Vincotech

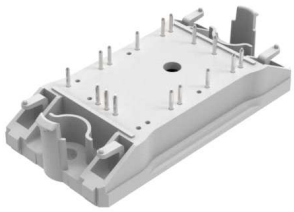
10-FZ071SA100SM02-L526L18
datasheet

flow S-PFC 0 — **650 V / 100 A**

Features

- Ultra fast IGBT and recovery boost diodes
- Integrated capacitor
- Temperature sensor

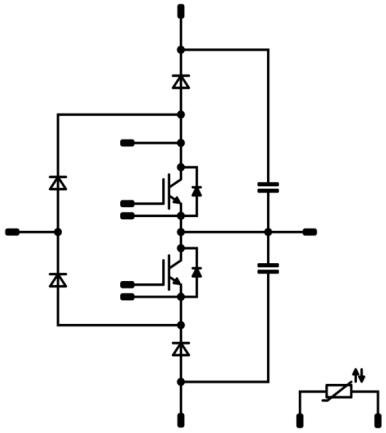
flow 0 12mm housing



Target applications

- Grid connected motor drive
- UPS
- Battery charger

Schematic



Types

- 10-FZ071SA100SM02-L526L18

Maximum Ratings

T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Condition	Value	Unit
Boost Switch				
Collector-emitter voltage	V_{CES}		650	V
Collector current	I_C	$T_j = T_{jmax}$ T_s = 80 °C	62	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}	400	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ T_s = 80 °C	100	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
Boost Diode				
Peak Repetitive Reverse Voltage	V_{RRM}		650	V
Continuous (direct) forward current	I_F	$T_j = T_{jmax}$ T_s = 80 °C	82	A
Repetitive peak forward current	I_{FRM}		200	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ T_s = 80 °C	106	W
Maximum Junction Temperature	T_{jmax}		175	°C
Boost Sw. Protection Diode				
Peak Repetitive Reverse Voltage	V_{RRM}		650	V
Continuous (direct) forward current	I_F	$T_j = T_{jmax}$ T_s = 80 °C	14	A
Repetitive peak forward current	I_{FRM}		20	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ T_s = 80 °C	33	W
Maximum Junction Temperature	T_{jmax}		175	°C
Rectifier Diode				
Peak Repetitive Reverse Voltage	V_{RRM}		1600	V
Continuous (direct) forward current	I_F	$T_j = T_{jmax}$ T_s = 80 °C	87	A
Surge (non-repetitive) forward current	I_{FSM}	t_p = 10 ms, sin 180° T_j = 150 °C	890	A
Surge current capability	I^2t		3960	A^2s
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ T_s = 80 °C	95	W
Maximum Junction Temperature	T_{jmax}		150	°C
DC Link Capacitance				
Maximum DC voltage	V_{MAX}		630	V
Operation Temperature	T_{op}		-55…+125	°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	4000	V
Creepage distance			min. 12,7	mm
Clearance			9,75	mm
Comparative Tracking Index	CTI		> 200	

Characteristic Values

Parameter	Symbol	Conditions					Value			Unit
			V_{GE} [V] V_{GS} [V]	V_{CE} [V] V_{DS} [V]	I_C [A] I_D [A]	T_j [°C]	Min	Typ	Max	
Boost Switch										
Static										
Gate-emitter threshold voltage	$V_{GE(th)}$	$V_{GE} = V_{CE}$			0,001	25	3,2	4	4,8	V
Collector-emitter saturation voltage	V_{CEsat}		15		100	25 125 150		1,77 1,86 1,91	2,1	V
Collector-emitter cut-off current	I_{CES}		0	650		25			100	µA
Gate-emitter leakage current	I_{GES}		20	0		25			100	nA
Internal gate resistance	r_g							none		Ω
Input capacitance	C_{ies}	f= 1 MHz	0	25		25		6560		pF
Output capacitance	C_{oes}							97		
Reverse transfer capacitance	C_{res}							21		
Gate charge	Q_g		15	520	100	25		210		nC
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	phase-change material λ = 3,4 W/mK						0,95		K/W
Dynamic										
Turn-on delay time	$t_{d(on)}$	R_{goff} = 4 Ω R_{gon} = 4 Ω	-5/15	350	99	25 125 150		49 49 49		ns
Rise time	t_r					25 125 150		10 15 15		
Turn-off delay time	$t_{d(off)}$					25 125 150		115 130 133		
Fall time	t_f					25 125 150		7 13 15		
Turn-on energy (per pulse)	E_{on}	Q_{rFWD} = 3,7 µC Q_{rFWD} = 6,5 µC Q_{rFWD} = 7,5 µC				25 125 150		1,631 1,942 1,995		mWs
Turn-off energy (per pulse)	E_{off}					25 125 150		0,618 1,084 1,182		

