Vincotech

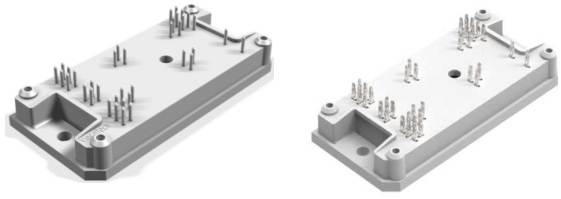
10-FY07NPA150SM02-L365F08
10-PY07NPA150SM02-L365F08Y
datasheet

flow **NPC 1** **650 V / 150 A**

Features

- NPC inverter topology
- Optimized for full rated bi-directional usage (4 quadrant operation)
- High-speed IGBT in all switch positions
- NTC
- Low inductive design with integrated DC capacitor
- *flow* 1 12mm package

flow 1 12mm housing

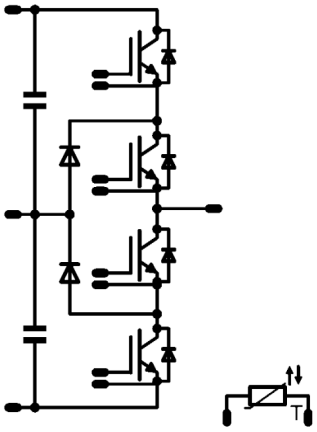


Solder Pin Press-fit

Target applications

- Solar inverter
- UPS

Schematic



Types

- 10-FY07NPA150SM02-L365F08
- 10-PY07NPA150SM02-L365F08Y

Maximum Ratings

T_j=25°C, unless otherwise specified

Parameter	Symbol	Condition	Value	Unit
Buck Switch\ Out. Boost Switch				
Collector-emitter voltage	V_{CES}		650	V
Collector current	I_C	$T_j = T_{jmax}$ T_S =80 °C	83	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	128	W
Gate-emitter voltage	V_{GES}		±20	V
Maximum Junction Temperature	T_{jmax}		175	°C

Parameter	Symbol	Conditions		Value	Unit
Buck Diode\ Out. Boost Diode					
Peak Repetitive Reverse Voltage	V_{RRM}			650	V
Continuous (direct) forward current	I_F	$T_j = T_{jmax}$	$T_S = 80°C$	87	A
Repetitive peak forward current	I_{FRM}			300	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	$T_S = 80°C$	113	W
Maximum Junction Temperature	T_{jmax}			175	°C

Parameter	Symbol	Conditions		Value	Unit
Out. Boost Inverse 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}			300	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	$T_s = 80°C$	149	W
Maximum Junction Temperature	T_{jmax}			175	°C

Parameter	Symbol	Conditions	Value	Unit
DC Link Capacitor				
Maximum DC voltage	V_{MAX}		500	V
Operation Temperature	T_{op}		-55…+125	°C

Parameter	Symbol	Conditions	Value	Unit
Module Properties				
Thermal Properties				
Storage temperature	T_{stg}		-40…+125	°C
Operation Junction Temperature	T_{jop}		-40…+(T_{jmax} - 25)	°C

Isolation Properties					
Isolation voltage	$V_{i\,sol}$	AC voltage RMS	$t_p = 60s$	2500	V
		DC voltage	$t_p = 2s$	6000	V
Creepage distance				min 12,7	mm
Clearance		solder pin \ Press-fit		8,07 \ 7,86	mm
Comparative Tracking Index	CTI			>200	

Characteristic Values

Buck Switch

Parameter	Symbol	Conditions					Value			Unit
			V_{GE} [V]	V_{CE} [V]	I_C [A]	T_j[°C]	Min	Typ	Max	
Static										
Gate-emitter threshold voltage	$V_{GE(th)}$	V_{GE}=V_{CE}			0,0015	25 125	3,3	4	4,7	V
Collector-emitter saturation voltage	V_{CEsat}		15		150	25 125 150		1,70 1,88 1,93	2,22	V
Collector-emitter cut-off current	I_{CES}		0	650		25 125			80	µA
Gate-emitter leakage current	I_{GES}		20	0		25 125			240	nA
Internal gate resistance	r_g							none		Ω
Input capacitance	C_{ies}	f=1 MHz	0	25		25		8600		pF
Output capacitance	C_{oes}							150		
Reverse transfer capacitance	C_{res}							32		
Gate charge	Q_g		15	520	150	25		332		nC
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	phase-change material λ=3,4W/mK						0,74		K/W
IGBT Switching										
Turn-on delay time	$t_{d(on)}$	R_{goff} = 2 Ω R_{gon} = 2 Ω	±15	350	89	25 125 150		48 46 46		ns
Rise time	t_r					25 125 150		11 12 13		
Turn-off delay time	$t_{d(off)}$					25 125 150		133 152 156		
Fall time	t_f					25 125 150		7 7 8		
Turn-on energy (per pulse)	E_{on}	Q_{rFWD} = 3,8 µC Q_{rFWD} = 7,1 µC Q_{rFWD} = 8,1 µC				25 125 150		0,737 1,118 1,210		mWs
Turn-off energy (per pulse)	E_{off}					25 125 150		0,367 0,706 0,798		

Buck Diode

Parameter	Symbol	Conditions					Value			Unit
				V_r [V]	I_F [A]	T_j [°C]	Min	Typ	Max	
Static										
Forward voltage	V_F				150	25 125 150		1,67 1,67 1,66	1,77	V
Reverse leakage current	I_r			650		25 150			7,6	µA
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	Phase-Change Material λ=3,4W/mK						0,84		K/W
FWD Switching										
Peak recovery current	I_{RRM}	di/dt = 7000 A/µs di/dt = 7124 A/µs di/dt = 6971 A/µs	±15	350	89	25 125 150		110 143 151		A
Reverse recovery time	t_{rr}					25 125 150		52 85 96		ns
Recovered charge	Q_r					25 125 150		3,795 7,081 8,085		µC
Reverse recovered energy	E_{rec}					25 125 150		0,853 1,613 1,849		mWs
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 125 150		2642 2119 2131		A/µs

Out. Boost Switch

Parameter	Symbol	Conditions					Value			Unit
			V_{GE} [V]	V_{CE} [V]	I_C [A]	T_j[°C]	Min	Typ	Max	
Static										
Gate-emitter threshold voltage	$V_{GE(th)}$	V_{GE}=V_{CE}			0,0015	25 125	3,3	4	4,7	V
Collector-emitter saturation voltage	V_{CEsat}		15		150	25 125 150		1,70 1,88 1,93	2,22	V
Collector-emitter cut-off current	I_{CES}		0	650		25 125			80	µA
Gate-emitter leakage current	I_{GES}		20	0		25 125			240	nA
Internal gate resistance	r_g							none		Ω
Input capacitance	C_{ies}	f=1 MHz	0	25		25		8600		pF
Output capacitance	C_{oes}							150		
Reverse transfer capacitance	C_{res}							32		
Gate charge	Q_g		15	520	150	25		332		nC
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	phase-change material λ=3,4W/mK						0,74		K/W
IGBT Switching										
Turn-on delay time	$t_{d(on)}$	R_{goff} = 2 Ω R_{gon} = 2 Ω	±15	350	89	25 125 150		50 51 50		ns
Rise time	t_r					25 125 150		11 13 14		
Turn-off delay time	$t_{d(off)}$					25 125 150		114 134 139		
Fall time	t_f					25 125 150		5 7 9		
Turn-on energy (per pulse)	E_{on}	Q_{rFWD} = 3,6 µC Q_{rFWD} = 6,9 µC Q_{rFWD} = 7,9 µC				25 125 150		1,100 1,773 1,921		mWs
Turn-off energy (per pulse)	E_{off}					25 125 150		0,243 0,621 0,719		

Out. Boost Diode

Parameter	Symbol	Conditions					Value			Unit
				V_r [V]	I_F [A]	T_j [°C]	Min	Typ	Max	
Static										
Forward voltage	V_F				150	25 125 150		1,67 1,67 1,66	1,77	V
Reverse leakage current	I_r			650		25 150			7,6	µA
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	Phase-Change Material λ=3,4W/mK						0,84		K/W
FWD Switching										
Peak recovery current	I_{RRM}	di/dt = 5600 A/µs di/dt = 6000 A/µs di/dt = 5796 A/µs	±15	350	89	25 125 150		90 117 121		A
Reverse recovery time	t_{rr}					25 125 150		61 97 109		ns
Recovered charge	Q_r					25 125 150		3,603 6,937 7,941		µC
Reverse recovered energy	E_{rec}					25 125 150		0,692 1,331 1,529		mWs
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 125 150		1618 1020 864		A/µs

Out. Boost Inverse Diode

Parameter	Symbol	Conditions					Value			Unit
				V_r [V]	I_F [A]	T_j [°C]	Min	Typ	Max	
Static										
Forward voltage	V_F				150	25 125 150		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=3,4W/mK						0,64		K/W

DC Link Capacitor

Parameter	Symbol	Conditions					Value			Unit
						T_j[°C]	Min	Typ	Max	
Capacitance	C							300		nF
Tolerance							-10		+10	%

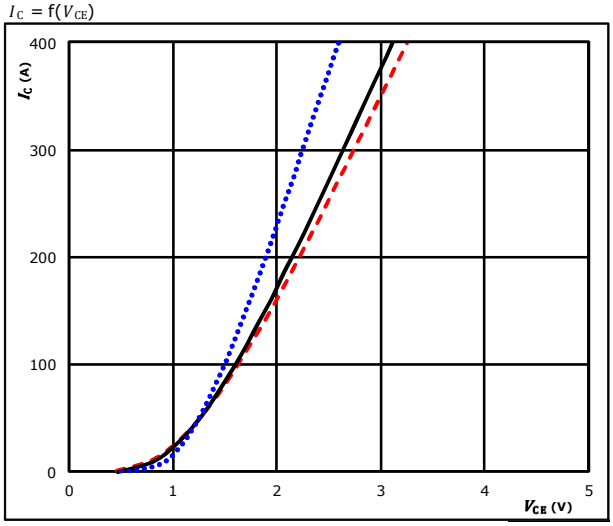
Thermistor

Parameter	Symbol	Conditions					Value			Unit
			V_{GE}[V]	V_{CE}[V]	I_C[A]	T_j[°C]	Min	Typ	Max	
Rated resistance	R					25		21,5		kΩ
Deviation of R100	$\Delta_{R/R}$	R100=1486 Ω				100	-4,5		+4,5	%
Power dissipation	P					25		210		mW
Power dissipation constant						25		3,5		mW/K
B-value	$B_{(25/50)}$					25		3884		K
B-value	$B_{(25/100)}$					25		3964		K
Vincotech NTC Reference									F	

