Vincotech

10-FY07NIA150S5-M516F58
datasheet

flow NPC 1	650 V / 150 A

Features

- Three-level high efficient topology
- Latest chip generation
- Low inductive package

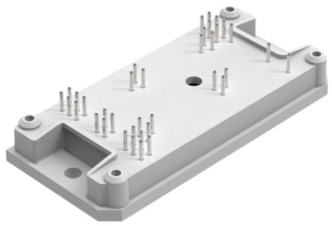
Target applications

- Solar Inverters

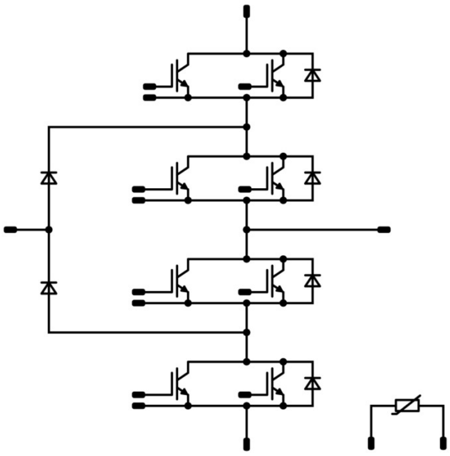
Types

- 10-FY07NIA150S5-M516F58

***flow* 1 12 mm housing**



Schematic



Maximum Ratings

T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Condition	Value	Unit
Buck Switch				
Collector-emitter voltage	V_{CES}		650	V
Collector current	I_C	$T_j = T_{jmax}$ T_s = 80 °C	104	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}	450	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ T_s = 80 °C	145	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
Buck Diode					
Peak Repetitive Reverse Voltage	V_{RRM}			650	V
Continuous (direct) forward current	I_F	$T_j = T_{jmax}$	T_s = 80 °C	101	A
Repetitive peak forward current	I_{FRM}	t_p limited by T_{jmax}		300	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	127	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	128	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}		450	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	133	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	85	A
Repetitive peak forward current	I_{FRM}			200	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	122	W
Maximum Junction Temperature	T_{jmax}			175	°C
Boost Sw.Inv.Diode					
Peak Repetitive Reverse Voltage	V_{RRM}			650	V
Continuous (direct) forward current	I_F	$T_j = T_{jmax}$	T_s = 80 °C	85	A
Repetitive peak forward current	I_{FRM}			200	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	122	W
Maximum Junction Temperature	T_{jmax}			175	°C

Maximum Ratings

T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Condition		Value	Unit
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				7,92	mm
Comparative Tracking Index	CTI			> 200	

*100 % tested in production

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]	Value Min	Typ	Max	Unit
Buck Switch										
Static										
Gate-emitter threshold voltage	$V_{GE(th)}$	$V_{GE} = V_{CE}$			0,0015	25	3,2	4	4,8	V
Collector-emitter saturation voltage	V_{CEsat}		15		150	25 125 150		1,43 1,52 1,55	1,75	V
Collector-emitter cut-off current	I_{CES}		0	650		25			100	µA
Gate-emitter leakage current	I_{GES}		20	0		25			200	nA
Internal gate resistance	r_g							none		Ω
Input capacitance	C_{ies}	f = 1 MHz	0	25		25		9000		pF
Output capacitance	C_{oes}							260		
Reverse transfer capacitance	C_{res}							34		
Gate charge	Q_g		15	520	150	25		328		nC
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	phase-change material λ = 3,4 W/mK						0,65		K/W
Dynamic										
Turn-on delay time	$t_{d(on)}$	R_{goff} = 2 Ω R_{gon} = 2 Ω	+15/-5	350	90	25 125 150		48 50 49		ns
Rise time	t_r					25 125 150		9 10 10		
Turn-off delay time	$t_{d(off)}$					25 125 150		147 170 176		
Fall time	t_f					25 125 150		11 19 22		
Turn-on energy (per pulse)	E_{on}	Q_{rFWD} = 3,3 µC Q_{rFWD} = 6,8 µC Q_{rFWD} = 7,8 µC				25 125 150		0,346 0,608 0,705		mWs
Turn-off energy (per pulse)	E_{off}					25 125 150		1,066 1,561 1,737		

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	
Buck Diode										
Static										
Forward voltage	V_F				150	25 125 150		1,56 1,50 1,48	1,92	V
Reverse leakage current	I_r			650		25			7,6	µA
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	phase-change material λ = 3,4 W/mK						0,75		K/W
Dynamic										
Peak recovery current	I_{RRM}	di/dt = 7165 A/µs di/dt = 8521 A/µs di/dt = 7698 A/µs	+15/-5	350	90	25 125 150		124 158 167		A
Reverse recovery time	t_{rr}					25 125 150		44 74 85		ns
Recovered charge	Q_r					25 125 150		3,349 6,779 7,785		µC
Reverse recovered energy	E_{rec}					25 125 150		0,870 1,722 1,922		mWs
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 125 150		3889 3024 3127		A/µs

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 Switch										
Static										
Gate-emitter threshold voltage	$V_{GE(th)}$	V_{GE}=V_{CE}			0,002	25	4,2	5	5,8	V
Collector-emitter saturation voltage	V_{CEsat}		15		150	25 150		1,10 1,09	1,45	V
Collector-emitter cut-off current	I_{CES}		0	650		25			80	µA
Gate-emitter leakage current	I_{GES}		20	0		25			200	nA
Internal gate resistance	r_g							none		Ω
Input capacitance	C_{ies}	f = 1 MHz	0	25		25		23250		pF
Reverse transfer capacitance	C_{res}	f = 1 MHz	0	25		25		60		pF
Gate charge	Q_g		15	520	75	25		872		nC
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	phase-change material λ = 3,4 W/mK						0,72		K/W
Dynamic										
Turn-on delay time	$t_{d(on)}$	R_{goff} = 4 Ω R_{gon} = 4 Ω	±15	350	89	25 125 150		183 184 182		ns
Rise time	t_r	R_{goff} = 4 Ω R_{gon} = 4 Ω	±15	350	89	25 125 150		11 12 13		ns
Turn-off delay time	$t_{d(off)}$	R_{goff} = 4 Ω R_{gon} = 4 Ω	±15	350	89	25 125 150		299 349 357		ns
Fall time	t_f	R_{goff} = 4 Ω R_{gon} = 4 Ω	±15	350	89	25 125 150		67 83 87		ns
Turn-on energy (per pulse)	E_{on}	Q_{rFWD} = 4,3 µC Q_{rFWD} = 8,5 µC Q_{rFWD} = 9,7 µC	±15	350	89	25 125 150		0,471 0,607 0,639		mWs
Turn-off energy (per pulse)	E_{off}		±15	350	89	25 125 150		4,177 6,264 6,774		mWs

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				100	25 150		1,77 1,57	1,82	V
Reverse leakage current	I_r			650		25			1,2	µA
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	phase-change material λ = 3,4 W/mK						0,78		K/W
Dynamic										
Peak recovery current	I_{RRM}	di/dt = 10752 A/µs di/dt = 9000 A/µs di/dt = 8249 A/µs	±15	350	89	25 125 150		107 132 139		A
Reverse recovery time	t_{rr}					25 125 150		129 184 193		ns
Recovered charge	Q_r					25 125 150		4,327 8,481 9,651		µC
Reverse recovered energy	E_{rec}					25 125 150		1,157 2,415 2,753		mWs
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 125 150		5512 3231 3015		A/µs
Boost Sw.Inv.Diode										
Static										
Forward voltage	V_F				100	25 150		1,77 1,57	1,82	V
Reverse leakage current	I_r			650		25			1,2	µA
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	phase-change material λ = 3,4 W/mK						0,78		K/W

Characteristic Values

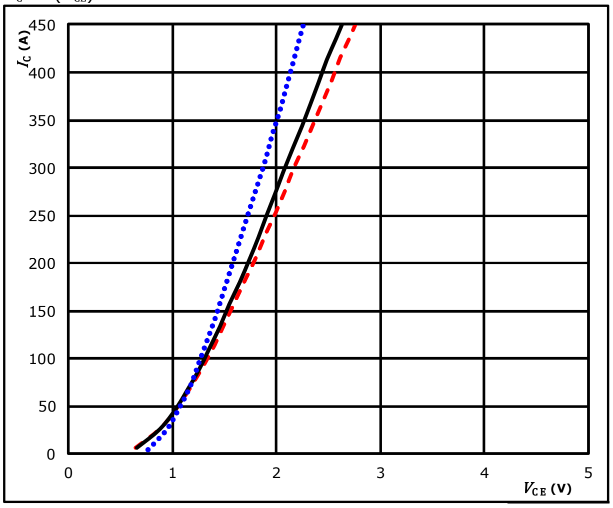
Parameter	Symbol	Conditions					Value			Unit
			V_{GE} [V] V_{GS} [V]	V_{CE} [V] V_{DS} [V] V_F [V]	I_C [A] I_D [A] I_F [A]	T_j [°C]	Min	Typ	Max	
Thermistor										
Rated resistance	R					25		22		kΩ
Deviation of R_{100}	$\Delta_{R/R}$	R_{100} = 1484 Ω				100	-5		5	%
Power dissipation	P					25		5		mW
Power dissipation constant						25		1,5		mW/K
B-value	$B_{(25/50)}$	Tol. ±1 %				25		3962		K
B-value	$B_{(25/100)}$	Tol. ±1 %				25		4000		K
Vincotech NTC Reference									I	

Buck Switch Characteristics

figure 1. **IGBT**

Typical output characteristics

$I_C = f(V_{CE})$

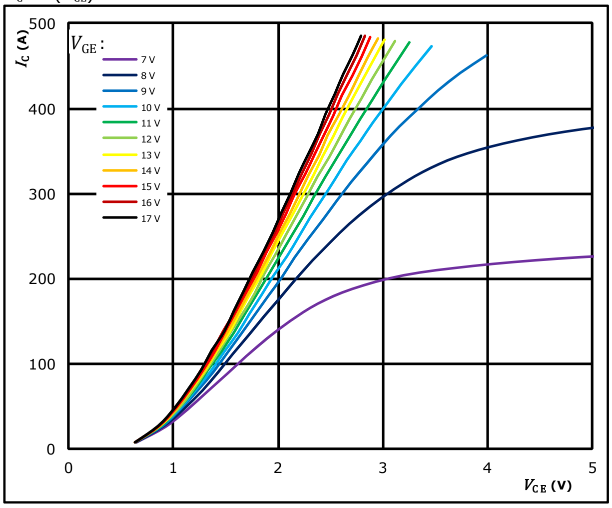


t_p =	250	µs		25 °C	dotted (blue)
V_{GE} =	15	V	T_j:	125 °C	solid (black)
				150 °C	dashed (red)

figure 2. **IGBT**

Typical output characteristics

$I_C = f(V_{CE})$



t_p = 250 µs

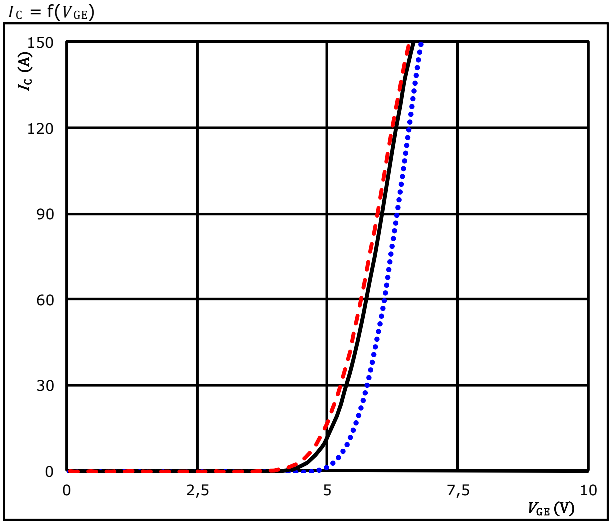
T_j = 150 °C

V_{GE} from 7 V to 17 V in steps of 1 V

figure 3. **IGBT**

Typical transfer characteristics

$I_C = f(V_{GE})$

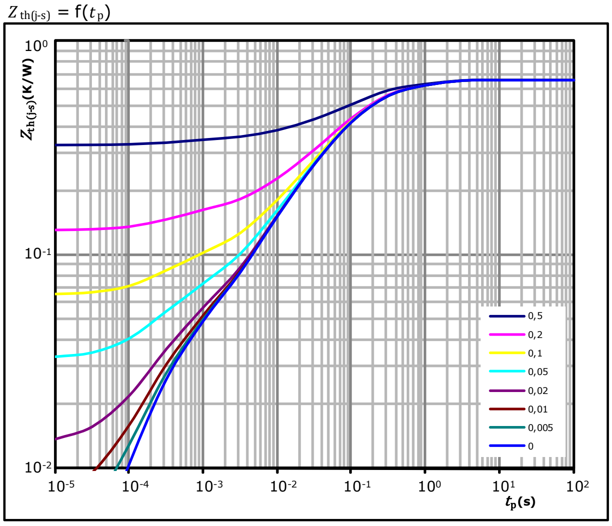


t_p =	100	µs		25 °C	dotted (blue)
V_{CE} =	10	V	T_j:	125 °C	solid (black)
				150 °C	dashed (red)

