Vincotech

10-FY07BIA050SM-M523E38
10-PY07BIA050SM-M523E38Y

datasheet

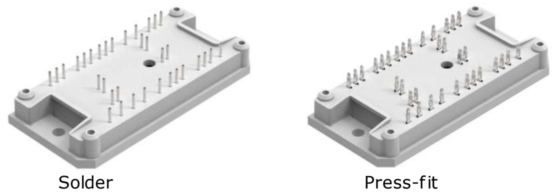
***flow* SOL 1 BI (TL)** **650 V / 50 A**

Features

Booster:
- Dual boost topology
- Ultra HighSpeed IGBT and Diode
- High efficiency bypass rectifier

Inverter:
- Split Output HBridge topology
- HighSpeed IGBT and Diode
- Integrated DC capacitors
- Temperature sensor

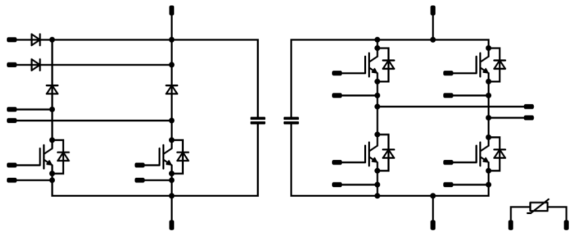
flow 1 12 mm housing



Target applications

- Power Supply
- Solar Inverters
- Welding & Cutting

Schematic



Types

- 10-FY07BIA050SM-M523E38
- 10-PY07BIA050SM-M523E38Y

Maximum Ratings

T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Condition		Value	Unit
H-Bridge Switch					
Collector-emitter voltage	V_{CES}			650	V
Collector current	I_C	$T_j = T_{jmax}$	T_s = 80 °C	41	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}		150	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	78	W
Gate-emitter voltage	V_{GES}			±20	V
Maximum Junction Temperature	T_{jmax}			175	°C

Maximum Ratings

T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Condition		Value	Unit
H-Bridge Diode					
Peak Repetitive Reverse Voltage	V_{RRM}			650	V
Continuous (direct) forward current	I_F	$T_j = T_{jmax}$	T_s = 80 °C	33	A
Repetitive peak forward current	I_{FRM}			60	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	50	W
Maximum Junction Temperature	T_{jmax}			175	°C
Boost Switch					
Collector-emitter voltage	V_{CES}			650	V
Collector current	I_C	$T_j = T_{jmax}$	T_s = 80 °C	41	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}		150	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	78	W
Gate-emitter voltage	V_{GES}			±20	V
Maximum Junction Temperature	T_{jmax}			175	°C
Boost Diode					
Peak Repetitive Reverse Voltage	V_{RRM}			650	V
Continuous (direct) forward current	I_F	$T_j = T_{jmax}$	T_s = 80 °C	29	A
Repetitive peak forward current	I_{FRM}	t_p limited by T_{jmax}		180	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	52	W
Maximum Junction Temperature	T_{jmax}			175	°C
Boost Sw. Protection Diode					
Peak Repetitive Reverse Voltage	V_{RRM}			650	V
Continuous (direct) forward current	I_F	$T_j = T_{jmax}$	T_s = 80 °C	14	A
Repetitive peak forward current	I_{FRM}	T_j < 150 °C		20	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	33	W
Maximum Junction Temperature	T_{jmax}			175	°C

Maximum Ratings

T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Condition		Value	Unit
ByPass Diode					
Peak Repetitive Reverse Voltage	V_{RRM}			1600	V
Continuous (direct) forward current	I_F	$T_j = T_{jmax}$	T_s = 80 °C	40	A
Surge (non-repetitive) forward current	I_{FSM}	50 Hz Single Half Sine Wave t_p = 10 ms	T_j = 150 °C	270	A
Surge current capability	I^2t			370	A^2s
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	47	W
Maximum Junction Temperature	T_{jmax}			150	°C
Capacitor (DC)					
Maximum DC voltage	V_{MAX}			630	V
Operation Temperature	T_{op}			-55…+125	°C
Module Properties					
Thermal Properties					
Storage temperature	T_{stg}			-40…+125	°C
Operation temperature under switching condition	T_{jop}			-40…(T_{jmax} - 25)	°C
Isolation Properties					
Isolation voltage	V_{isol}	DC Test Voltage*	t_p = 2 s	6000	V
		AC Voltage	t_p = 1 min	2500	V
Creepage distance				min. 12,7	mm
Clearance				min. 12,7	mm
Comparative Tracking Index	CTI			> 200	

*100 % tested in production

Characteristic Values

Parameter	Symbol	Conditions					Value			Unit
			V_{GE} [V] V_{GS} [V]	V_{CE} [V] V_{DS} [V] V_F [V]	I_C [A] I_D [A] I_F [A]	T_j [°C]	Min	Typ	Max	
H-Bridge Switch										
Static										
Gate-emitter threshold voltage	$V_{GE(th)}$	$V_{GE} = V_{CE}$			0,0005	25	3,3	4	4,7	V
Collector-emitter saturation voltage	V_{CEsat}		15		50	25 125		1,82 2,00	2,22	V
Collector-emitter cut-off current	I_{CES}		0	650		25			40	µA
Gate-emitter leakage current	I_{GES}		20	0		25			120	nA
Internal gate resistance	r_g							none		Ω
Input capacitance	C_{ies}	f = 1 MHz	0	25		25		3000		pF
Output capacitance	C_{oes}							50		
Reverse transfer capacitance	C_{res}							11		
Gate charge	Q_g		15	520	50	25		120		nC
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	phase-change material λ = 3,4 W/mK						1,22		K/W
Dynamic										
Turn-on delay time	$t_{d(on)}$	R_{goff} = 8 Ω R_{gon} = 8 Ω	±15	350	50	25 125 150		60 60 61		ns
Rise time	t_r					25 125 150		9 11 11		
Turn-off delay time	$t_{d(off)}$					25 125 150		68 80 83		
Fall time	t_f					25 125 150		6 8 9		
Turn-on energy (per pulse)	E_{on}	Q_{rFWD} = 1,5 µC Q_{rFWD} = 2,8 µC Q_{rFWD} = 3,1 µC				25 125 150		0,658 0,851 0,897		mWs
Turn-off energy (per pulse)	E_{off}					25 125 150		0,255 0,426 0,473		

Characteristic Values

Parameter	Symbol	Conditions					Value			Unit
			V_{GE} [V] V_{GS} [V]	V_{CE} [V] V_{DS} [V] V_F [V]	I_C [A] I_D [A] I_F [A]	T_j [°C]	Min	Typ	Max	
H-Bridge Diode										
Static										
Forward voltage	V_F				30	25		1,52	1,7	V
Reverse leakage current	I_r			650		25			1,6	µA
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	phase-change material λ = 3,4 W/mK						1,92		K/W
Dynamic										
Peak recovery current	I_{RRM}	di/dt = 4520 A/µs di/dt = 4636 A/µs di/dt = 4022 A/µs	±15	350	50	25 125 150		34 45 47		A
Reverse recovery time	t_{rr}					25 125 150		86 126 137		ns
Recovered charge	Q_r					25 125 150		1,485 2,752 3,072		µC
Reverse recovered energy	E_{rec}					25 125 150		0,325 0,649 0,731		mWs
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 125 150		272 387 400		A/µs

Characteristic Values

Parameter	Symbol	Conditions	V_{GE} [V] V_{GS} [V]	V_{CE} [V] V_{DS} [V] V_F [V]	I_C [A] I_D [A] I_F [A]	T_j [°C]	Min	Typ	Max	Unit
Boost Switch										
Static										
Gate-emitter threshold voltage	$V_{GE(th)}$	$V_{GE} = V_{CE}$			0,0005	25	3,3	4	4,7	V
Collector-emitter saturation voltage	V_{CEsat}		15		50	25 125		1,82 2,00	2,22	V
Collector-emitter cut-off current	I_{CES}		0	650		25			40	µA
Gate-emitter leakage current	I_{GES}		20	0		25			120	nA
Internal gate resistance	r_g							none		Ω
Input capacitance	C_{ies}	f = 1 MHz	0	25		25		3000		pF
Output capacitance	C_{oes}							50		
Reverse transfer capacitance	C_{res}							11		
Gate charge	Q_g		15	520	50	25		120		nC
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	phase-change material λ = 3,4 W/mK						1,22		K/W
Dynamic										
Turn-on delay time	$t_{d(on)}$	R_{goff} = 8 Ω R_{gon} = 8 Ω	15/0	400	50	25 125 150		21 21 21		ns
Rise time	t_r					25 125 150		8 10 10		
Turn-off delay time	$t_{d(off)}$					25 125 150		132 148 153		
Fall time	t_f					25 125 150		3 7 9		
Turn-on energy (per pulse)	E_{on}	Q_{rFWD} = 0,3 µC Q_{rFWD} = 1,1 µC Q_{rFWD} = 1,4 µC				25 125 150		0,605 0,826 0,888		mWs
Turn-off energy (per pulse)	E_{off}					25 125 150		0,215 0,377 0,422		

Characteristic Values

Parameter	Symbol	Conditions					Value			Unit
			V_{GE} [V] V_{GS} [V]	V_{CE} [V] V_{DS} [V] V_F [V]	I_C [A] I_D [A] I_F [A]	T_j [°C]	Min	Typ	Max	
Boost Diode										
Static										
Forward voltage	V_F				30	25 125		2,46 2,03	2,6	V
Reverse leakage current	I_r			665		25			10	µA
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	phase-change material λ = 3,4 W/mK						1,83		K/W
Dynamic										
Peak recovery current	I_{RRM}	di/dt = 6055 A/µs di/dt = 4295 A/µs di/dt = 3281 A/µs	15/0	400	50	25 125 150		34 44 47		A
Reverse recovery time	t_{rr}					25 125 150		17 100 106		ns
Recovered charge	Q_r					25 125 150		0,654 1,665 1,954		µC
Reverse recovered energy	E_{rec}					25 125 150		0,134 0,422 0,500		mWs
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 125 150		6286 2523 1606		A/µs
Boost Sw. Protection Diode										
Static										
Forward voltage	V_F				10	25 125		1,67 1,56	1,87	V
Reverse leakage current	I_r			650		25			0,14	µA
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	phase-change material λ = 3,4 W/mK						2,87		K/W

Characteristic Values

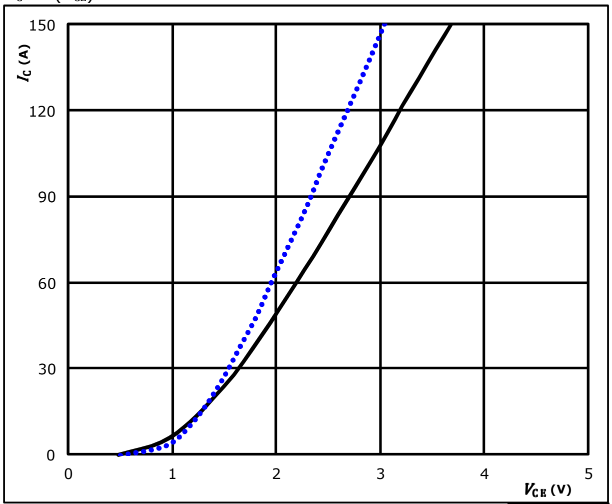
Parameter	Symbol	Conditions					Value			Unit
			V_{GE} [V] V_{GS} [V]	V_{CE} [V] V_{DS} [V] V_{F} [V]	I_{C} [A] I_{D} [A] I_{F} [A]	T_{j} [°C]	Min	Typ	Max	
ByPass Diode										
Static										
Forward voltage	V_{F}				35	25 125	0,8	1,17 1,13	1,6	V
Reverse leakage current	I_{r}			1600		25 145			50 1100	µA
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	phase-change material λ = 3,4 W/mK						1,48		K/W
Capacitor (DC)										
Capacitance	C							47		nF
Tolerance							-10		+10	%
Climatic category								55/125/56		
Thermistor										
Rated resistance	R					25		22		kΩ
Deviation of R_{100}	$\Delta_{R/R}$	R_{100} = 1486 Ω				100	-12		+14	%
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	