Buck Switch\ Out. Boost Switch Characteristics

Typical output characteristics **IGBT**

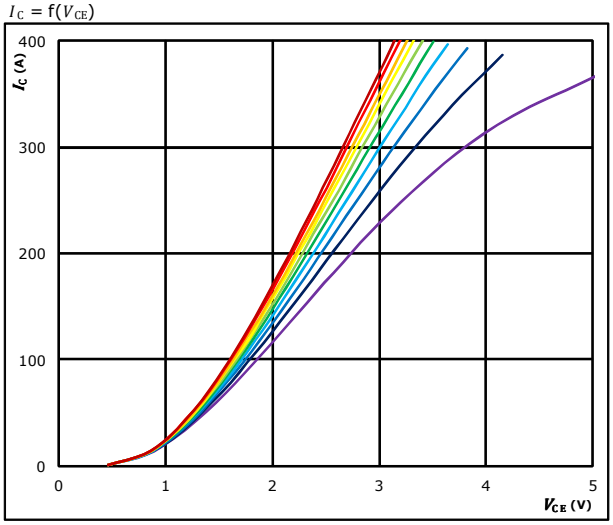
$I_C = f(V_{CE})$



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

Typical output characteristics **IGBT**

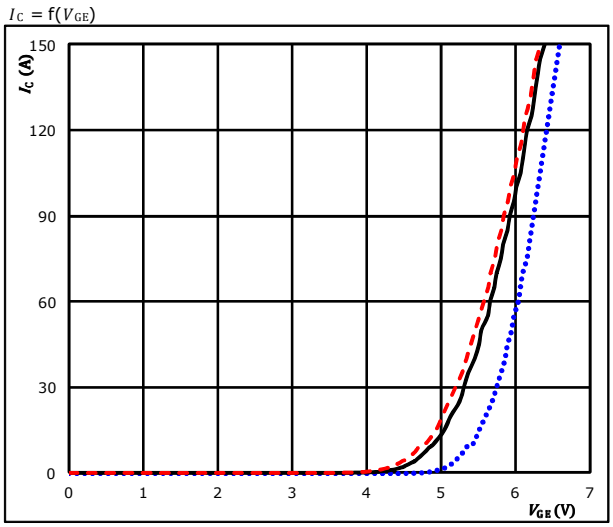
$I_C = f(V_{CE})$



t_p =	250	µs
T_j =	150	°C
V_{GE} from	8 V to 17 V in steps of 1 V	

Typical transfer characteristics **IGBT**

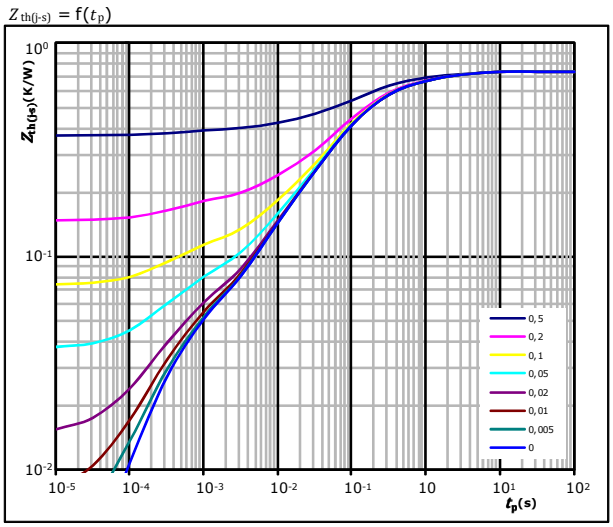
$I_C = f(V_{GE})$



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

Transient Thermal Impedance as function of Pulse duration **IGBT**

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



D =	t_p / T	
$R_{th(j-s)}$ =	0,74	K/W

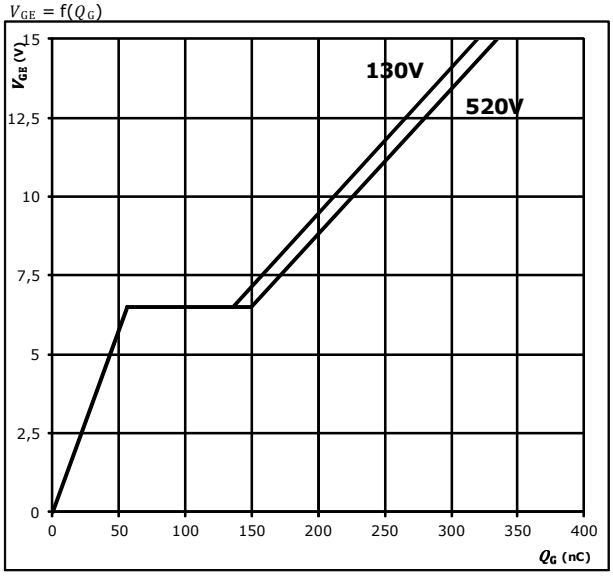
IGBT thermal model values

R_{th} (K/W)	τ (s)
1,09E-01	1,94E+00
2,21E-01	2,60E-01
2,87E-01	6,98E-02
8,43E-02	8,29E-03
3,94E-02	3,67E-04

Buck Switch\ Out. Boost Switch Characteristics

Gate voltage vs Gate charge **IGBT**

$V_{GE} = f(Q_G)$

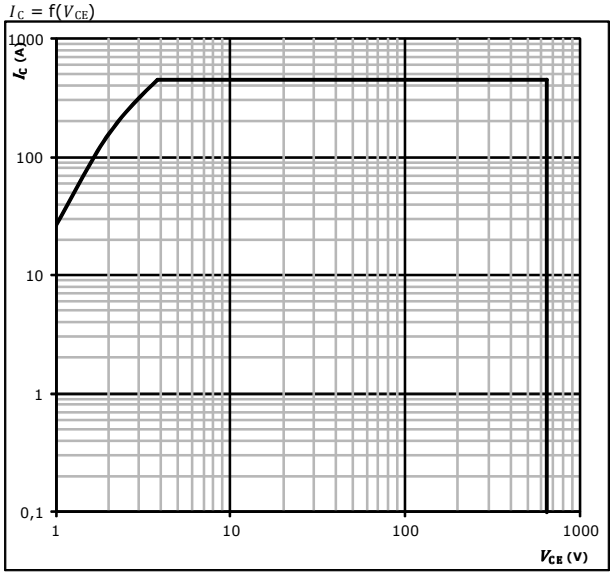


At

I_C= 150 A

Safe operating area **IGBT**

$I_C = f(V_{CE})$



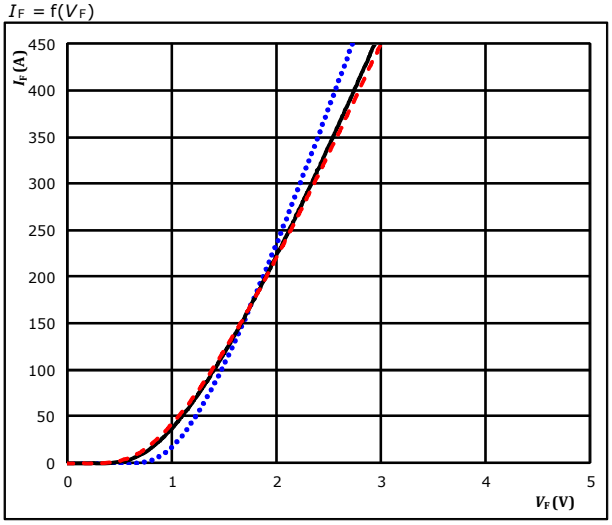
At

D = single pulse
T_h = 80 °C
V_{GE} = ±15 V
T_j = T_{jmax} °C

Buck Diode\ Out. Boost Diode Characteristics

Typical forward characteristics **FWD**

$I_F = f(V_F)$

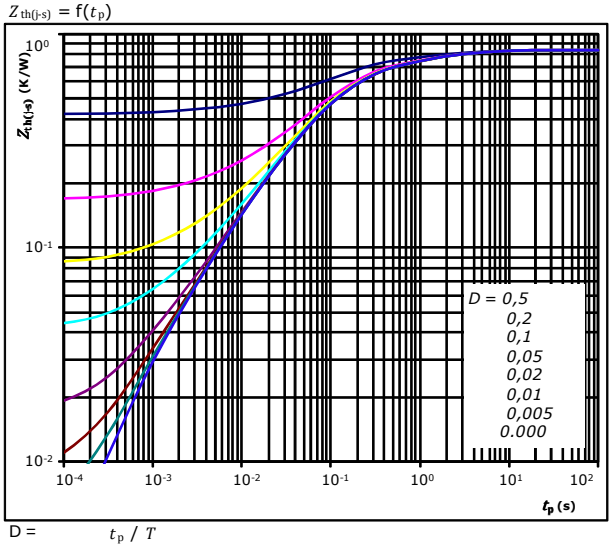


t_p = 250 µs

T_j: 25 °C, 125 °C, 150 °C

Transient thermal impedance as a function of pulse width **FWD**

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



D = t_p / T

$R_{th(j-s)}$ = 0,84 K/W

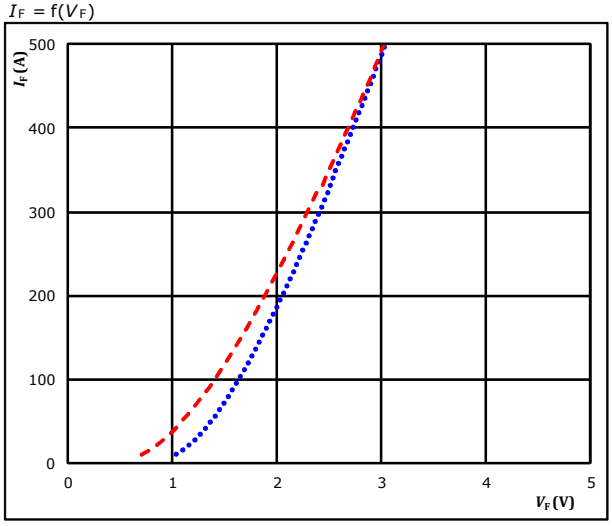
FWD thermal model values

R (K/W)	τ (s)
6,09E-02	4,33E+00
1,45E-01	8,74E-01
3,25E-01	1,39E-01
2,06E-01	4,67E-02
8,27E-02	9,15E-03
2,35E-02	1,16E-03

