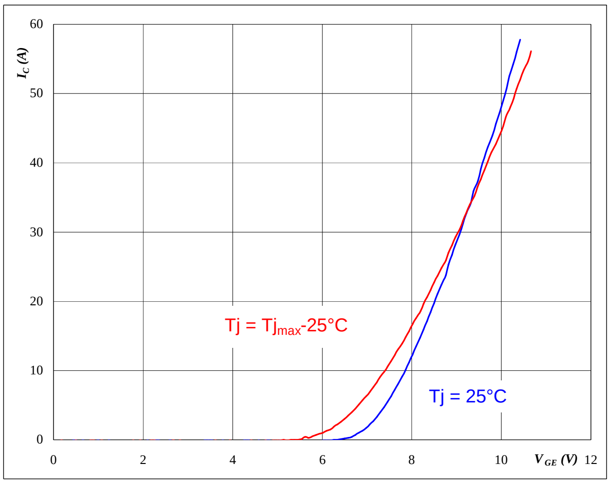
T_j = 150 °C

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

figure 3.	IGBT

Typical transfer characteristics

$I_C = f(V_{GE})$



At

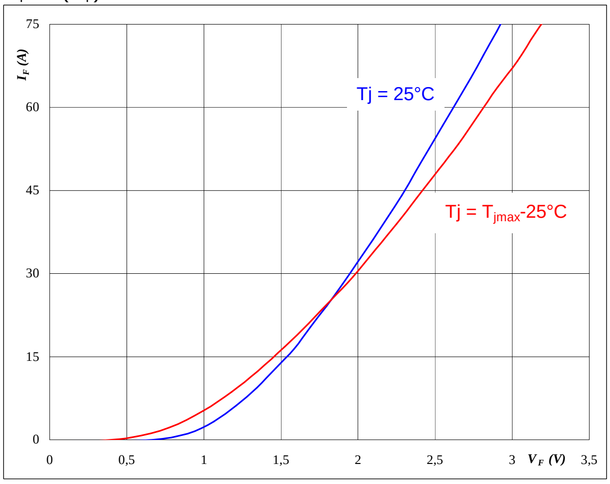
t_p = 250 µs

V_{CE} = 10 V

figure 4.	FWD

Typical diode forward current as a function of forward voltage

$I_F = f(V_F)$



At

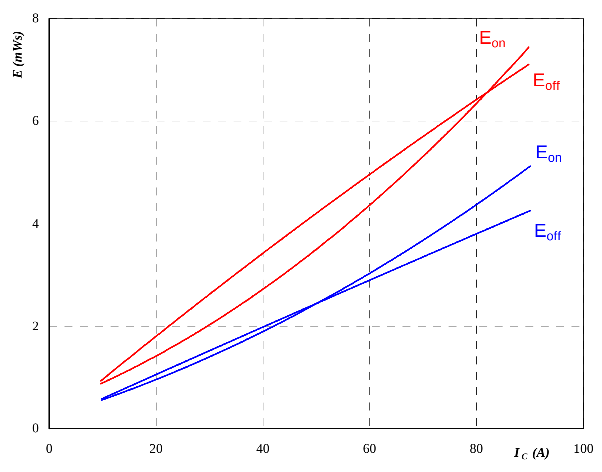
t_p = 250 µs

Brake

figure 5. **IGBT**

Typical switching energy losses as a function of collector current

$E = f(I_C)$



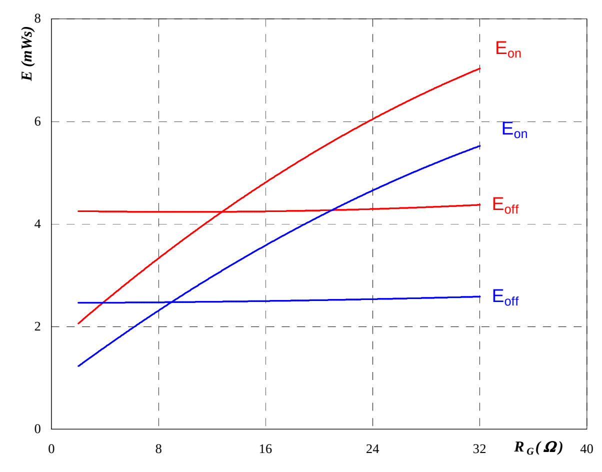
With an inductive load at

T_j =	25/150	°C
V_{CE} =	600	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