Characteristic Values

Parameter	Symbol	Conditions					Value			Unit
			V_{GE} [V] V_{GS} [V]	V_{CE} [V] V_{DS} [V]	I_C [A] I_D [A]	T_j [°C]	Min	Typ	Max	
Boost Diode										
Static										
Forward voltage	V_F				100	25 125 150		1,50 1,43 1,40	1,77	V
Reverse leakage current	I_r			650		25			5,3	µA
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	phase-change material λ = 3,4 W/mK						0,90		K/W
Dynamic										
Peak recovery current	I_{RRM}	di/dt = 2647 A/µs di/dt = 5693 A/µs di/dt = 5734 A/µs	-5/15	350	99	25 125 150		57 93 104		A
Reverse recovery time	t_{rr}					25 125 150		105 114 121		ns
Recovered charge	Q_r					25 125 150		3,659 6,478 7,514		µC
Reverse recovered energy	E_{rec}					25 125 150		0,797 1,521 1,808		mWs
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 125 150		5326 1200 939		A/µs
Boost Sw. Protection Diode										
Static										
Forward voltage	V_F				10	25 125		1,67 1,56	1,87	V
Reverse leakage current	I_r			650		25			0,14	µA
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	phase-change material λ = 3,4 W/mK						2,87		K/W

Characteristic Values

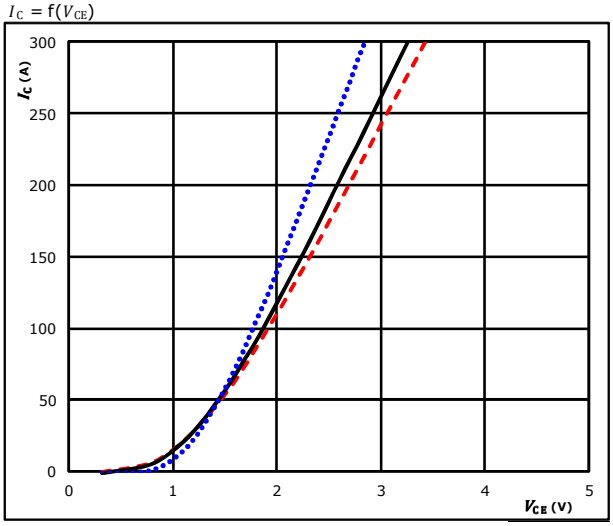
Parameter	Symbol	Conditions					Value			Unit
			V_{GE} [V] V_{GS} [V]	V_{CE} [V] V_{DS} [V]	I_C [A] I_D [A]	T_j [°C]	Min	Typ	Max	
Rectifier Diode										
Static										
Forward voltage	V_F				75	25 125		1,10 1,05	1,8	V
Reverse leakage current	I_r			1600		25 145			50 1100	µA
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	phase-change material λ = 3,4 W/mK						0,74		K/W
DC Link Capacitance										
Capacitance	C							150		nF
Tolerance							-10		+10	%
Dissipation factor		f = 1 kHz				25			2,5	%
Climatic category							55/125/56			
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	