figure 4. **IGBT**

Transient thermal impedance as function of pulse duration

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



D = t_p / T

$R_{th(j\text{-}s)}$ = 0,65 K/W

IGBT thermal model values

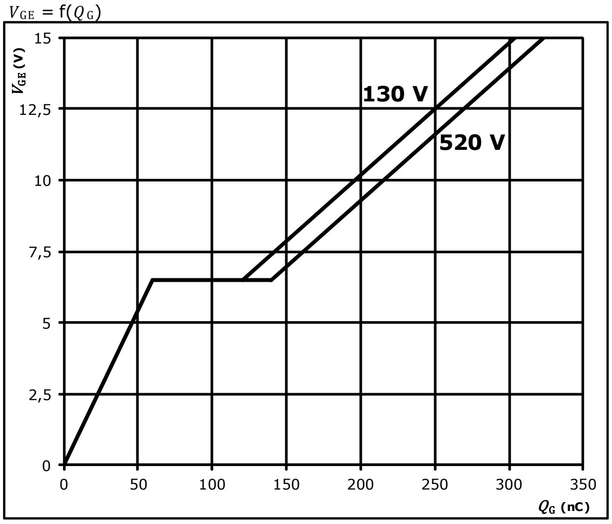
R (K/W)	τ (s)
1,13E-01	8,46E-01
2,91E-01	1,23E-01
1,38E-01	3,33E-02
6,68E-02	8,32E-03
1,32E-02	2,63E-03
3,21E-02	3,23E-04

Buck Switch Characteristics

figure 5. IGBT

Gate voltage vs gate charge

$V_{GE} = f(Q_G)$

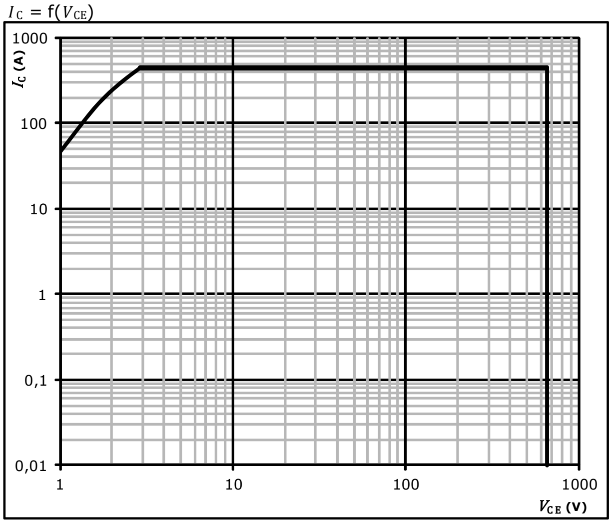


I_C= 150 A

figure 6. IGBT

Safe operating area

$I_C = f(V_{CE})$



D = single pulse

T_s = 80 ºC

V_{GE} = ±15 V

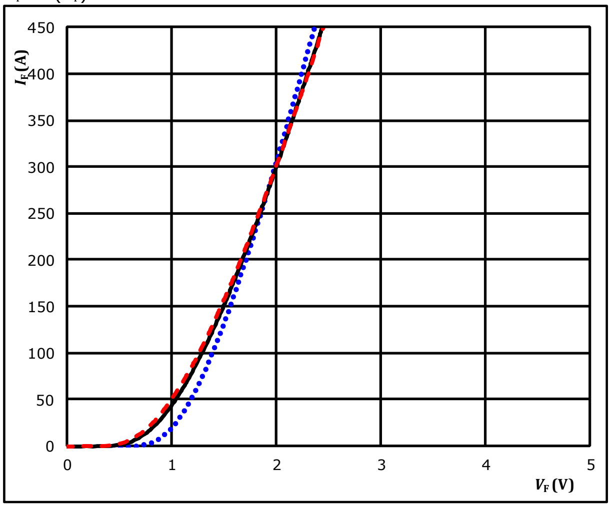
T_j = T_{jmax}

Buck Diode Characteristics

figure 1. **FWD**

Typical forward characteristics

$I_F = f(V_F)$

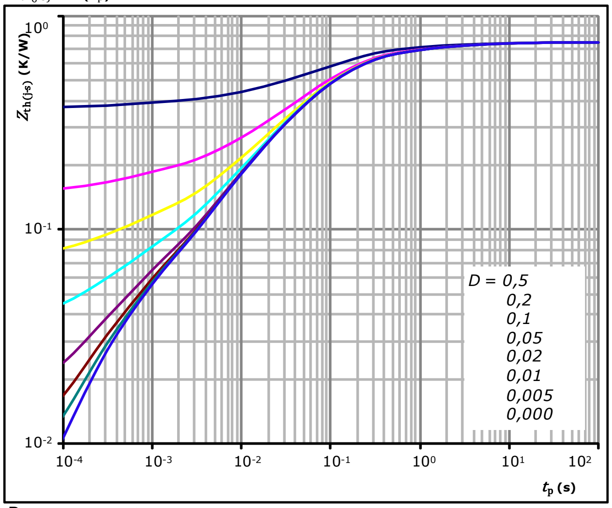


t_p =	250	µs	25 °C	dotted blue
		T_j:	125 °C	solid black
			150 °C	dashed red

figure 2. **FWD**

Transient thermal impedance as a function of pulse width

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



D = t_p / T

$R_{th(j\text{-}s)}$ = 0,75 K/W

FWD thermal model values

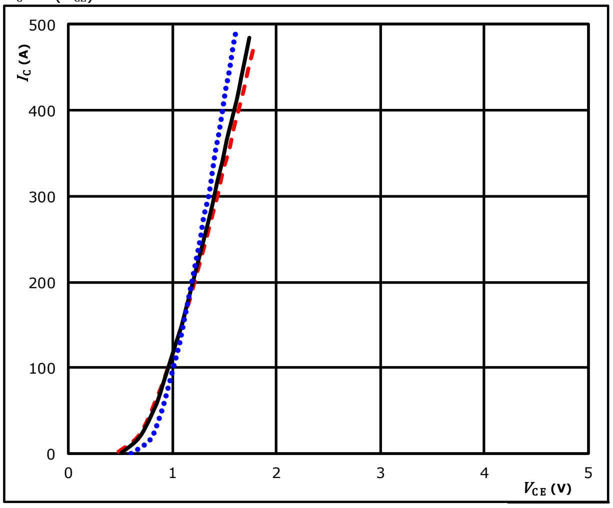
R (K/W)	τ (s)
2,88E-02	7,46E+00
7,02E-02	1,27E+00
1,95E-01	2,04E-01
2,65E-01	6,33E-02
1,21E-01	1,27E-02
3,39E-02	3,05E-03
3,36E-02	3,74E-04

Boost Switch Characteristics

figure 1. **IGBT**

Typical output characteristics

$I_C = f(V_{CE})$

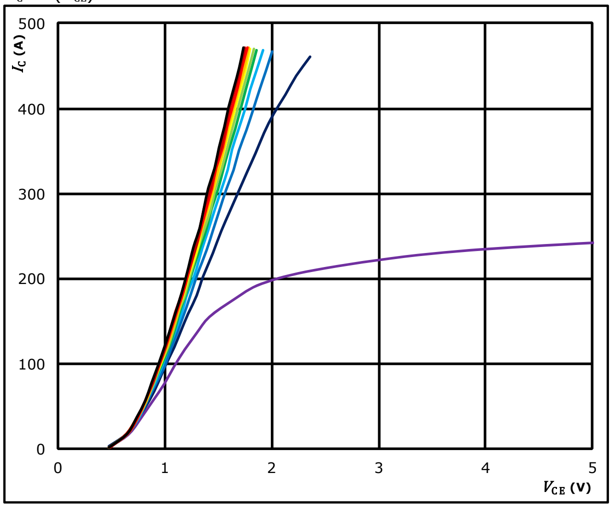


t_p =	250	μs		25 °C	············
V_{GE} =	15	V	T_j:	125 °C	———
				150 °C	– – –

figure 2. **IGBT**

Typical output characteristics

$I_C = f(V_{CE})$

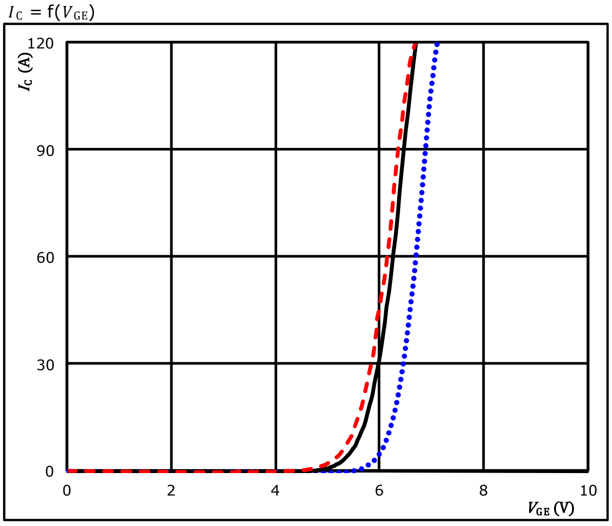


t_p =	250	μs
T_j =	150	°C
V_{GE} from	7 V to 17 V in steps of 1 V	

figure 3. **IGBT**

Typical transfer characteristics

$I_C = f(V_{GE})$

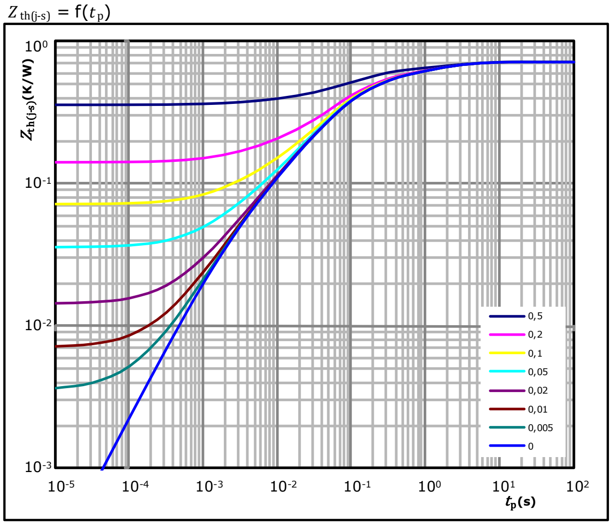


t_p =	100	μs		25 °C	············
V_{CE} =	10	V	T_j:	125 °C	———
				150 °C	– – –

figure 4. **IGBT**

Transient Thermal Impedance as function of Pulse duration

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



D =	t_p / T	
$R_{th(j-s)}$ =	0,72	K/W

IGBT thermal model values

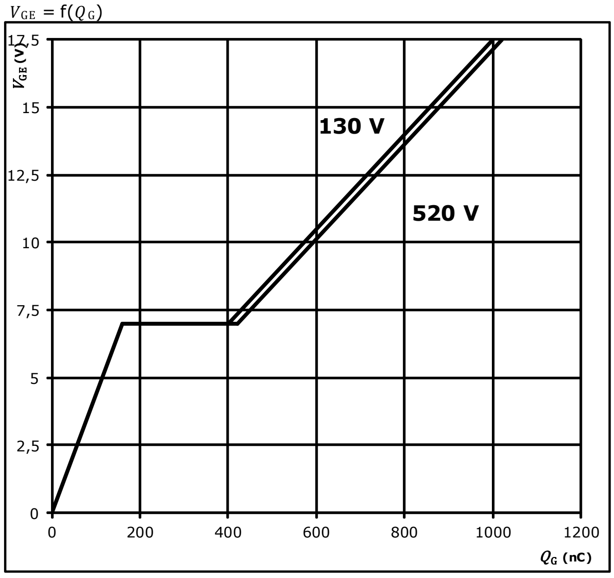
R (K/W)	τ (s)
1,29E-01	2,09E+00
1,33E-01	4,46E-01
3,21E-01	8,45E-02
6,42E-02	2,97E-02
5,12E-02	7,88E-03
1,68E-02	1,62E-03