Out. Boost Inverse Diode Characteristics

Typical forward characteristics **FWD**

$I_F = f(V_F)$

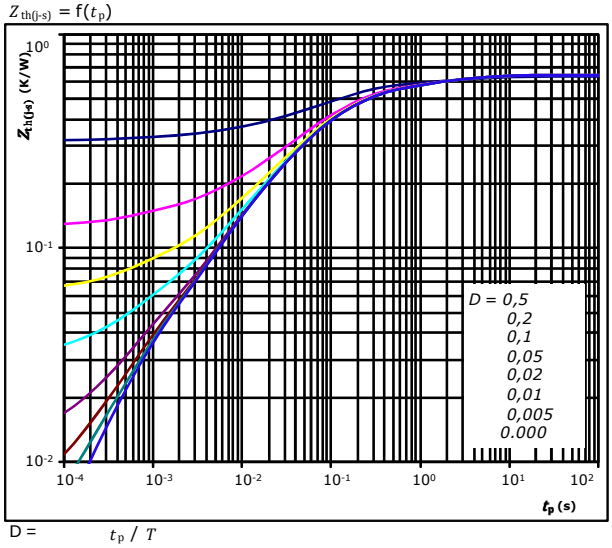


t_p = 250 µs

T_j: 25 °C, 125 °C, 150 °C

Transient thermal impedance as a function of pulse width **FWD**

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



D = t_p / T

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

FWD thermal model values

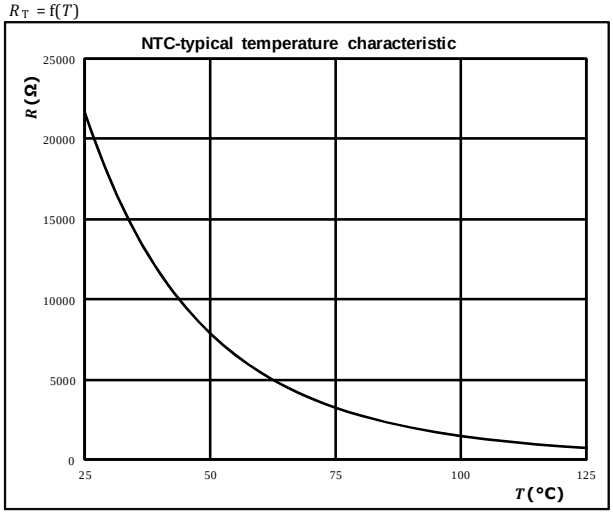
R (K/W)	τ (s)
6,14E-02	3,48E+00
1,03E-01	5,85E-01
2,81E-01	9,46E-02
1,21E-01	2,14E-02
4,83E-02	5,07E-03
2,26E-02	5,92E-04

Thermistor

Thermistor typical temperature characteristic

Typical NTC characteristic as a function of temperature

$R_T = f(T)$

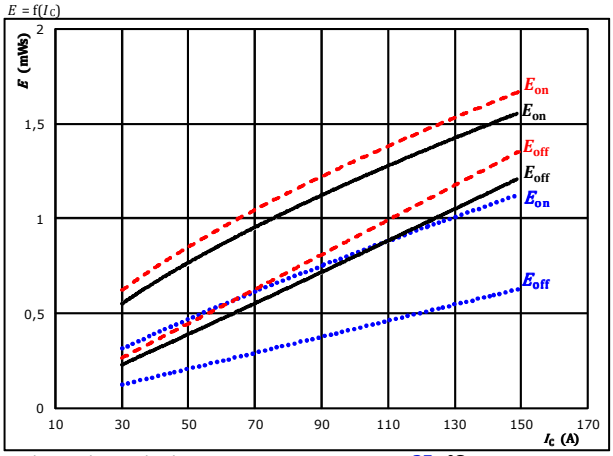


Buck Switching Characteristics

Figure 1. **IGBT**

Typical switching energy losses as a function of collector current

$E = f(I_C)$



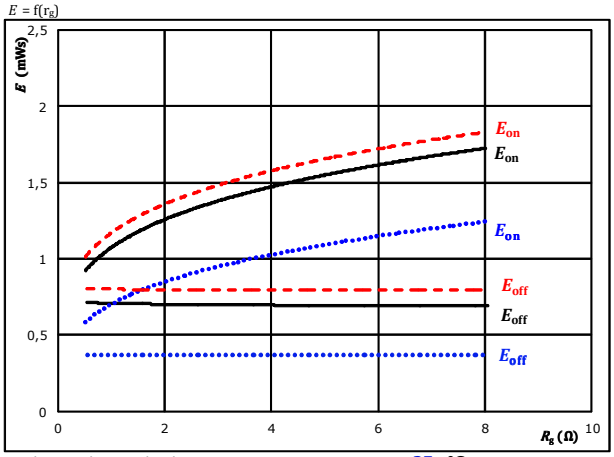
With an inductive load at

V_{CE} =	350	V	T_j:	25 °C, 125 °C, 150 °C
V_{GE} =	±15	V		
R_{gon} =	2	Ω		
R_{goff} =	2	Ω		

Figure 2. **IGBT**

Typical switching energy losses as a function of gate resistor

$E = f(r_g)$



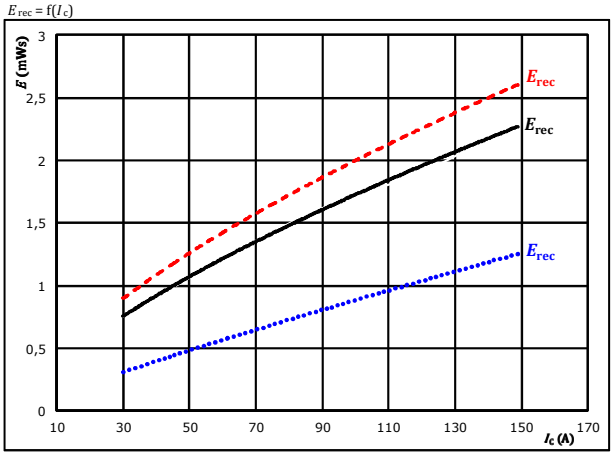
With an inductive load at

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

Figure 3. **FWD**

Typical reverse recovered energy loss as a function of collector current

$E_{rec} = f(I_C)$



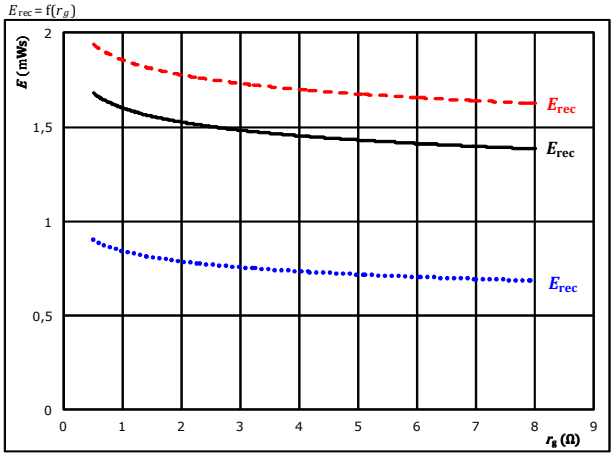
With an inductive load at

V_{CE} =	350	V	T_j:	25 °C, 125 °C, 150 °C
V_{GE} =	±15	V		
R_{gon} =	2	Ω		

Figure 4. **FWD**

Typical reverse recovered energy loss as a function of gate resistor

$E_{rec} = f(r_g)$



With an inductive load at

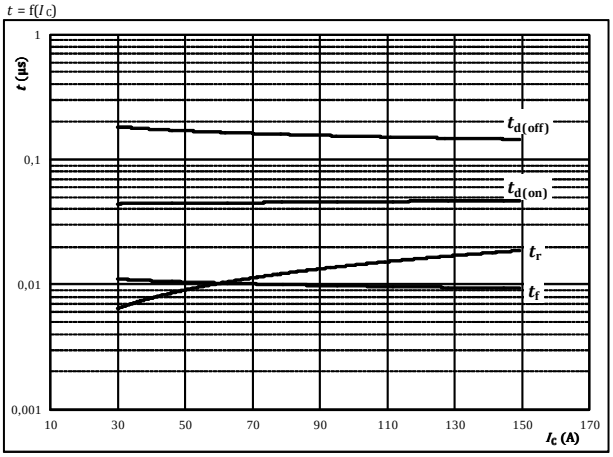
V_{CE} =	350	V	T_j:	25 °C, 125 °C, 150 °C
V_{GE} =	±15	V		
I_C =	89	A		

Buck Switching Characteristics

Figure 5. **IGBT**

Typical switching times as a function of collector current

$t = f(I_C)$



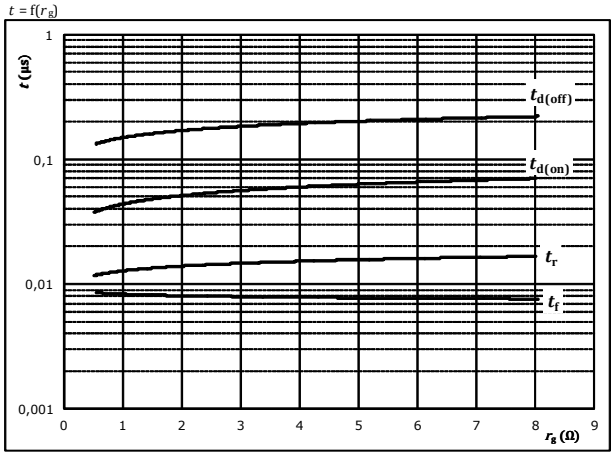
With an inductive load at

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

Figure 6. **IGBT**

Typical switching times as a function of gate resistor

$t = f(r_g)$



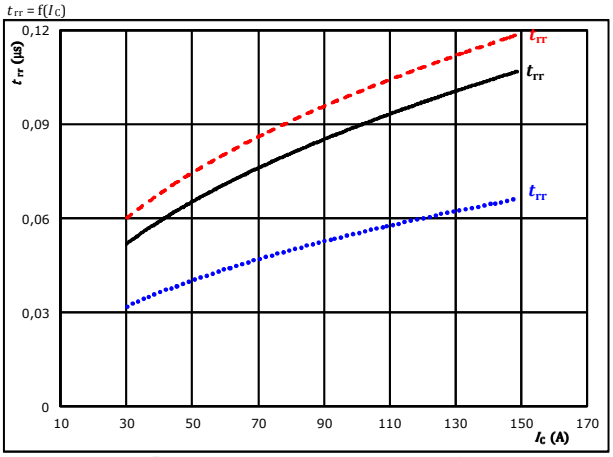
With an inductive load at

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

Figure 7. **FWD**

Typical reverse recovery time as a function of collector current

$t_{rr} = f(I_C)$



At

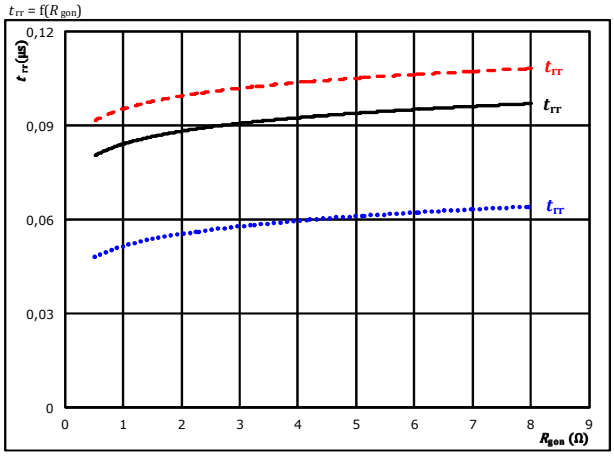
V_{CE} =	350	V
V_{GE} =	±15	V
R_{gon} =	2	Ω