Boost Switch Characteristics

figure 1. **IGBT**

Typical output characteristics

$I_C = f(V_{CE})$

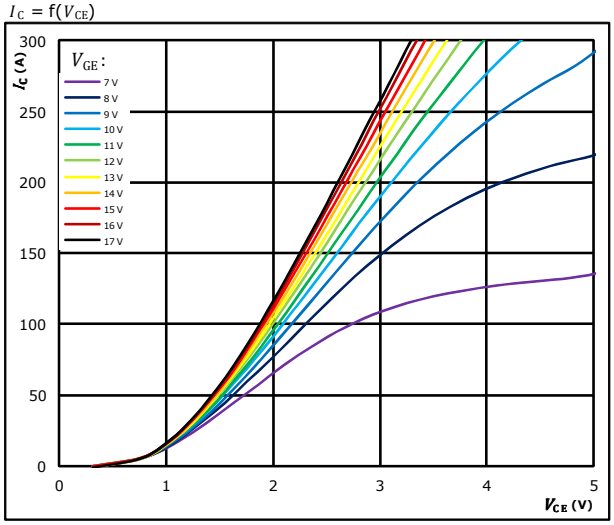


t_p =	250	µs		25 °C
V_{GE} =	15	V	T_j:	125 °C
				150 °C

figure 2. **IGBT**

Typical output characteristics

$I_C = f(V_{CE})$

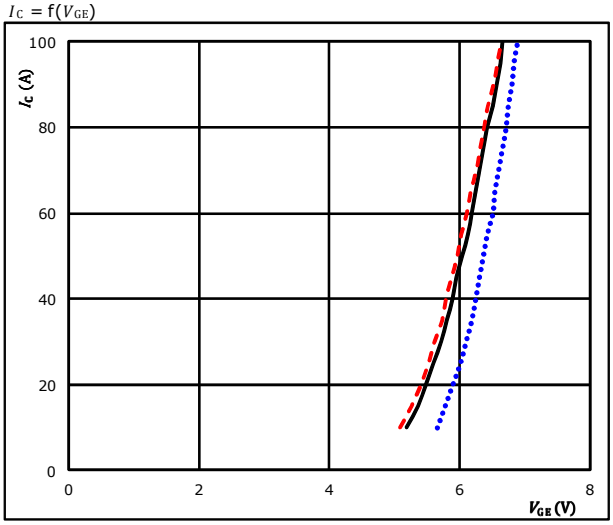


t_p =	250	µs
T_j =	150	°C
V_{GE} from	7 V to 17 V in steps of 1 V	

figure 3. **IGBT**

Typical transfer characteristics

$I_C = f(V_{GE})$

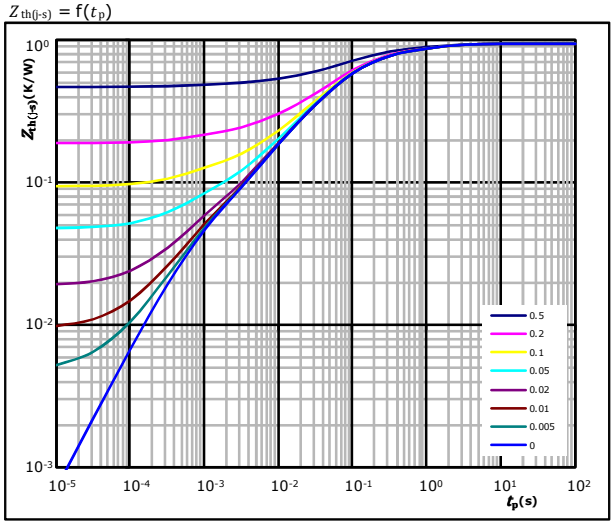


t_p =	100	µs		25 °C
V_{CE} =	10	V	T_j:	125 °C
				150 °C

figure 4. **IGBT**

Transient thermal impedance as function of pulse duration

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



D =	t_p / T	
$R_{th(j-s)}$ =	0,95	K/W

IGBT thermal model values

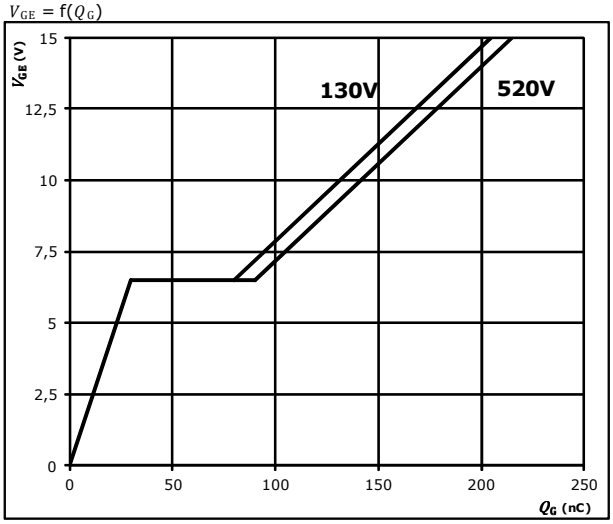
R (K/W)	τ (s)
1,57E-01	1,21E+00
3,43E-01	1,58E-01
3,28E-01	4,39E-02
9,05E-02	7,74E-03
3,40E-02	6,69E-04