$E = f(R_G)$



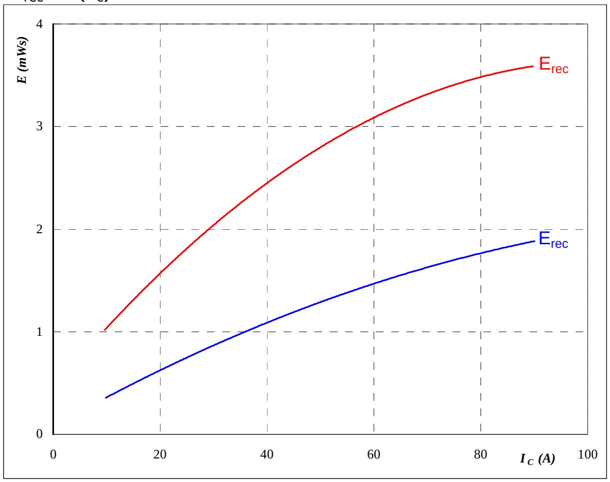
With an inductive load at

T_j =	25/150	°C
V_{CE} =	600	V
V_{GE} =	±15	V
I_C =	50	A

figure 7. **IGBT**

Typical reverse recovery energy loss as a function of collector current

$E_{rec} = f(I_c)$



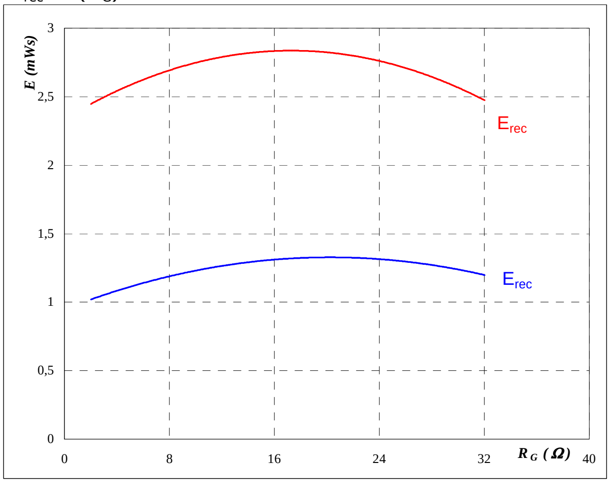
With an inductive load at

T_j =	25/150	°C
V_{CE} =	600	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

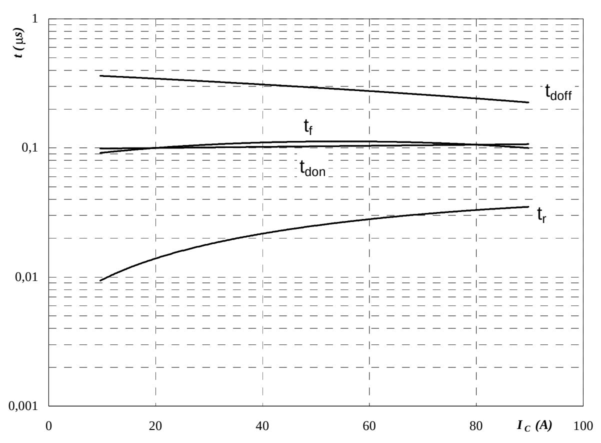
T_j =	25/150	°C
V_{CE} =	600	V
V_{GE} =	±15	V
I_C =	50	A

Brake

figure 9. **IGBT**

Typical switching times as a function of collector current

t = f(I_C)



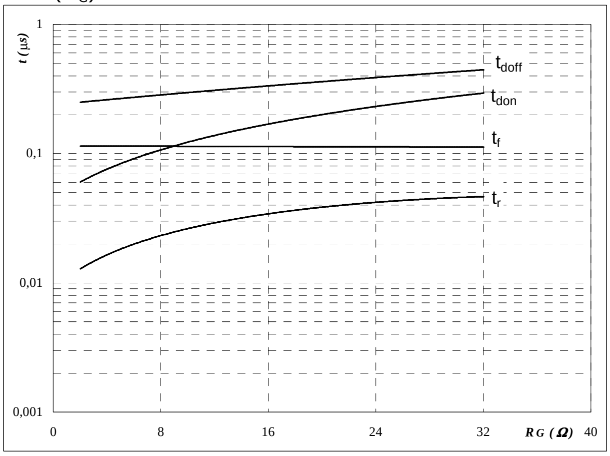
With an inductive load at

T_j =	150	°C
V_{CE} =	600	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)