T_j: 25 °C, 125 °C, 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
V_{GE} =	±15	V
I_C =	89	A

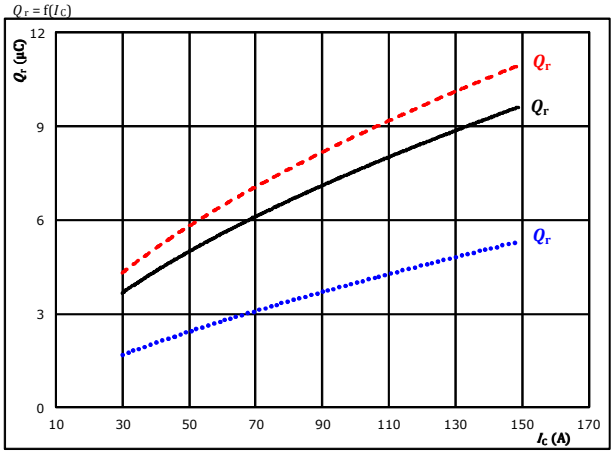
T_j: 25 °C, 125 °C, 150 °C

Buck Switching Characteristics

Figure 9. FWD

Typical recovered charge as a function of collector current

$Q_r = f(I_C)$

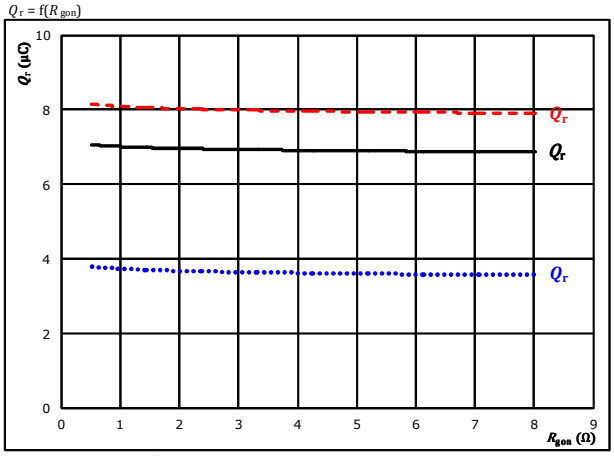


At	V_{CE} =	350	V		25 °C
	V_{GE} =	±15	V	T_j:	125 °C
	R_{gon} =	2	Ω		150 °C

Figure 10. FWD

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

$Q_r = f(R_{gon})$

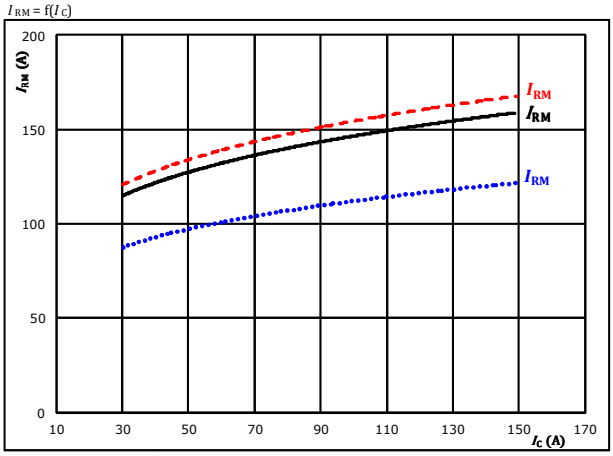


At	V_{CE}=	350	V		25 °C
	V_{GE} =	±15	V	T_j:	125 °C
	I_C=	89	A		150 °C

Figure 11. FWD

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

$I_{RM} = f(I_C)$

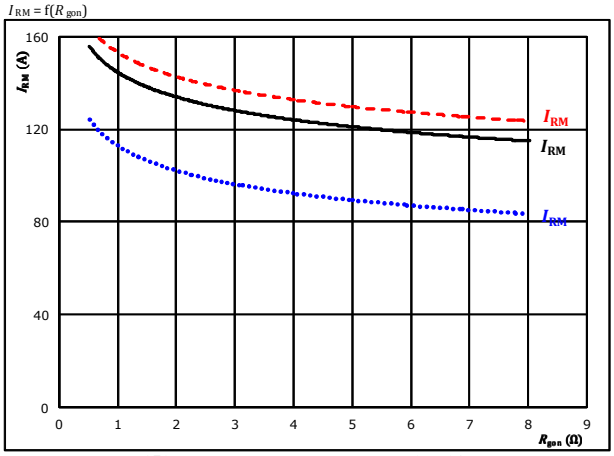


At	V_{CE} =	350	V		25 °C
	V_{GE} =	±15	V	T_j:	125 °C
	R_{gon} =	2	Ω		150 °C

Figure 12. FWD

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

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



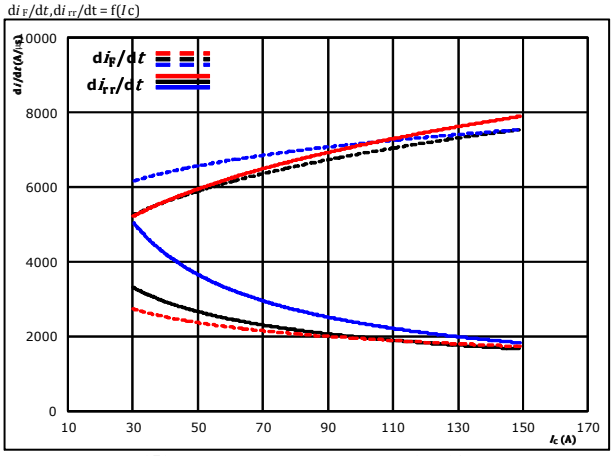
At	V_{CE} =	350	V		25 °C
	V_{GE} =	±15	V	T_j:	125 °C
	I_C =	89	A		150 °C

Buck Switching Characteristics

Figure 13. **FWD**

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

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

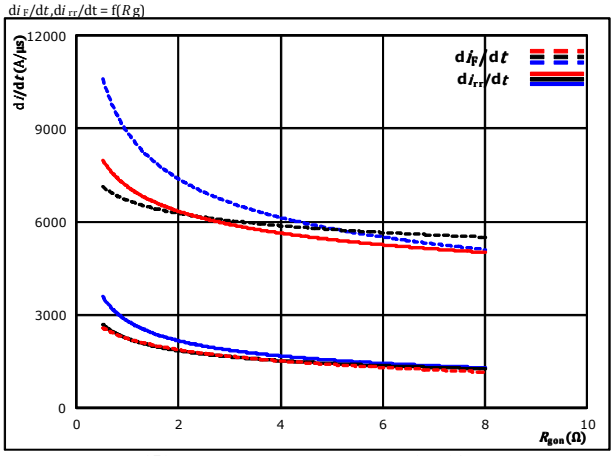


At	V_{CE} =	350	V		25 °C
	V_{GE} =	±15	V	T_j:	125 °C
	R_{gon} =	2	Ω		150 °C

Figure 14. **FWD**

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

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

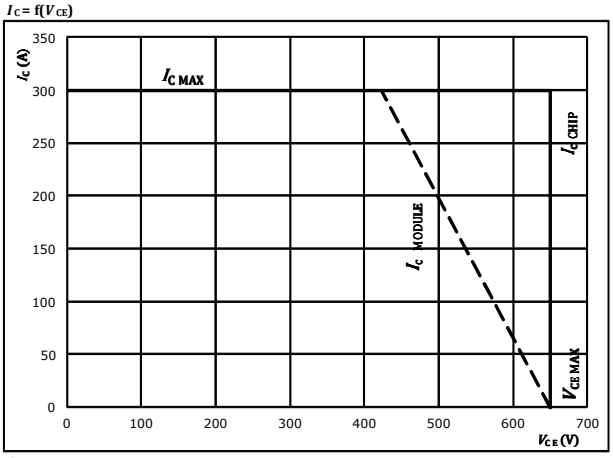


At	V_{CE} =	350	V		25 °C
	V_{GE} =	±15	V	T_j:	125 °C
	I_C =	89	A		150 °C

Figure 15. **IGBT**

Reverse bias safe operating area

$I_C = f(V_{CE})$



At

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

Buck Switching Definition

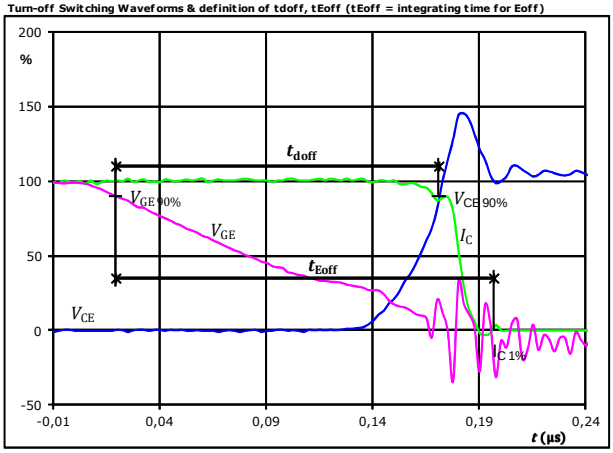
Without internal capacitor

General conditions

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

Figure 1. IGBT

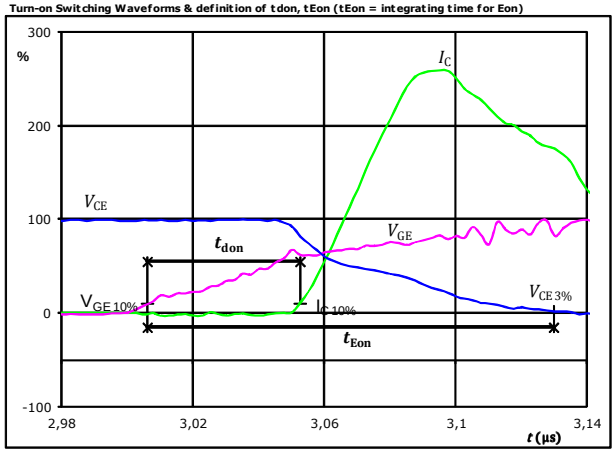
Turn-off Switching Waveforms & definition of tdoff, tEoff (tEoff = integrating time for Eoff)