H-Bridge Switch Characteristics

figure 1. **IGBT**

Typical output characteristics

$I_C = f(V_{CE})$

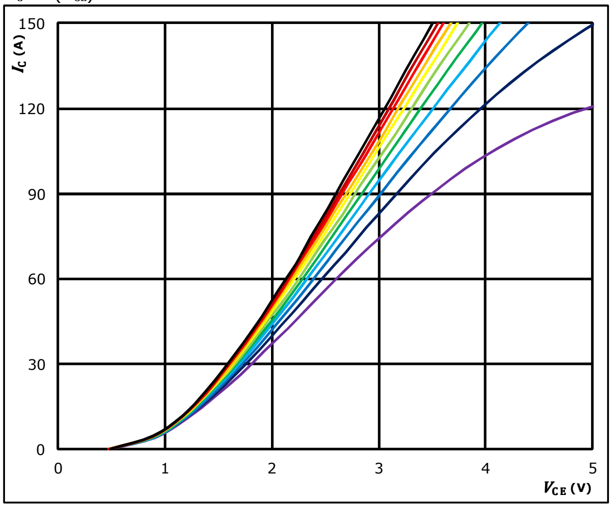


t_p =	250	μs		25 °C	············
V_{GE} =	15	V	T_j:	125 °C	———

figure 2. **IGBT**

Typical output characteristics

$I_C = f(V_{CE})$

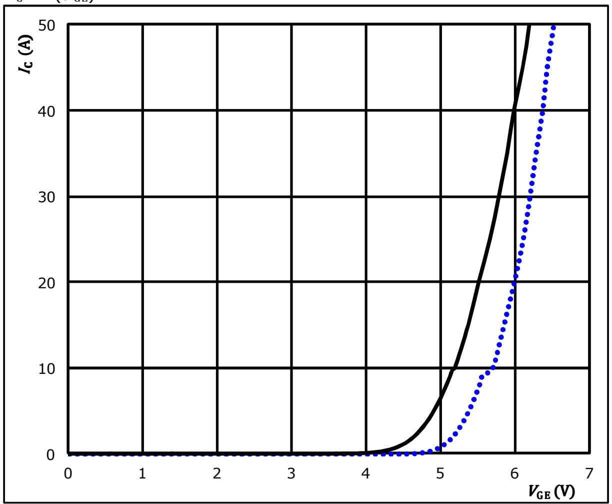


t_p =	250	μs
T_j =	125	°C
V_{GE} from	8 V to 18 V in steps of 1 V	

figure 3. **IGBT**

Typical transfer characteristics

$I_C = f(V_{GE})$

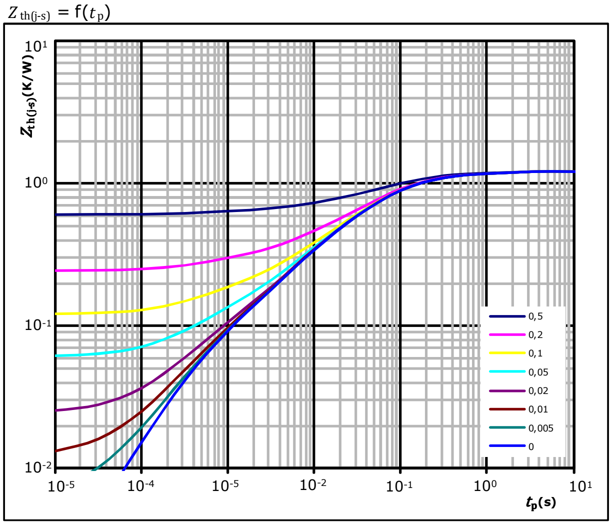


t_p =	100	μs		25 °C	············
V_{CE} =	10	V	T_j:	125 °C	———

figure 4. **IGBT**

Transient Thermal Impedance as function of Pulse duration

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



D =	t_p / T	
$R_{th(j\text{-}s)}$ =	1,22	K/W

IGBT thermal model values

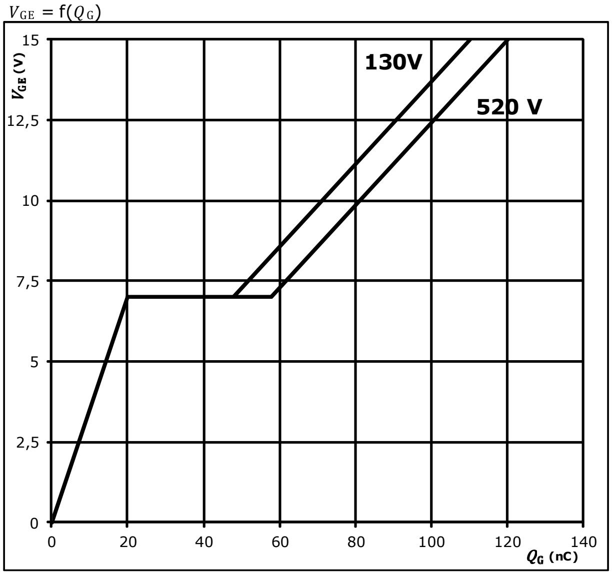
R (K/W)	τ (s)
4,40E-01	1,12E-01
3,96E-01	3,56E-02
1,75E-01	7,55E-03
3,44E-02	1,97E-03
4,80E-02	4,33E-04

H-Bridge Switch Characteristics

figure 5. **IGBT**

Gate voltage vs Gate charge

$V_{GE} = f(Q_G)$



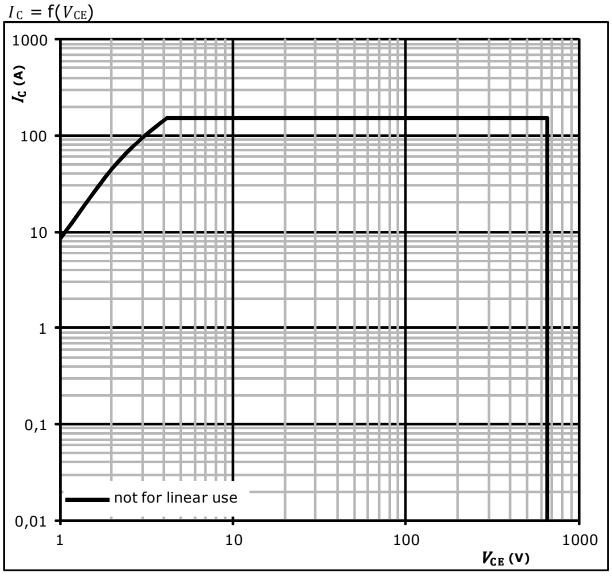
At

I_C=	50	A

Safe operating area **IGBT**

Safe operating area

$I_C = f(V_{CE})$



At

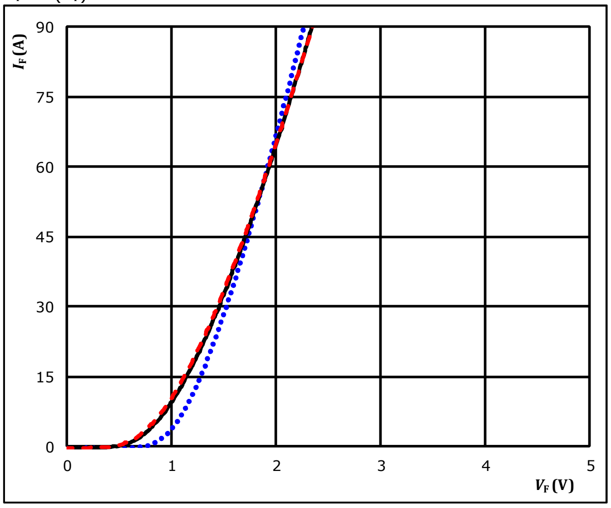
D =	single pulse	
T_c =	25	ºC
V_{GE} =	15	V
T_j =	T_{jmax}	

H-Bridge Diode Characteristics

figure 1. **FWD**

Typical forward characteristics

$I_F = f(V_F)$



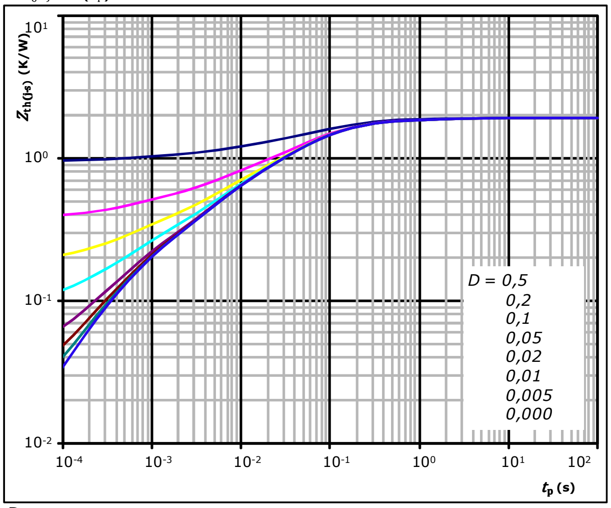
t_p = 250 µs

T_j: 25 °C, 125 °C, 150 °C

figure 2. **FWD**

Transient thermal impedance as a function of pulse width

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



D = t_p / T

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

FWD thermal model values

R (K/W)	τ (s)
9,41E-02	2,25E+00
3,44E-01	2,12E-01
8,56E-01	5,84E-02
3,61E-01	9,83E-03
1,37E-01	2,89E-03
1,27E-01	4,79E-04