Boost Switch Characteristics

figure 5. **IGBT**

Gate voltage vs Gate charge

$V_{GE} = f(Q_G)$



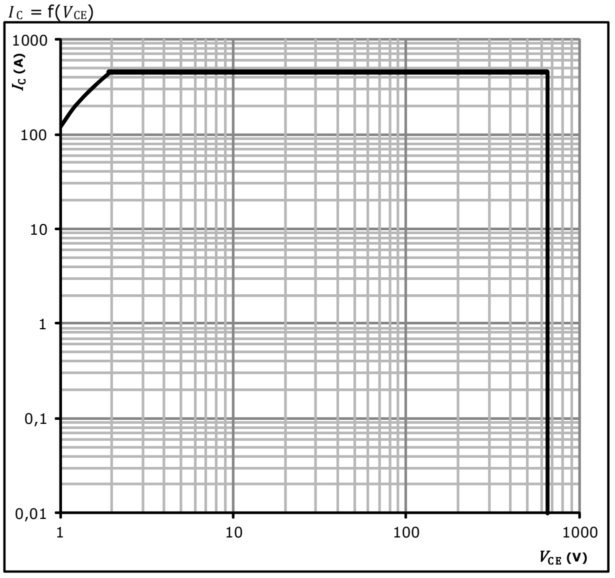
At

I_C= 150 A

figure 6. **IGBT**

Safe operating area

$I_C = f(V_{CE})$



At

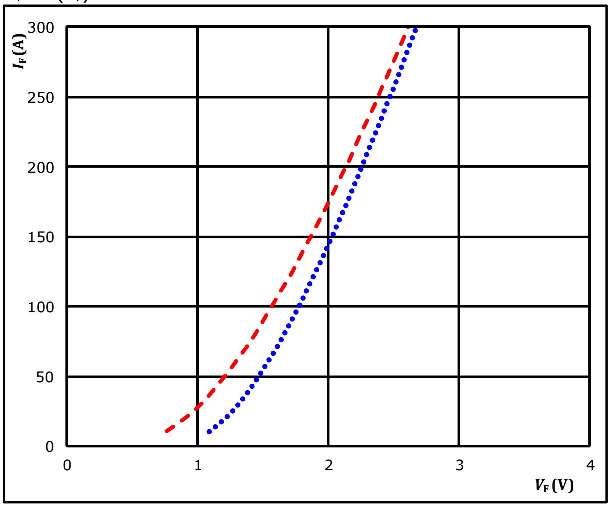
D =	single pulse	
T_s =	80	ºC
V_{GE} =	±15	V
T_j =	T_{jmax}	

Boost Diode Characteristics

figure 1. **FWD**

Typical forward characteristics

$I_F = f(V_F)$



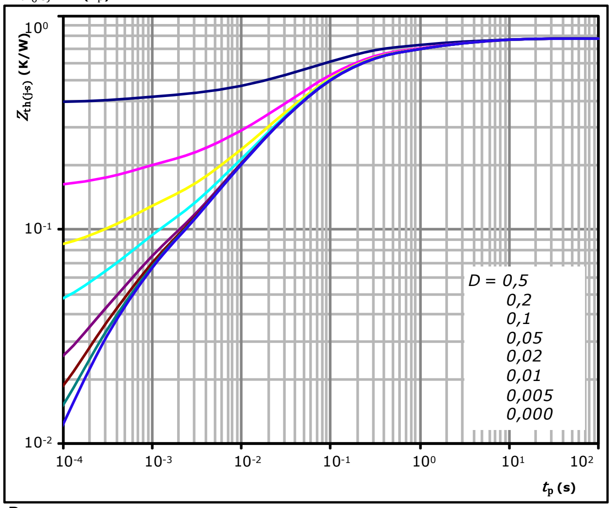
t_p = 250 µs

T_j: 25 °C; 150 °C

figure 2. **FWD**

Transient thermal impedance as a function of pulse width

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



D = t_p / T

$R_{th(j-s)}$ = 0,78 K/W

FWD thermal model values

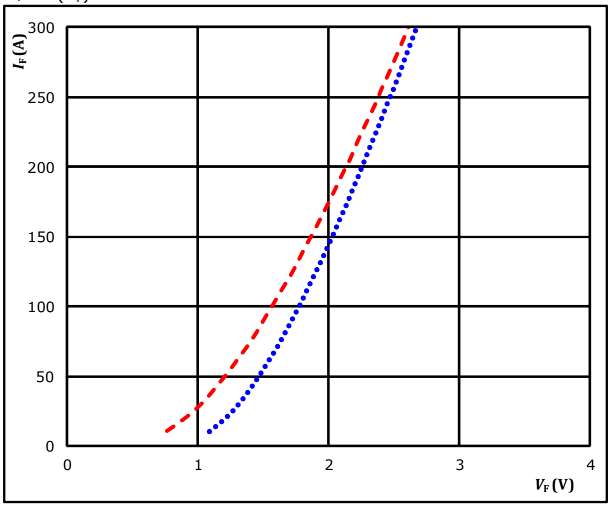
R (K/W)	τ (s)
5,76E-02	5,42E+00
8,79E-02	1,09E+00
2,14E-01	1,59E-01
2,31E-01	4,95E-02
1,16E-01	1,05E-02
3,20E-02	2,39E-03
4,19E-02	4,10E-04

Boost Sw.Inv.Diode Characteristics

figure 1. **FWD**

Typical forward characteristics

$I_F = f(V_F)$



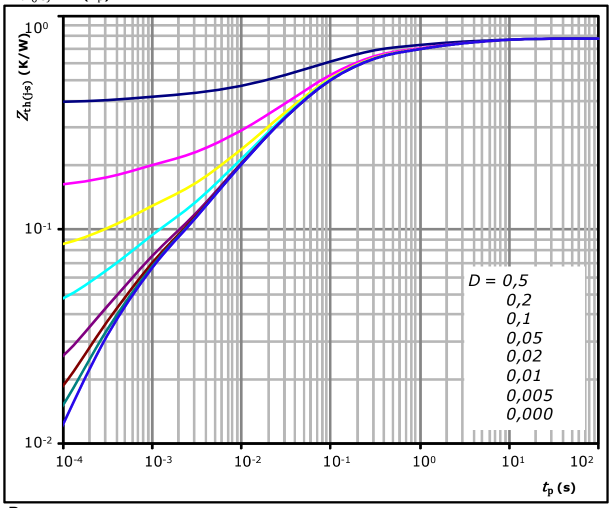
t_p = 250 µs

T_j: 25 °C ; 150 °C

figure 2. **FWD**

Transient thermal impedance as a function of pulse width

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



D = t_p / T

$R_{th(j-s)}$ = 0,78 K/W

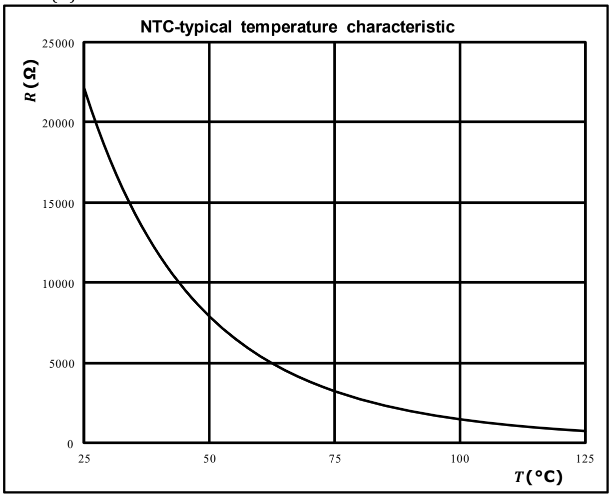
FWD thermal model values

R (K/W)	τ (s)
5,76E-02	5,42E+00
8,79E-02	1,09E+00
2,14E-01	1,59E-01
2,31E-01	4,95E-02
1,16E-01	1,05E-02
3,20E-02	2,39E-03
4,19E-02	4,10E-04

NTC Characteristics

figure 1.	**Thermistor**

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



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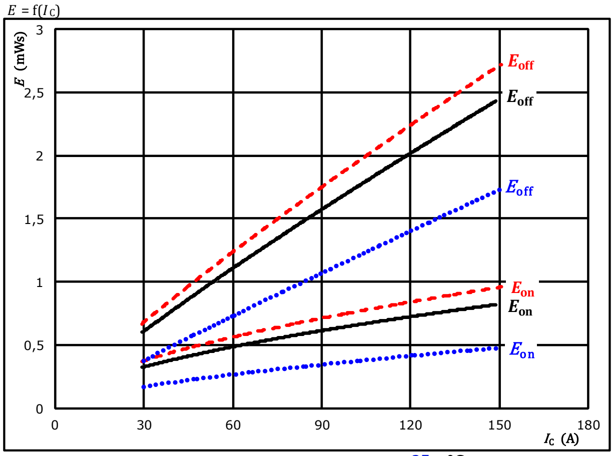
Buck Switching Characteristics

figure 1. **IGBT**

Typical switching energy losses as a function of collector current

$E = f(I_C)$



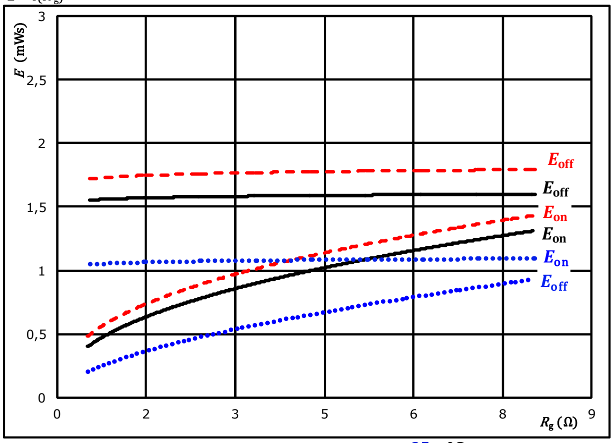
With an inductive load at

V_{CE} =	350	V	T_j:	25 °C
V_{GE} =	+15/-5	V		125 °C
R_{gon} =	2	Ω		150 °C
R_{goff} =	2	Ω		