$V_{GE}(0\%)$ =	0	V
$V_{GE}(100\%)$ =	20	V
$V_C(100\%)$ =	350	V
$I_C(100\%)$ =	89	A
t_{doff} =	0,152	µs
t_{Eoff} =	0,177	µs

Figure 2. IGBT

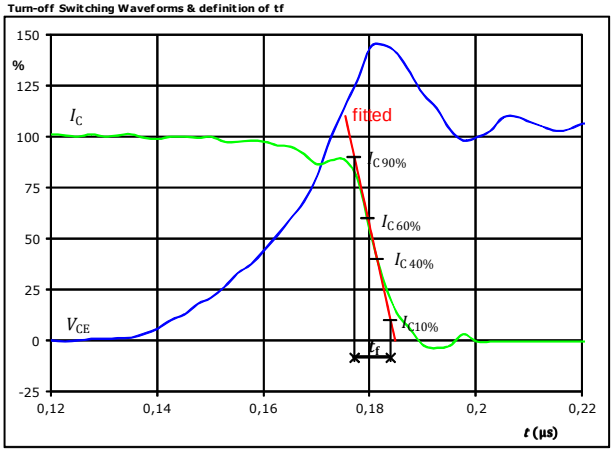
Turn-on Switching Waveforms & definition of tdon, tEon (tEon = integrating time for Eon)



$V_{GE}(0\%)$ =	0	V
$V_{GE}(100\%)$ =	20	V
$V_C(100\%)$ =	350	V
$I_C(100\%)$ =	89	A
t_{don} =	0,046	µs
t_{Eon} =	0,124	µs

Figure 3. IGBT

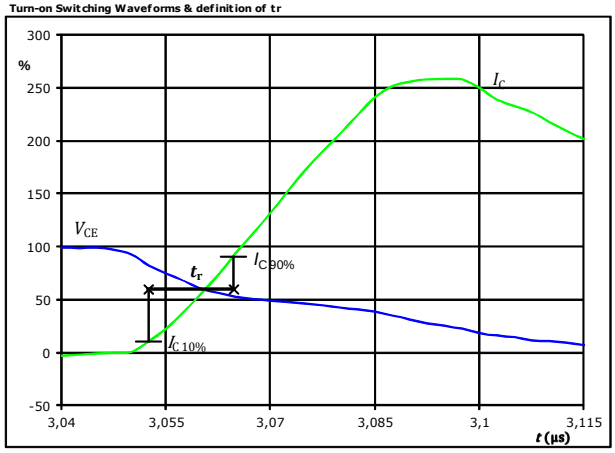
Turn-off Switching Waveforms & definition of tf



$V_C(100\%)$ =	350	V
$I_C(100\%)$ =	89	A
t_f =	0,007	µs

Figure 4. IGBT

Turn-on Switching Waveforms & definition of tr

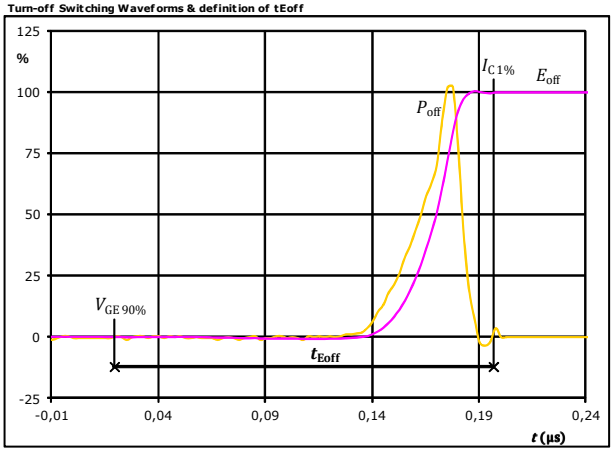


$V_C(100\%)$ =	350	V
$I_C(100\%)$ =	89	A
t_r =	0,012	µs

Buck Switching Definition

Figure 5. **IGBT**

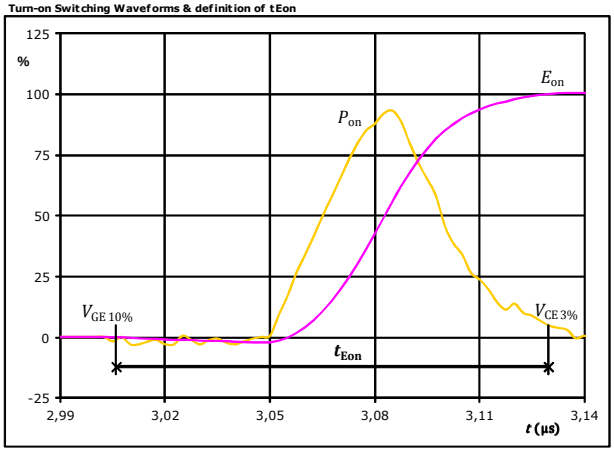
Turn-off Switching Waveforms & definition of tEoff



$P_{off}(100\%) =$	31,16	kW
$E_{off}(100\%) =$	0,71	mJ
$t_{Eoff} =$	0,18	µs

Figure 6. **IGBT**

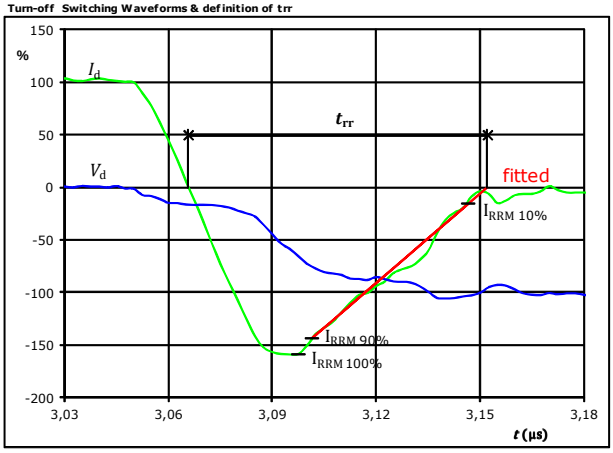
Turn-on Switching Waveforms & definition of tEon



$P_{on}(100\%) =$	31,16	kW
$E_{on}(100\%) =$	1,12	mJ
$t_{Eon} =$	0,12	µs

Figure 7. **FWD**

Turn-off Switching Waveforms & definition of trr

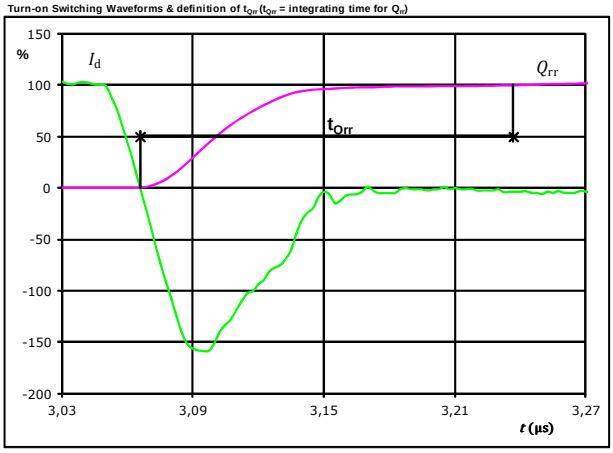


$V_d(100\%) =$	350	V
$I_d(100\%) =$	89	A
$I_{RRM}(100\%) =$	-143	A
$t_{rr} =$	0,085	µs

Buck Switching Definition

Figure 8. **FWD**

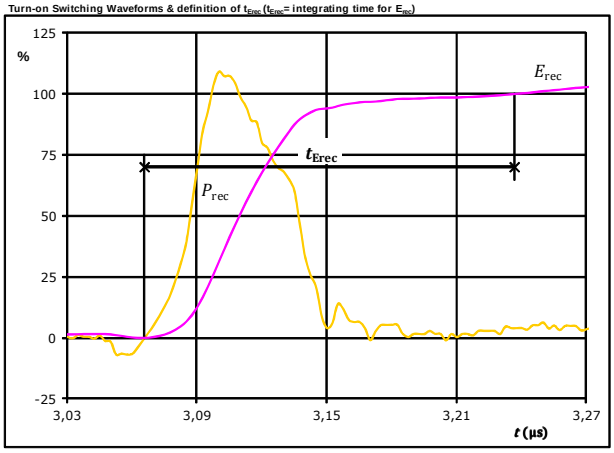
Turn-on Switching Waveforms & definition of t_{Qrr} (t_{Qrr} = integrating time for Q_{rr})



I_d (100%) =	89	A
Q_{rr} (100%) =	7,08	µC
t_{Qrr} =	0,17	µs

Figure 9. **FWD**

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



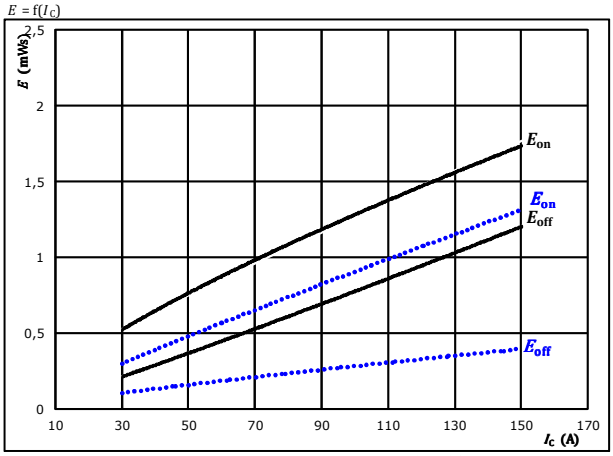
P_{rec} (100%) =	31,16	kW
E_{rec} (100%) =	1,61	mJ
t_{Erec} =	0,17	µs

Out. Boost Switching Characteristics

Figure 1. IGBT

Typical switching energy losses as a function of collector current

$E = f(I_C)$



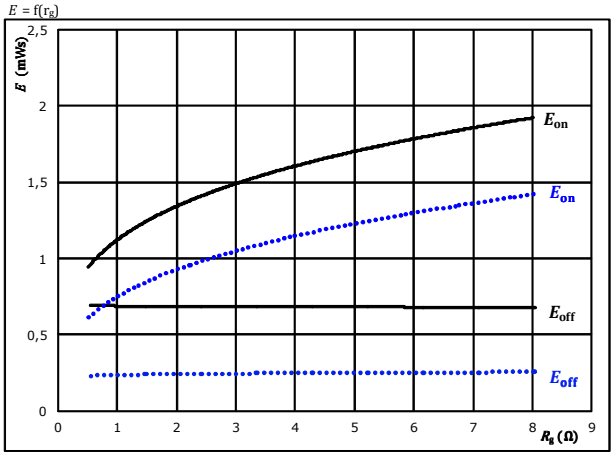
With an inductive load at — 25 °C ····· / T_j: 125 °C ——