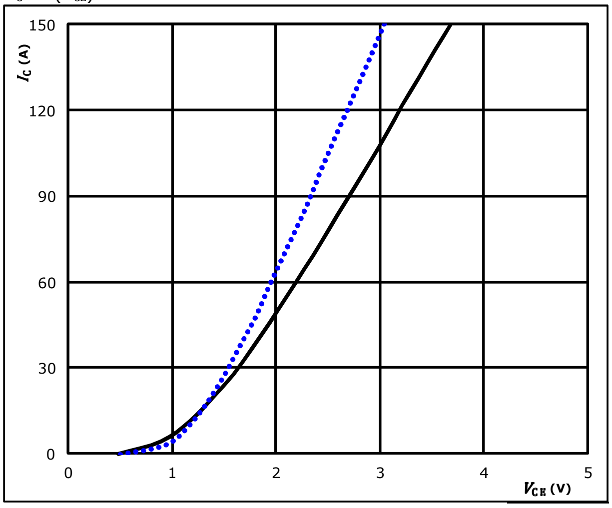
Vincotech

Boost Switch Characteristics

figure 1. **IGBT**

Typical output characteristics

$I_C = f(V_{CE})$

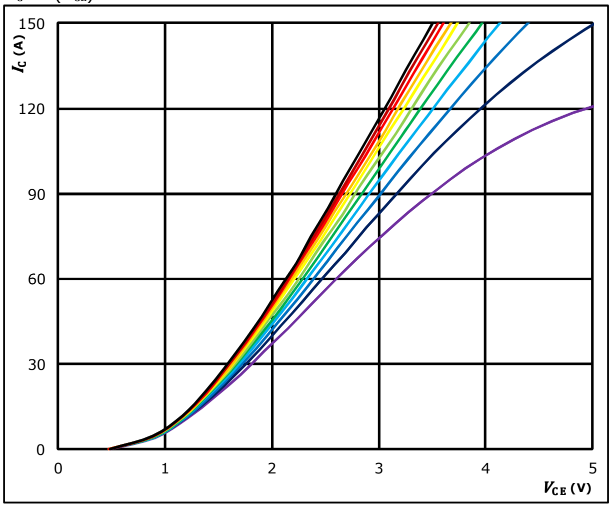


t_p =	250	μs		25 °C	············
V_{GE} =	15	V	T_j:	125 °C	————

figure 2. **IGBT**

Typical output characteristics

$I_C = f(V_{CE})$

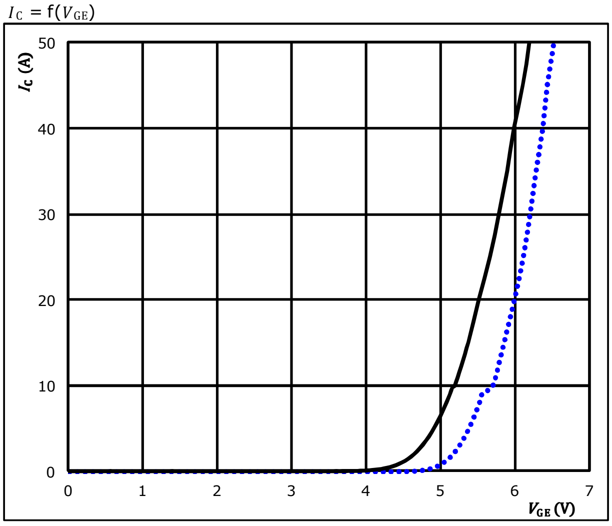


t_p =	250	μs
T_j =	125	°C
V_{GE} from	8 V to 18 V in steps of 1 V	

figure 3. **IGBT**

Typical transfer characteristics

$I_C = f(V_{GE})$

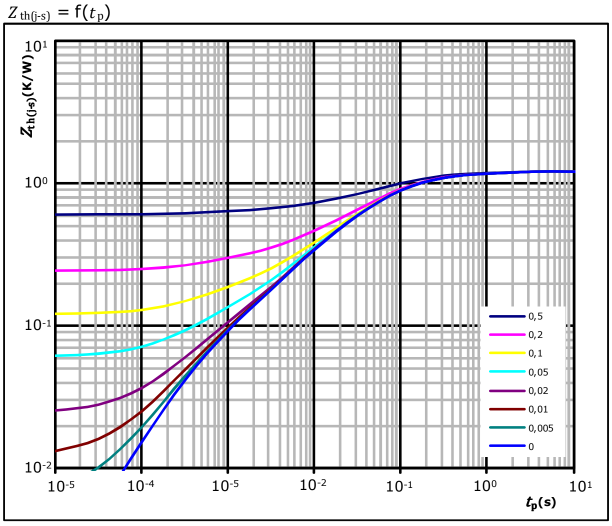


t_p =	100	μs		25 °C	············
V_{CE} =	10	V	T_j:	125 °C	————

figure 4. **IGBT**

Transient Thermal Impedance as function of Pulse duration

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



D =	t_p / T	
$R_{th(j-s)}$ =	1,22	K/W

IGBT thermal model values

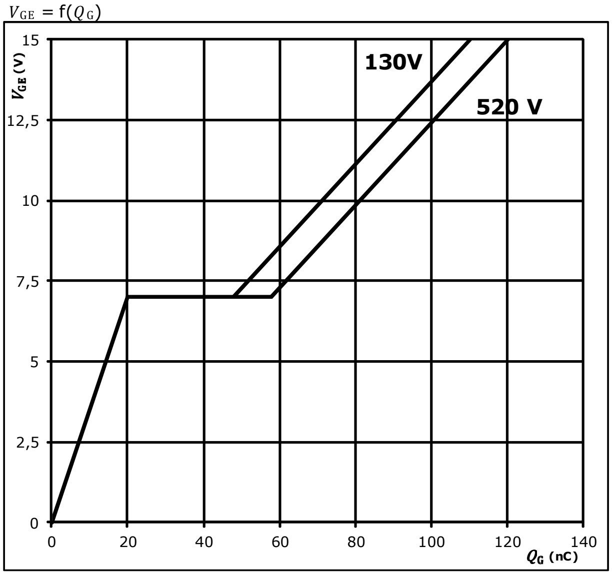
R (K/W)	τ (s)
4,40E-01	1,12E-01
3,96E-01	3,56E-02
1,75E-01	7,55E-03
3,44E-02	1,97E-03
4,80E-02	4,33E-04

Boost Switch Characteristics

figure 5.	IGBT

Gate voltage vs Gate charge

$V_{GE} = f(Q_G)$



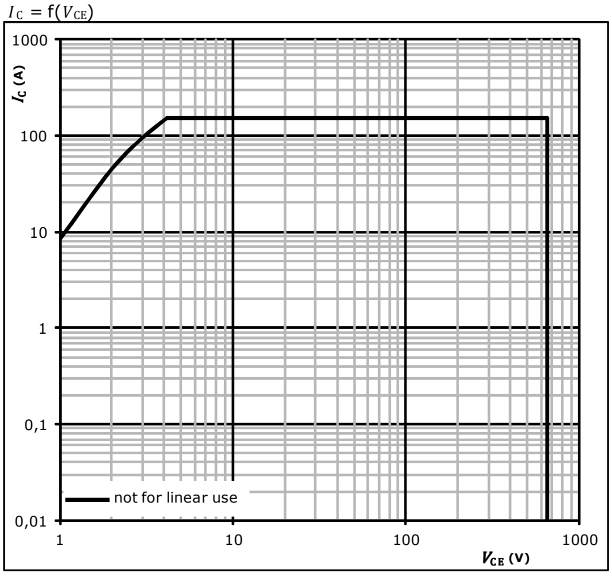
At

I_C= 50 A

Safe operating area	IGBT

Safe operating area

$I_C = f(V_{CE})$



At

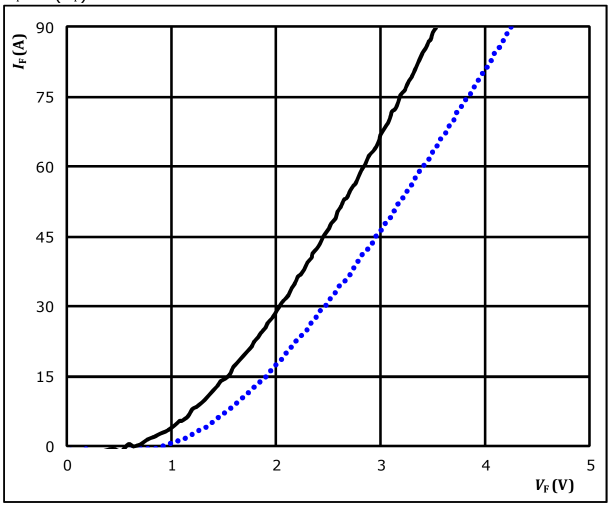
D =	single pulse	
T_c =	25	ºC
V_{GE} =	15	V
T_j =	T_{jmax}	

Boost Diode Characteristics

figure 1. **FWD**

Typical forward characteristics

$I_F = f(V_F)$



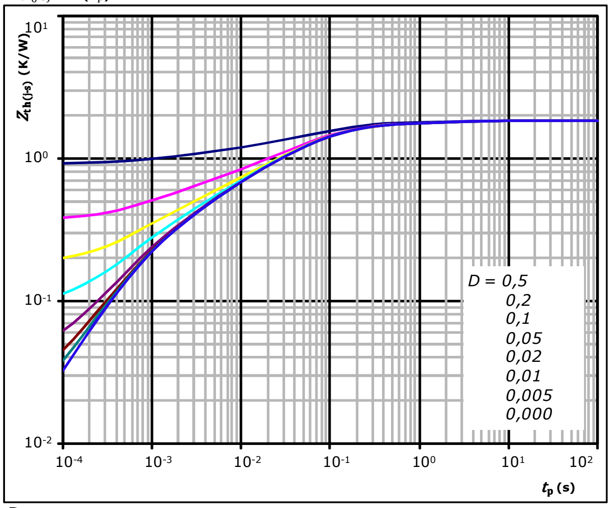
t_p = 250 µs

T_j: 25 °C (dotted line); 125 °C (solid line)

figure 2. **FWD**

Transient thermal impedance as a function of pulse width

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



D = t_p / T

$R_{th(j-s)}$ = 1,83 K/W

FWD thermal model values

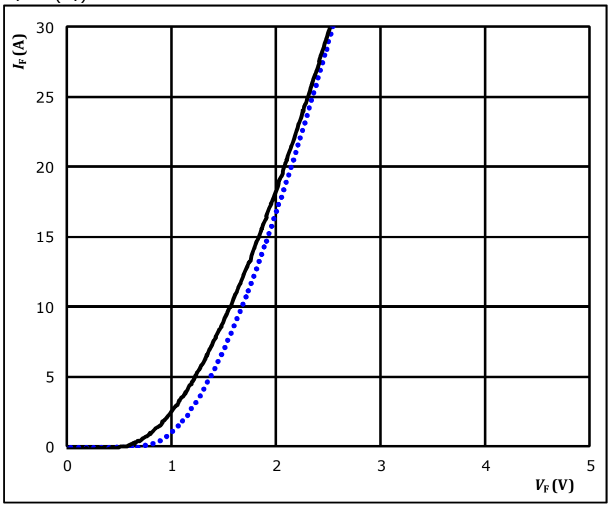
R (K/W)	τ (s)
6,05E-02	3,63E+00
1,50E-01	6,48E-01
8,27E-01	7,70E-02
4,06E-01	1,51E-02
2,16E-01	3,45E-03

Boost Sw. Protection Diode Characteristics

figure 1. **FWD**

Typical forward characteristics

$I_F = f(V_F)$



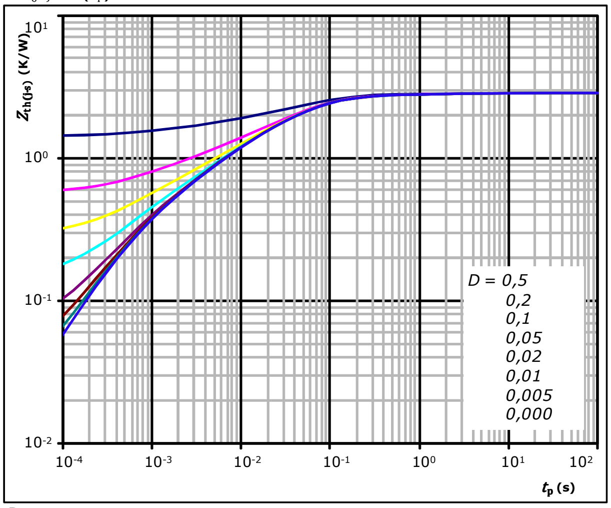
t_p = 250 µs

T_j: 25 °C (dotted), 125 °C (solid)

figure 2. **FWD**

Transient thermal impedance as a function of pulse width

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



D = t_p / T

$R_{th(j\text{-}s)}$ = 2,87 K/W

FWD thermal model values

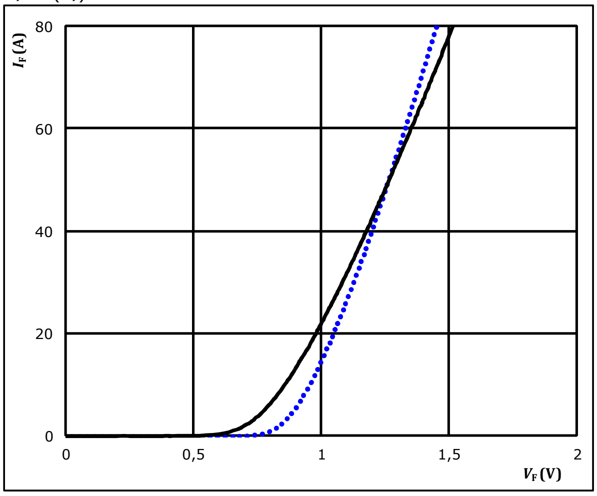
R (K/W)	τ (s)
6,53E-02	3,94E+00
1,48E-01	4,48E-01
1,31E+00	5,96E-02
7,32E-01	1,36E-02
4,04E-01	2,79E-03
2,11E-01	5,37E-04

ByPass Diode Characteristics

figure 1. **Rectifier Diode**

Typical forward characteristics

$I_F = f(V_F)$



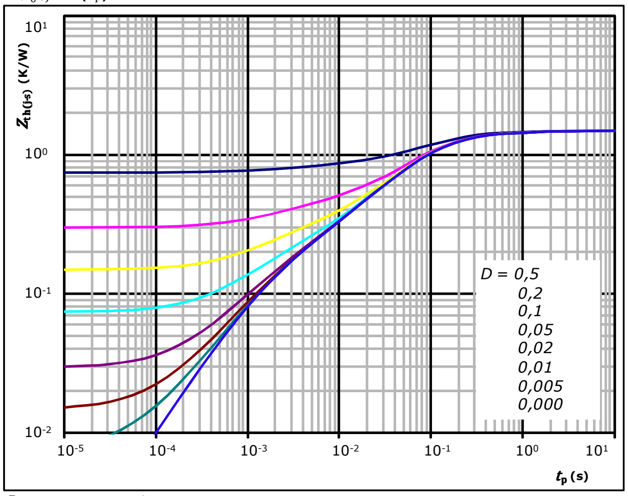
t_p = 250 µs

T_j: 25 °C (dotted) / 125 °C (solid)

figure 2. **Rectifier Diode**

Transient thermal impedance as a function of pulse width

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



D = t_p / T

$R_{th(j\text{-}s)}$ = 1,48 K/W

Diode thermal model values

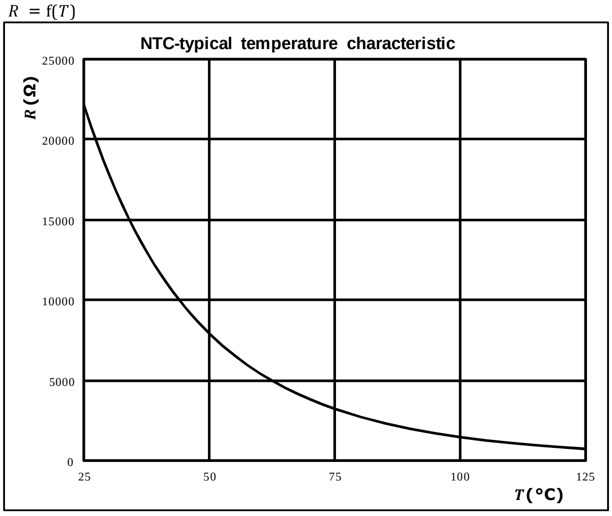
R (K/W)	τ (s)
3,27E-02	6,38E+00
1,05E-01	8,23E-01
4,24E-01	1,46E-01
6,94E-01	5,66E-02
1,32E-01	7,21E-03
8,99E-02	1,29E-03