figure 2. **IGBT**

Typical switching energy losses as a function of gate resistor

$E = f(R_g)$



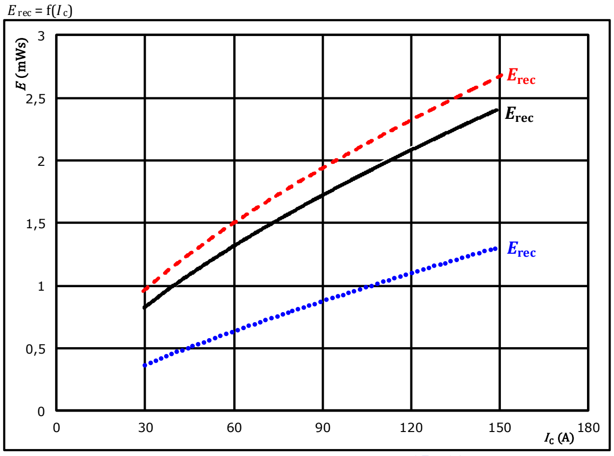
With an inductive load at

V_{CE} =	350	V	T_j:	25 °C
V_{GE} =	+15/-5	V		125 °C
I_C =	90	A		150 °C

figure 3. **FWD**

Typical reverse recovered energy loss as a function of collector current

$E_{rec} = f(I_C)$



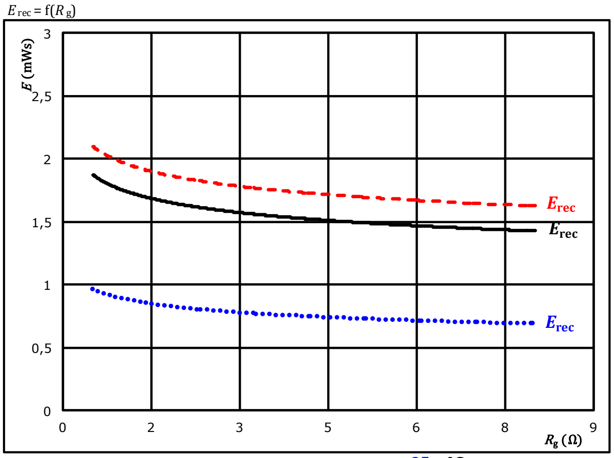
With an inductive load at

V_{CE} =	350	V	T_j:	25 °C
V_{GE} =	+15/-5	V		125 °C
R_{gon} =	2	Ω		150 °C

figure 4. **FWD**

Typical reverse recovered energy loss as a function of gate resistor

$E_{rec} = f(R_g)$



With an inductive load at

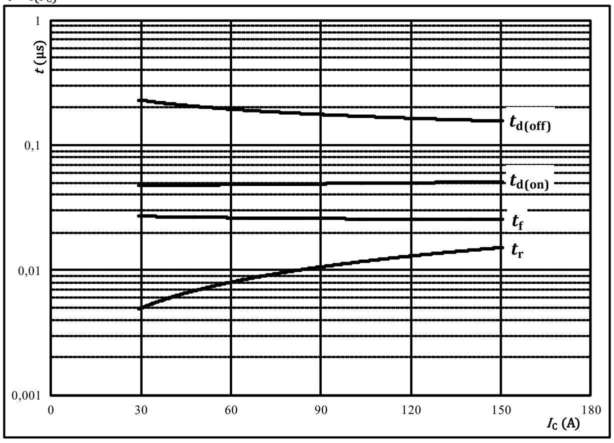
V_{CE} =	350	V	T_j:	25 °C
V_{GE} =	+15/-5	V		125 °C
I_C =	90	A		150 °C

Buck Switching Characteristics

figure 5. **IGBT**

Typical switching times as a function of collector current

$t = f(I_C)$



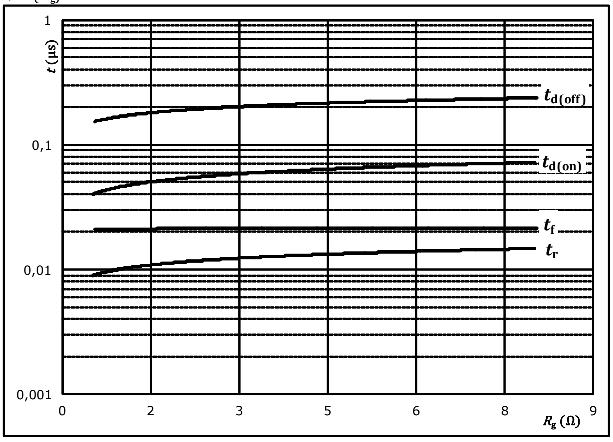
With an inductive load at

T_j =	150	°C
V_{CE} =	350	V
V_{GE} =	+15/-5	V
R_{gon} =	2	Ω
R_{goff} =	2	Ω

figure 6. **IGBT**

Typical switching times as a function of gate resistor

$t = f(R_g)$



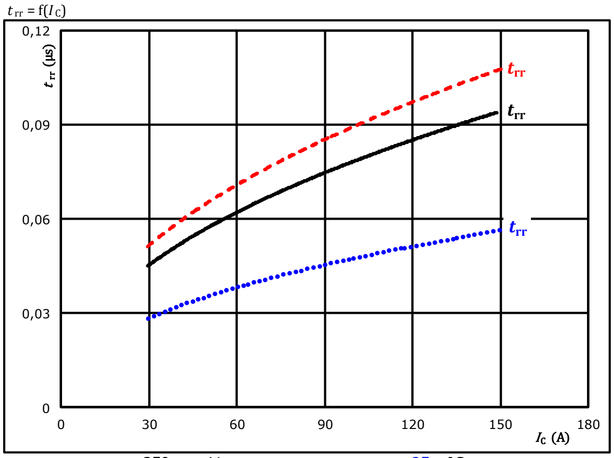
With an inductive load at

T_j =	150	°C
V_{CE} =	350	V
V_{GE} =	+15/-5	V
I_C =	90	A

figure 7. **FWD**

Typical reverse recovery time as a function of collector current

$t_{rr} = f(I_C)$

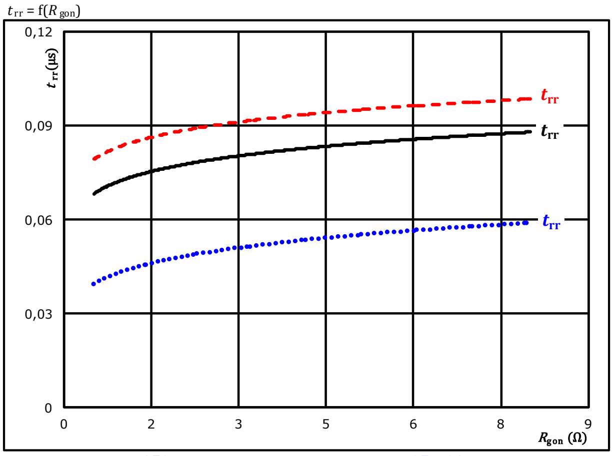


At					
V_{CE}=	350	V		25 °C	blue dotted
V_{GE} =	+15/-5	V	T_j:	125 °C	black solid
R_{gon} =	2	Ω		150 °C	red dashed

figure 8. **FWD**

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

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



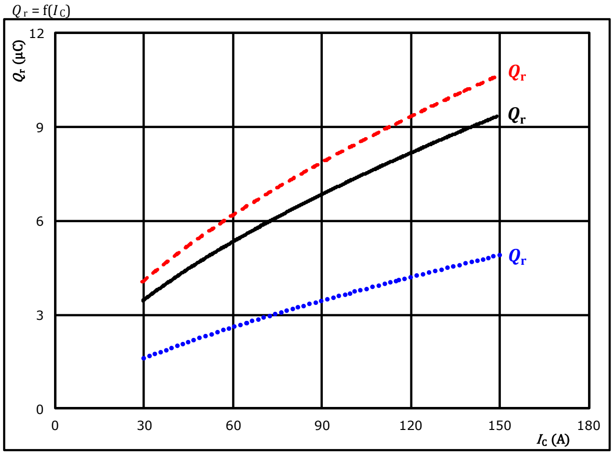
At					
V_{CE} =	350	V		25 °C	blue dotted
V_{GE} =	+15/-5	V	T_j:	125 °C	black solid
I_C =	90	A		150 °C	red dashed

Buck Switching Characteristics

figure 9. **FWD**

Typical recovered charge as a function of collector current

$Q_r = f(I_C)$

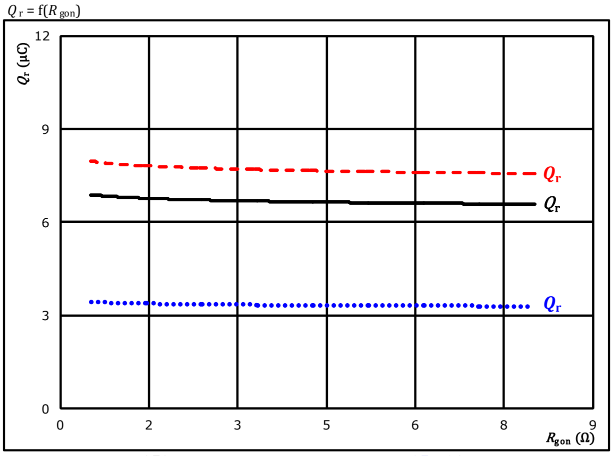


At						
V_{CE} =	350	V		25	°C	dotted (blue)
V_{GE} =	+15/-5	V	T_j:	125	°C	solid (black)
R_{gon} =	2	Ω		150	°C	dashed (red)

figure 10. **FWD**

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

$Q_r = f(R_{gon})$

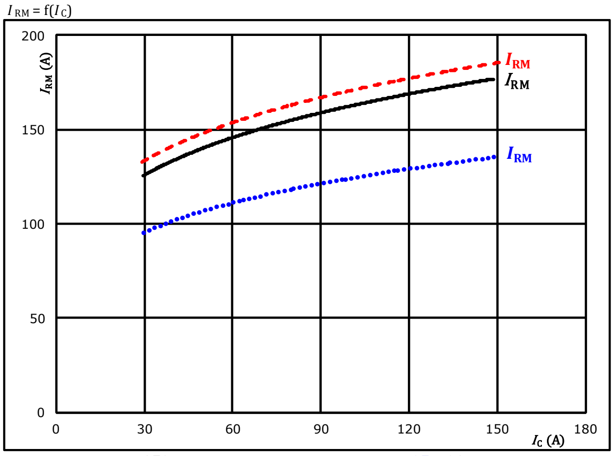


At						
V_{CE}=	350	V		25	°C	dotted (blue)
V_{GE} =	+15/-5	V	T_j:	125	°C	solid (black)
I_C=	90	A		150	°C	dashed (red)

figure 11. **FWD**

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

$I_{RM} = f(I_C)$

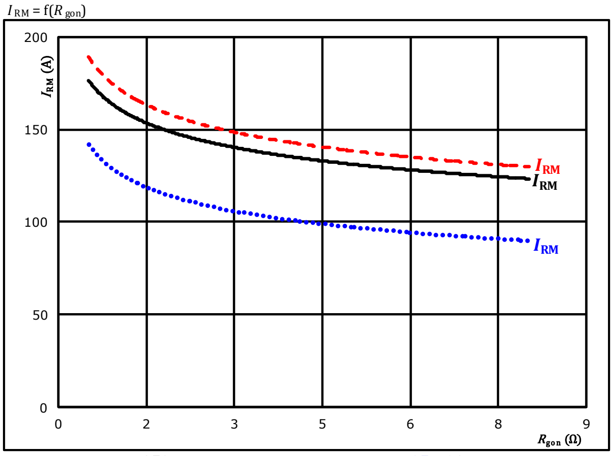


At						
V_{CE}:	350	V		25	°C	dotted (blue)
V_{GE} =	+15/-5	V	T_j:	125	°C	solid (black)
R_{gon} =	2	Ω		150	°C	dashed (red)

figure 12. **FWD**

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

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



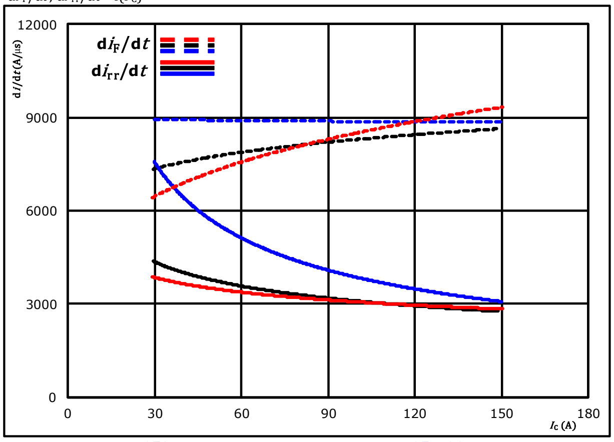
At						
V_{CE} =	350	V		25	°C	dotted (blue)
V_{GE} =	+15/-5	V	T_j:	125	°C	solid (black)
I_C =	90	A		150	°C	dashed (red)

