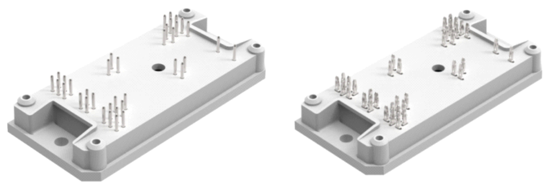
Vincotech

***flow* NPC 1** — **1200 V / 150 A**

Features

- High efficiency
- Low inductive package
- Ultra fast IGBTs
- four-quadrant operation

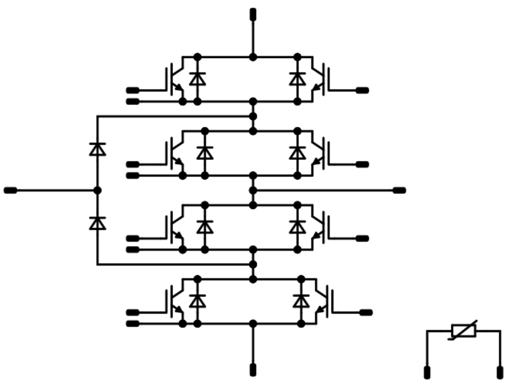
flow 1 12 mm housing



Target applications

- Solar Inverters
- UPS

Schematic



Types

- 10-FY07NIA150S502-L365F58
- 10-PY07NIA150S502-L365F58Y

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

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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	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
Boost 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 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	106	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	149	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		solder pins / press-fit pins		min. 12,7 / min. 12,7	mm
Clearance		solder pins / press-fit pins		8,07 / 11,83	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]	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	-5/+15	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	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
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	-5/+15	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	$V_{GE(th)}$	$V_{GE} = V_{CE}$			0,0015	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_{gon} = 2 Ω R_{goff} = 2 Ω	-5 / 15	350	90	25 125 150		52 52 52		ns
Rise time	t_{r}					25 125 150		10 11 11		
Turn-off delay time	$t_{d(off)}$					25 125 150		131 153 160		
Fall time	t_{f}					25 125 150		13 19 22		
Turn-on energy (per pulse)	E_{on}	Q_{rFWD} = 3,5 µC Q_{rFWD} = 6,8 µC Q_{rFWD} = 7,8 µC				25 125 150		0,666 1,225 1,391		mWs
Turn-off energy (per pulse)	E_{off}					25 125 150		1,140 1,685 1,855		

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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				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 = 9576 A/µs di/dt = 6720 A/µs di/dt = 7333 A/µs	-5 / 15	350	90	25 125 150		101 127 133		A
Reverse recovery time	t_{rr}					25 125 150		54 88 101		ns
Recovered charge	Q_r					25 125 150		3,474 6,778 7,836		µC
Reverse recovered energy	E_{rec}					25 125 150		0,807 1,467 1,668		mWs
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 125 150		2283 1335 1270		A/µs

Boost Sw.Inv.Diode

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
Static										
Forward voltage	V_F				150	25 150		1,85 1,66	2	V
Reverse leakage current	I_r			650		25 150			1,8	µA
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	phase-change material λ = 3,4 W/mK						0,64		K/W

Characteristic Values

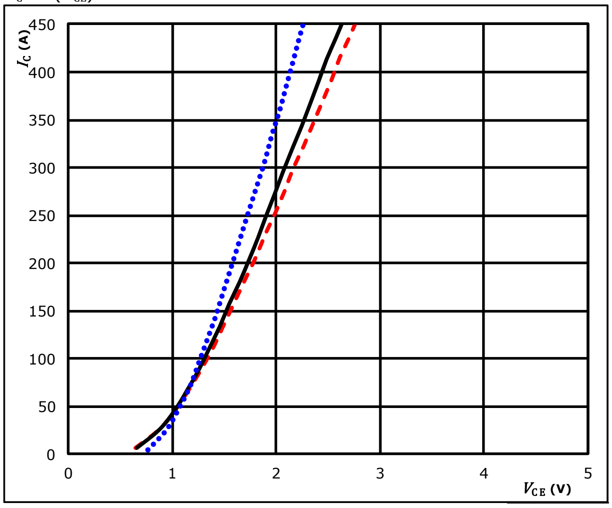
Parameter	Symbol	Conditions					Value			Unit
			V_{GE} [V] V_{GS} [V]	V_{CE} [V] V_{DS} [V] V_F [V]	I_C [A] I_D [A] I_F [A]	T_j [°C]	Min	Typ	Max	
Thermistor										
Rated resistance	R					25		22		kΩ
Deviation of R_{100}	$\Delta_{R/R}$	R_{100} = 1484 Ω				100	-5		5	%
Power dissipation	P					25		5		mW
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

$I_C = f(V_{CE})$

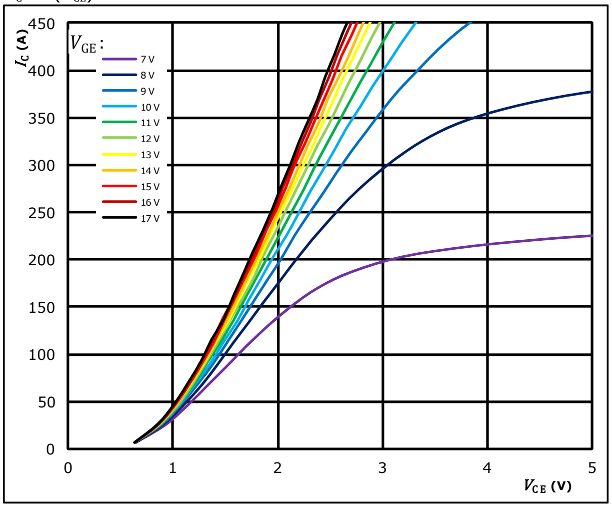


t_p =	250	µs		25 °C	············
V_{GE} =	15	V	T_j:	125 °C	———
				150 °C	– – –

figure 2. **IGBT**

Typical output characteristics

$I_C = f(V_{CE})$

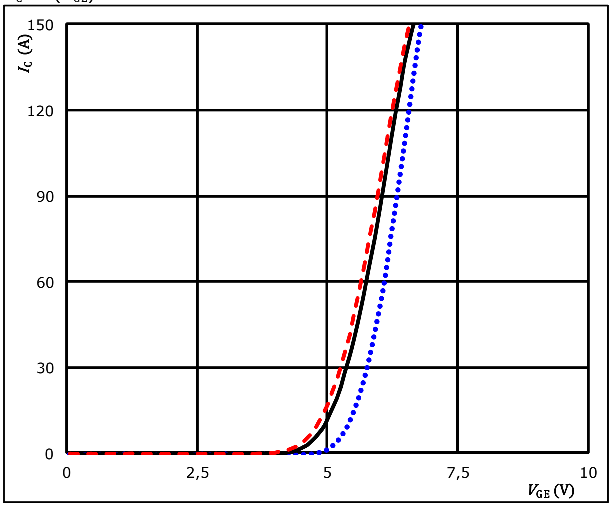


t_p = 250 µs
T_j = 150 °C
V_{GE} from 7 V to 17 V in steps of 1 V

figure 3. **IGBT**

Typical transfer characteristics

$I_C = f(V_{GE})$

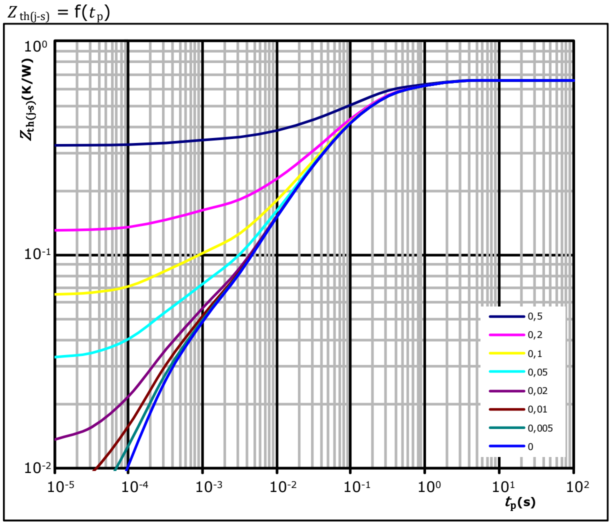


t_p =	100	µs		25 °C	············
V_{CE} =	10	V	T_j:	125 °C	———
				150 °C	– – –

figure 4. **IGBT**

Transient thermal impedance as function of pulse duration

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



D = t_p / T
$R_{th(j-s)}$ = 0,65 K/W

IGBT thermal model values

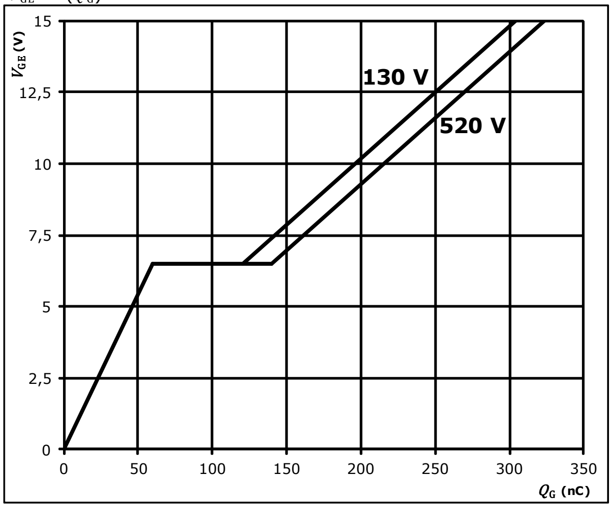
R (K/W)	τ (s)
1,13E-01	8,46E-01
2,91E-01	1,23E-01
1,38E-01	3,33E-02
6,68E-02	8,32E-03
1,32E-02	2,63E-03
3,21E-02	3,23E-04