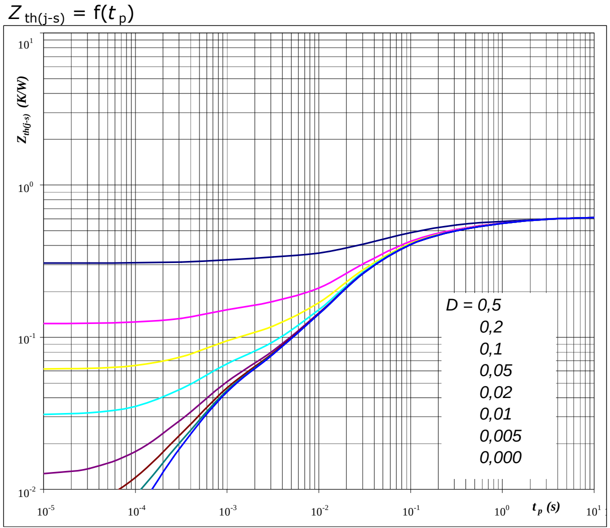
With an inductive load at

T_j =	150	°C
V_{CE} =	600	V
V_{GE} =	±15	V
I_C =	50	A

figure 11. **IGBT**

IGBT transient thermal impedance as a function of pulse width

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



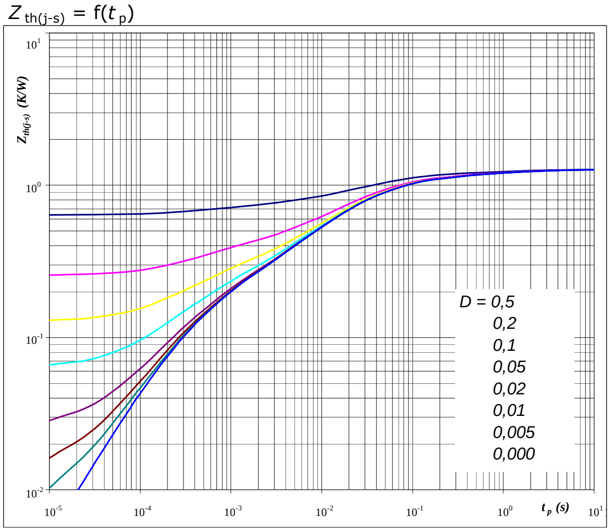
At

D =	t_p / T	
$R_{th(j\text{-}s)}$ =	0,61	K/W

figure 12. **IGBT**

FWD transient thermal impedance as a function of pulse width

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



At

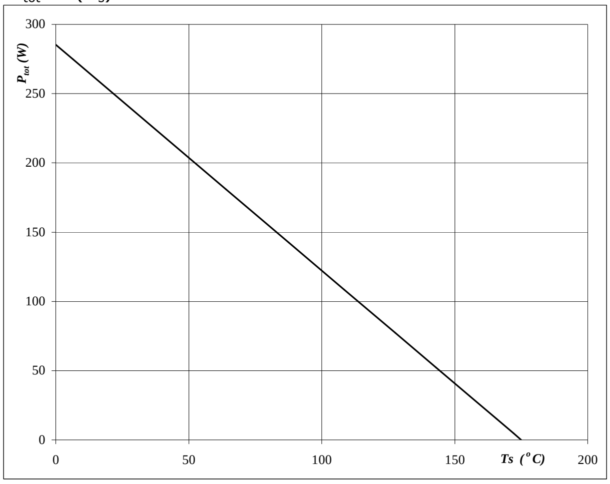
D =	t_p / T	
$R_{th(j\text{-}s)}$ =	1,27	K/W