Thermistor Characteristics

figure 1. **Thermistor**

Typical NTC characteristic
as a function of temperature

$R = f(T)$

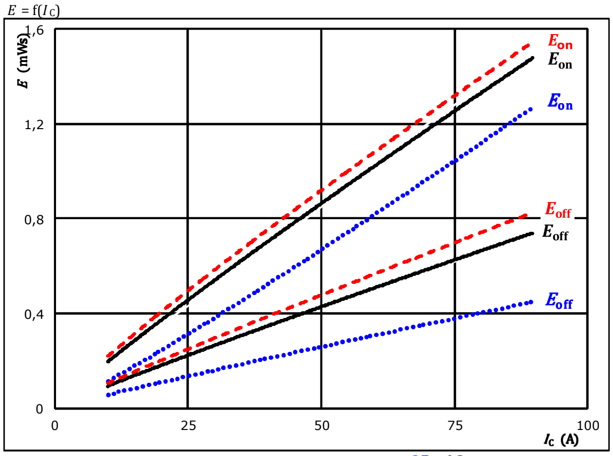


H-Bridge Switching Characteristics

figure 1. **IGBT**

Typical switching energy losses as a function of collector current

$E = f(I_C)$



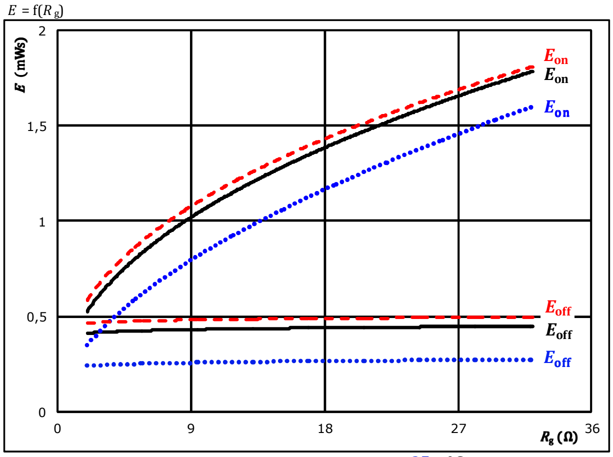
With an inductive load at

V_{CE} =	350	V	T_j:	25 °C	(blue dotted)
V_{GE} =	±15	V		125 °C	(black solid)
R_{gon} =	8	Ω		150 °C	(red dashed)
R_{goff} =	8	Ω			

figure 2. **IGBT**

Typical switching energy losses as a function of gate resistor

$E = f(R_g)$



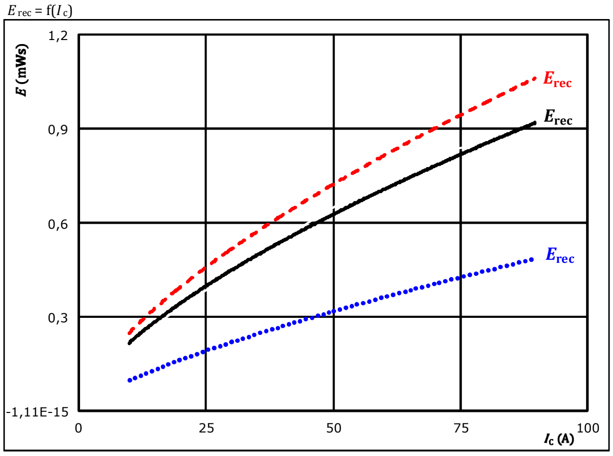
With an inductive load at

V_{CE} =	350	V	T_j:	25 °C	(blue dotted)
V_{GE} =	±15	V		125 °C	(black solid)
I_C =	50	A		150 °C	(red dashed)

figure 3. **FWD**

Typical reverse recovered energy loss as a function of collector current

$E_{rec} = f(I_C)$



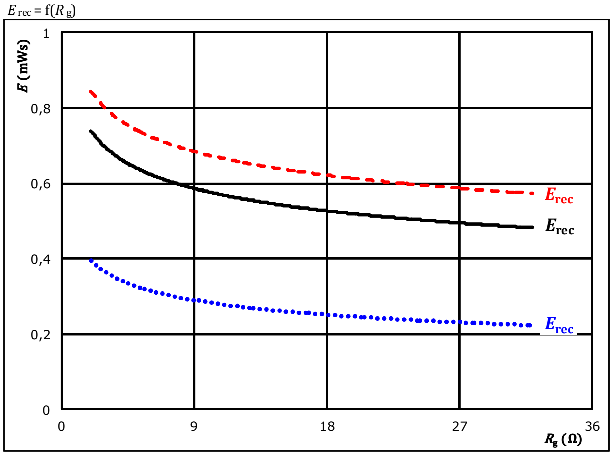
With an inductive load at

V_{CE} =	350	V	T_j:	25 °C	(blue dotted)
V_{GE} =	±15	V		125 °C	(black solid)
R_{gon} =	8	Ω		150 °C	(red dashed)

figure 4. **FWD**

Typical reverse recovered energy loss as a function of gate resistor

$E_{rec} = f(R_g)$



With an inductive load at

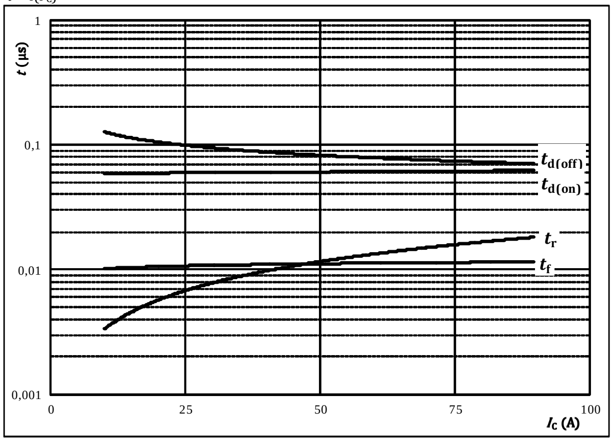
V_{CE} =	350	V	T_j:	25 °C	(blue dotted)
V_{GE} =	±15	V		125 °C	(black solid)
I_C =	50	A		150 °C	(red dashed)

H-Bridge Switching Characteristics

figure 5. **IGBT**

Typical switching times as a function of collector current

$t = f(I_C)$



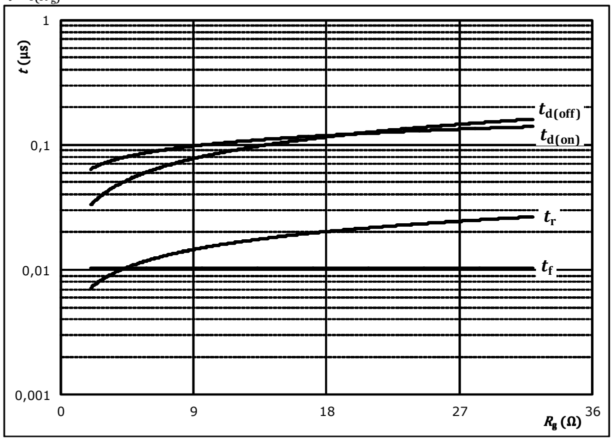
With an inductive load at

T_j =	150	°C
V_{CE} =	350	V
V_{GE} =	±15	V
R_{gon} =	8	Ω
R_{goff} =	8	Ω

figure 6. **IGBT**

Typical switching times as a function of gate resistor

$t = f(R_g)$



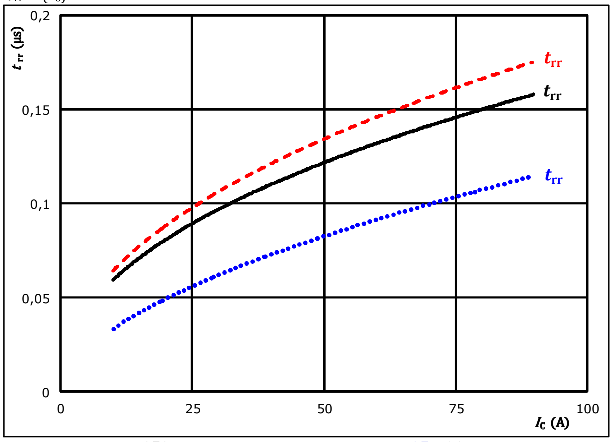
With an inductive load at

T_j =	150	°C
V_{CE} =	350	V
V_{GE} =	±15	V
I_C =	50	A

figure 7. **FWD**

Typical reverse recovery time as a function of collector current

$t_{rr} = f(I_C)$

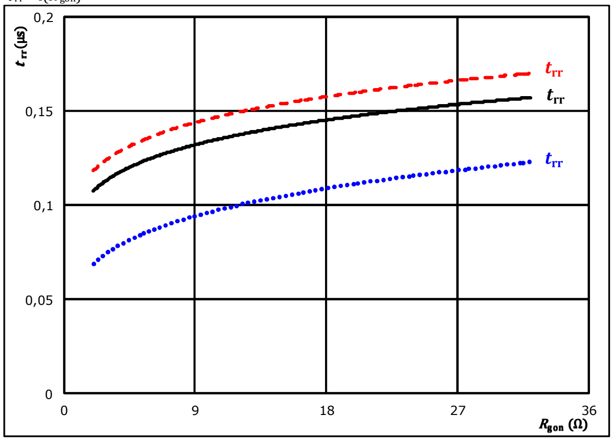


At						
V_{CE} =	350	V	T_j:	25	°C	dotted
V_{GE} =	±15	V		125	°C	solid
R_{gon} =	8	Ω		150	°C	dashed

figure 8. **FWD**

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

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



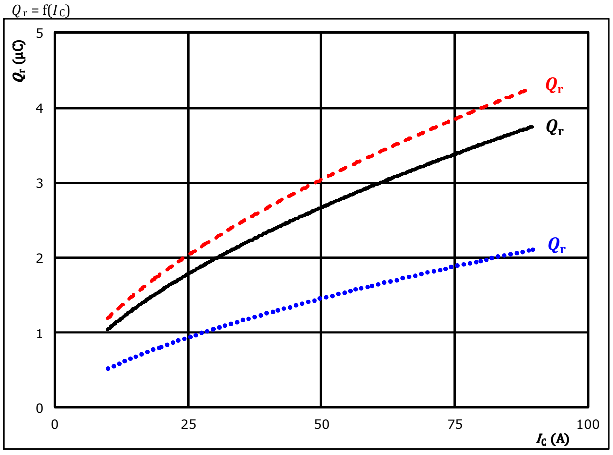
At						
V_{CE} =	350	V	T_j:	25	°C	dotted
V_{GE} =	±15	V		125	°C	solid
I_C =	50	A		150	°C	dashed

H-Bridge Switching Characteristics

figure 9. **FWD**

Typical recovered charge as a function of collector current

$Q_r = f(I_C)$

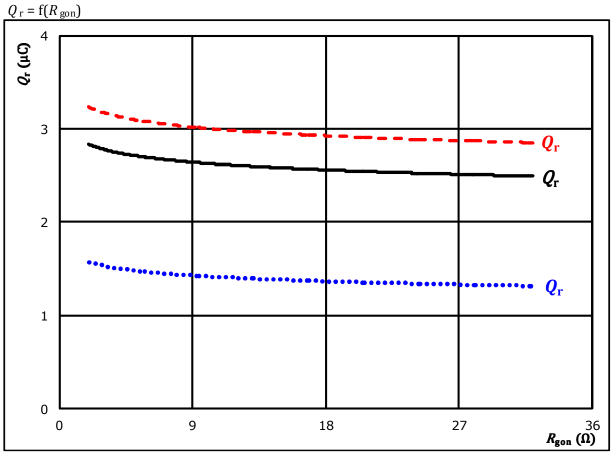


At				
V_{CE} =	350	V	T_j:	25 °C (dotted)
V_{GE} =	±15	V		125 °C (solid)
R_{gon} =	8	Ω		150 °C (dashed)

figure 10. **FWD**

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

$Q_r = f(R_{gon})$

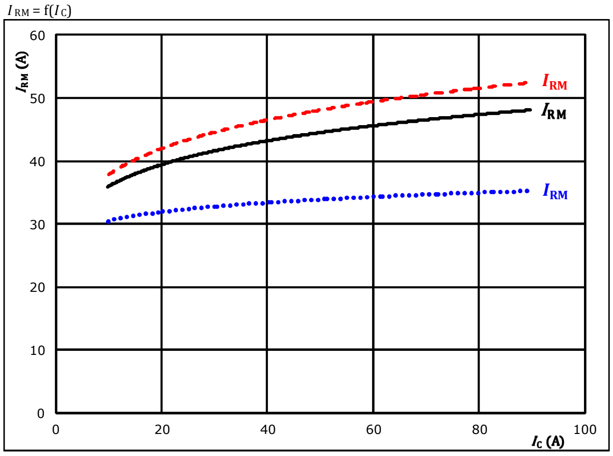


At				
V_{CE} =	350	V	T_j:	25 °C (dotted)
V_{GE} =	±15	V		125 °C (solid)
I_C =	50	A		150 °C (dashed)