Buck Switch Characteristics

figure 5. **IGBT**

Gate voltage vs gate charge

$V_{GE} = f(Q_G)$

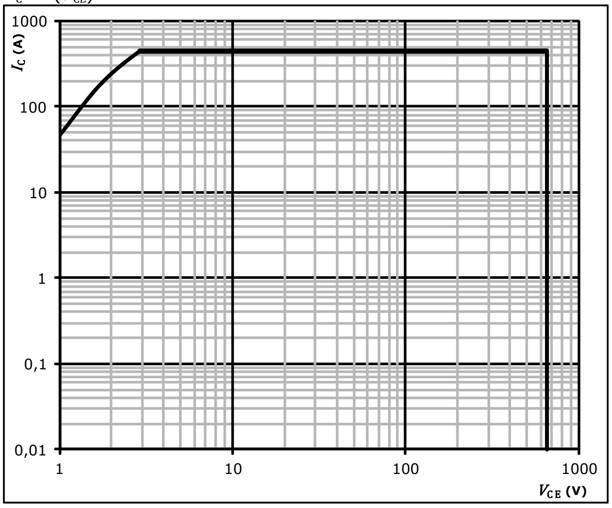


I_C= 150 A

figure 6. **IGBT**

Safe operating area

$I_C = f(V_{CE})$



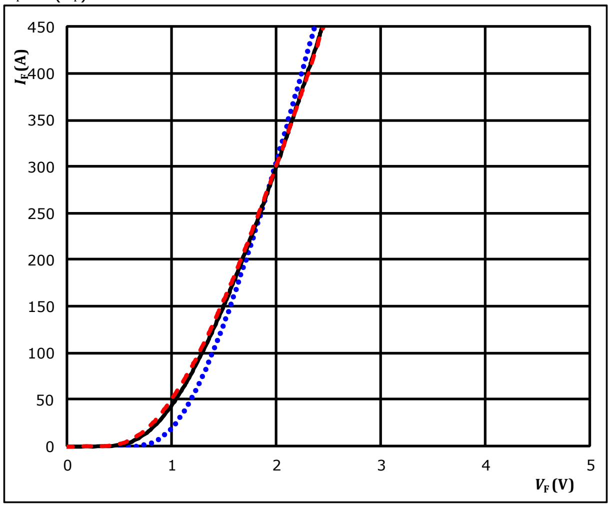
D =	single pulse	
T_s =	80	ºC
V_{GE} =	±15	V
T_j =	T_{jmax}	

Buck Diode Characteristics

figure 1. **FWD**

Typical forward characteristics

$I_F = f(V_F)$

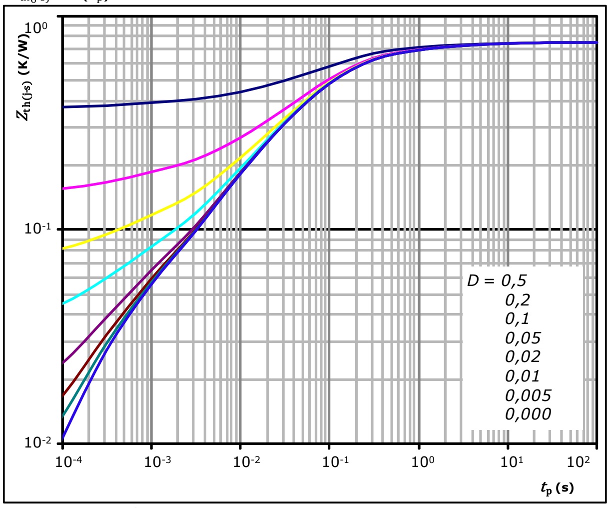


t_p =	250	µs		25 °C	•••••••••••
			T_j:	125 °C	———
				150 °C	– – – –

figure 2. **FWD**

Transient thermal impedance as a function of pulse width

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



D = t_p / T

$R_{th(j\text{-}s)}$ = 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

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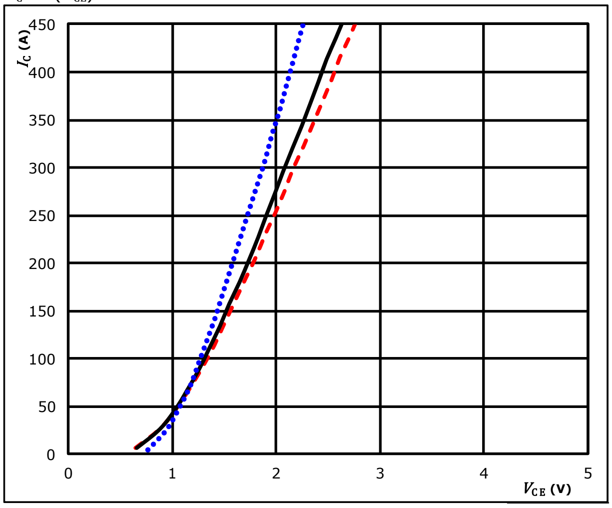
Boost Switch Characteristics

figure 1. **IGBT**

Typical output characteristics

$I_C = f(V_{CE})$

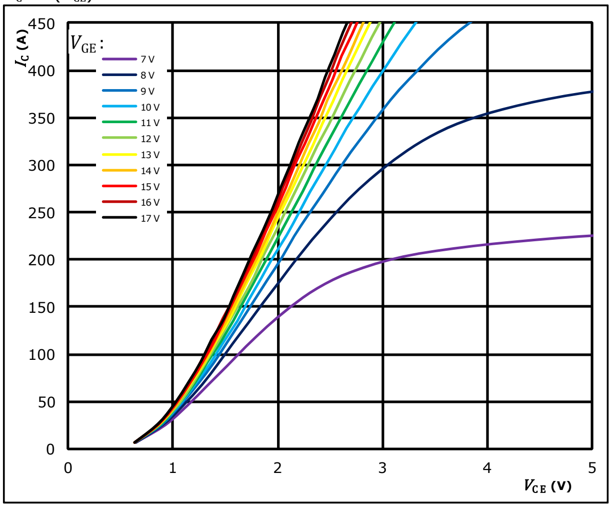


t_p =	250	μs		25 °C	···········
V_{GE} =	15	V	T_j:	125 °C	———
				150 °C	– – – –

figure 2. **IGBT**

Typical output characteristics

$I_C = f(V_{CE})$



t_p = 250 μs

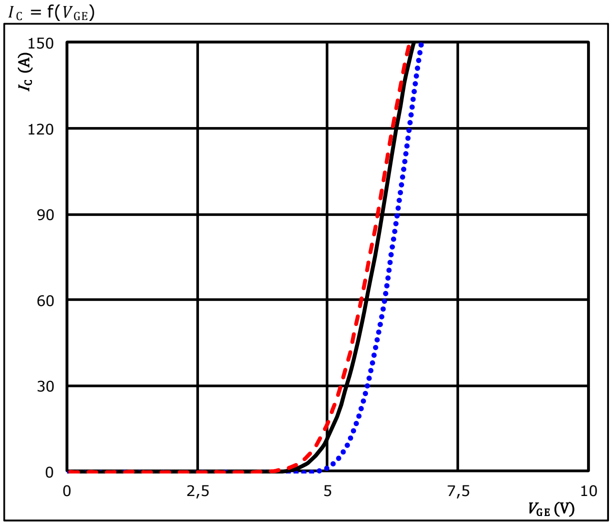
T_j = 150 °C

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

figure 3. **IGBT**

Typical transfer characteristics

$I_C = f(V_{GE})$

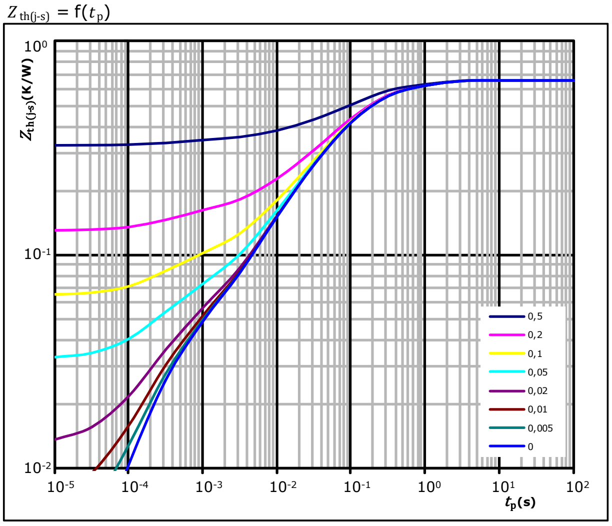


t_p =	100	μs		25 °C	···········
V_{CE} =	10	V	T_j:	125 °C	———
				150 °C	– – – –

figure 4. **IGBT**

Transient thermal impedance as function of pulse duration

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



D = t_p / T

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

IGBT thermal model values

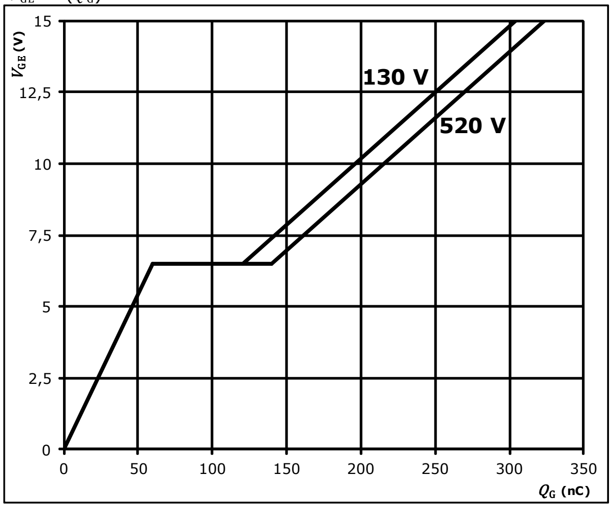
R (K/W)	τ (s)
1,13E-01	8,46E-01
2,91E-01	1,23E-01
1,38E-01	3,33E-02
6,68E-02	8,32E-03
1,32E-02	2,63E-03
3,21E-02	3,23E-04