Brake

figure 13. **IGBT**

Power dissipation as a function of heatsink temperature

$P_{tot} = f(T_s)$



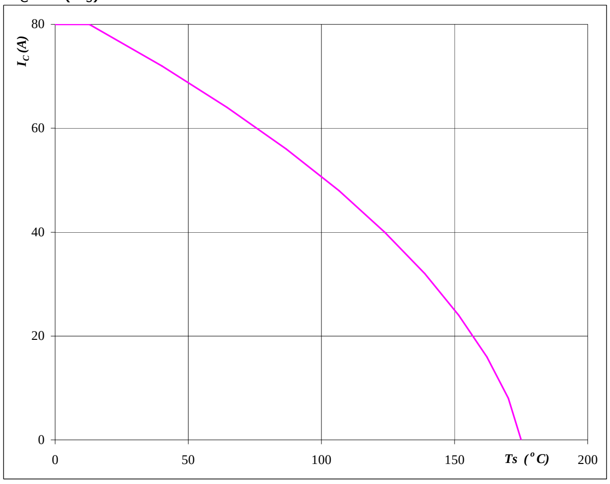
At

T_j = 175 ºC

figure 14. **IGBT**

Collector current as a function of heatsink temperature

$I_C = f(T_s)$



At

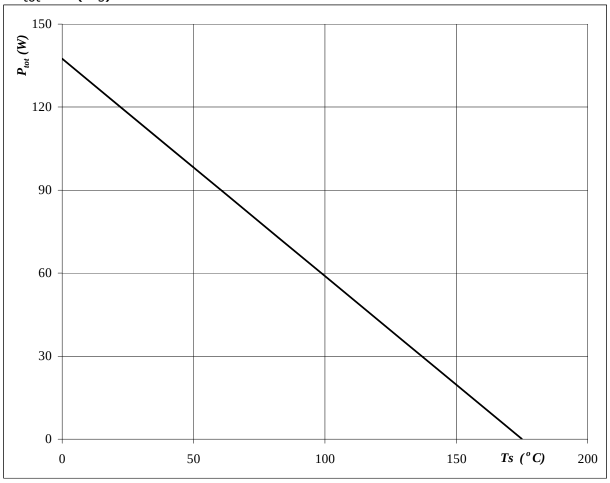
T_j = 175 ºC

V_{GE} = 15 V

figure 15. **FWD**

Power dissipation as a function of heatsink temperature

$P_{tot} = f(T_s)$



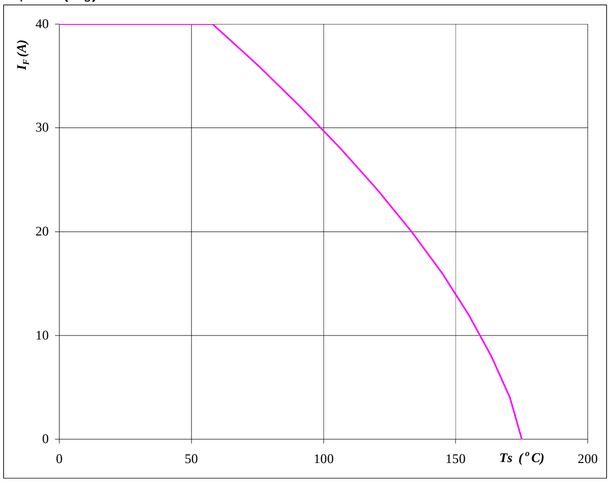
At

T_j = 175 ºC

figure 16. **FWD**

Forward current as a function of heatsink temperature

$I_F = f(T_s)$



At

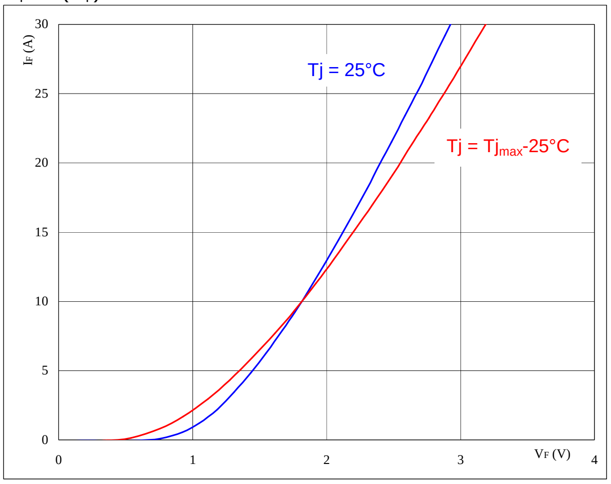
T_j = 175 ºC

Brake Inverse Diode

figure 1. **Brake inverse diode**

Typical diode forward current as a function of forward voltage

$I_F = f(V_F)$



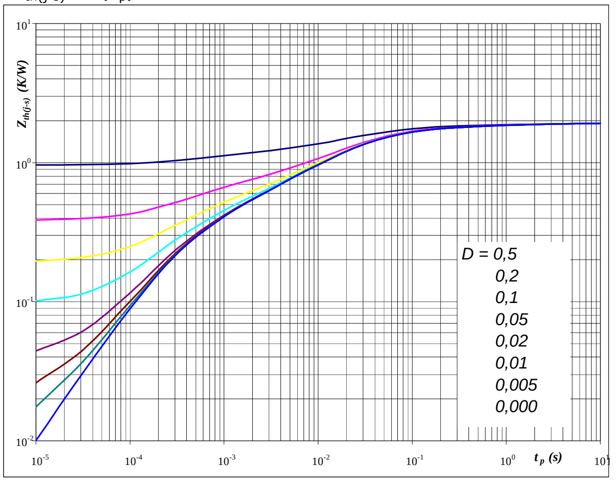
At

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

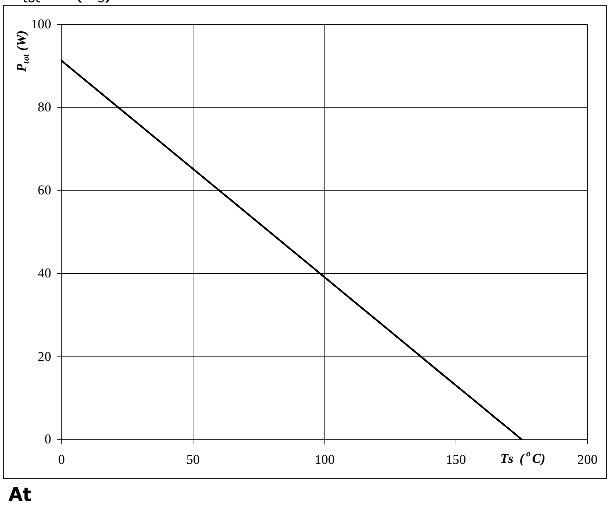
D = t_p / T

$R_{th(j-s)}$ = 1,92 K/W

figure 3. **Brake inverse diode**