V_{CE} =	350	V
V_{GE} =	±15	V
R_{gon} =	2	Ω
R_{goff} =	2	Ω

Figure 2. IGBT

Typical switching energy losses as a function of gate resistor

$E = f(r_g)$



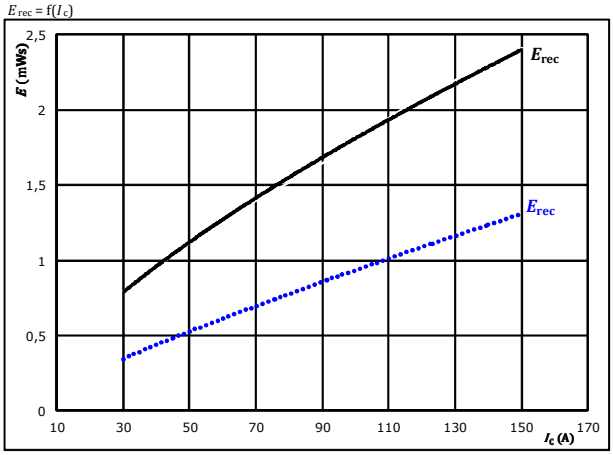
With an inductive load at — 25 °C ····· / T_j: 125 °C ——

V_{CE} =	350	V
V_{GE} =	±15	V
I_C =	90	A

Figure 3. FWD

Typical reverse recovered energy loss as a function of collector current

$E_{rec} = f(I_C)$



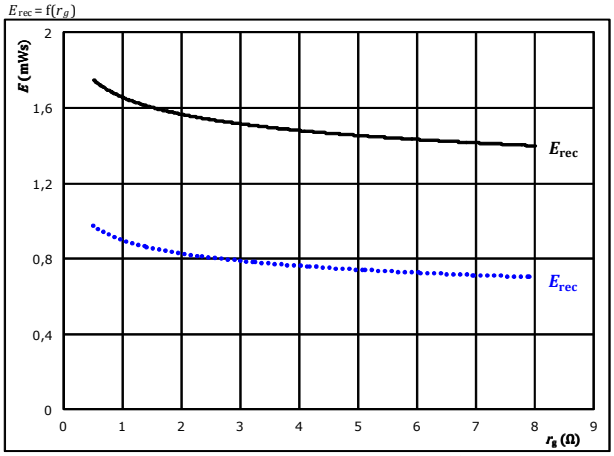
With an inductive load at — 25 °C ····· / T_j: 125 °C ——

V_{CE} =	350	V
V_{GE} =	±15	V
R_{gon} =	2	Ω

Figure 4. FWD

Typical reverse recovered energy loss as a function of gate resistor

$E_{rec} = f(r_g)$



With an inductive load at — 25 °C ····· / T_j: 125 °C ——

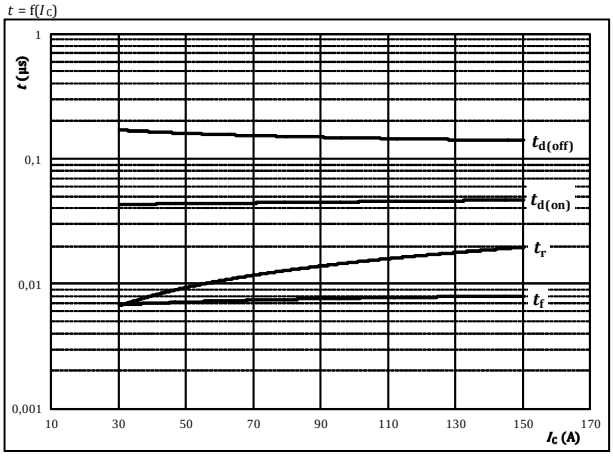
V_{CE} =	350	V
V_{GE} =	±15	V
I_C =	90	A

Out. Boost Switching Characteristics

Figure 5. **IGBT**

Typical switching times as a function of collector current

$t = f(I_C)$



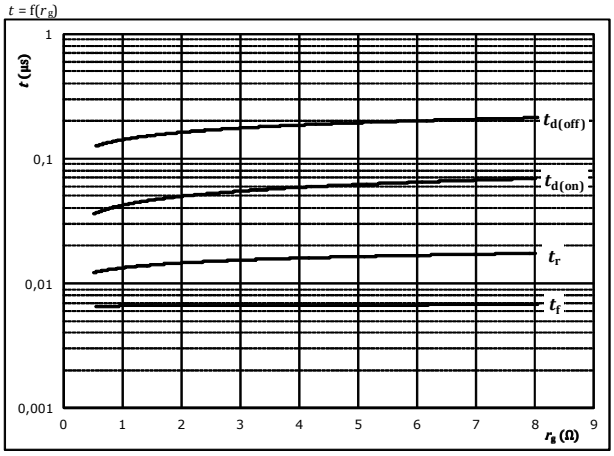
With an inductive load at

T_j =	125	°C
V_{CE} =	350	V
V_{GE} =	±15	V
R_{gon} =	2	Ω
R_{goff} =	2	Ω

Figure 6. **IGBT**

Typical switching times as a function of gate resistor

$t = f(r_g)$



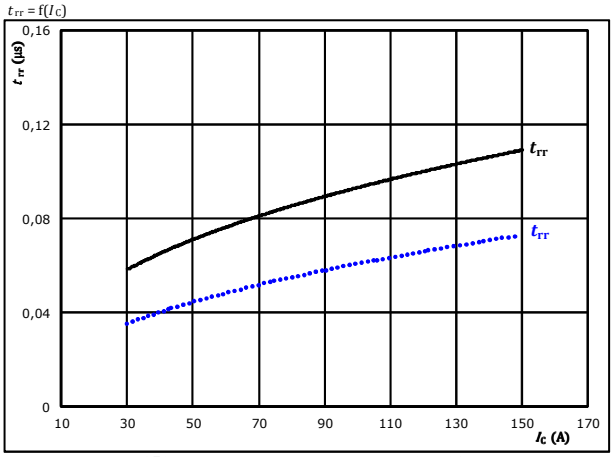
With an inductive load at

T_j =	125	°C
V_{CE} =	350	V
V_{GE} =	±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

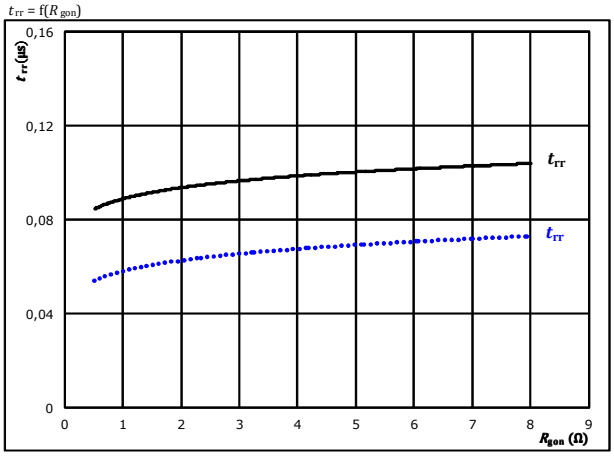
V_{CE} =	350	V
V_{GE} =	±15	V
R_{gon} =	2	Ω

T_j: **25 °C** (dotted) **125 °C** (solid)

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
V_{GE} =	±15	V
I_C =	90	A

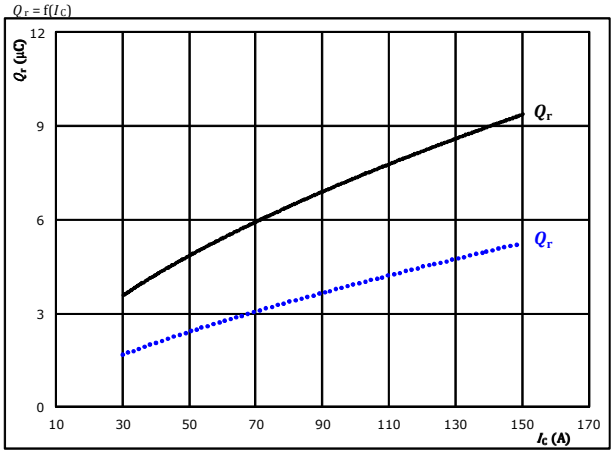
T_j: **25 °C** (dotted) **125 °C** (solid)