Boost Switch Characteristics

figure 5. **IGBT**

Gate voltage vs gate charge

$V_{GE} = f(Q_G)$

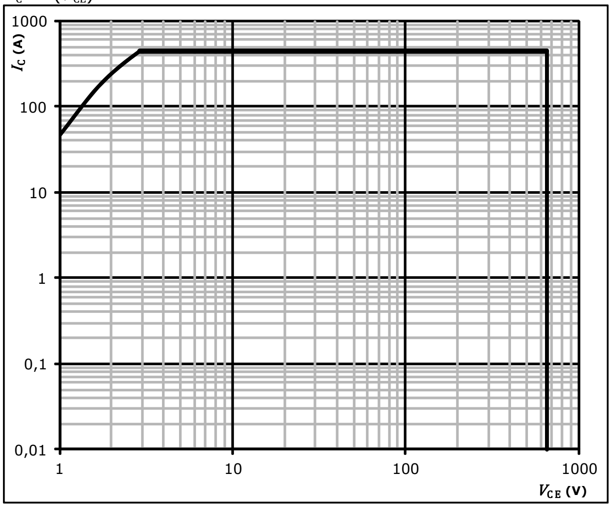


I_C=	150	A

figure 6. **IGBT**

Safe operating area

$I_C = f(V_{CE})$



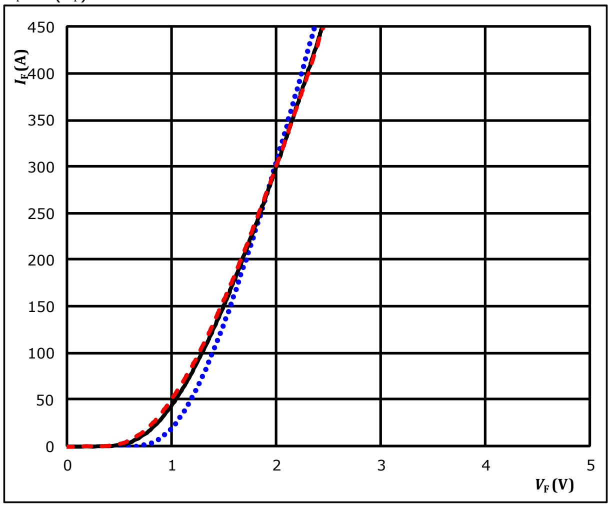
D =	single pulse	
T_s =	80	ºC
V_{GE} =	±15	V
T_j =	T_{jmax}	

Boost Diode Characteristics

figure 1. **FWD**

Typical forward characteristics

$I_F = f(V_F)$



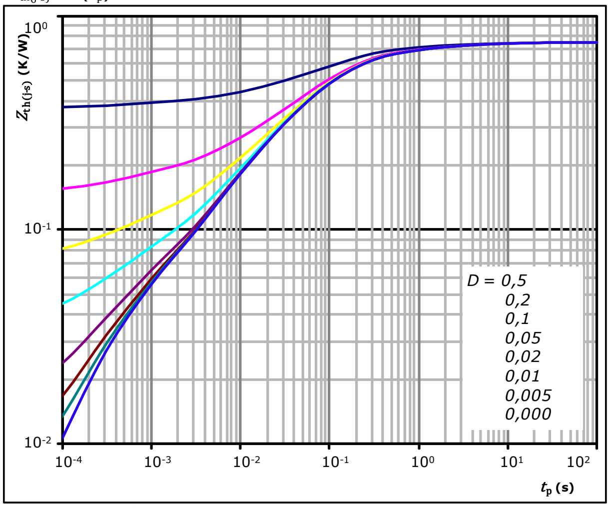
t_p = 250 µs

T_j: 25 °C; 125 °C; 150 °C

figure 2. **FWD**

Transient thermal impedance as a function of pulse width

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



D = t_p / T

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

FWD thermal model values

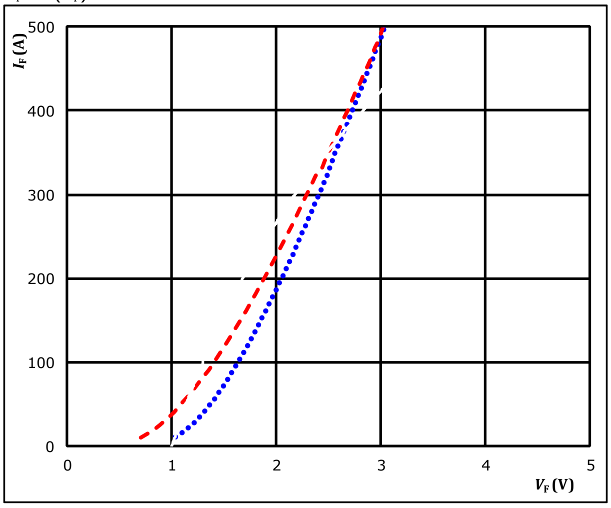
R (K/W)	τ (s)
2,88E-02	7,46E+00
7,02E-02	1,27E+00
1,95E-01	2,04E-01
2,65E-01	6,33E-02
1,21E-01	1,27E-02
3,39E-02	3,05E-03
3,36E-02	3,74E-04

Boost Sw.Inv.Diode Characteristics

figure 1. **FWD**

Typical forward characteristics

$I_F = f(V_F)$



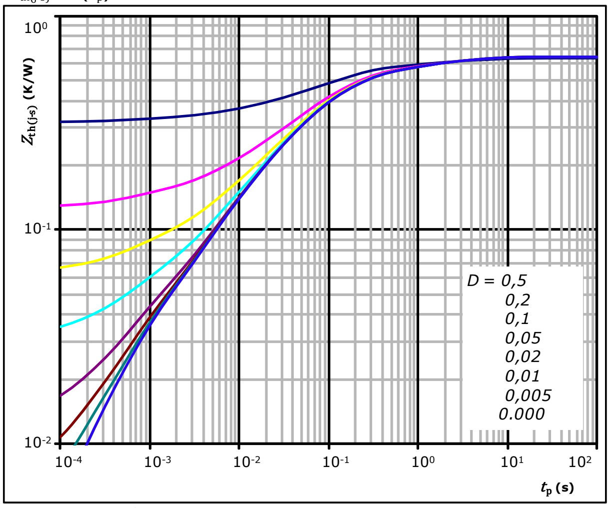
t_p = 250 μs

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

$R_{th(j-s)}$ = 0,64 K/W

FWD thermal model values

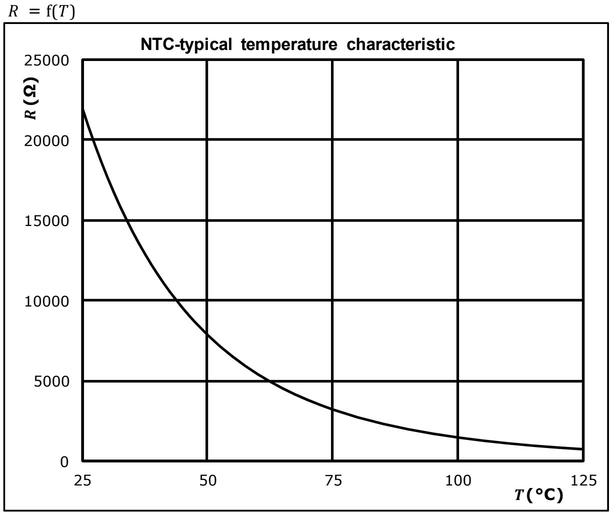
R (K/W)	τ (s)
6,14E-02	3,48E+00
1,03E-01	5,85E-01
2,81E-01	9,46E-02
1,21E-01	2,14E-02
4,83E-02	5,07E-03
2,26E-02	5,92E-04

Thermistor Characteristics

figure 1. **Thermistor**

Typical NTC characteristic as a function of temperature

$R = f(T)$



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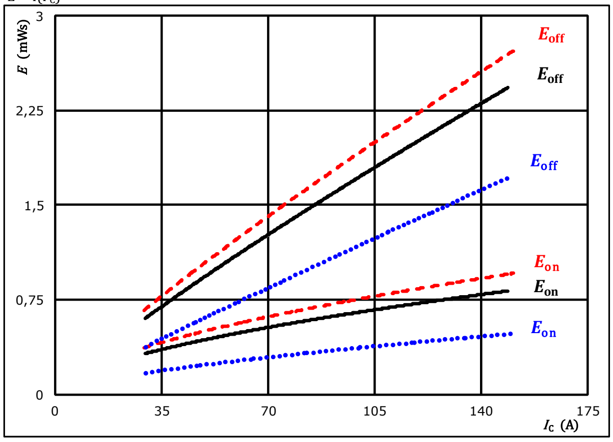
Buck Switching Characteristics