Power dissipation as a function of heatsink temperature

$P_{tot} = f(T_s)$



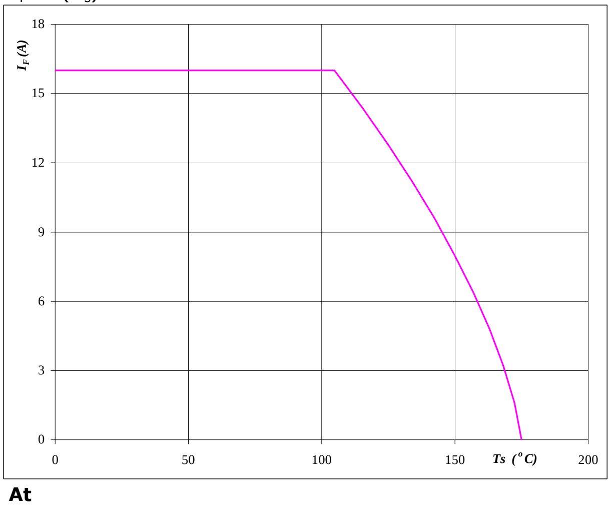
At

T_j = 175 ºC

figure 4. **Brake inverse diode**

Forward current as a function of heatsink temperature

$I_F = f(T_s)$



At

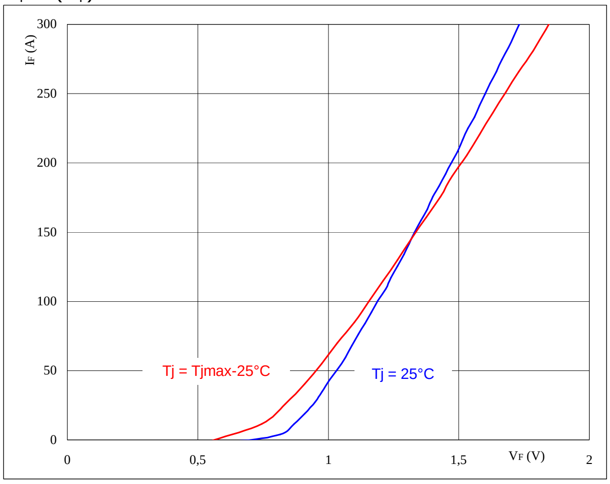
T_j = 175 ºC

Input Rectifier Bridge

figure 1. **Rectifier Diode**

Typical diode forward current as a function of forward voltage

$I_F = f(V_F)$



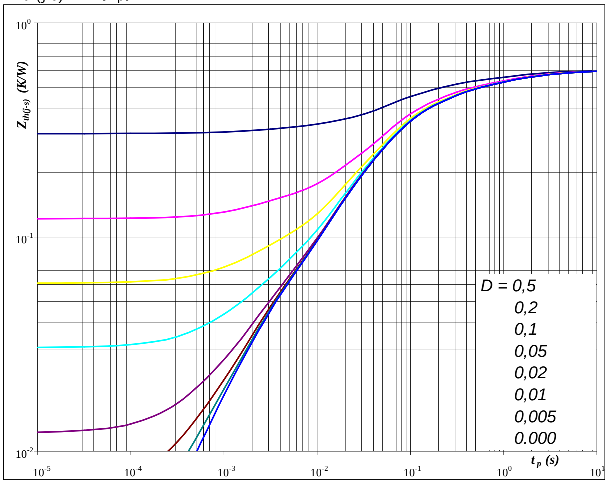
At

t_p =	250	µs

figure 2. **Rectifier Diode**

Diode transient thermal impedance as a function of pulse width

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



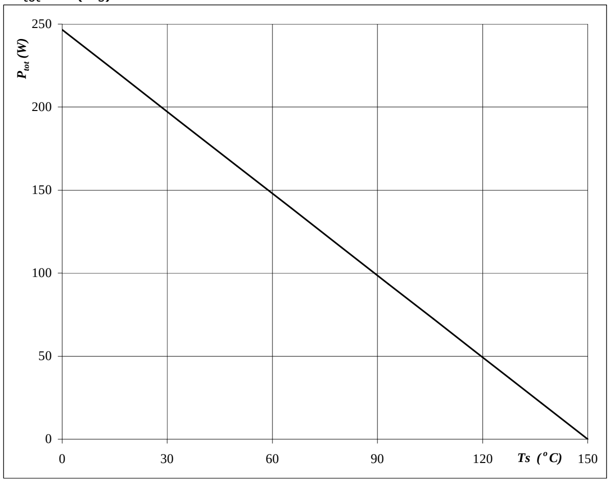
At

D =	t_p / T	
$R_{th(j-s)}$ =	0,61	K/W

figure 3. **Rectifier Diode**

Power dissipation as a function of heatsink temperature

$P_{tot} = f(T_s)$



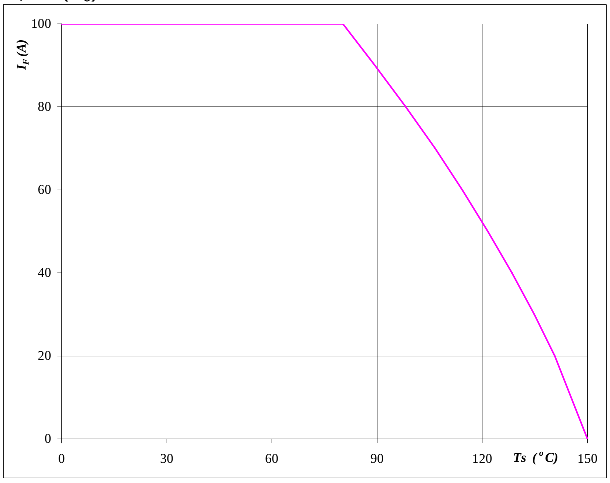
At

T_j =	150	ºC

figure 4. **Rectifier Diode**

Forward current as a function of heatsink temperature

$I_F = f(T_s)$