Out. Boost Switching Characteristics

Figure 9. **FWD**

Typical recovered charge as a function of collector current

$Q_r = f(I_C)$

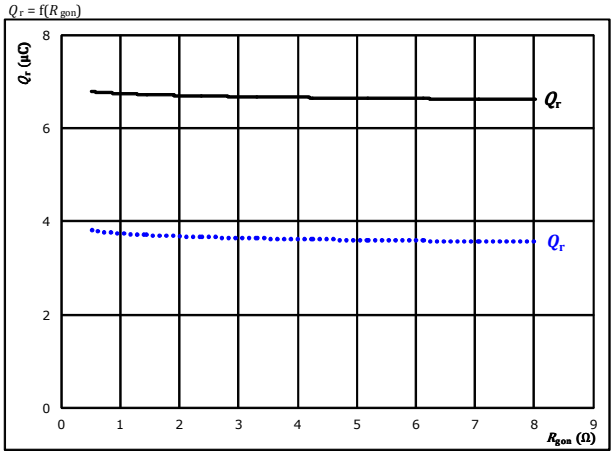


At					
	V_{CE} =	350	V		25 °C
	V_{GE} =	±15	V	T_j:	125 °C
	R_{gon} =	2	Ω		

Figure 10. **FWD**

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

$Q_r = f(R_{gon})$

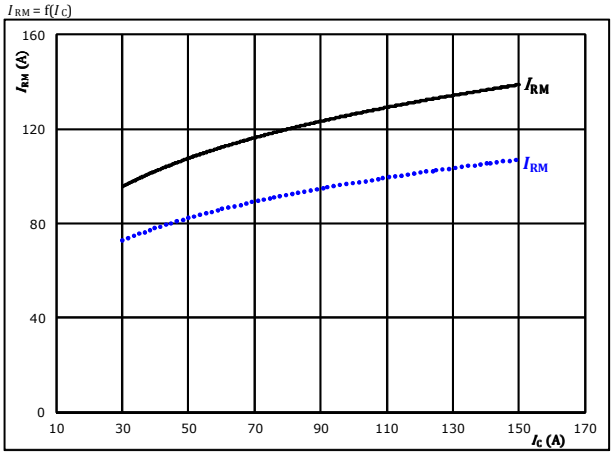


At					
	V_{CE}=	350	V		25 °C
	V_{GE} =	±15	V	T_j:	125 °C
	I_C=	90	A		

Figure 11. **FWD**

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

$I_{RM} = f(I_C)$

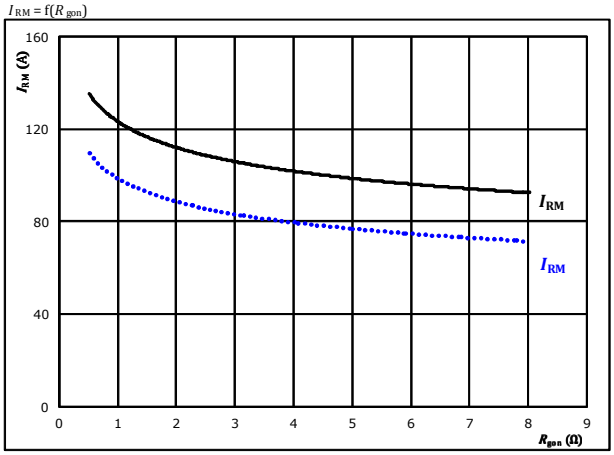


At					
	V_{CE} =	350	V		25 °C
	V_{GE} =	±15	V	T_j:	125 °C
	R_{gon} =	2	Ω		

Figure 12. **FWD**

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

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



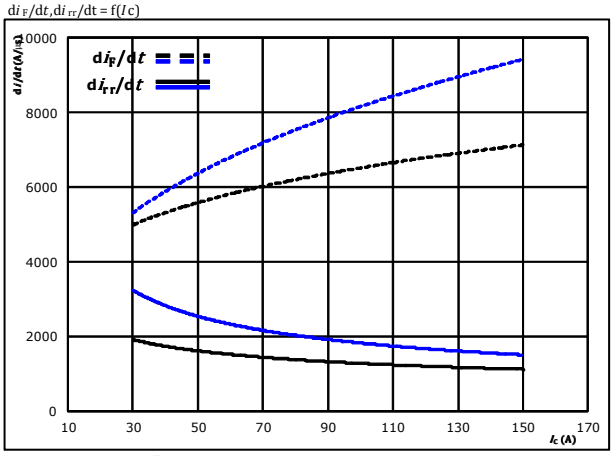
At					
	V_{CE} =	350	V		25 °C
	V_{GE} =	±15	V	T_j:	125 °C
	I_C =	90	A		

Out. Boost Switching Characteristics

Figure 13. **FWD**

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

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

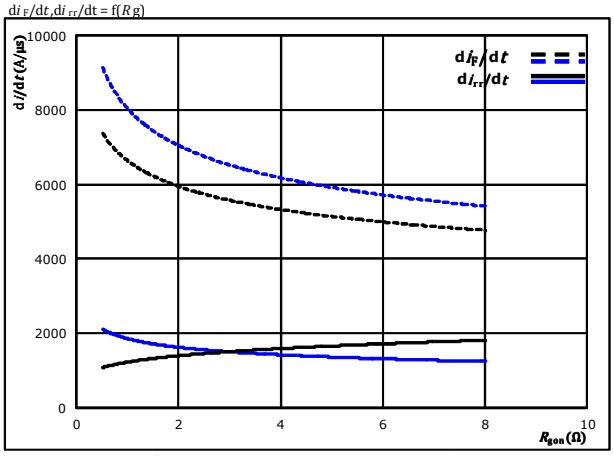


At					
V_{CE} =	350	V	T_j:	25 °C	•••••••••••••••
V_{GE} =	±15	V		125 °C	———————
R_{gon} =	2	Ω			

Figure 14. **FWD**

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

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

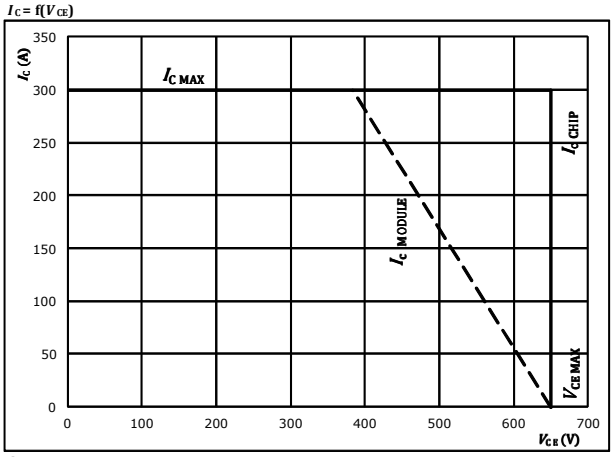


At					
V_{CE} =	350	V	T_j:	25 °C	•••••••••••••••
V_{GE} =	±15	V		125 °C	———————
I_C =	90	A			

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

Out. Boost Switching Definition

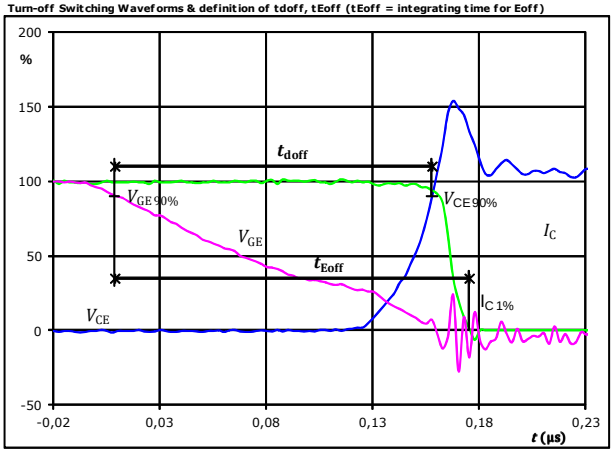
Without internal capacitor

General conditions

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

Figure 1. IGBT

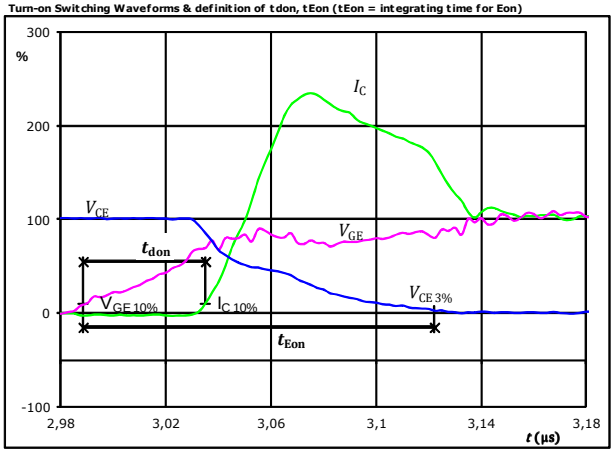
Turn-off Switching Waveforms & definition of tdoff, tEoff (tEoff = integrating time for Eoff)



$V_{GE}(0\%)$ =	0	V
$V_{GE}(100\%)$ =	20	V
$V_C(100\%)$ =	350	V
$I_C(100\%)$ =	90	A
t_{doff} =	0,149	µs
t_{Eoff} =	0,166	µs

Figure 2. IGBT

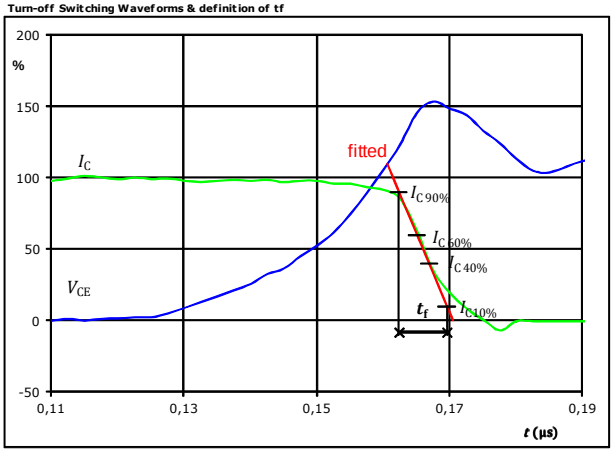
Turn-on Switching Waveforms & definition of tdon, tEon (tEon = integrating time for Eon)



$V_{GE}(0\%)$ =	0	V
$V_{GE}(100\%)$ =	20	V
$V_C(100\%)$ =	350	V
$I_C(100\%)$ =	90	A
t_{don} =	0,045	µs
t_{Eon} =	0,134	µs

Figure 3. IGBT

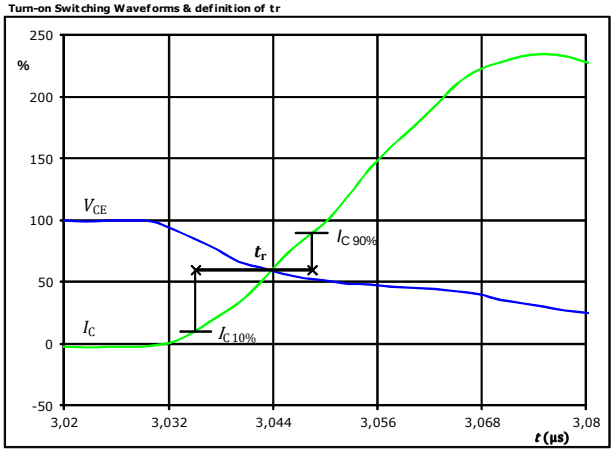
Turn-off Switching Waveforms & definition of tf



$V_C(100\%)$ =	350	V
$I_C(100\%)$ =	90	A
t_f =	0,006	µs

Figure 4. IGBT

Turn-on Switching Waveforms & definition of tr

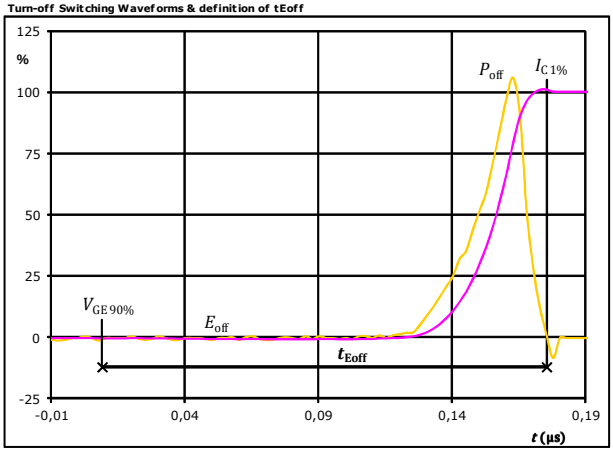


$V_C(100\%)$ =	350	V
$I_C(100\%)$ =	90	A
t_r =	0,014	µs

Out. Boost Switching Definition

Figure 5. **IGBT**

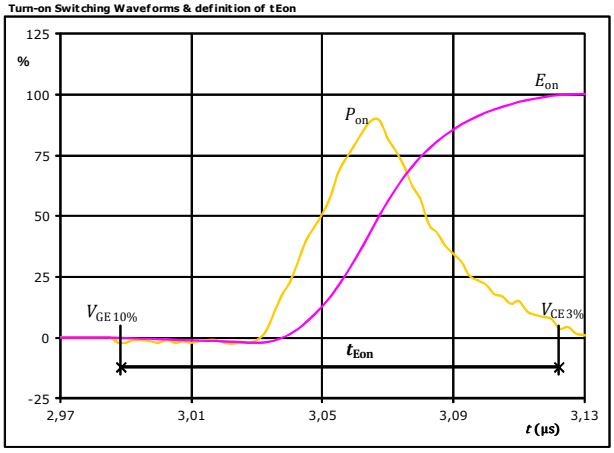
Turn-off Switching Waveforms & definition of tEoff