Buck Switching Characteristics

figure 13. **FWD**

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

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

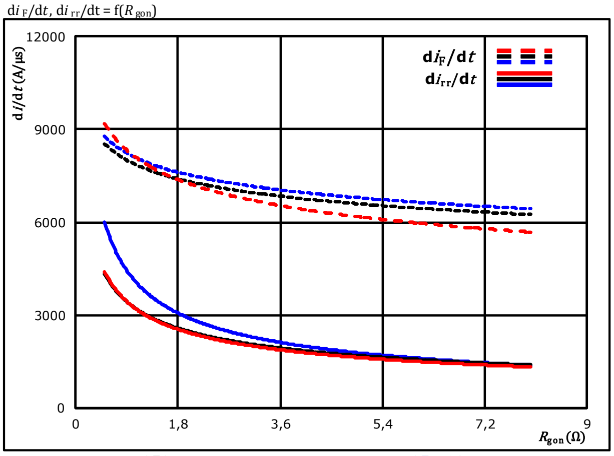


At						
V_{CE} =	350	V		25	°C	•••••••••••••
V_{GE} =	+15/-5	V	T_j:	125	°C	———
R_{gon} =	2	Ω		150	°C	– – – –

figure 14. **FWD**

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

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

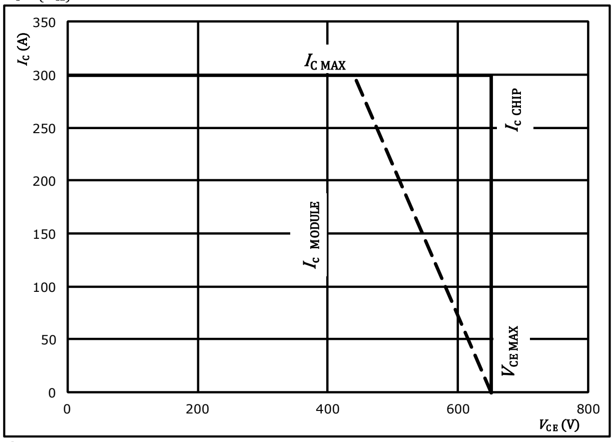


At						
V_{CE} =	350	V		25	°C	•••••••••••••
V_{GE} =	+15/-5	V	T_j:	125	°C	———
I_C =	90	A		150	°C	– – – –

figure 15. **IGBT**

Reverse bias safe operating area

$I_C = f(V_{CE})$



At		
T_j =	175	°C
R_{gon} =	2	Ω
R_{goff} =	2	Ω

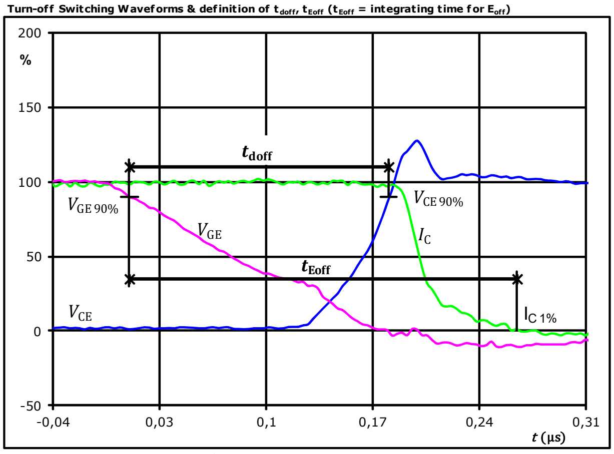
Buck Switching Definitions

General conditions

T_j	=	125 °C
R_{gon}	=	2 Ω
R_{goff}	=	2 Ω

figure 1. IGBT

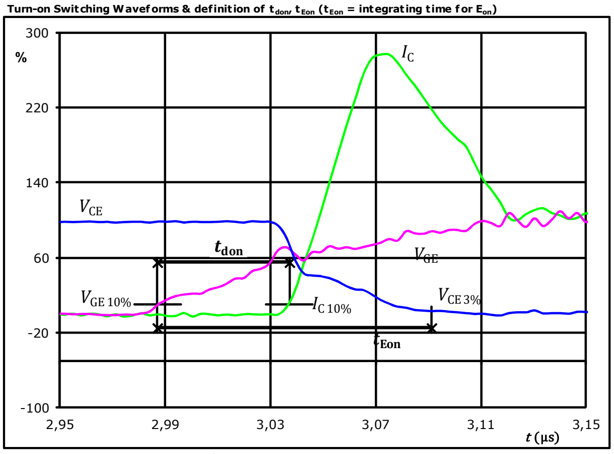
Turn-off Switching Waveforms & definition of t_{doff}, t_{Eoff} (t_{Eoff} = integrating time for E_{off})



$V_{GE}(0\%)$ =	0	V
$V_{GE}(100\%)$ =	20	V
$V_C(100\%)$ =	350	V
$I_C(100\%)$ =	89	A
t_{doff} =	0,170	µs
t_{Eoff} =	0,254	µs

figure 2. IGBT

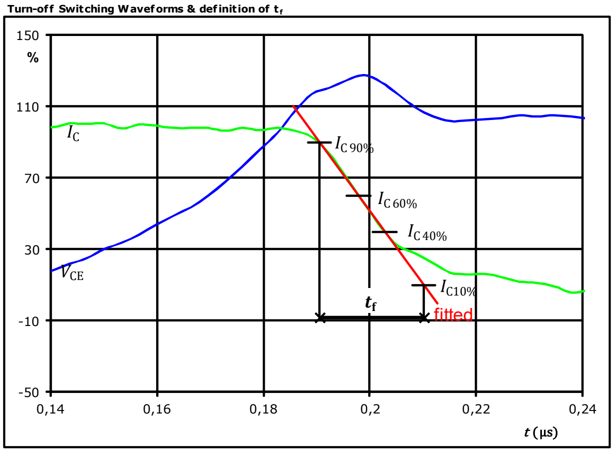
Turn-on Switching Waveforms & definition of t_{don}, t_{Eon} (t_{Eon} = integrating time for E_{on})



$V_{GE}(0\%)$ =	0	V
$V_{GE}(100\%)$ =	20	V
$V_C(100\%)$ =	350	V
$I_C(100\%)$ =	89	A
t_{don} =	0,050	µs
t_{Eon} =	0,104	µs

figure 3. IGBT

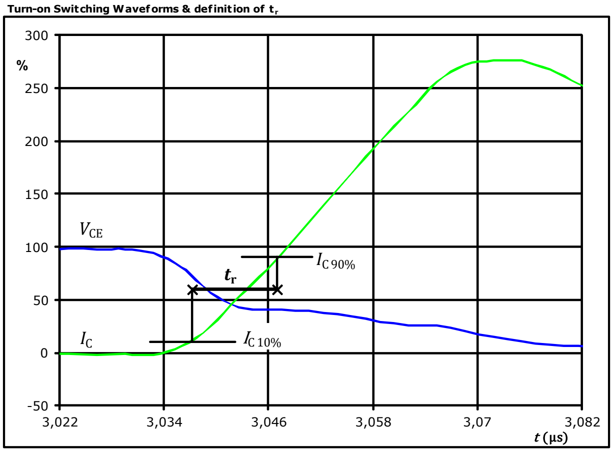
Turn-off Switching Waveforms & definition of t_f



$V_C(100\%)$ =	350	V
$I_C(100\%)$ =	89	A
t_f =	0,019	µs

figure 4. IGBT

Turn-on Switching Waveforms & definition of t_r

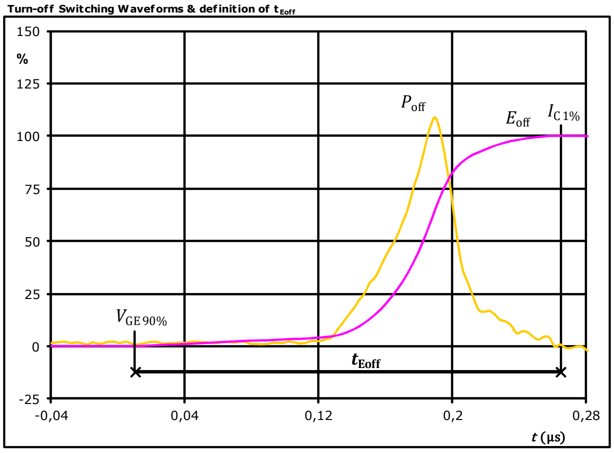


$V_C(100\%)$ =	350	V
$I_C(100\%)$ =	89	A
t_r =	0,010	µs

Buck Switching Characteristics

figure 5. IGBT

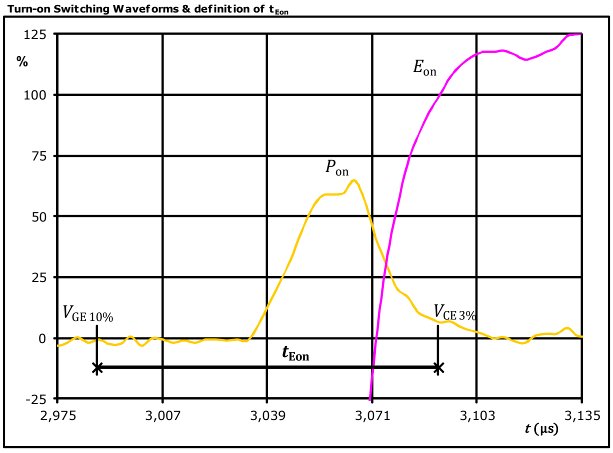
Turn-off Switching Waveforms & definition of t_{Eoff}



P_{off} (100%) =	31,31	kW
E_{off} (100%) =	1,56	mJ
t_{Eoff} =	0,25	μs

figure 6. IGBT

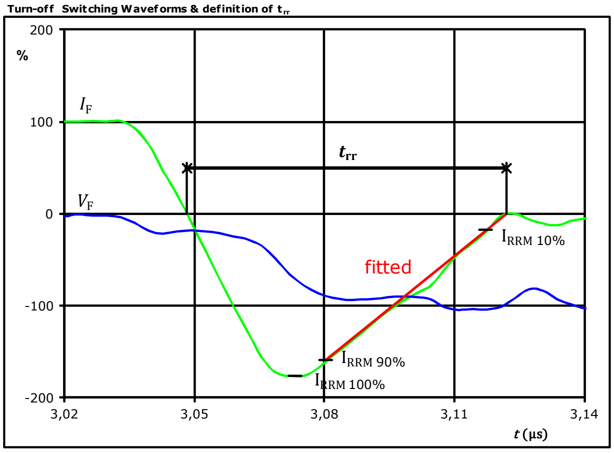
Turn-on Switching Waveforms & definition of t_{Eon}