figure 1. IGBT

Typical switching energy losses as a function of collector current

$E = f(I_C)$



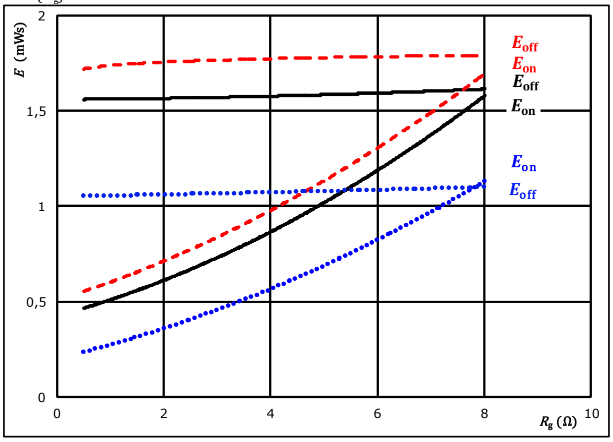
With an inductive load at

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

figure 2. IGBT

Typical switching energy losses as a function of gate resistor

$E = f(R_g)$



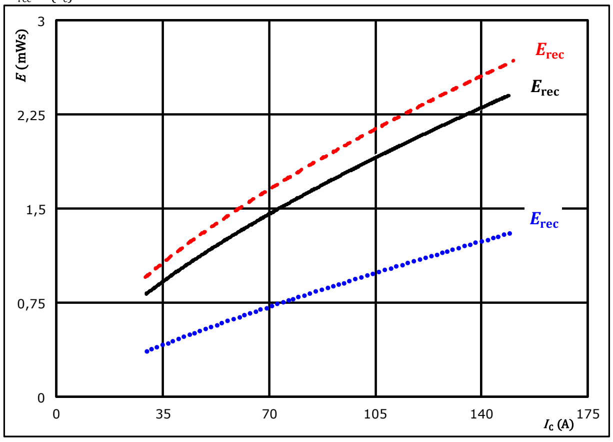
With an inductive load at

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

figure 3. FWD

Typical reverse recovered energy loss as a function of collector current

$E_{rec} = f(I_c)$



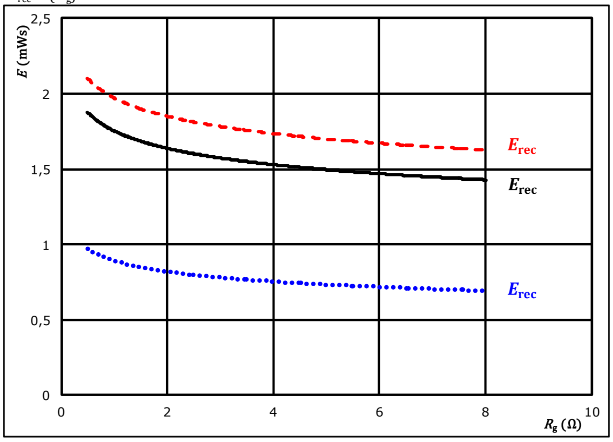
With an inductive load at

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

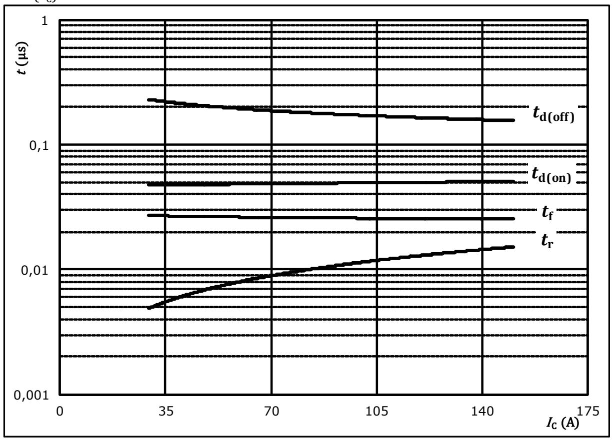
V_{CE} =	350	V	T_j:	25 °C	dotted
V_{GE} =	-5 / 15	V		125 °C	solid
I_C =	90	A		150 °C	dashed

Buck Switching Characteristics

figure 5. **IGBT**

Typical switching times as a function of collector current

$t = f(I_C)$



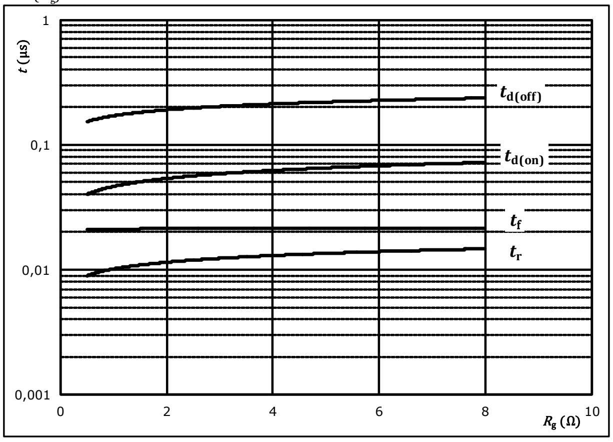
With an inductive load at

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

figure 6. **IGBT**

Typical switching times as a function of gate resistor

$t = f(R_g)$



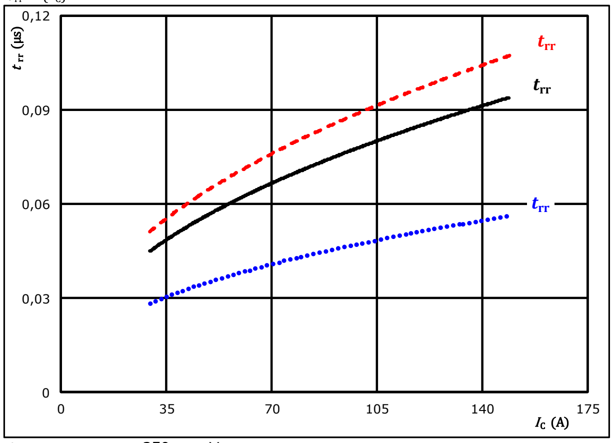
With an inductive load at

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

figure 7. **FWD**

Typical reverse recovery time as a function of collector current

$t_{rr} = f(I_C)$

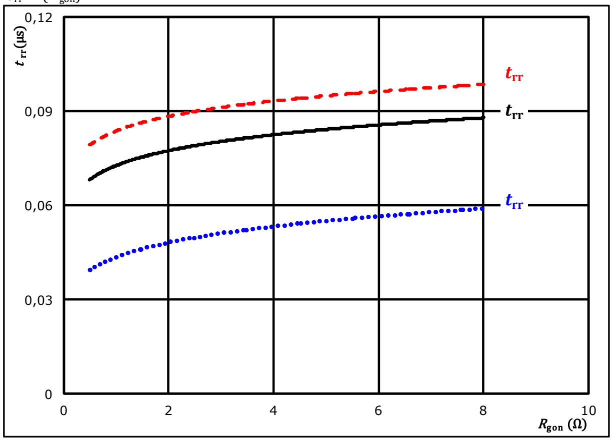


At					
V_{CE} =	350	V		25 °C	···········
V_{GE} =	-5 / 15	V	T_j:	125 °C	———
R_{gon} =	2	Ω		150 °C	– – –

figure 8. **FWD**

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

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



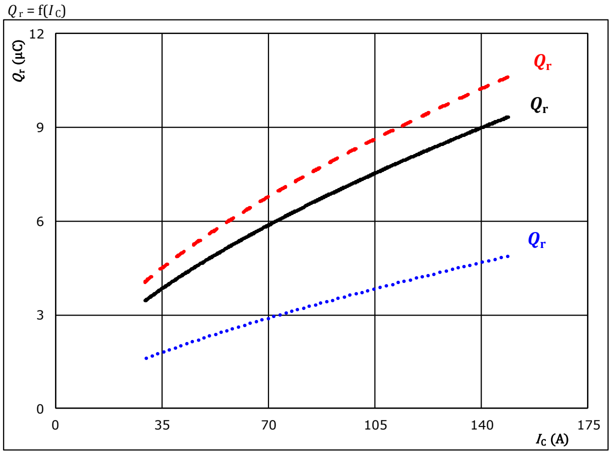
At					
V_{CE} =	350	V		25 °C	···········
V_{GE} =	-5 / 15	V	T_j:	125 °C	———
I_C =	90	A		150 °C	– – –

Buck Switching Characteristics

figure 9. **FWD**

Typical recovered charge as a function of collector current

$Q_r = f(I_C)$

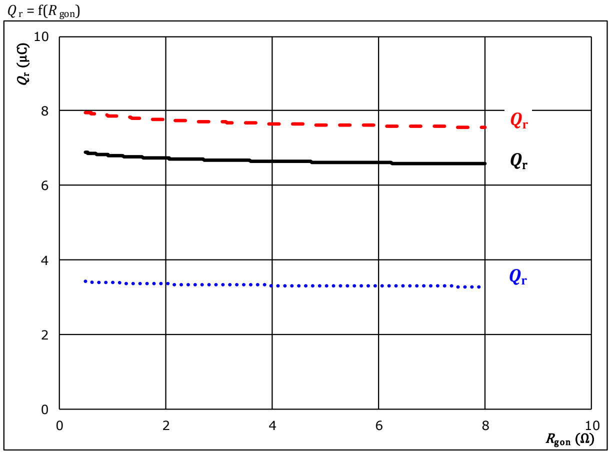


At						
	V_{CE} =	350	V		25 °C	···········
	V_{GE} =	-5 / 15	V	T_j:	125 °C	———
	R_{gon} =	2	Ω		150 °C	– – –

figure 10. **FWD**

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

$Q_r = f(R_{gon})$

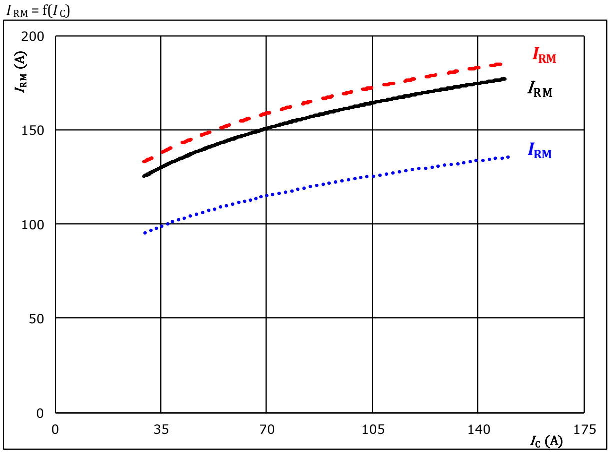


At						
	V_{CE} =	350	V		25 °C	···········
	V_{GE} =	-5 / 15	V	T_j:	125 °C	———
	I_C =	90	A		150 °C	– – –

figure 11. **FWD**

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

$I_{RM} = f(I_C)$

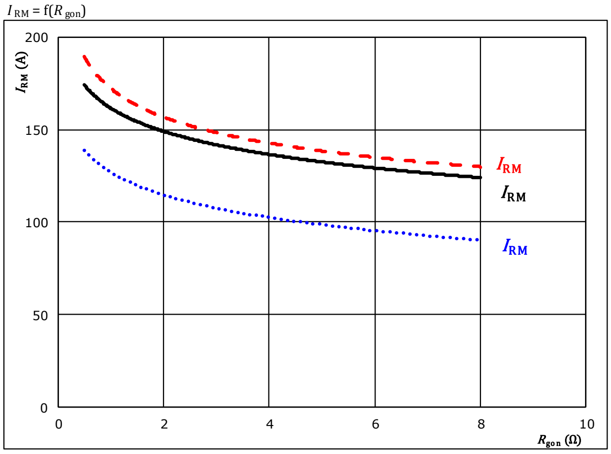


At						
	V_{CE} =	350	V		25 °C	···········
	V_{GE} =	-5 / 15	V	T_j:	125 °C	———
	R_{gon} =	2	Ω		150 °C	– – –

figure 12. **FWD**

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

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



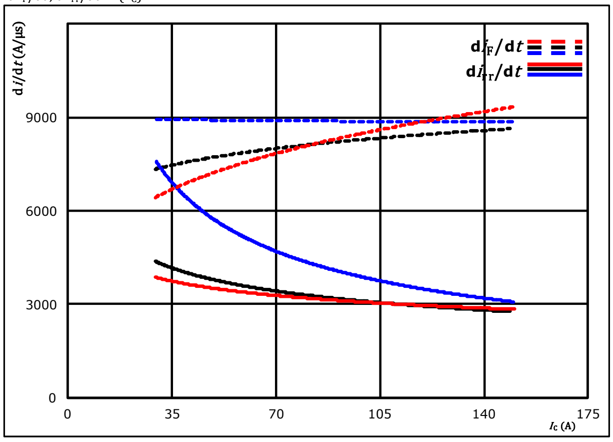
At						
	V_{CE} =	350	V		25 °C	···········
	V_{GE} =	-5 / 15	V	T_j:	125 °C	———
	I_C =	90	A		150 °C	– – –