figure 11. **FWD**

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

$I_{RM} = f(I_C)$

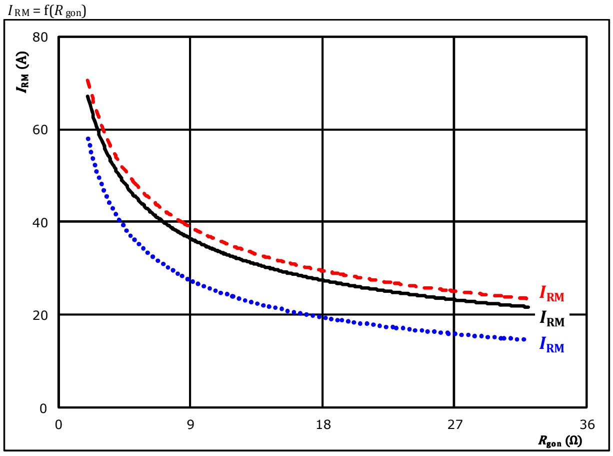


At				
V_{CE} =	350	V	T_j:	25 °C (dotted)
V_{GE} =	±15	V		125 °C (solid)
R_{gon} =	8	Ω		150 °C (dashed)

figure 12. **FWD**

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

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



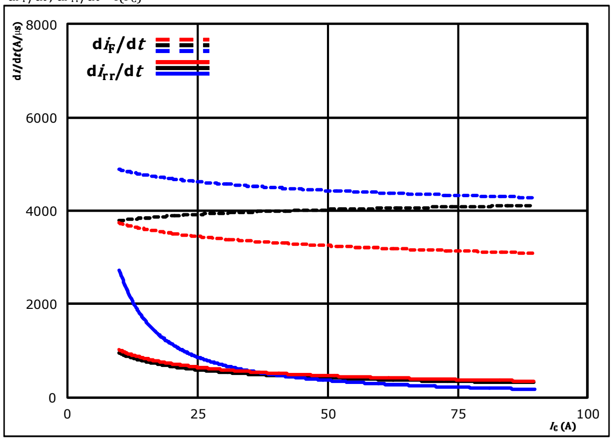
At				
V_{CE} =	350	V	T_j:	25 °C (dotted)
V_{GE} =	±15	V		125 °C (solid)
I_C =	50	A		150 °C (dashed)

H-Bridge Switching Characteristics

figure 13. **FWD**

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

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

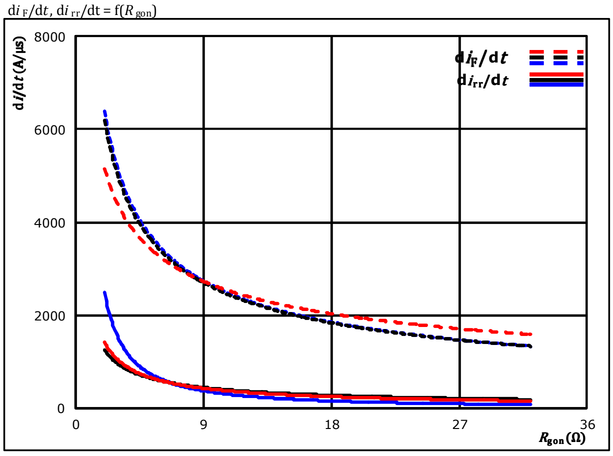


At						
V_{CE} =	350	V		25	°C	dotted
V_{GE} =	±15	V	T_j:	125	°C	solid
R_{gon} =	8	Ω		150	°C	dashed

figure 14. **FWD**

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

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

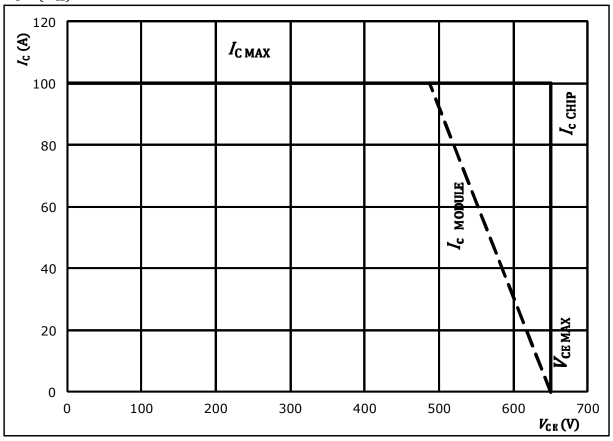


At						
V_{CE} =	350	V		25	°C	dotted
V_{GE} =	±15	V	T_j:	125	°C	solid
I_C =	50	A		150	°C	dashed

figure 15. **IGBT**

Reverse bias safe operating area

$I_C = f(V_{CE})$



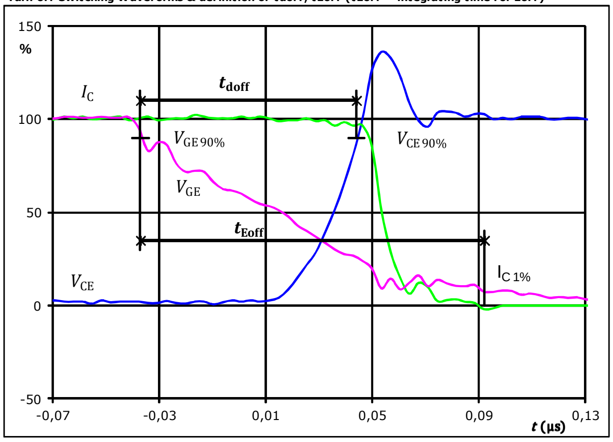
At		
T_j =	175	°C
R_{gon} =	8	Ω
R_{goff} =	8	Ω

H-Bridge Switching Definitions

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

figure 1. IGBT

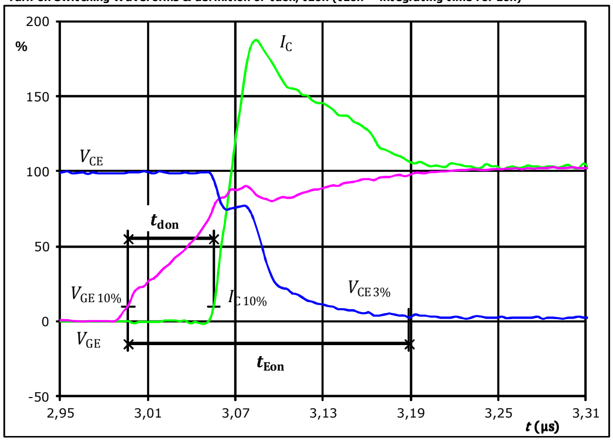
Turn-off Switching Waveforms & definition of tdoff, tEoff (tEoff = integrating time for Eoff)



$V_{GE}(0\%)$ =	-15	V
$V_{GE}(100\%)$ =	15	V
$V_C(100\%)$ =	350	V
$I_C(100\%)$ =	50	A
t_{doff} =	0,080	μs
t_{Eoff} =	0,129	μs

figure 2. IGBT

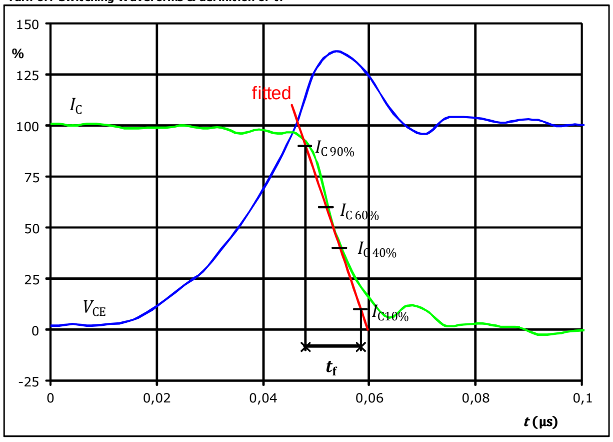
Turn-on Switching Waveforms & definition of tdon, tEon (tEon = integrating time for Eon)



$V_{GE}(0\%)$ =	-15	V
$V_{GE}(100\%)$ =	15	V
$V_C(100\%)$ =	350	V
$I_C(100\%)$ =	50	A
t_{don} =	0,060	μs
t_{Eon} =	0,192	μs

figure 3. IGBT

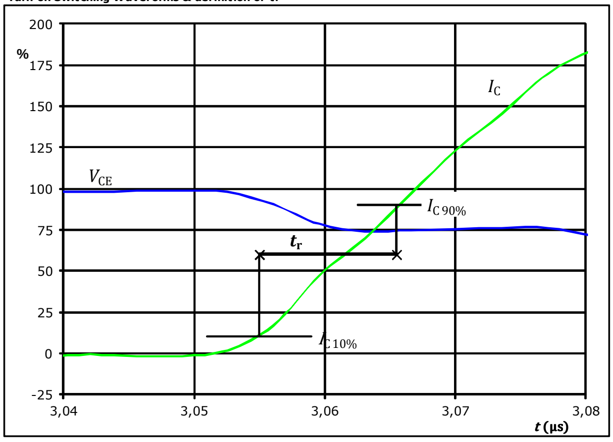
Turn-off Switching Waveforms & definition of tf



$V_C(100\%)$ =	350	V
$I_C(100\%)$ =	50	A
t_f =	0,008	μs

figure 4. IGBT

Turn-on Switching Waveforms & definition of tr

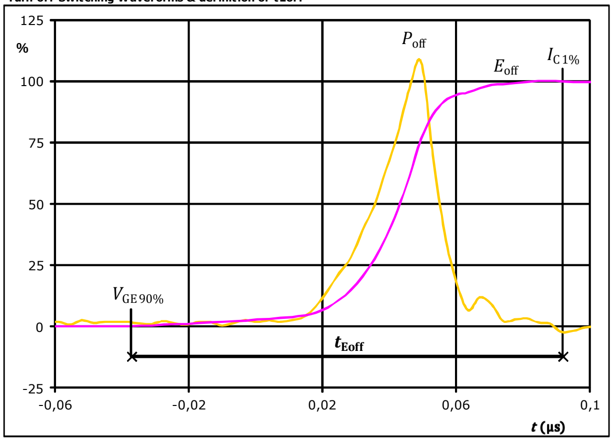


$V_C(100\%)$ =	350	V
$I_C(100\%)$ =	50	A
t_r =	0,011	μs

H-Bridge Switching Characteristics

figure 5. **IGBT**

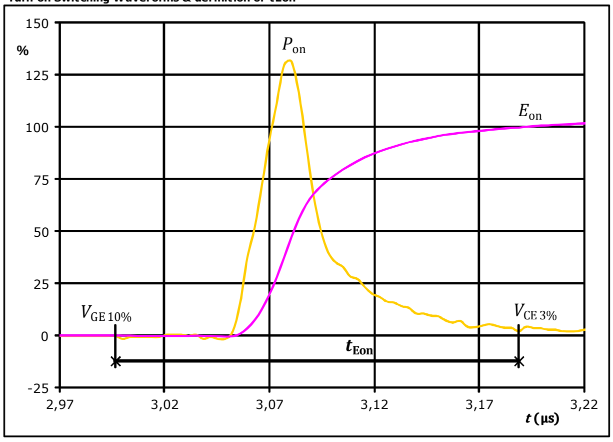
Turn-off Switching Waveforms & definition of tEoff



P_{off} (100%) =	17,46	kW
E_{off} (100%) =	0,43	mJ
t_{Eoff} =	0,13	µs

figure 6. **IGBT**

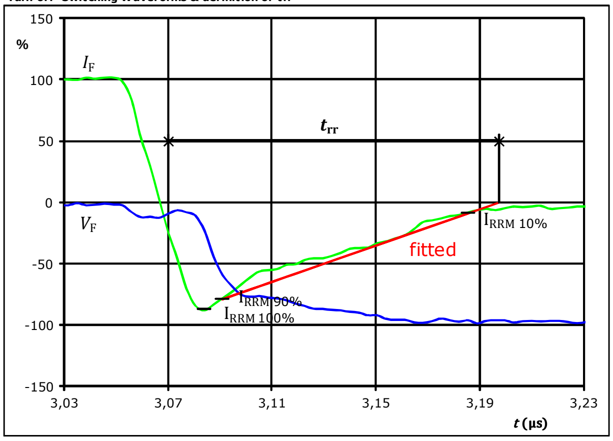
Turn-on Switching Waveforms & definition of tEon