P_{on} (100%) =	31,31	kW
E_{on} (100%) =	0,61	mJ
t_{Eon} =	0,10	μs

figure 7. FWD

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

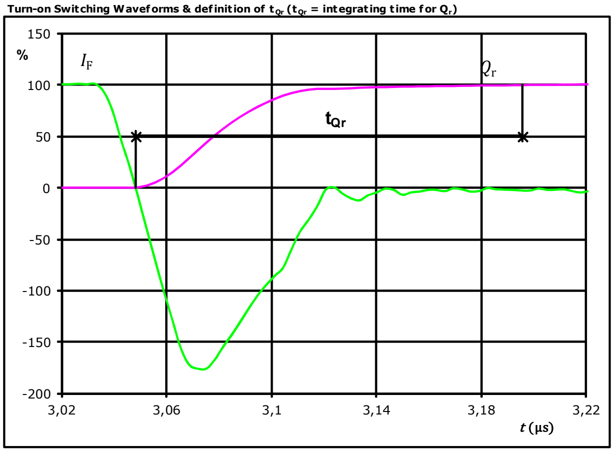


V_F (100%) =	350	V
I_F (100%) =	89	A
I_{RRM} (100%) =	-158	A
t_{rr} =	0,074	μs

Buck Switching Characteristics

figure 8.	FWD

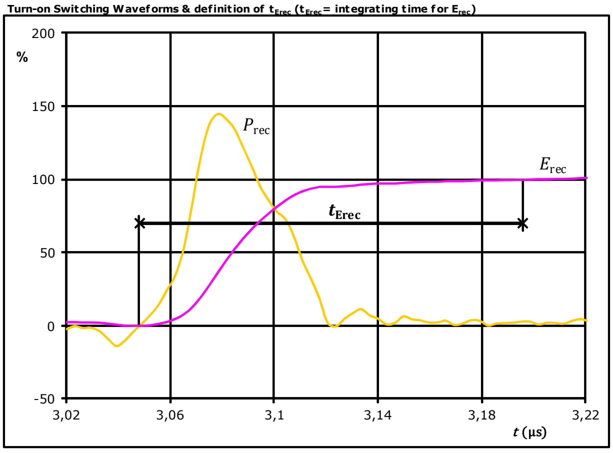
Turn-on Switching Waveforms & definition of t_{Qr} (t_{Qr} = integrating time for Q_r)



I_F (100%) =	89	A
Q_r (100%) =	6,78	µC
t_{Qr} =	0,15	µs

figure 9.	FWD

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



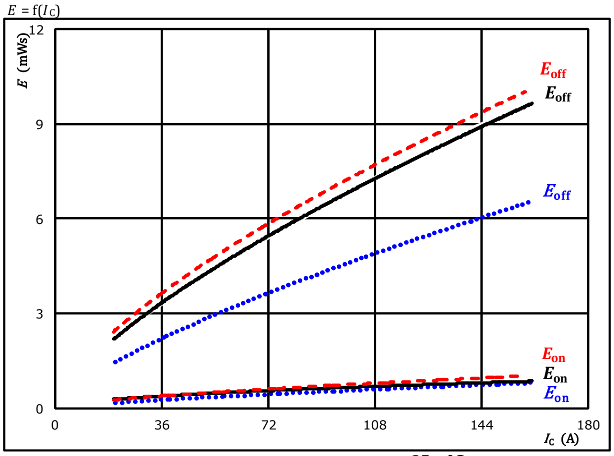
P_{rec} (100%) =	31,31	kW
E_{rec} (100%) =	1,72	mJ
t_{Erec} =	0,15	µs

Boost Switching Characteristics

figure 1. IGBT

Typical switching energy losses as a function of collector current

$E = f(I_C)$



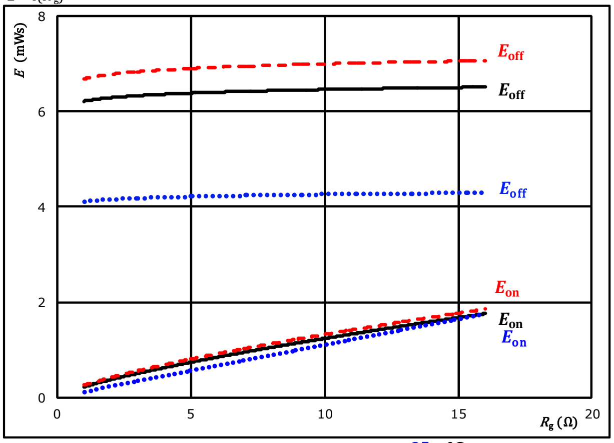
With an inductive load at

V_{CE} =	350	V	T_j:	25 °C	dotted
V_{GE} =	±15	V		125 °C	solid
R_{gon} =	4	Ω		150 °C	dashed
R_{goff} =	4	Ω			

figure 2. IGBT

Typical switching energy losses as a function of gate resistor

$E = f(R_g)$



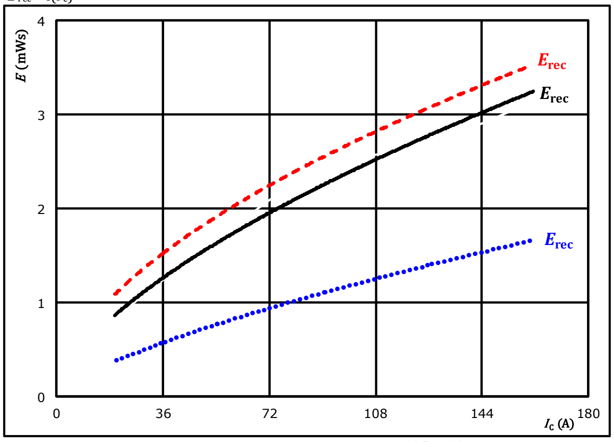
With an inductive load at

V_{CE} =	350	V	T_j:	25 °C	dotted
V_{GE} =	±15	V		125 °C	solid
I_C =	89	A		150 °C	dashed

figure 3. FWD

Typical reverse recovered energy loss as a function of collector current

$E_{rec} = f(I_c)$



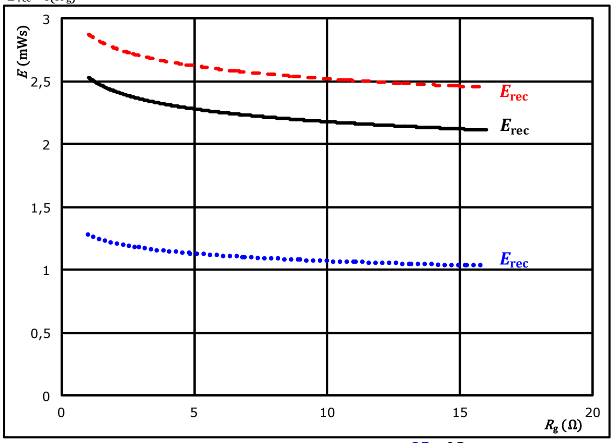
With an inductive load at

V_{CE} =	350	V	T_j:	25 °C	dotted
V_{GE} =	±15	V		125 °C	solid
R_{gon} =	4	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

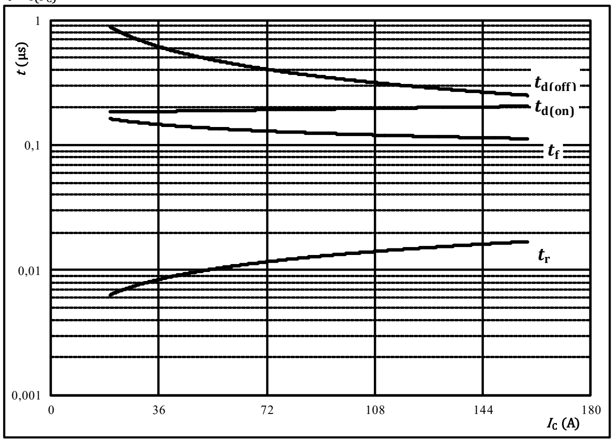
V_{CE} =	350	V	T_j:	25 °C	dotted
V_{GE} =	±15	V		125 °C	solid
I_C =	89	A		150 °C	dashed

Boost Switching Characteristics

figure 5. IGBT

Typical switching times as a function of collector current

$t = f(I_C)$



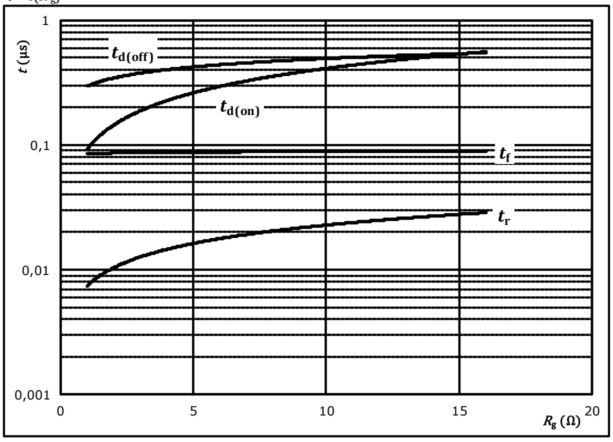
With an inductive load at

T_j =	150	°C
V_{CE} =	350	V
V_{GE} =	±15	V
R_{gon} =	4	Ω
R_{goff} =	4	Ω

figure 6. IGBT

Typical switching times as a function of gate resistor

$t = f(R_g)$



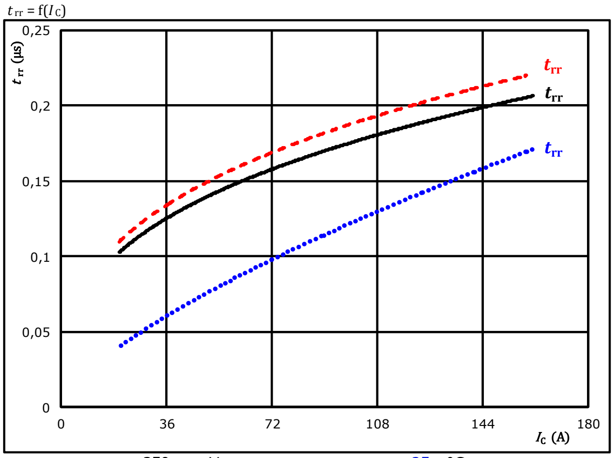
With an inductive load at

T_j =	150	°C
V_{CE} =	350	V
V_{GE} =	±15	V
I_C =	89	A

figure 7. FWD

Typical reverse recovery time as a function of collector current

$t_{rr} = f(I_C)$

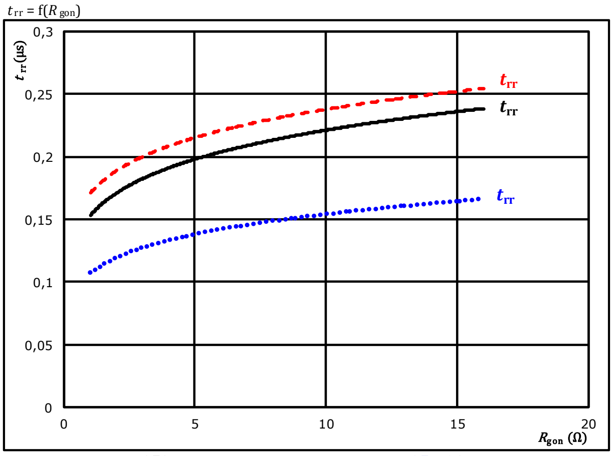


At					
V_{CE} =	350	V	T_j:	25 °C	dotted
V_{GE} =	±15	V		125 °C	solid
R_{gon} =	4	Ω		150 °C	dashed

figure 8. FWD

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

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



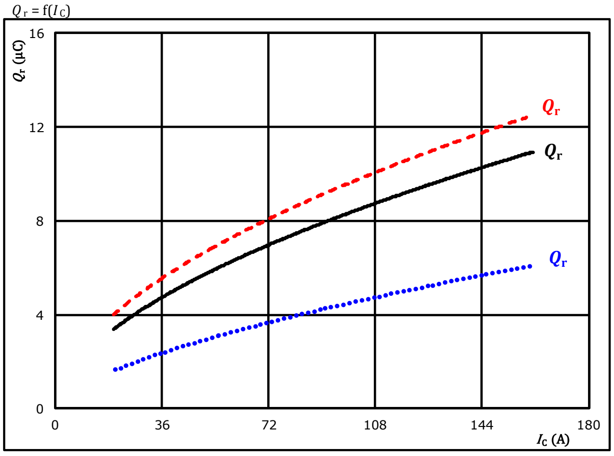
At					
V_{CE} =	350	V	T_j:	25 °C	dotted
V_{GE} =	±15	V		125 °C	solid
I_C =	89	A		150 °C	dashed