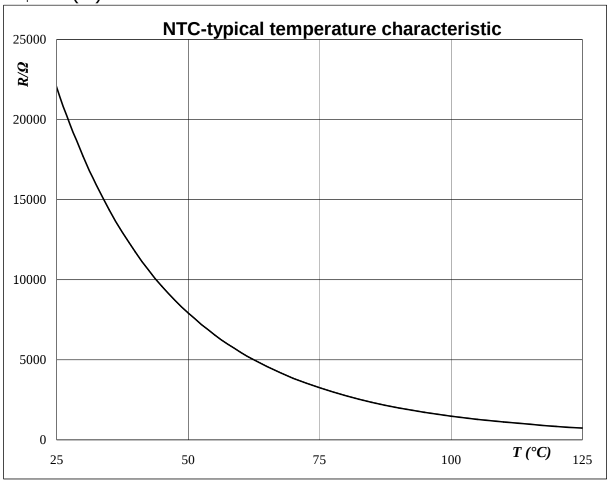
At

T_j =	150	ºC

Thermistor

figure 1.	Thermistor

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



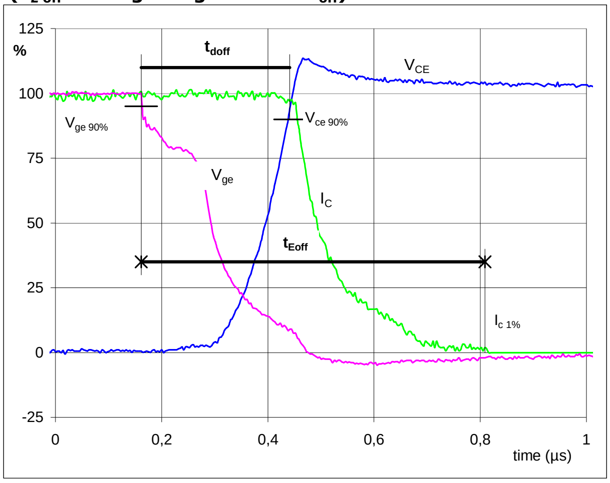
Switching Definitions Output Inverter

General conditions

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

figure 1. **IGBT**

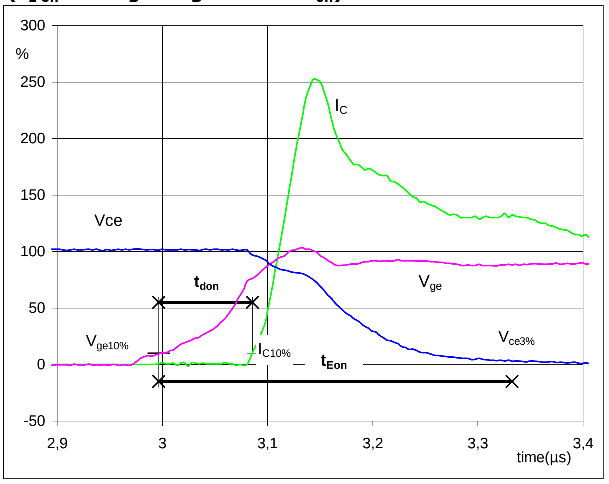
Turn-off Switching Waveforms & definition of t_{doff}, t_{Eoff}
($t_{E\,off}$ = integrating time for E_{off})



V_{GE} (0%) =	-15	V
V_{GE} (100%) =	15	V
V_C (100%) =	600	V
I_C (100%) =	75	A
t_{doff} =	0,27	µs
$t_{E\,off}$ =	0,65	µs

figure 2. **IGBT**

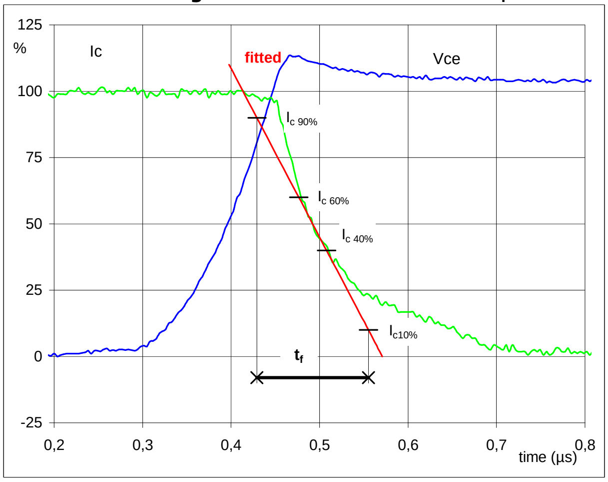
Turn-on Switching Waveforms & definition of t_{don}, t_{Eon}
($t_{E\,on}$ = integrating time for E_{on})



V_{GE} (0%) =	-15	V
V_{GE} (100%) =	15	V
V_C (100%) =	600	V
I_C (100%) =	75	A
t_{don} =	0,09	µs
$t_{E\,on}$ =	0,34	µs

figure 3. **IGBT**

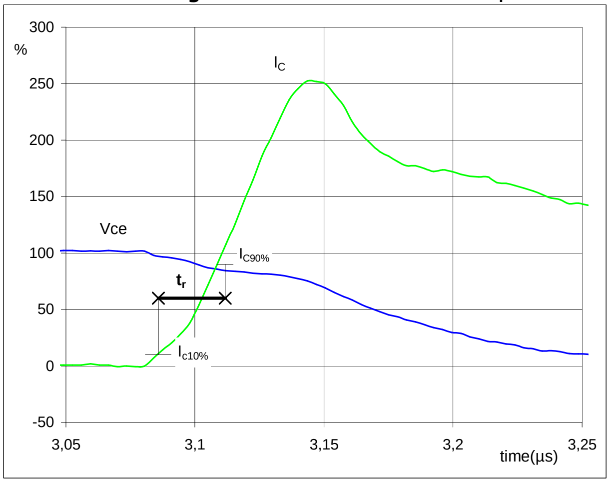
Turn-off Switching Waveforms & definition of t_f