P_{on} (100%) =	17,46	kW
E_{on} (100%) =	0,85	mJ
t_{Eon} =	0,19	µs

figure 7. **FWD**

Turn-off Switching Waveforms & definition of trr

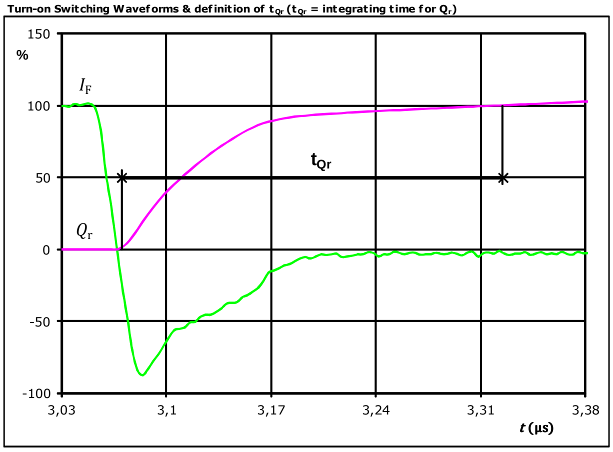


V_F (100%) =	350	V
I_F (100%) =	50	A
I_{RRM} (100%) =	-45	A
t_{rr} =	0,126	µs

H-Bridge Switching Characteristics

figure 8. **FWD**

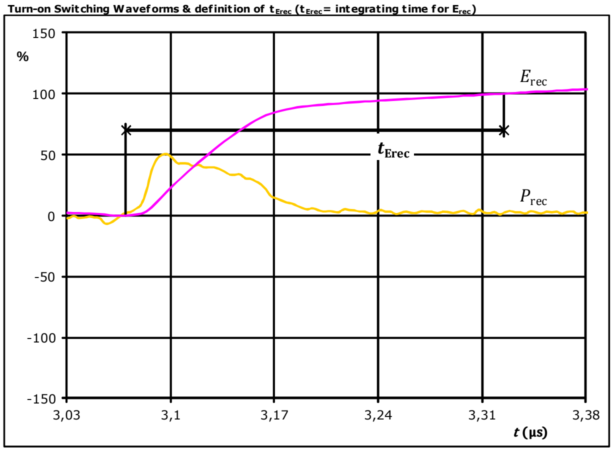
Turn-on Switching Waveforms & definition of t_{Qr} (t_{Qr} = integrating time for Q_r)



I_F (100%) =	50	A
Q_r (100%) =	2,75	µC
t_{Qr} =	0,25	µs

figure 9. **FWD**

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



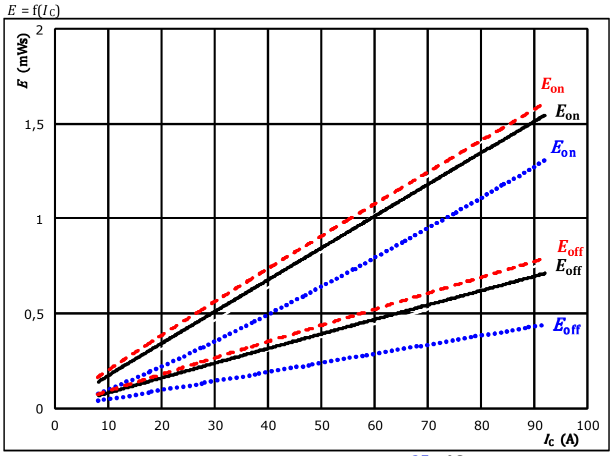
P_{rec} (100%) =	17,46	kW
E_{rec} (100%) =	0,65	mJ
t_{Erec} =	0,25	µs

Boost Switching Characteristics

figure 1. IGBT

Typical switching energy losses as a function of collector current

$E = f(I_C)$



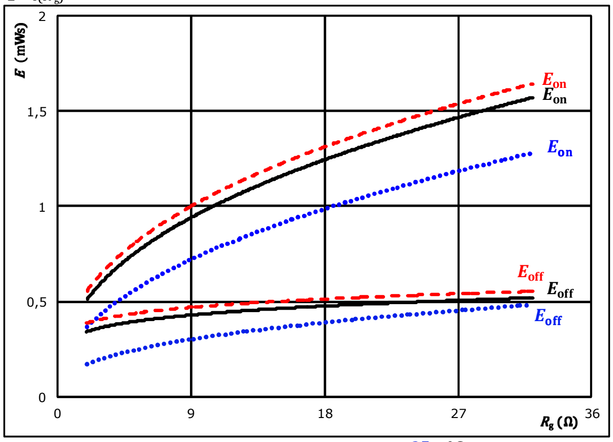
With an inductive load at

V_{CE} =	400	V	T_j:	25 °C	dotted
V_{GE} =	15/0	V		125 °C	solid
R_{gon} =	8	Ω		150 °C	dashed
R_{goff} =	8	Ω			

figure 2. IGBT

Typical switching energy losses as a function of gate resistor

$E = f(R_g)$



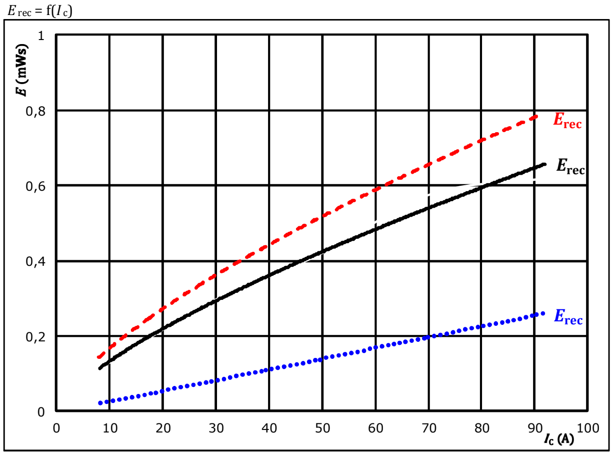
With an inductive load at

V_{CE} =	400	V	T_j:	25 °C	dotted
V_{GE} =	15/0	V		125 °C	solid
I_C =	50	A		150 °C	dashed

figure 3. FWD

Typical reverse recovered energy loss as a function of collector current

$E_{rec} = f(I_C)$



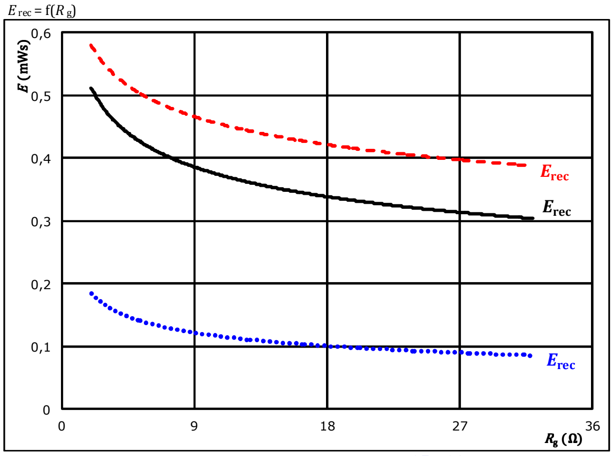
With an inductive load at

V_{CE} =	400	V	T_j:	25 °C	dotted
V_{GE} =	15/0	V		125 °C	solid
R_{gon} =	8	Ω		150 °C	dashed

figure 4. FWD

Typical reverse recovered energy loss as a function of gate resistor

$E_{rec} = f(R_g)$



With an inductive load at

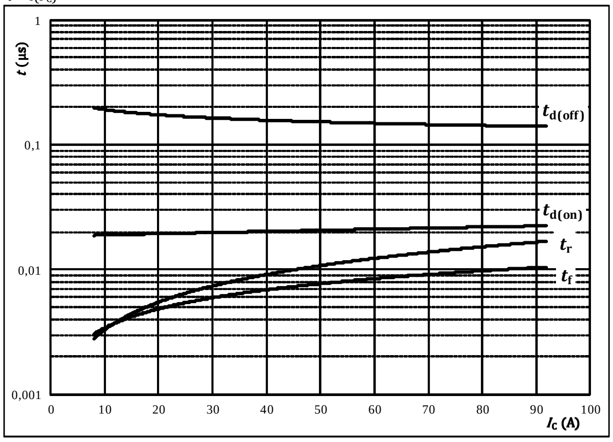
V_{CE} =	400	V	T_j:	25 °C	dotted
V_{GE} =	15/0	V		125 °C	solid
I_C =	50	A		150 °C	dashed

Boost Switching Characteristics

figure 5. IGBT

Typical switching times as a function of collector current

$t = f(I_C)$



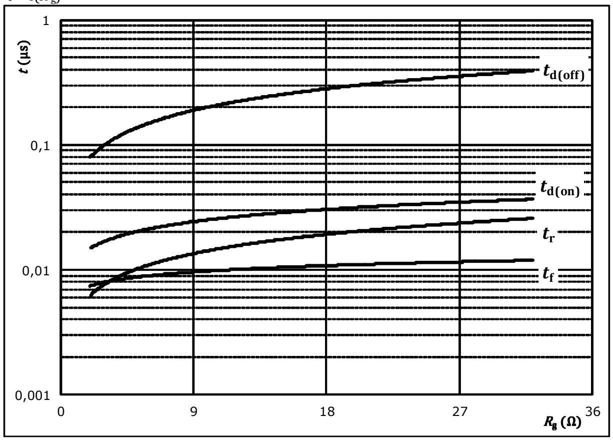
With an inductive load at

T_j =	150	°C
V_{CE} =	400	V
V_{GE} =	15/0	V
R_{gon} =	8	Ω
R_{goff} =	8	Ω

figure 6. IGBT

Typical switching times as a function of gate resistor

$t = f(R_g)$



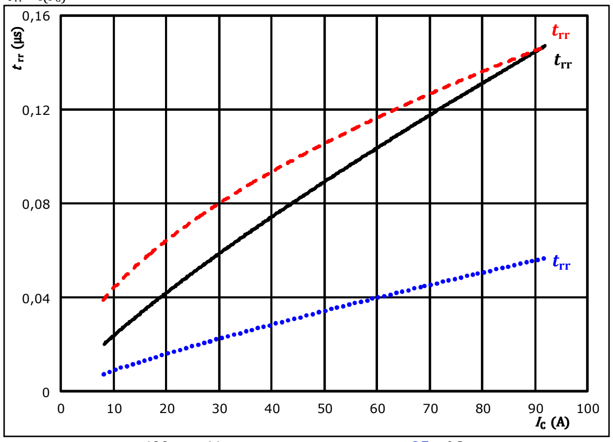
With an inductive load at

T_j =	150	°C
V_{CE} =	400	V
V_{GE} =	15/0	V
I_C =	50	A

figure 7. FWD

Typical reverse recovery time as a function of collector current

$t_{rr} = f(I_C)$

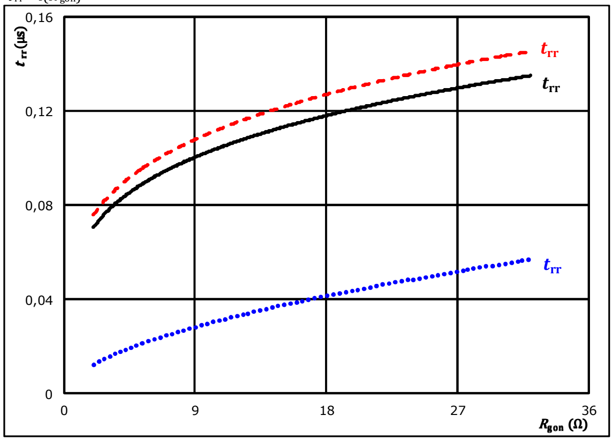


At					
V_{CE} =	400	V		25 °C	dotted blue
V_{GE} =	15/0	V	T_j:	125 °C	solid black
R_{gon} =	8	Ω		150 °C	dashed red

figure 8. FWD

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

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



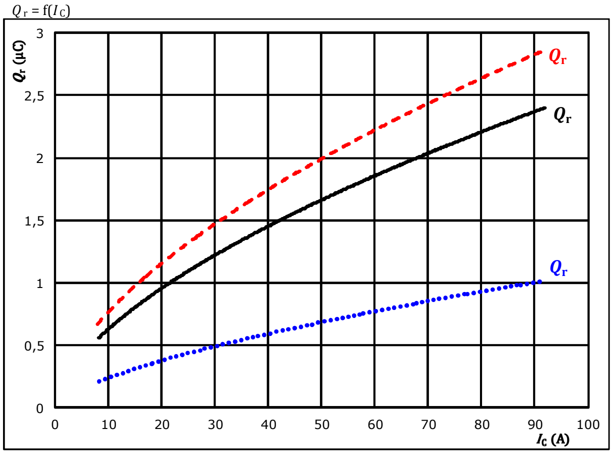
At					
V_{CE} =	400	V		25 °C	dotted blue
V_{GE} =	15/0	V	T_j:	125 °C	solid black
I_C =	50	A		150 °C	dashed red