Boost Switching Characteristics

figure 9. **FWD**

Typical recovered charge as a function of collector current

$Q_r = f(I_C)$

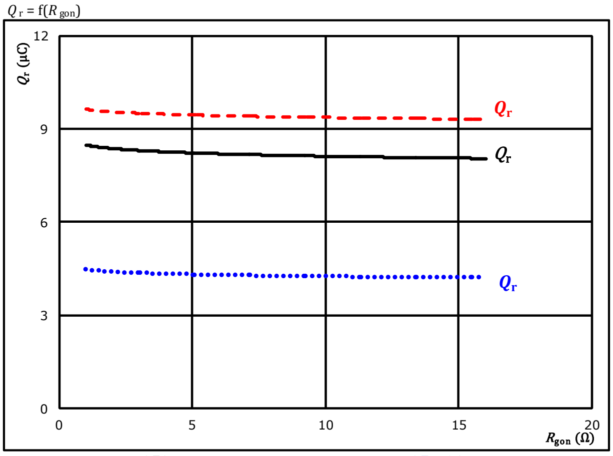


At					
V_{CE} =	350	V		25 °C	dotted
V_{GE} =	±15	V	T_j:	125 °C	solid
R_{gon} =	4	Ω		150 °C	dashed

figure 10. **FWD**

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

$Q_r = f(R_{gon})$

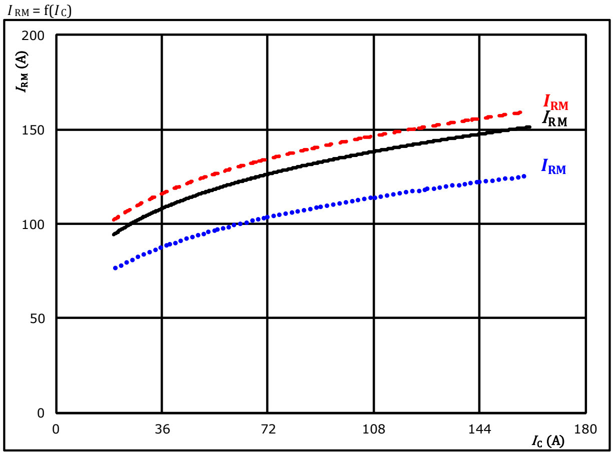


At					
V_{CE}=	350	V		25 °C	dotted
V_{GE} =	±15	V	T_j:	125 °C	solid
I_C=	89	A		150 °C	dashed

figure 11. **FWD**

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

$I_{RM} = f(I_C)$

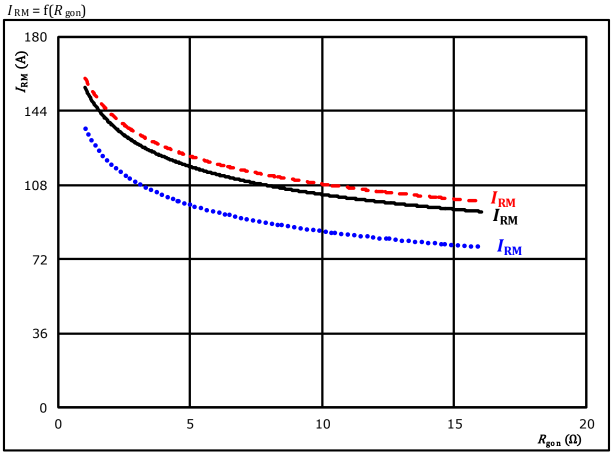


At					
V_{CE}:	350	V		25 °C	dotted
V_{GE} =	±15	V	T_j:	125 °C	solid
R_{gon} =	4	Ω		150 °C	dashed

figure 12. **FWD**

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

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



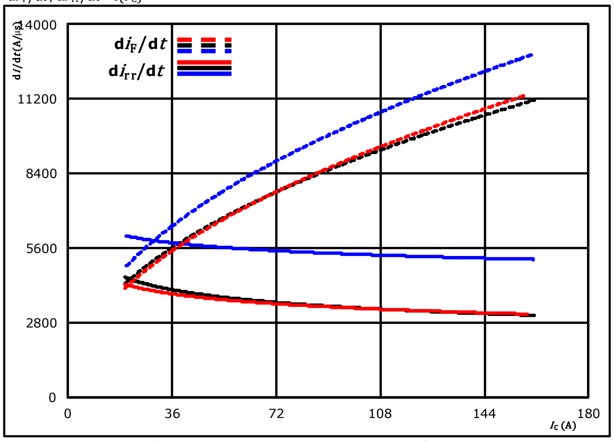
At					
V_{CE}=	350	V		25 °C	dotted
V_{GE} =	±15	V	T_j:	125 °C	solid
I_C=	89	A		150 °C	dashed

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

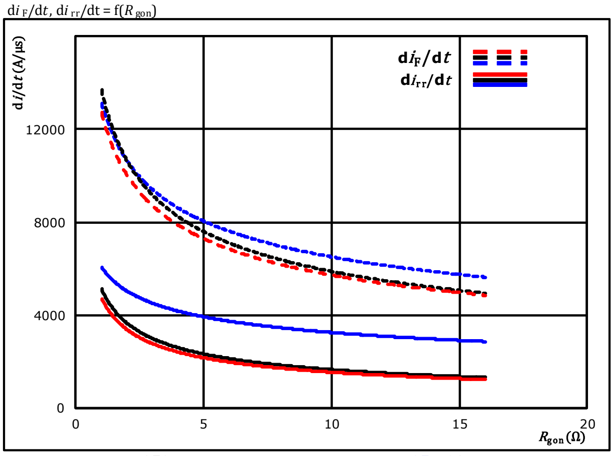


At					
V_{CE} =	350	V		25 °C	
V_{GE} =	±15	V	T_j:	125 °C	
R_{gon} =	4	Ω		150 °C	

figure 14. **FWD**

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

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

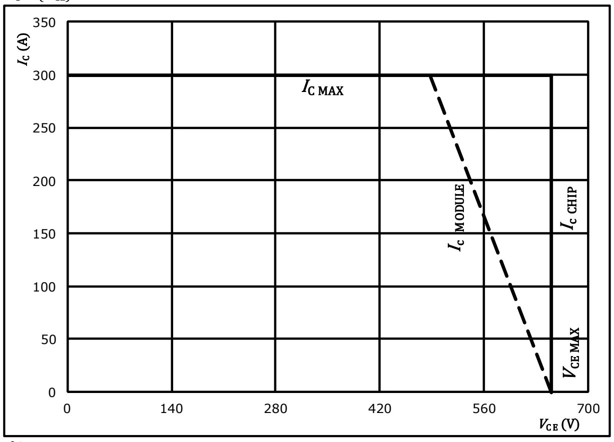


At					
V_{CE} =	350	V		25 °C	
V_{GE} =	±15	V	T_j:	125 °C	
I_C =	89	A		150 °C	

figure 15. **IGBT**

Reverse bias safe operating area

$I_C = f(V_{CE})$

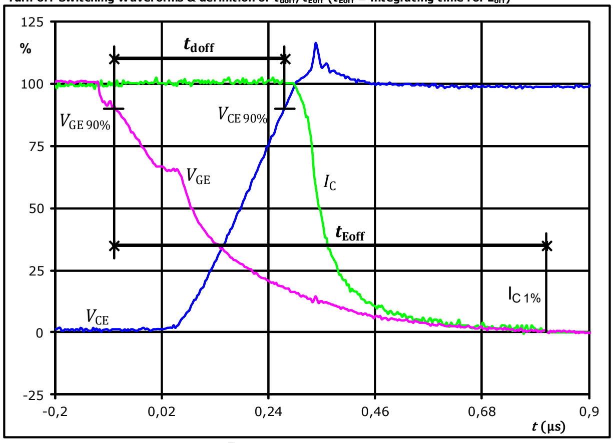


At		
T_j =	175	°C
R_{gon} =	4	Ω
R_{goff} =	4	Ω

Boost Switching Definitions

figure 1. IGBT

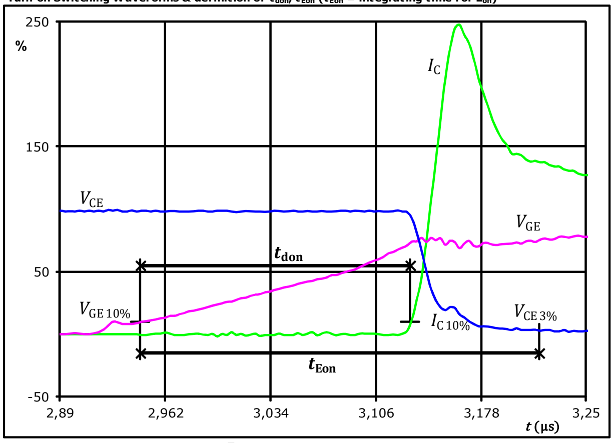
Turn-off Switching Waveforms & definition of t_{doff}, t_{Eoff} (t_{Eoff} = integrating time for E_{off})



$V_{GE}(0\%)$ =	-15	V
$V_{GE}(100\%)$ =	15	V
$V_{C}(100\%)$ =	350	V
$I_{C}(100\%)$ =	89	A
t_{doff} =	0,349	µs
t_{Eoff} =	0,892	µs

figure 2. IGBT

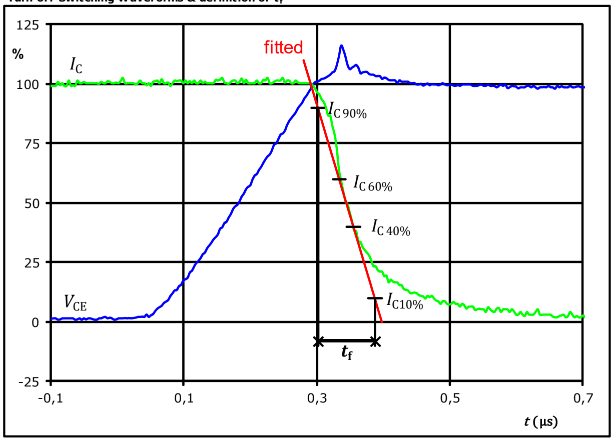
Turn-on Switching Waveforms & definition of t_{don}, t_{Eon} (t_{Eon} = integrating time for E_{on})



$V_{GE}(0\%)$ =	-15	V
$V_{GE}(100\%)$ =	15	V
$V_{C}(100\%)$ =	350	V
$I_{C}(100\%)$ =	89	A
t_{don} =	0,184	µs
t_{Eon} =	0,273	µs

figure 3. IGBT

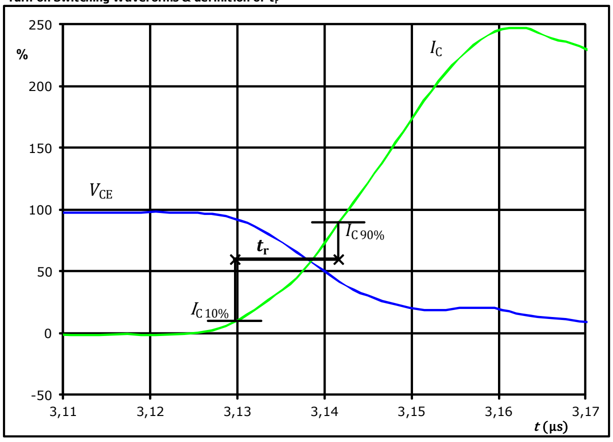
Turn-off Switching Waveforms & definition of t_f