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

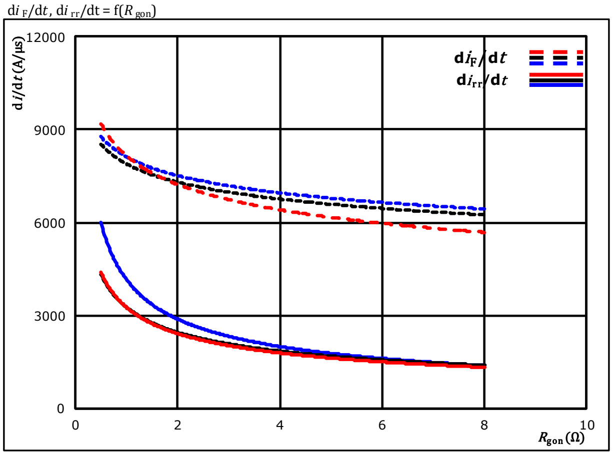


At					
V_{CE} =	350	V		25	°C
V_{GE} =	-5 / 15	V	T_j:	125	°C
R_{gon} =	2	Ω		150	°C

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

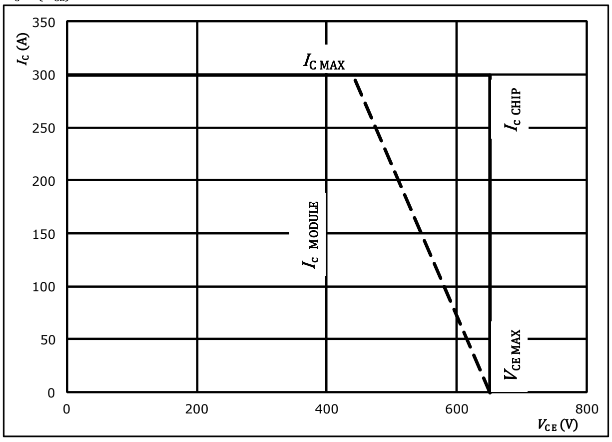


At					
V_{CE} =	350	V		25	°C
V_{GE} =	-5 / 15	V	T_j:	125	°C
I_C =	90	A		150	°C

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

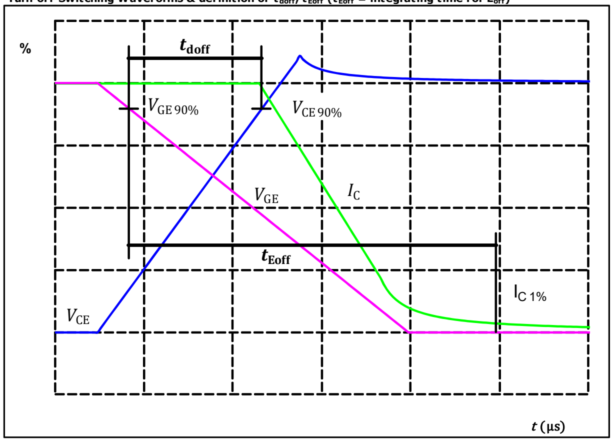
Buck Switching Definitions

General conditions

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

figure 1. IGBT

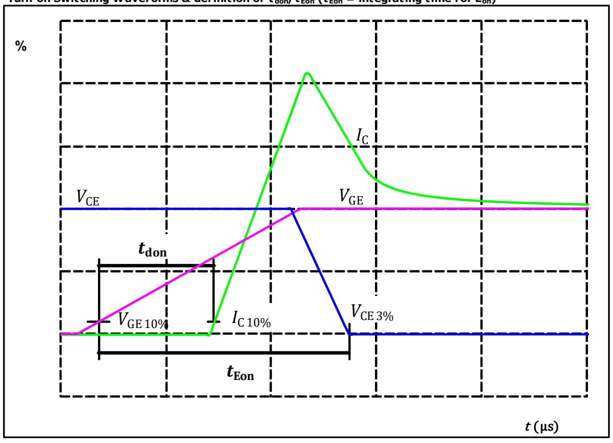
Turn-off Switching Waveforms & definition of t_{doff}, t_{Eoff} (t_{Eoff} = integrating time for E_{off})



$V_{GE}(0\%)$ =	-5	V
$V_{GE}(100\%)$ =	15	V
$V_C(100\%)$ =	350	V
$I_C(100\%)$ =	90	A
t_{doff} =	170	ns

figure 2. IGBT

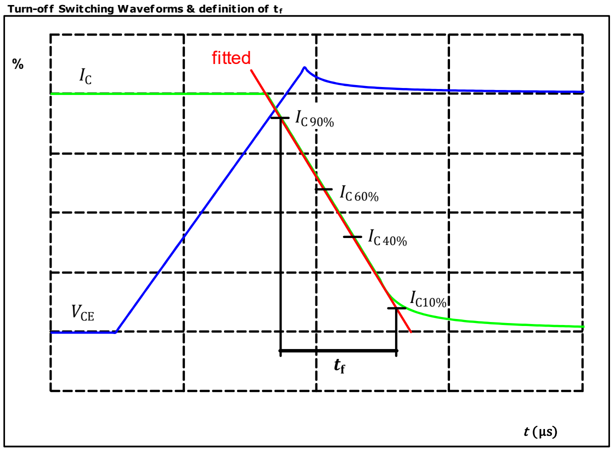
Turn-on Switching Waveforms & definition of t_{don}, t_{Eon} (t_{Eon} = integrating time for E_{on})



$V_{GE}(0\%)$ =	-5	V
$V_{GE}(100\%)$ =	15	V
$V_C(100\%)$ =	350	V
$I_C(100\%)$ =	90	A
t_{don} =	50	ns

figure 3. IGBT

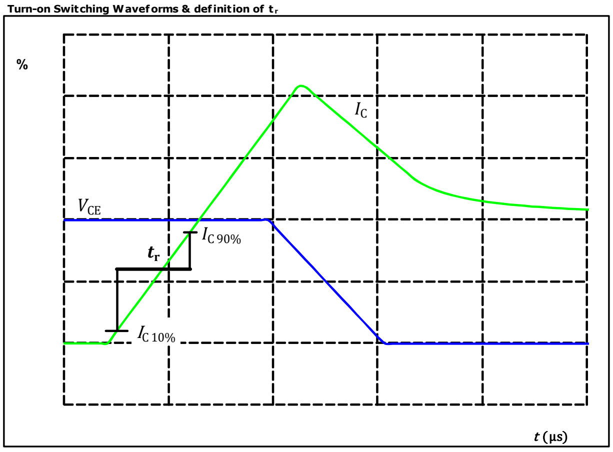
Turn-off Switching Waveforms & definition of t_f



$V_C(100\%)$ =	350	V
$I_C(100\%)$ =	90	A
t_f =	19	ns

figure 4. IGBT

Turn-on Switching Waveforms & definition of t_r

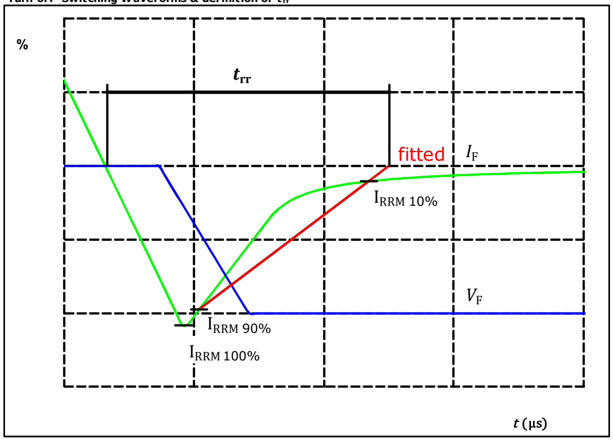


$V_C(100\%)$ =	350	V
$I_C(100\%)$ =	90	A
t_r =	10	ns

Buck Switching Characteristics

figure 5. **FWD**

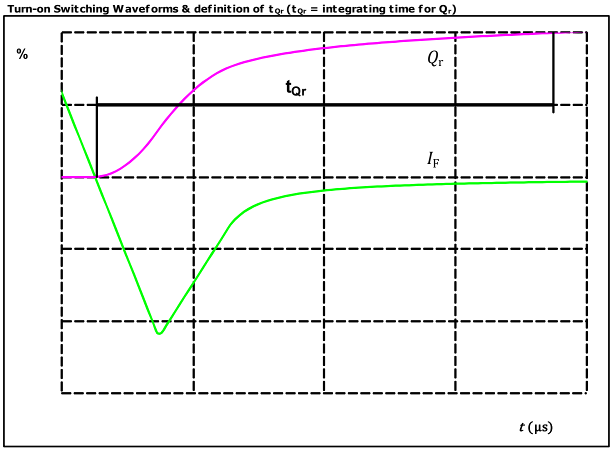
Turn-off Switching Waveforms & definition of t_{rr}