Boost Switching Characteristics

figure 9. FWD

Typical recovered charge as a function of collector current

$Q_r = f(I_C)$

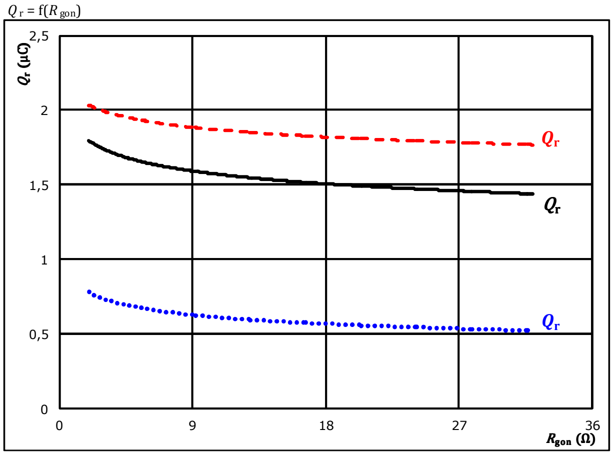


At	V_{CE} =	400	V		25	°C
	V_{GE} =	15/0	V	T_j:	125	°C
	R_{gon} =	8	Ω		150	°C

figure 10. FWD

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

$Q_r = f(R_{gon})$

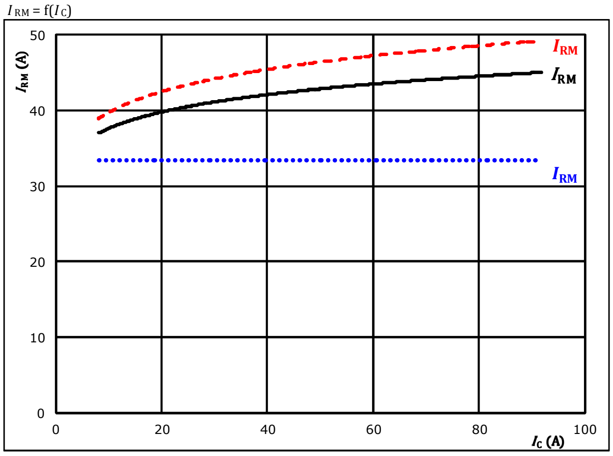


At	V_{CE}=	400	V		25	°C
	V_{GE} =	15/0	V	T_j:	125	°C
	I_C=	50	A		150	°C

figure 11. FWD

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

$I_{RM} = f(I_C)$

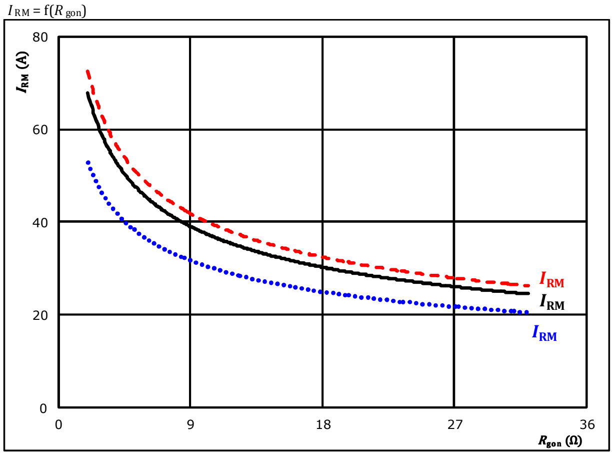


At	V_{CE}:	400	V		25	°C
	V_{GE} =	15/0	V	T_j:	125	°C
	R_{gon} =	8	Ω		150	°C

figure 12. FWD

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

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



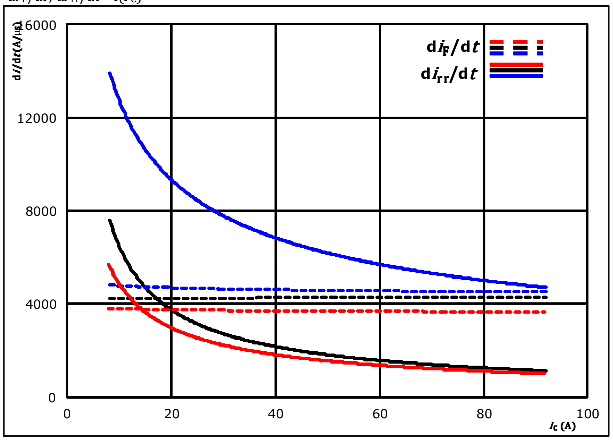
At	V_{CE} =	400	V		25	°C
	V_{GE} =	15/0	V	T_j:	125	°C
	I_C =	50	A		150	°C

Boost Switching Characteristics

figure 13. **FWD**

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

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

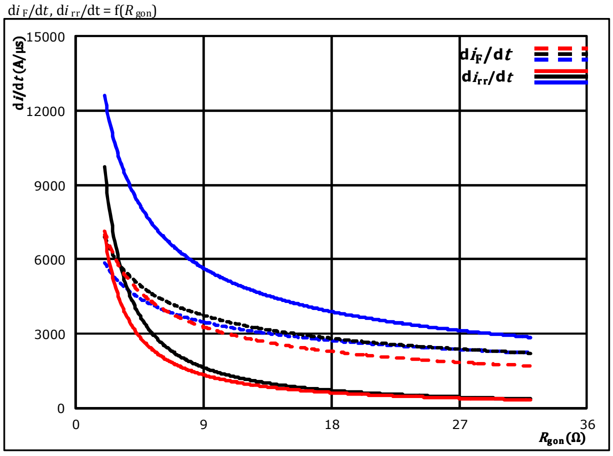


At					
V_{CE} =	400	V	T_j:	25 °C	dotted
V_{GE} =	15/0	V		125 °C	solid
R_{gon} =	8	Ω		150 °C	dashed

figure 14. **FWD**

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

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

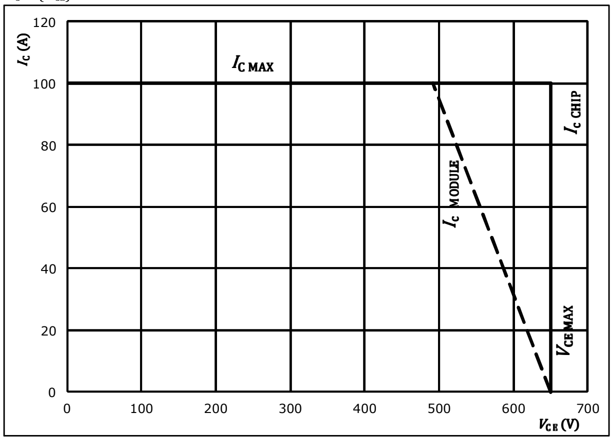


At					
V_{CE} =	400	V	T_j:	25 °C	dotted
V_{GE} =	15/0	V		125 °C	solid
I_C =	50	A		150 °C	dashed

figure 15. **IGBT**

Reverse bias safe operating area

$I_C = f(V_{CE})$



At		
T_j =	175	°C
R_{gon} =	8	Ω
R_{goff} =	8	Ω

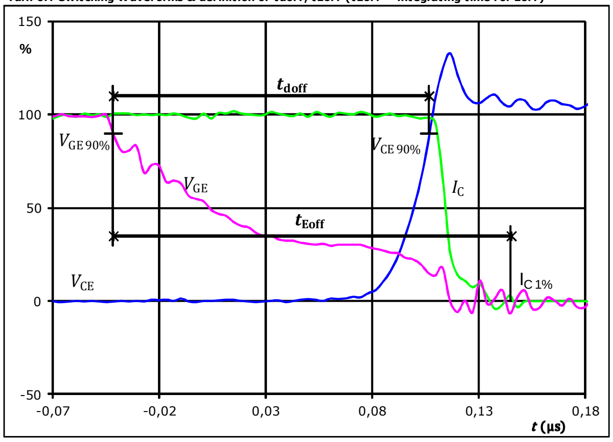
Boost Switching Definitions

General conditions

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

figure 1. IGBT

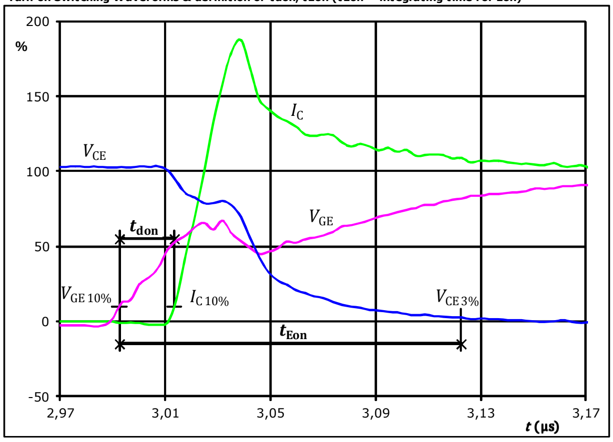
Turn-off Switching Waveforms & definition of tdoff, tEoff (tEoff = integrating time for Eoff)



$V_{GE}(0\%)$ =	0	V
$V_{GE}(100\%)$ =	15	V
$V_C(100\%)$ =	400	V
$I_C(100\%)$ =	50	A
t_{doff} =	0,148	µs
t_{Eoff} =	0,186	µs

figure 2. IGBT

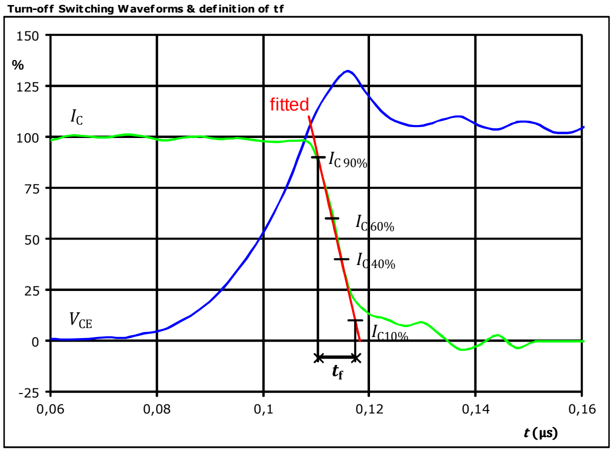
Turn-on Switching Waveforms & definition of tdon, tEon (tEon = integrating time for Eon)



$V_{GE}(0\%)$ =	0	V
$V_{GE}(100\%)$ =	15	V
$V_C(100\%)$ =	400	V
$I_C(100\%)$ =	50	A
t_{don} =	0,021	µs
t_{Eon} =	0,130	µs

figure 3. IGBT

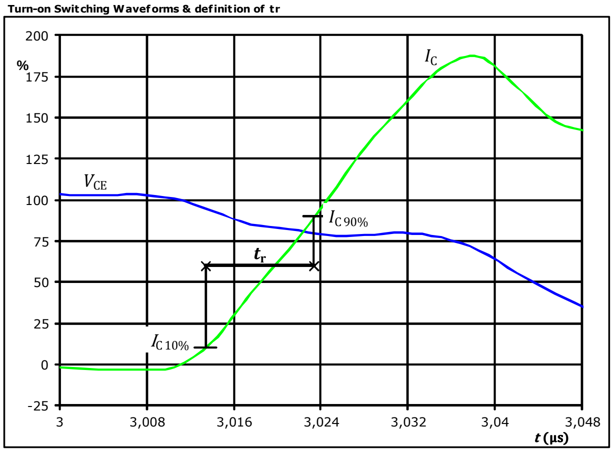
Turn-off Switching Waveforms & definition of tf