V_C (100%) =	600	V
I_C (100%) =	75	A
t_f =	0,11	µs

figure 4. **IGBT**

Turn-on Switching Waveforms & definition of t_r

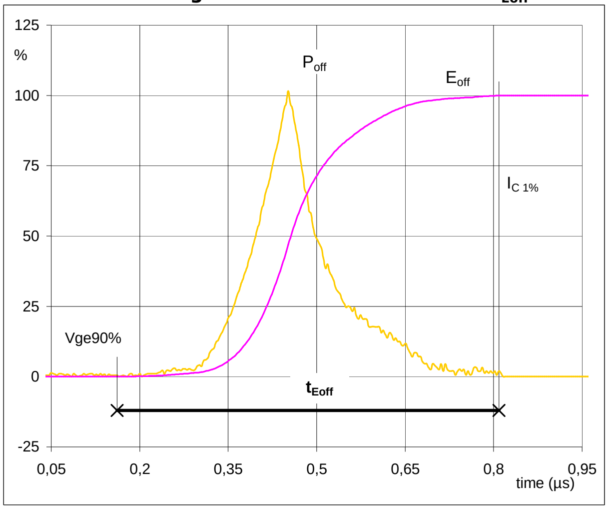


V_C (100%) =	600	V
I_C (100%) =	75	A
t_r =	0,02	µs

Switching Definitions Output Inverter

figure 5. **IGBT**

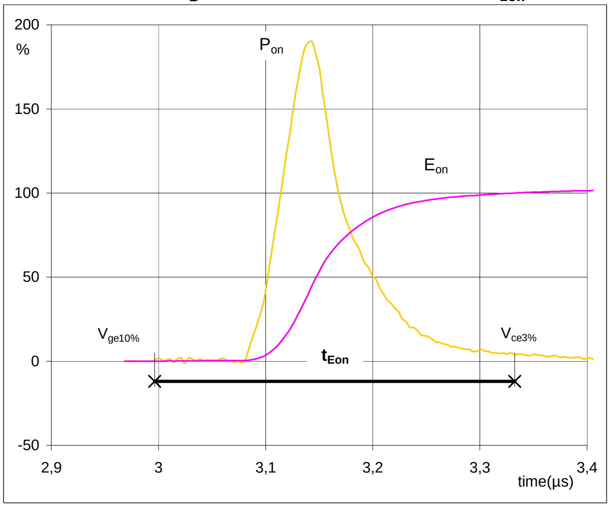
Turn-off Switching Waveforms & definition of t_{Eoff}



P_{off} (100%) =	45,16	kW
E_{off} (100%) =	6,39	mJ
$t_{E\,off}$ =	0,65	µs

figure 6. **IGBT**

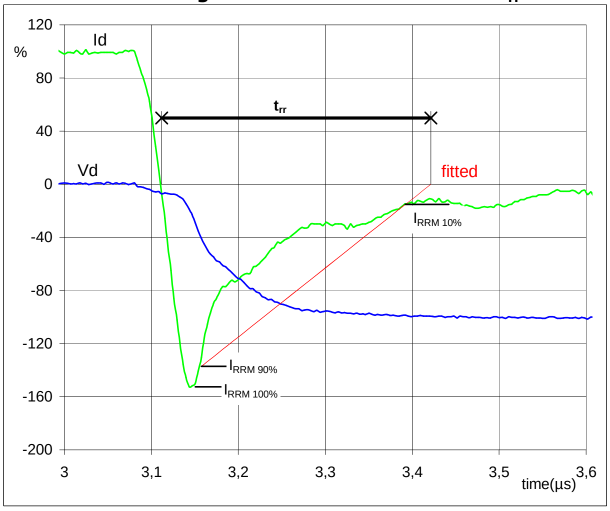
Turn-on Switching Waveforms & definition of t_{Eon}