$V_{C}(100\%)$ =	350	V
$I_{C}(100\%)$ =	89	A
t_{f} =	0,083	µs

figure 4. IGBT

Turn-on Switching Waveforms & definition of t_r

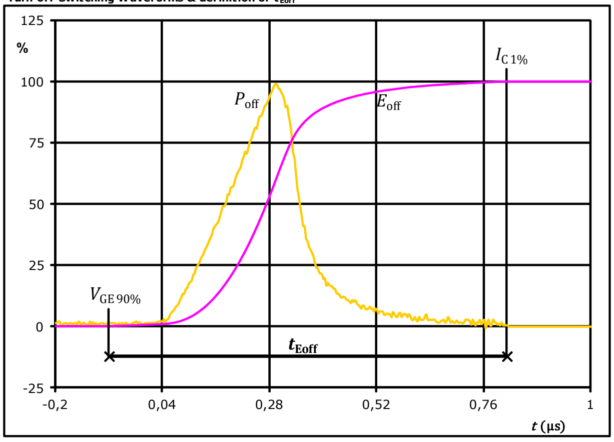


$V_{C}(100\%)$ =	350	V
$I_{C}(100\%)$ =	89	A
t_{r} =	0,012	µs

Boost Switching Characteristics

figure 5. IGBT

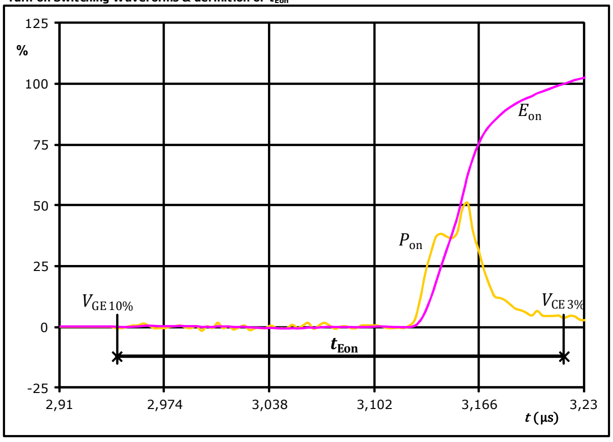
Turn-off Switching Waveforms & definition of t_{Eoff}



P_{off} (100%) =	31,19	kW
E_{off} (100%) =	6,30	mJ
t_{Eoff} =	0,89	µs

figure 6. IGBT

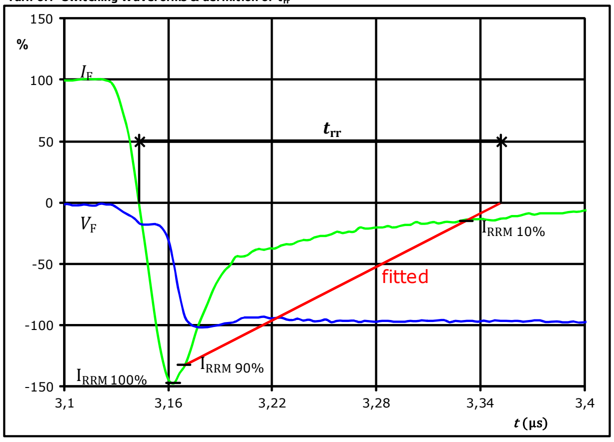
Turn-on Switching Waveforms & definition of t_{Eon}



P_{on} (100%) =	31,19	kW
E_{on} (100%) =	0,61	mJ
t_{Eon} =	0,27	µs

figure 7. FWD

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

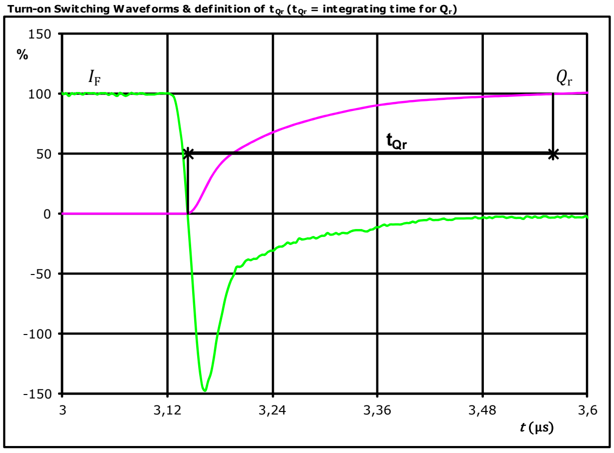


V_F (100%) =	350	V
I_F (100%) =	89	A
I_{RRM} (100%) =	-132	A
t_{rr} =	0,184	µs

Boost Switching Characteristics

figure 8. **FWD**

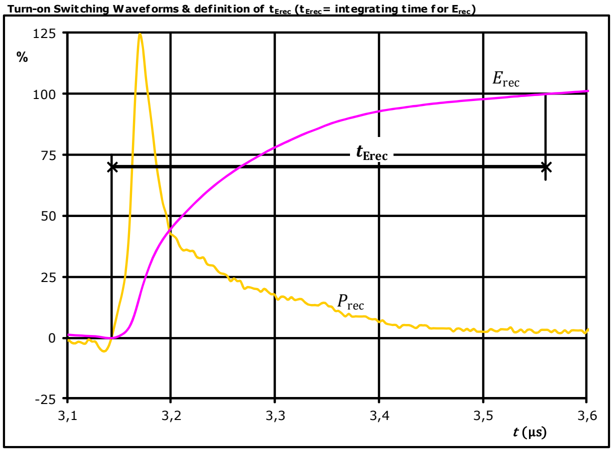
Turn-on Switching Waveforms & definition of t_{Qr} (t_{Qr} = integrating time for Q_r)



I_F (100%) =	89	A
Q_r (100%) =	8,48	µC
t_{Qr} =	0,42	µs

figure 9. **FWD**

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



P_{rec} (100%) =	31,19	kW
E_{rec} (100%) =	2,42	mJ
t_{Erec} =	0,42	µs

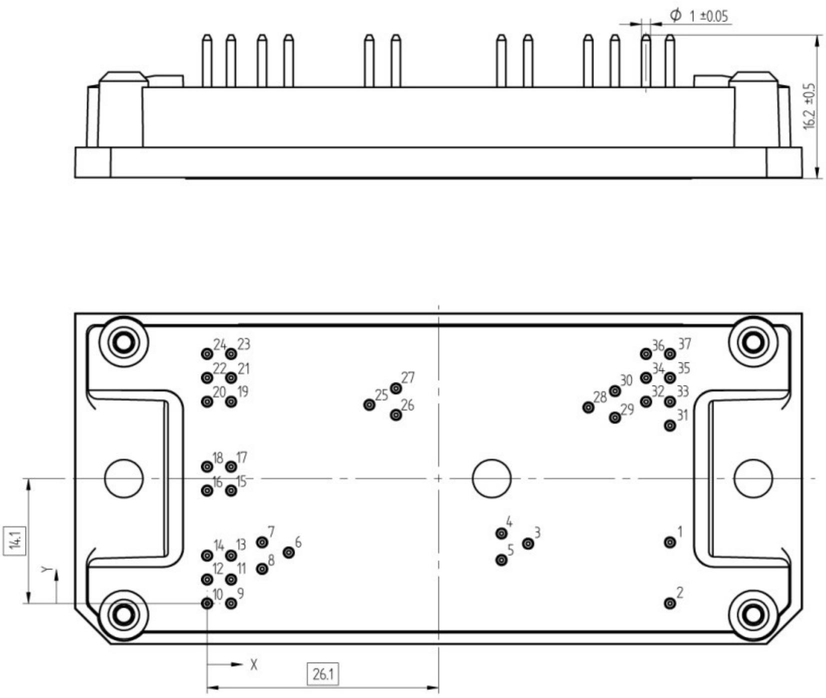
Ordering Code & Marking

Version	Ordering Code
without thermal paste 12mm housing with solder pins	10-FY07NIA150S5-M516F58
with thermal paste 12mm housing with solder pins	10-FY07NIA150S5-M516F58-/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		

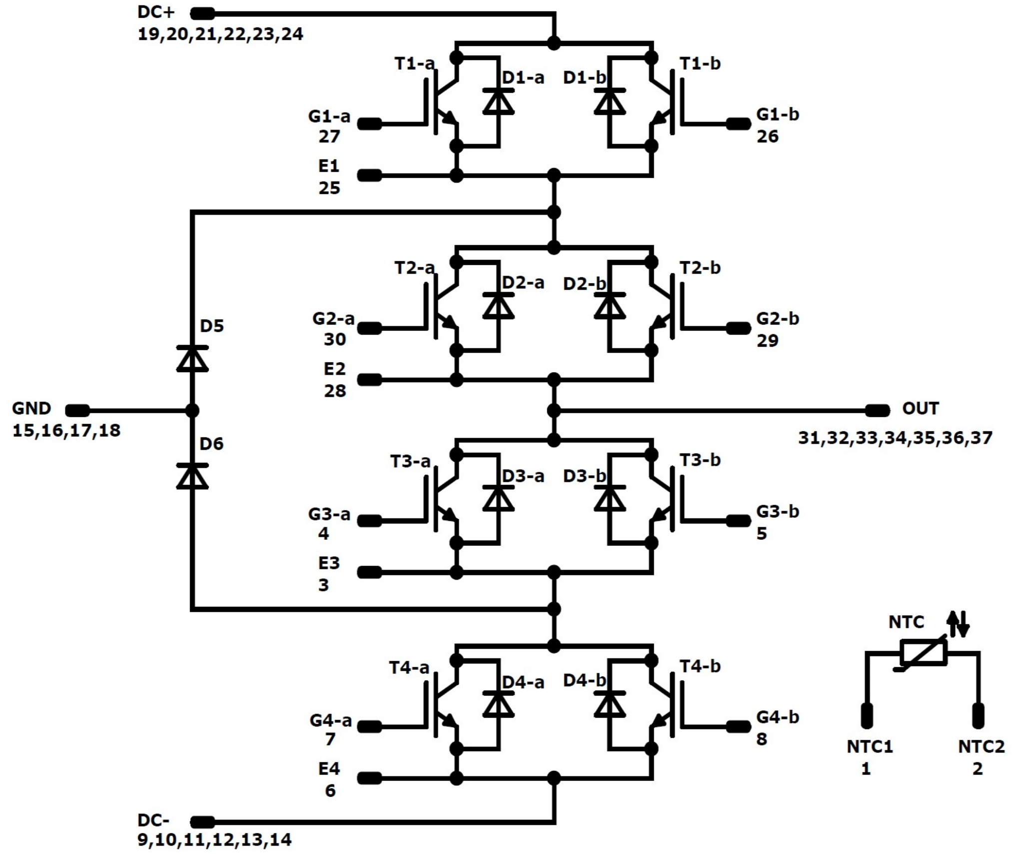
Outline

Pin	X	Y	Function
1	52,2	6,9	NTC1
2	52,2	0	NTC2
3	36,2	6,75	E3
4	33,2	7,9	G3-a
5	33,2	4,9	G3-b
6	9,2	5,75	E4
7	6,2	6,9	G4-a
8	6,2	3,9	G4-b
9	2,7	0	DC-
10	0	0	DC-
11	2,7	2,7	DC-
12	0	2,7	DC-
13	2,7	5,4	DC-
14	0	5,4	DC-
15	2,7	12,75	GND
16	0	12,75	GND
17	2,7	15,45	GND
18	0	15,45	GND
19	2,7	22,8	DC+
20	0	22,8	DC+
21	2,7	25,5	DC+
22	0	25,5	DC+
23	2,7	28,2	DC+
24	0	28,2	DC+
25	18,3	22,45	E1
26	21,3	21,3	G1-b
27	21,3	24,3	G1-a
28	43	22,15	E2
29	46	21	G2-b
30	46	24	G2-a
31	52,2	20,1	OUT
32	49,5	22,8	OUT
33	52,2	22,8	OUT
34	49,5	25,5	OUT
35	52,2	25,5	OUT
36	49,5	28,2	OUT
37	52,2	28,2	OUT



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
T1-a, T1-b, T4-a, T4-b	IGBT	650 V	150 A	Buck Switch	Parallel devices with separate control. Values apply to complete device.
D5, D6	FWD	650 V	150 A	Buck Diode	
T2-a, T2-b, T3-a, T3-b	IGBT	650 V	150 A	Boost Switch	Parallel devices with separate control. Values apply to complete device.
D1, D4	FWD	650 V	200 A	Boost Diode	
D2, D3	FWD	650 V	200 A	Boost Sw.Inv.Diode	
NTC	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-FY07NIA150S5-M516F58-D1-14	12 Aug. 2017		