V_F (100%) =	350	V
I_F (100%) =	90	A
I_{RRM} (100%) =	158	A
t_{rr} =	74	ns

figure 6. **FWD**

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



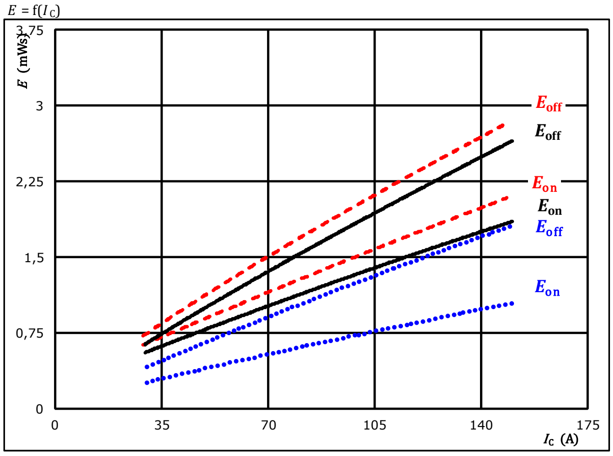
I_F (100%) =	90	A
Q_r (100%) =	6,78	µC

Boost Switching Characteristics

figure 1. **IGBT**

Typical switching energy losses as a function of collector current

$E = f(I_C)$



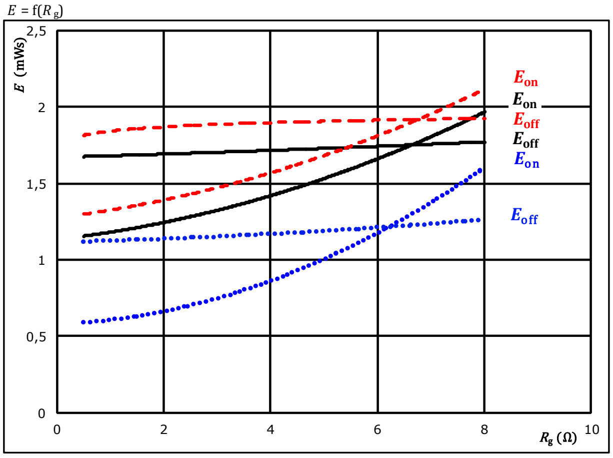
With an inductive load at

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

figure 2. **IGBT**

Typical switching energy losses as a function of gate resistor

$E = f(R_g)$



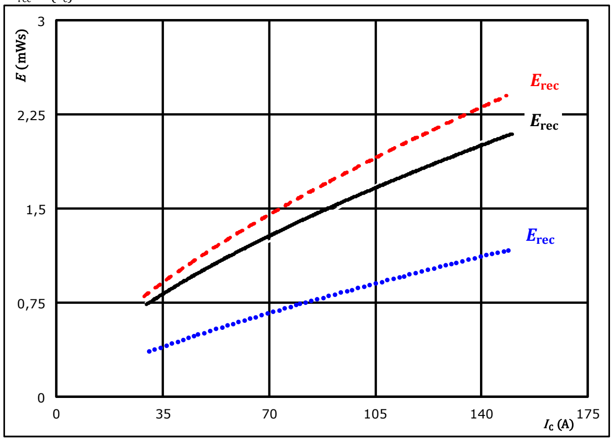
With an inductive load at

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

figure 3. **FWD**

Typical reverse recovered energy loss as a function of collector current

$E_{rec} = f(I_c)$



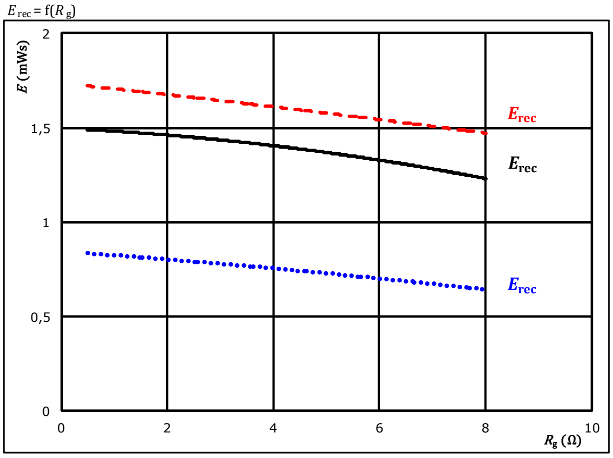
With an inductive load at

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

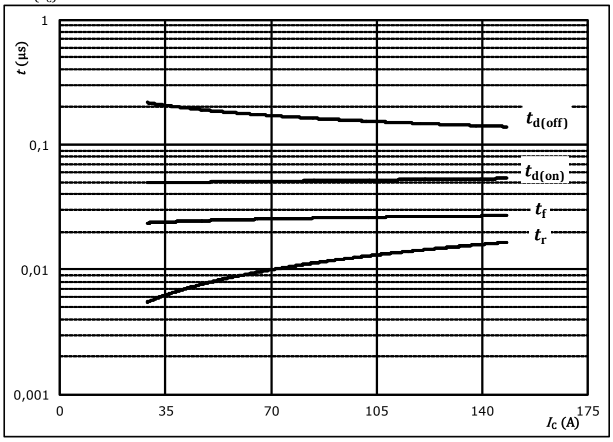
V_{CE} =	350	V	T_j:	25 °C	dotted
V_{GE} =	-5 / 15	V		125 °C	solid
I_C =	90	A		150 °C	dashed

Boost Switching Characteristics

figure 5. **IGBT**

Typical switching times as a function of collector current

$t = f(I_C)$



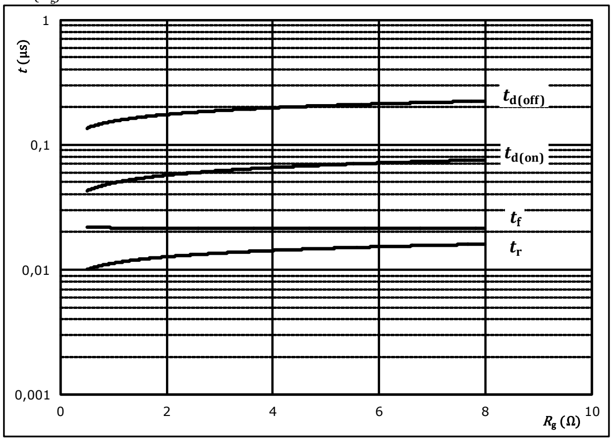
With an inductive load at

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

figure 6. **IGBT**

Typical switching times as a function of gate resistor

$t = f(R_g)$



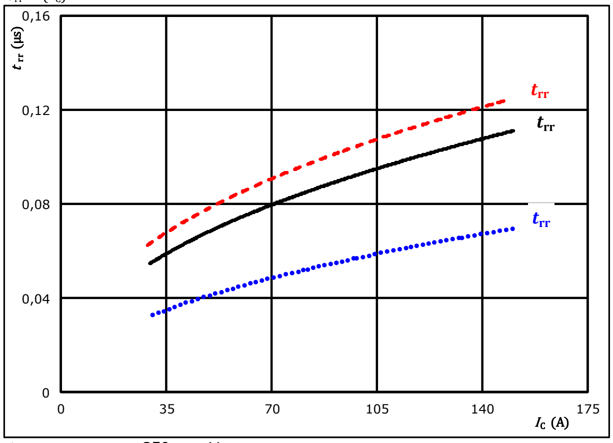
With an inductive load at

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

figure 7. **FWD**

Typical reverse recovery time as a function of collector current

$t_{rr} = f(I_C)$

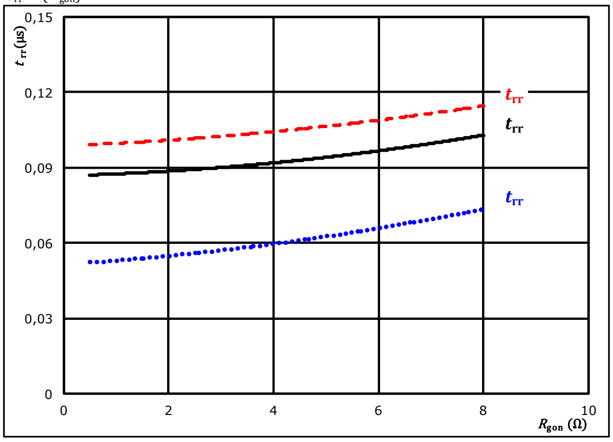


At					
V_{CE} =	350	V	T_j:	25 °C	dotted (blue)
V_{GE} =	-5 / 15	V		125 °C	solid (black)
R_{gon} =	2	Ω		150 °C	dashed (red)

figure 8. **FWD**

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

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



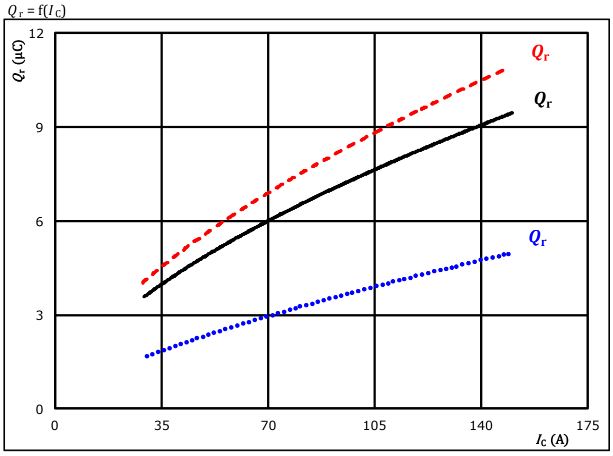
At					
V_{CE} =	350	V	T_j:	25 °C	dotted (blue)
V_{GE} =	-5 / 15	V		125 °C	solid (black)
I_C =	90	A		150 °C	dashed (red)

Boost Switching Characteristics

figure 9. FWD

Typical recovered charge as a function of collector current

$Q_r = f(I_C)$

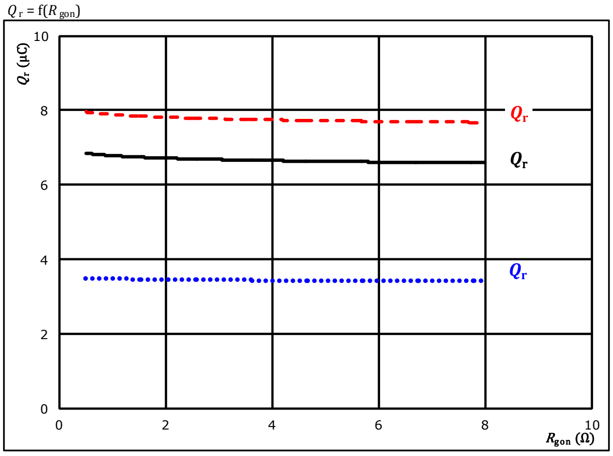


At					
V_{CE} =	350	V		25 °C	dotted
V_{GE} =	-5 / 15	V	T_j:	125 °C	solid
R_{gon} =	2	Ω		150 °C	dashed