P_{on} (100%) =	45,16	kW
E_{on} (100%) =	6,39	mJ
$t_{E\,on}$ =	0,34	µs

figure 7. **FWD**

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

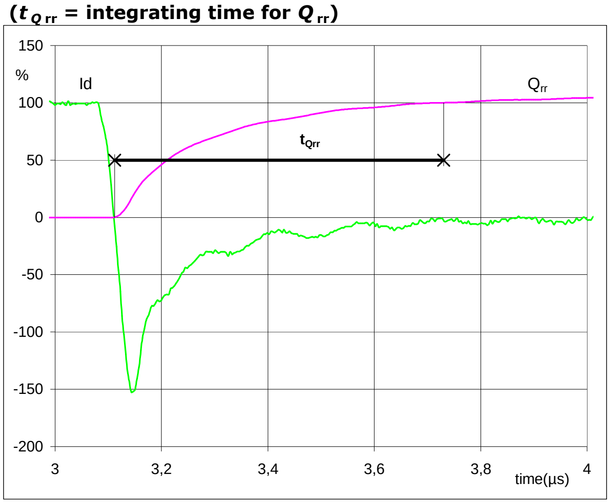


V_d (100%) =	600	V
I_d (100%) =	75	A
I_{RRM} (100%) =	-117	A
t_{rr} =	0,31	µs

Switching Definitions Output Inverter

figure 8. **FWD**

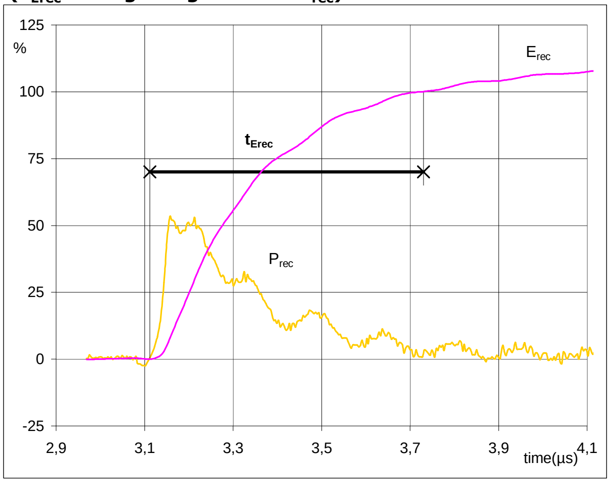
Turn-on Switching Waveforms & definition of t_{Qrr}
($t_{Q\,rr}$ = integrating time for Q_{rr})



I_d (100%) =	75	A
Q_{rr} (100%) =	14,13	µC
t_{Qint} =	0,62	µs

figure 9. **FWD**

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



P_{rec} (100%) =	45,16	kW
E_{rec} (100%) =	5,64	mJ
$t_{E\,rec}$ =	0,62	µs

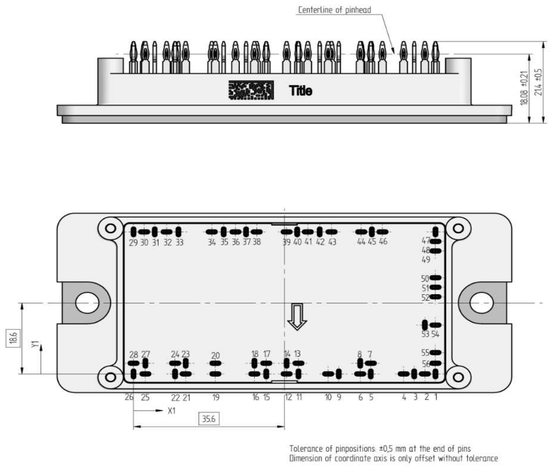
Ordering Code and Marking - Outline - Pinout

Ordering Code & Marking

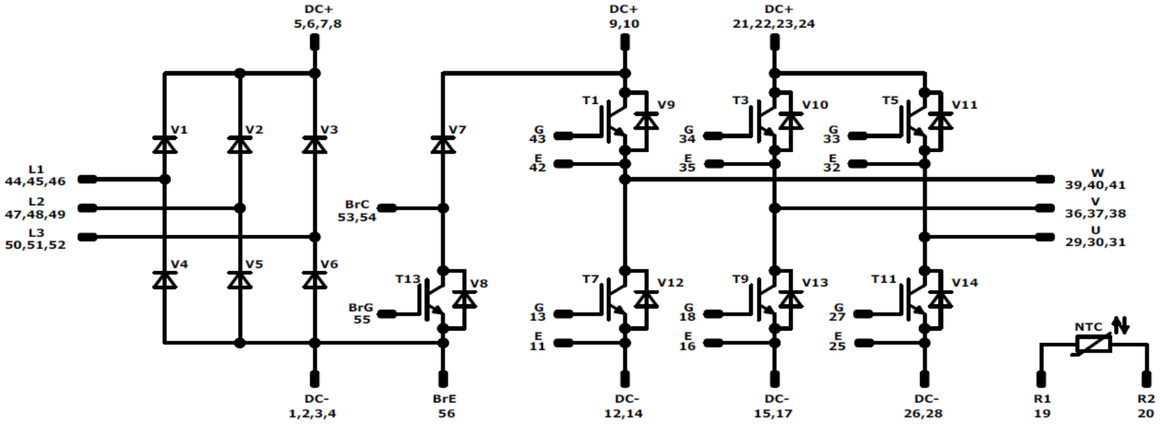
Version	Ordering Code	in DataMatrix as	in packaging barcode as
without thermal paste with Solder pins	V23990-P769-A-PM	P769A	P769A
without thermal paste with Press-fit pins	V23990-P769-AY-PM	P769AY	P769AY
with thermal paste with Solder pins	V23990-P769-A-/3/-PM	P769A	P769A-/3/
with thermal paste with Press-fit pins	V23990-P769-AY-/3/-PM	P769AY	P769AY-/3/

Outline

Pin table [mm]				Pin table [mm]			
Pin	Func	X	Y	Pin	Func	X	Y
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	1200V	70A	Inverter Switch	
V9-V14	FWD	1200V	75A	Inverter Diode	
T13	IGBT	1200V	50A	Brake Switch	
V7	FWD	1200V	25A	Brake Diode	
V8	FWD	1200V	10A	Brake Inverse Diode	
V1-V6	Rectifier	1600V	75A	Rectifier 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-P769-Ax-D7-14	04 May. 2017	New design, packing unit number	All

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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.