$V_C(100\%)$ =	400	V
$I_C(100\%)$ =	50	A
t_f =	0,007	µs

figure 4. IGBT

Turn-on Switching Waveforms & definition of tr

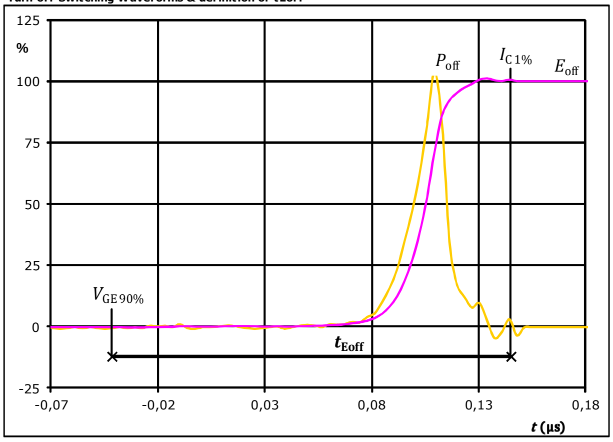


$V_C(100\%)$ =	400	V
$I_C(100\%)$ =	50	A
t_r =	0,010	µs

Boost Switching Characteristics

figure 5. IGBT

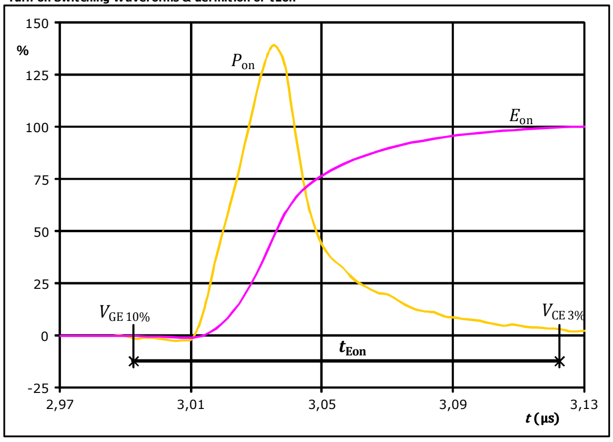
Turn-off Switching Waveforms & definition of tEoff



P_{off} (100%) =	20,05	kW
E_{off} (100%) =	0,38	mJ
t_{Eoff} =	0,19	μs

figure 6. IGBT

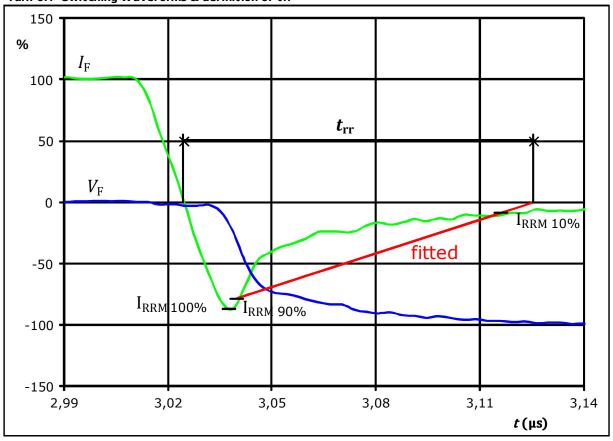
Turn-on Switching Waveforms & definition of tEon



P_{on} (100%) =	20,05	kW
E_{on} (100%) =	0,83	mJ
t_{Eon} =	0,13	μs

figure 7. FWD

Turn-off Switching Waveforms & definition of trr

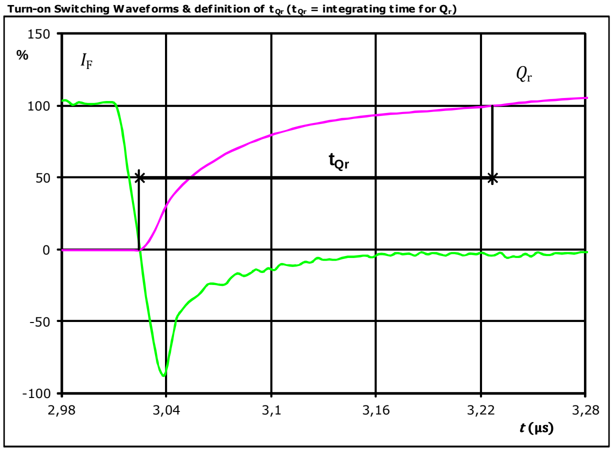


V_F (100%) =	400	V
I_F (100%) =	50	A
I_{RRM} (100%) =	-44	A
t_{rr} =	0,100	μs

Boost Switching Characteristics

figure 8. **FWD**

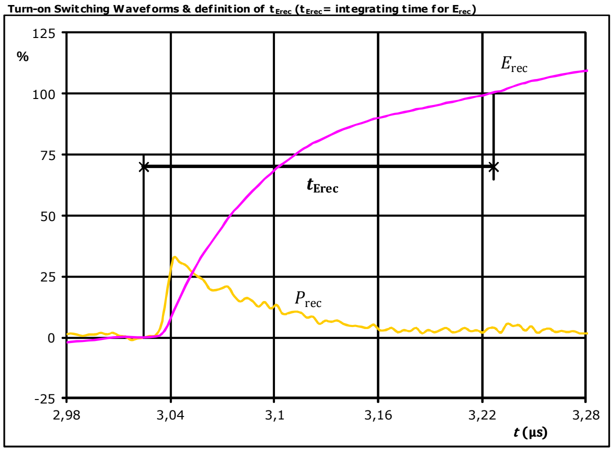
Turn-on Switching Waveforms & definition of t_{Qr} (t_{Qr} = integrating time for Q_r)



I_F (100%) =	50	A
Q_r (100%) =	1,67	µC
t_{Qr} =	0,20	µs

figure 9. **FWD**

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



P_{rec} (100%) =	20,05	kW
E_{rec} (100%) =	0,42	mJ
t_{Erec} =	0,20	µs

Vincotech

10-FY07BIA050SM-M523E38
10-PY07BIA050SM-M523E38Y
datasheet

Ordering Code & Marking

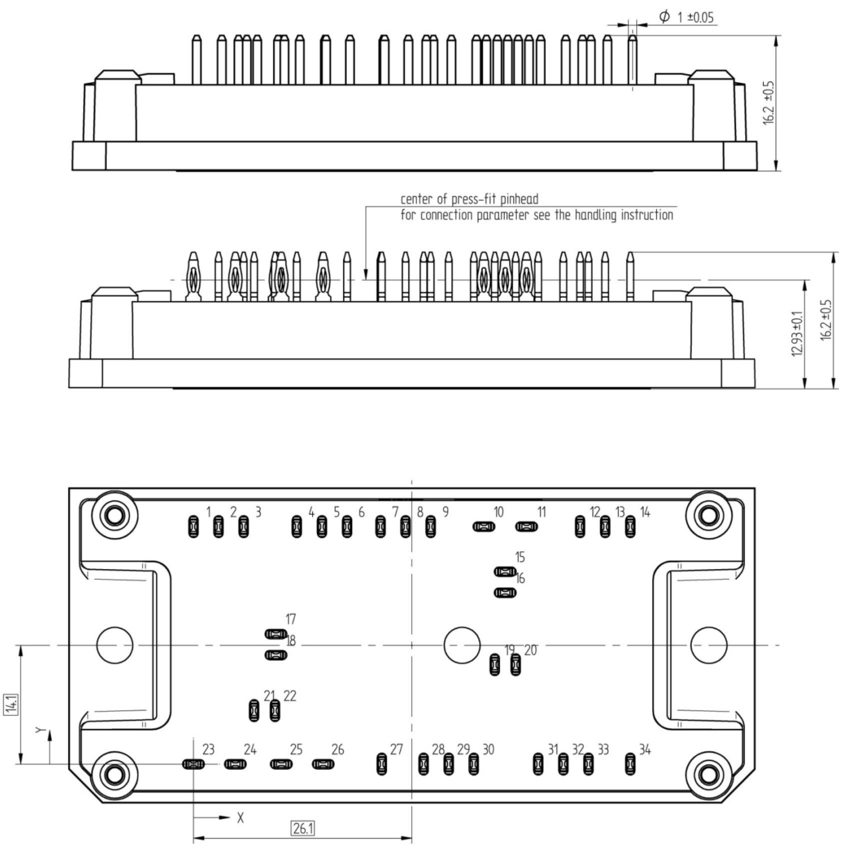
Version	Ordering Code
without thermal paste 12 mm housing with solder pins	10-FY07BIA050SM-M523E38
without thermal paste 12 mm housing with press-fit pins	10-PY07BIA050SM-M523E38Y
with thermal paste 12 mm housing with solder pins	10-FY07BIA050SM-M523E38-/3/
with thermal paste 12 mm housing with press-fit pins	10-PY07BIA050SM-M523E38Y-/3/

Text	Name		Date code	UL & VIN	Lot	Serial
	NN-NNNNNNNNNNNNNN-TTTTTTVV		WWYY	UL VIN	LLLLL	SSSS
Datamatrix	Type&Ver	Lot number	Serial	Date code		
	TTTTTTTVV	LLLLL	SSSS	WWYY		

Outline

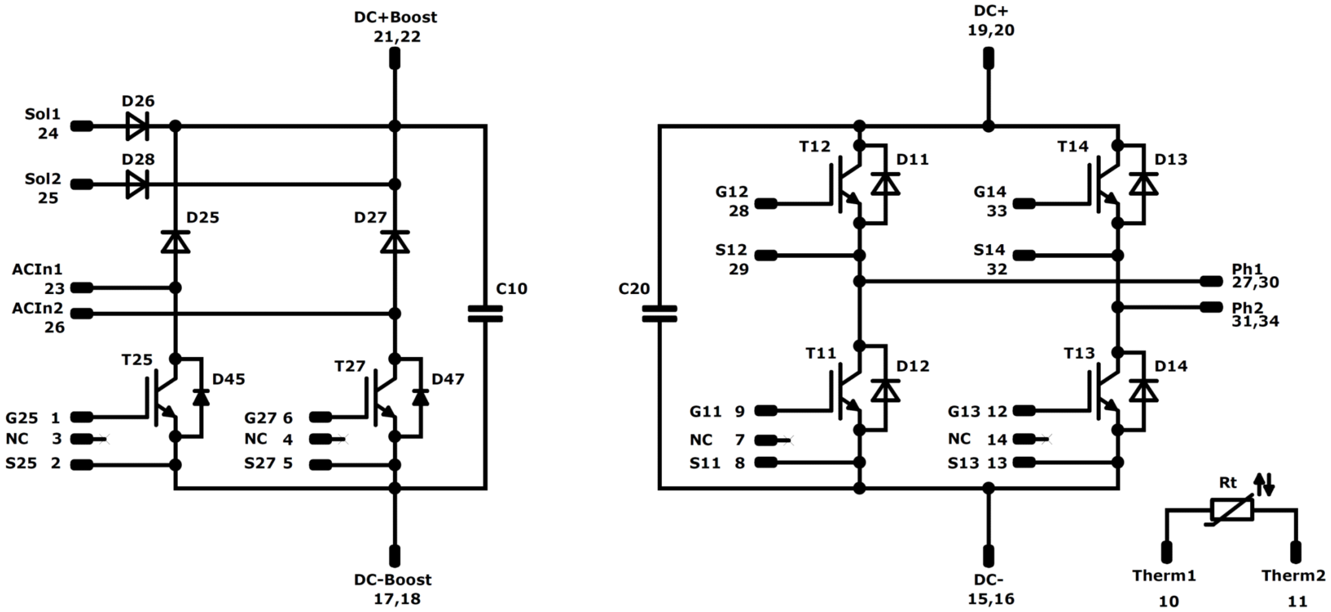
Pin table

Pin	X	Y	Function
1	0	28,2	G25
2	3	28,2	S25
3	6	28,2	NC
4	12,35	28,2	NC
5	15,35	28,2	S27
6	18,35	28,2	G27
7	22,35	28,2	NC
8	25,35	28,2	S11
9	28,35	28,2	G11
10	34,7	28,2	Therm1
11	39,8	28,2	Therm2
12	46,2	28,2	G13
13	49,2	28,2	S13
14	52,2	28,2	NC
15	37,25	22,85	DC-
16	37,25	20,35	DC-
17	9,85	15,45	DC-Boost
18	9,85	12,95	DC-Boost
19	36	11,8	DC+
20	38,5	11,8	DC+
21	7,25	6,35	DC+Boost
22	9,75	6,35	DC+Boost
23	0	0	ACIn1
24	5	0	SOL1
25	10,5	0	SOL2
26	15,5	0	ACIn2
27	22,5	0	Ph1
28	27,5	0	G12
29	30,5	0	S12
30	33,5	0	Ph1
31	41,2	0	Ph2
32	44,2	0	S14
33	47,2	0	G14
34	52,2	0	Ph2



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

Pinout



Identification

ID	Component	Voltage	Current	Function	Comment
T11 , T12, T13, T14	IGBT	650 V	50 A	H-Bridge Switch	
D11 , D12, D13 , D14	FWD	650 V	30 A	H-Bridge Diode	
T25 , T27	IGBT	650 V	50 A	Boost Switch	
D25 , D27	FWD	650 V	30 A	Boost Diode	
D45 , D47	FWD	650 V	10 A	Boost Sw. Protection Diode	
D26 , D28	FWD	1600 V	35 A	ByPass Diode	
C10 , C20	Capacitor	630 V		Capacitor (DC)	
Rt	NTC			Thermistor	

Packaging instruction				
Standard packaging quantity (SPQ) 100	>SPQ	Standard	<SPQ	Sample

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

Package data
Package data for *flow* 1 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
10-xY07BIA050SM-M523E38x-D1-14	26 Jul. 2017		