figure 10. FWD

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

$Q_r = f(R_{gon})$

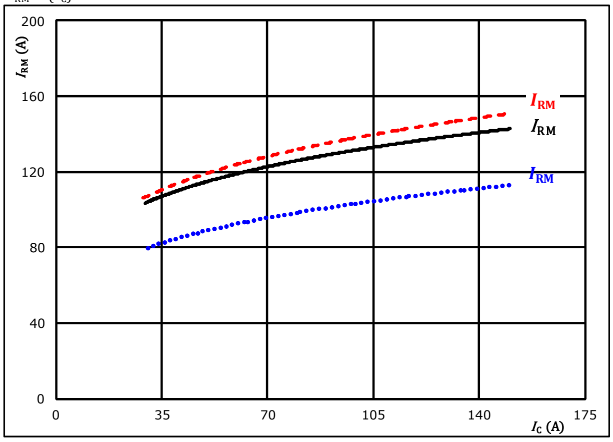


At					
V_{CE}=	350	V		25 °C	dotted
V_{GE} =	-5 / 15	V	T_j:	125 °C	solid
I_C=	90	A		150 °C	dashed

figure 11. FWD

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

$I_{RM} = f(I_C)$

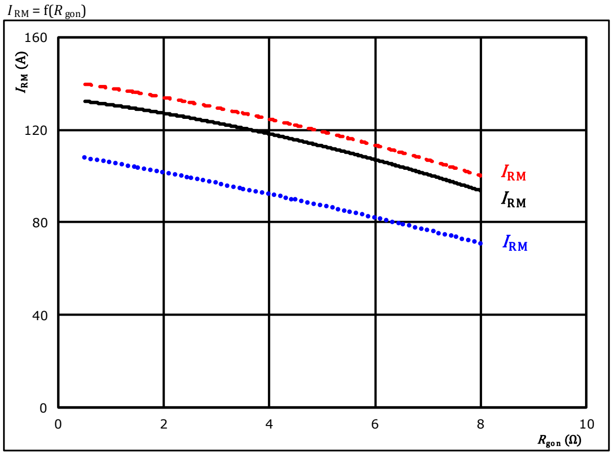


At					
V_{CE}:	350	V		25 °C	dotted
V_{GE} =	-5 / 15	V	T_j:	125 °C	solid
R_{gon} =	2	Ω		150 °C	dashed

figure 12. FWD

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

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



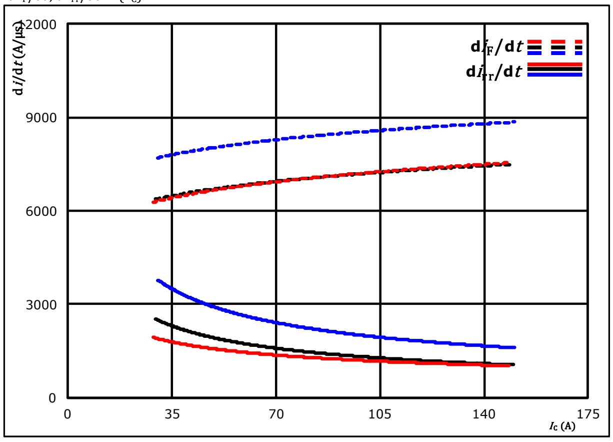
At					
V_{CE} =	350	V		25 °C	dotted
V_{GE} =	-5 / 15	V	T_j:	125 °C	solid
I_C =	90	A		150 °C	dashed

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

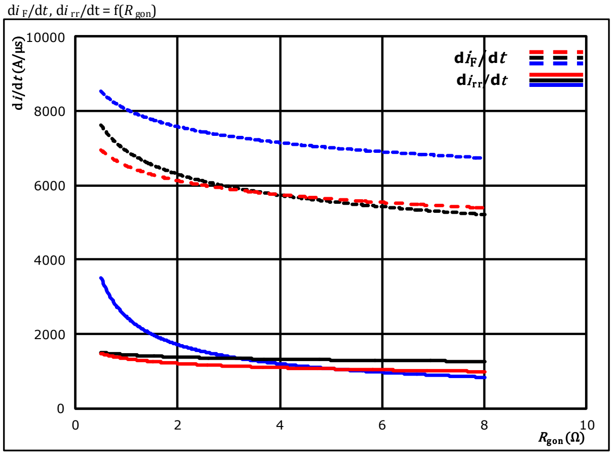


At					
V_{CE} =	350	V		25	°C
V_{GE} =	-5 / 15	V	T_j:	125	°C
R_{gon} =	2	Ω		150	°C

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

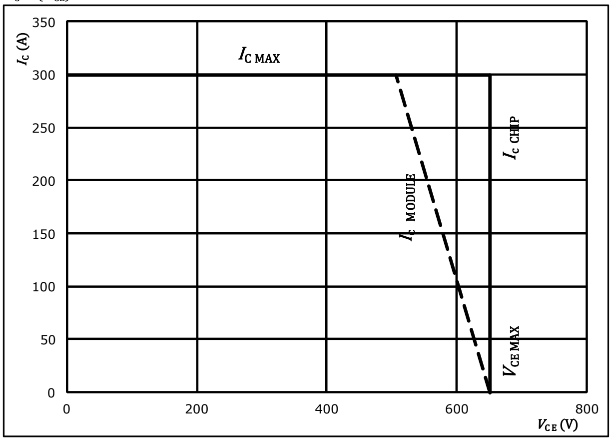


At					
V_{CE} =	350	V		25	°C
V_{GE} =	-5 / 15	V	T_j:	125	°C
I_C =	90	A		150	°C

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

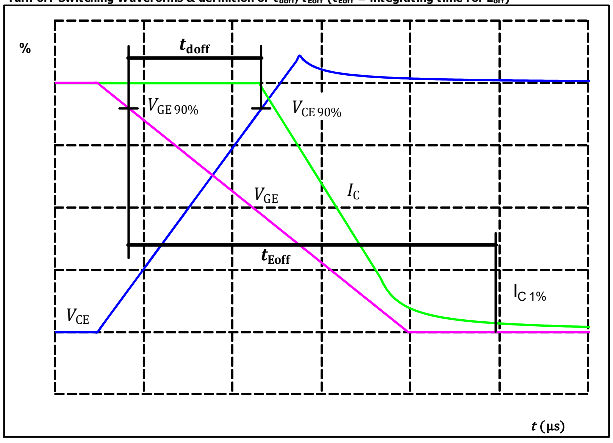
Boost Switching Definitions

General conditions

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

figure 1. IGBT

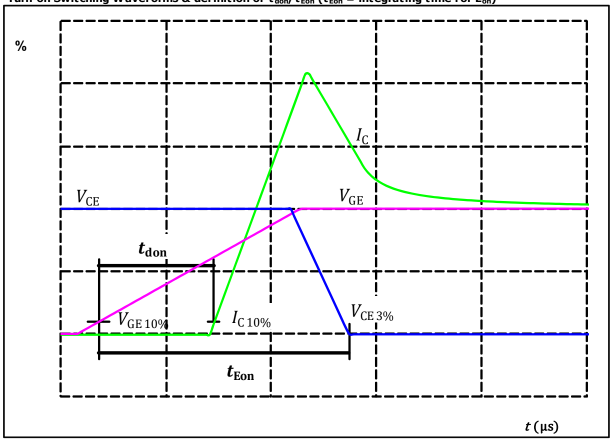
Turn-off Switching Waveforms & definition of t_{doff}, t_{Eoff} (t_{Eoff} = integrating time for E_{off})



V_{GE} (0%) =	-5	V
V_{GE} (100%) =	15	V
V_C (100%) =	350	V
I_C (100%) =	90	A
t_{doff} =	153	ns

figure 2. IGBT

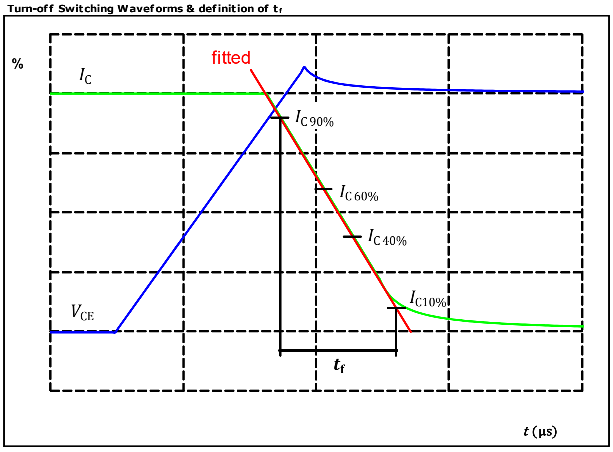
Turn-on Switching Waveforms & definition of t_{don}, t_{Eon} (t_{Eon} = integrating time for E_{on})



V_{GE} (0%) =	-5	V
V_{GE} (100%) =	15	V
V_C (100%) =	350	V
I_C (100%) =	90	A
t_{don} =	52	ns

figure 3. IGBT

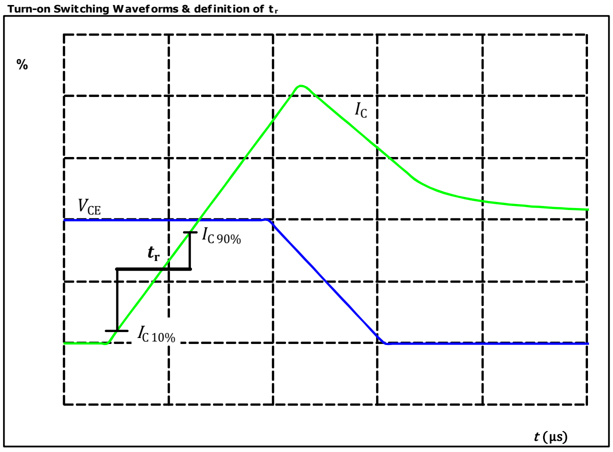
Turn-off Switching Waveforms & definition of t_f