$P_{off}(100\%)$ =	31,58	kW
$E_{off}(100\%)$ =	0,69	mJ
t_{Eoff} =	0,17	µs

Figure 6. **IGBT**

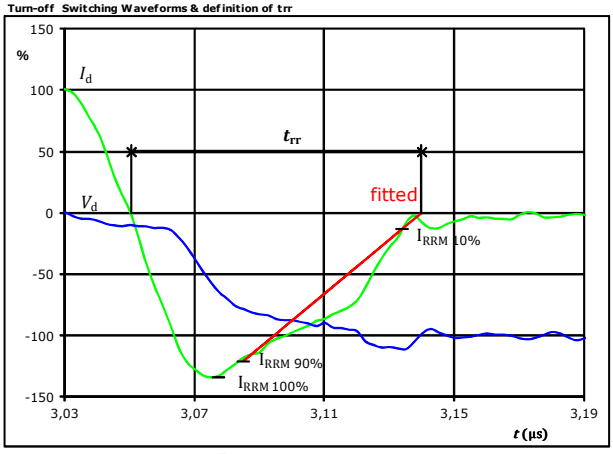
Turn-on Switching Waveforms & definition of tEon



$P_{on}(100\%)$ =	31,58	kW
$E_{on}(100\%)$ =	1,17	mJ
t_{Eon} =	0,13	µs

Figure 7. **FWD**

Turn-off Switching Waveforms & definition of trr

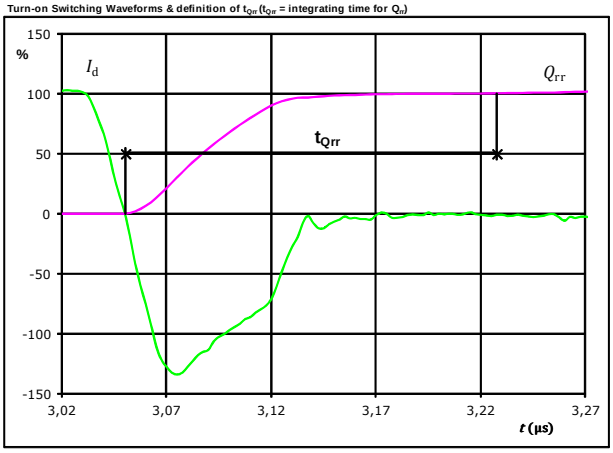


$V_d(100\%)$ =	350	V
$I_d(100\%)$ =	90	A
$I_{RRM}(100\%)$ =	-122	A
t_{rr} =	0,089	µs

Out. Boost Switching Definition

Figure 8. **FWD**

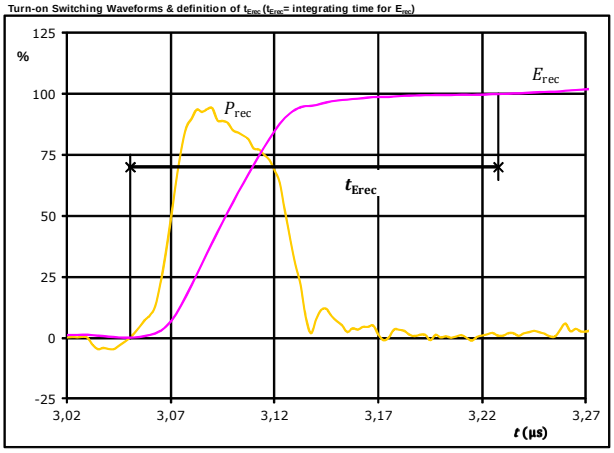
Turn-on Switching Waveforms & definition of t_{Qrr} (t_{Qrr} = integrating time for Q_{rr})



I_d (100%) =	90	A
Q_{rr} (100%) =	6,75	µC
t_{Qrr} =	0,18	µs

Figure 9. **FWD**

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



P_{rec} (100%) =	31,58	kW
E_{rec} (100%) =	1,65	mJ
t_{Erec} =	0,18	µs

Ordering Code & Marking

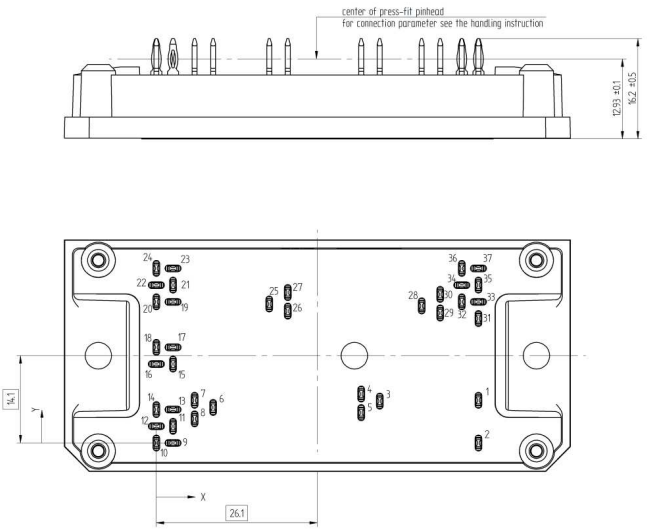
Version	Ordering Code
without thermal paste 12mm housing with solder pins	10-FY07NPA150SM02-L365F08
without thermal paste 12mm housing with Press-fit pins	10-PY07NPA150SM02-L365F08Y

	Name	Date code	UL & Vinco	Lot	Serial
Text	N-NNNNNNNNNNNNN-TTTTTTTV	WWYY	UL Vinco	LLLLL	SSSS

Datamatrix	Type	Lot number	Serial	Date code		
	TTTTTTTVV	LLLLL	SSSS	WWYY		

Outline

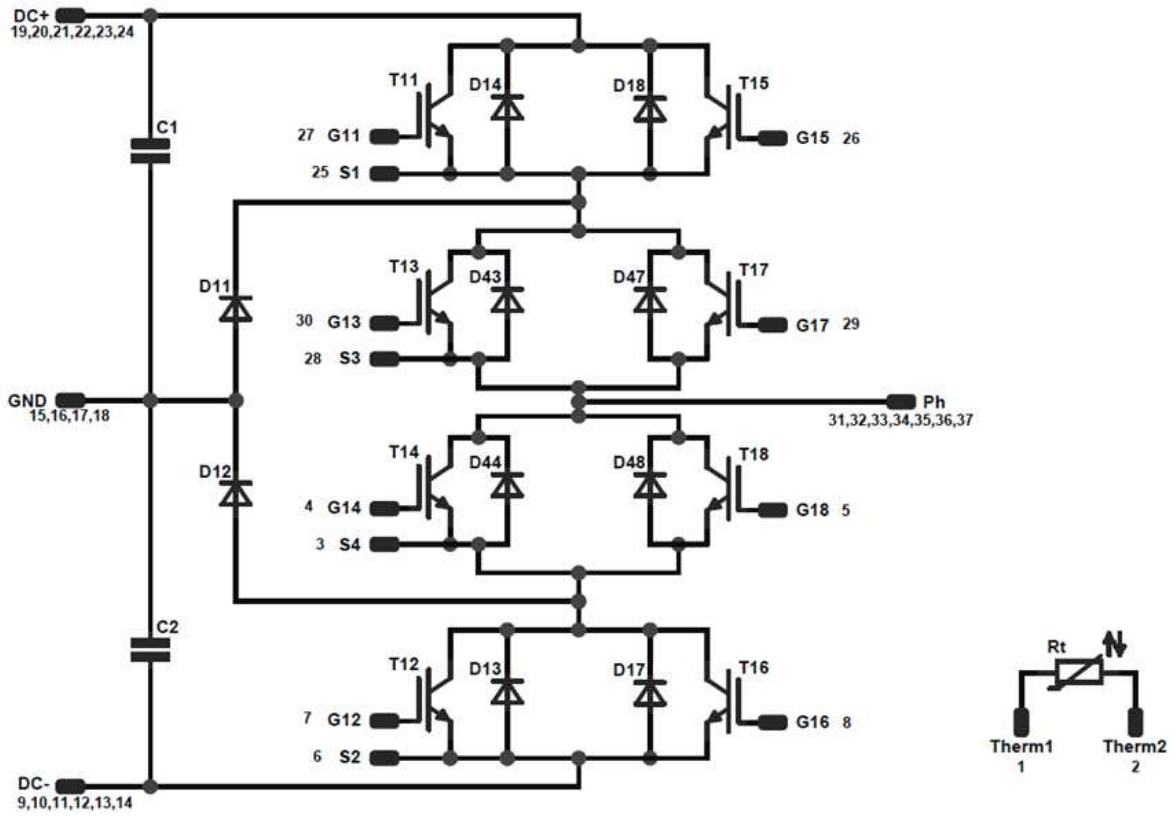
Pin table [mm]			
Pin	X	Y	Function
1	52,2	6,9	NTC1
2	52,2	0	NTC2
3	36,2	6,75	E37
4	33,2	7,9	G3
5	33,2	4,9	G7
6	9,2	5,75	E48
7	6,2	6,9	G4
8	6,2	3,9	G8
9	2,7	0	DC-
10	0	0	DC-
11	2,7	2,7	DC-
12	0	2,7	DC-
13	2,7	5,4	DC-
14	0	5,4	DC-
15	2,7	12,75	GND
16	0	12,75	GND
17	2,7	15,45	GND
18	0	15,45	GND
19	2,7	22,8	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	E15
26	21,3	21,3	G5
27	21,3	24,3	G1
28	43	22,15	E26
29	46	21	G6



Pin table[mm]			
Pin	X	Y	Function
30	46	24	G2
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
T11,T12,T15,T16	IGBT	650V	75A	Buck Switch	
D11, D12	FWD	650V	150A	Buck Diode	
T13,T14,T17,T18	IGBT	650V	75A	Out. Boost Switch	
D13,D14,D17,D18	FWD	650V	75A	Out. Boost Diode	
D43,D44,D47,D48	FWD	650V	75A	Out. Boost Inverse Diode	
C1,C2	Capacitor	500V	-	DC Link Capacitor	
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.

Document No.:	Date:	Modification:	Pages
10-FY07NPA150SM02-L365F08-D4-14	16 Nov. 2015	Added Press-fit option	1, 30