V_C (100%) =	350	V
I_C (100%) =	90	A
t_f =	19	ns

figure 4. IGBT

Turn-on Switching Waveforms & definition of t_r

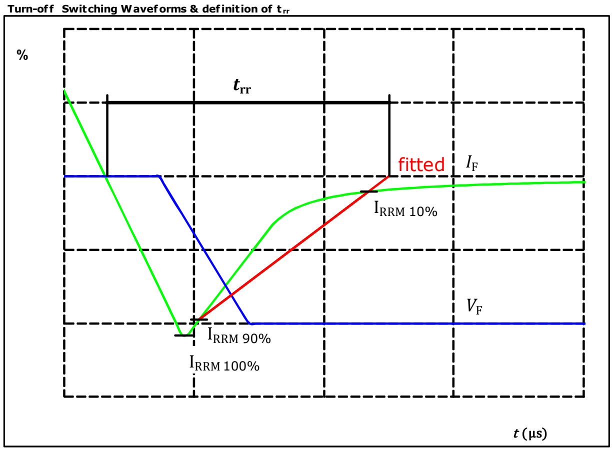


V_C (100%) =	350	V
I_C (100%) =	90	A
t_r =	11	ns

Boost Switching Characteristics

figure 5. **FWD**

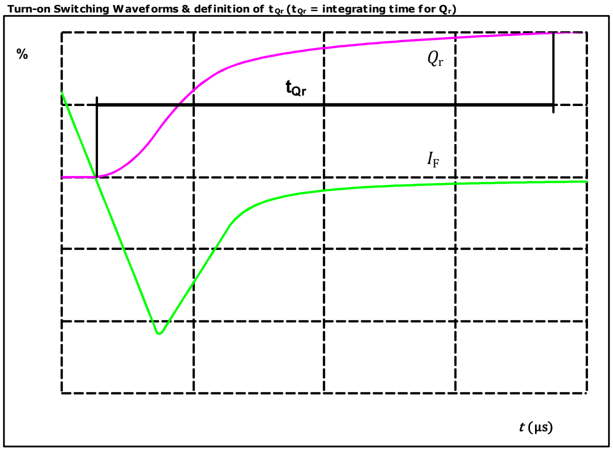
Turn-off Switching Waveforms & definition of t_{rr}



V_F (100%) =	350	V
I_F (100%) =	90	A
I_{RRM} (100%) =	127	A
t_{rr} =	88	ns

figure 6. **FWD**

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



I_F (100%) =	90	A
Q_r (100%) =	6,78	µC

10-FY07NIA150S502-L365F58
10-PY07NIA150S502-L365F58Y
datasheet

Vincotech

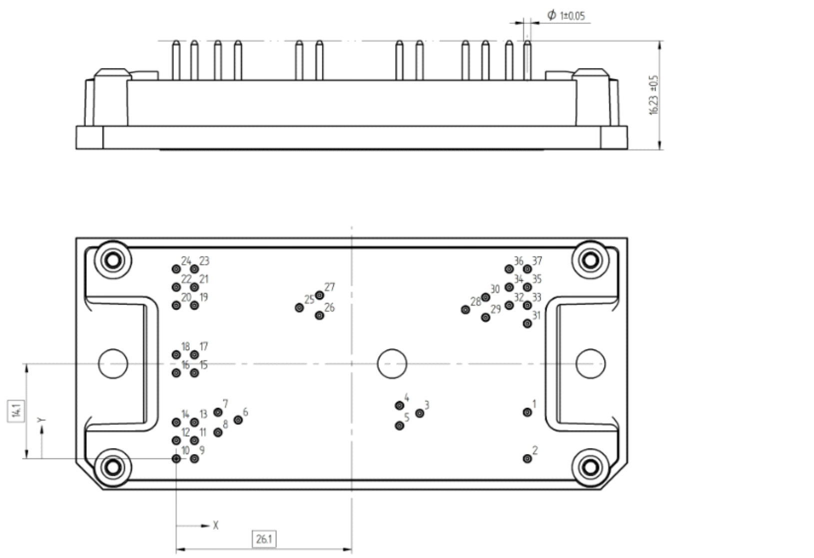
Ordering Code & Marking

Version	Ordering Code
without thermal paste with 12 mm housing with solder pins	10-FY07NIA150S502-L365F58
without thermal paste with 12 mm housing with Press-fit pins	10-PY07NIA150S502-L365F58Y

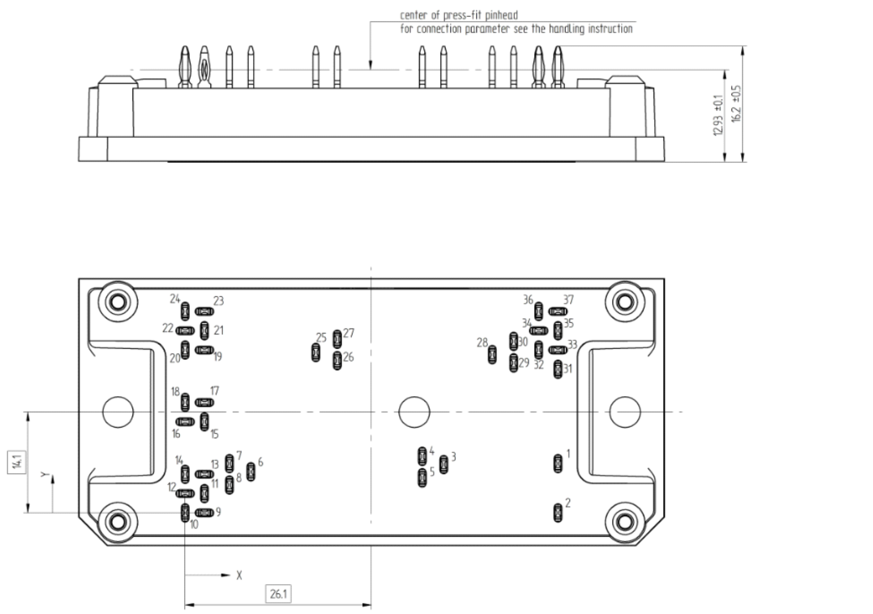
	Name		Date code	UL & VIN	Lot	Serial
Text	NN-NNNNNNNNNNNNNN-TTTTTTVV		WWYY	UL VIN	LLLLL	SSSS
Datamatrix	Type&Ver	Lot number	Serial	Date code		
	TTTTTTTVV	LLLLL	SSSS	WWYY		

Outline

Pin table			
Pin	X	Y	Function
1	52,2	6,9	Therm1
2	52,2	0	Therm2
3	36,2	6,75	S4
4	33,2	7,9	G14
5	33,2	4,9	G18
6	9,2	5,75	S2
7	6,2	6,9	G12
8	6,2	3,9	G16
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	S1
26	21,3	21,3	G15
27	21,3	24,3	G11
28	43	22,15	S3
29	46	21	G17
30	46	24	G13
31	52,2	20,1	Ph
32	49,5	22,8	Ph
33	52,2	22,8	Ph
34	49,5	25,5	Ph
35	52,2	25,5	Ph
36	49,5	28,2	Ph
37	52,2	28,2	Ph

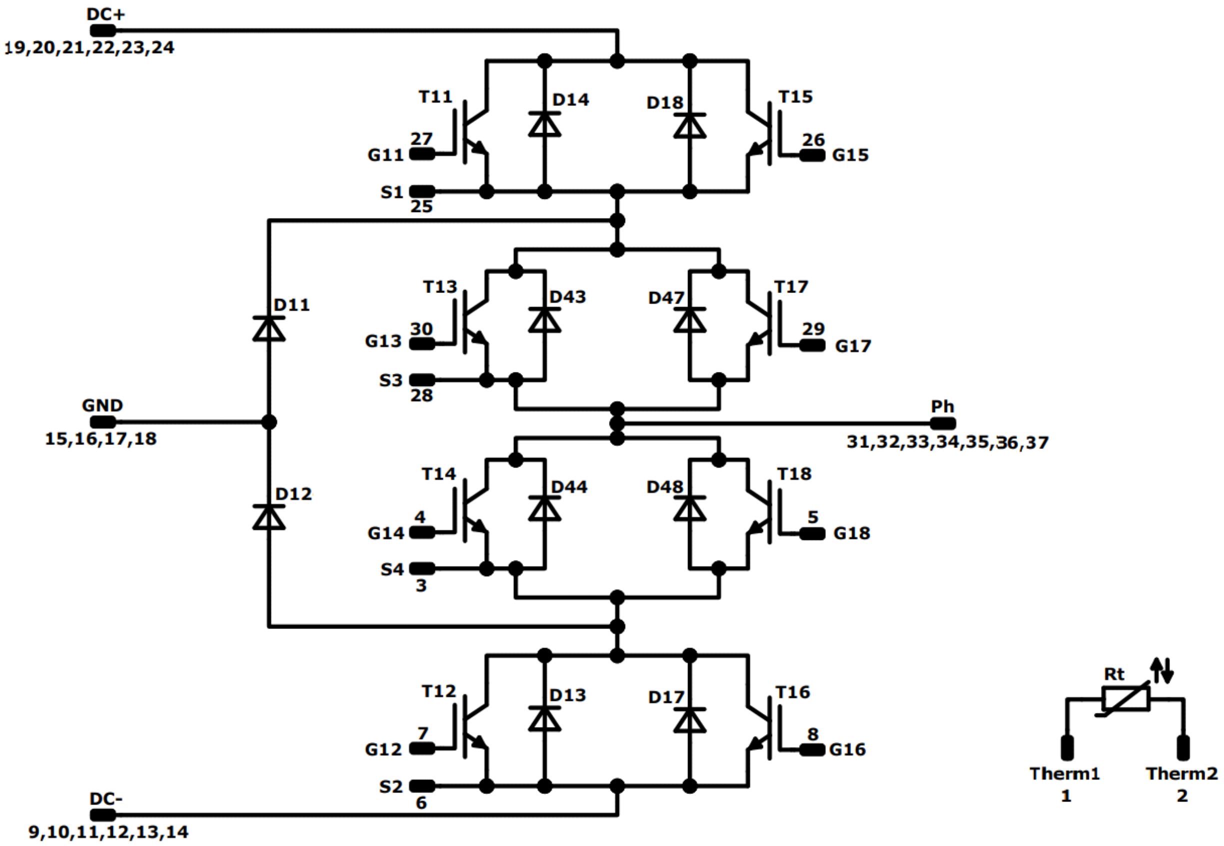


Tolerance of pinpositions: ±0,5mm at the end of pins
Dimension of coordinate axis is only offset without tolerance



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, T15, T16	IGBT	650 V	150 A	Buck Switch	Parallel devices with separate control. Values apply to complete device.
D11, D12	FWD	650 V	150 A	Buck Diode	
T13, T14, T17, T18	IGBT	650 V	150 A	Boost Switch	Parallel devices with separate control. Values apply to complete device.
D13, D14, D17, D18	FWD	650 V	150 A	Boost Diode	
D44, D43, D48, D47	FWD	650 V	150 A	Boost Sw.Inv.Diode	
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-xY07NIA150S502-L365F58x-D2-14	21 Jun. 2018	Correct Boost switch and diode switching values	22-27