Boost Switch Characteristics

figure 5. **IGBT**

Gate voltage vs gate charge

$V_{GE} = f(Q_G)$

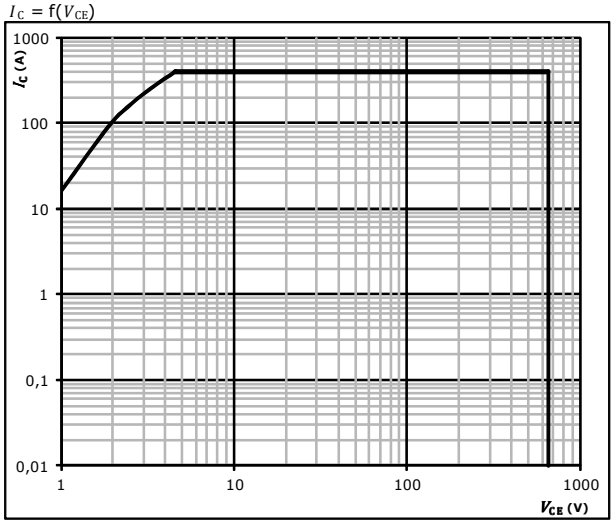


I_C= 100 A

figure 6. **IGBT**

Safe operating area

$I_C = f(V_{CE})$

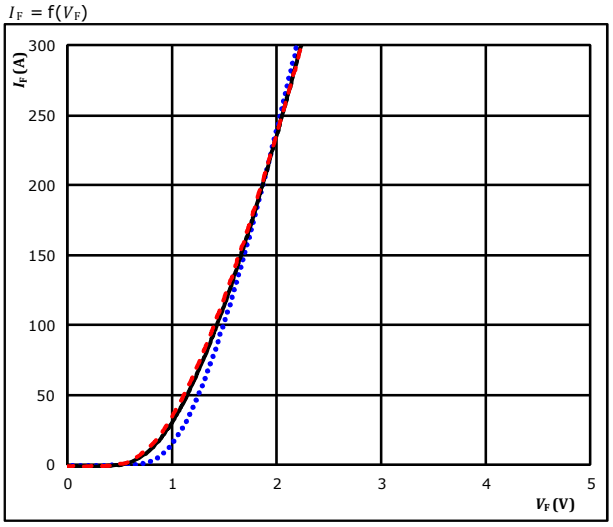


D =	single pulse	
T_s =	80	°C
V_{GE} =	±15	V
T_j =	T_{jmax}	°C

Boost Diode Characteristics

figure 1. **Diode**

Typical forward characteristics

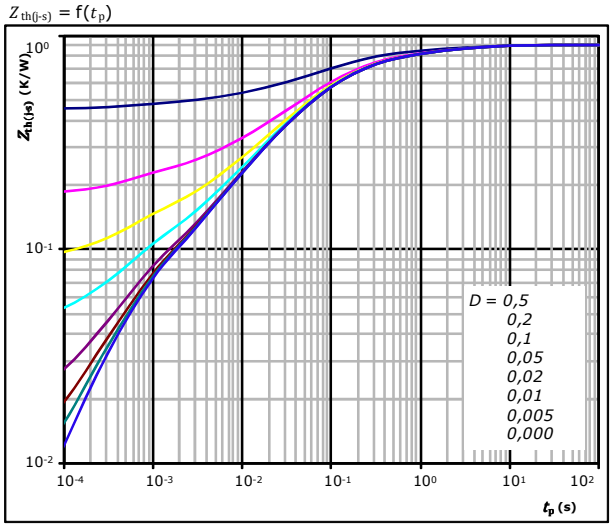


t_p = 250 µs

T_j: 25 °C, 125 °C, 150 °C

figure 2. **Diode**

Transient thermal impedance as a function of pulse width



D = t_p / T

$R_{th(j-s)}$ = 0,90 K/W

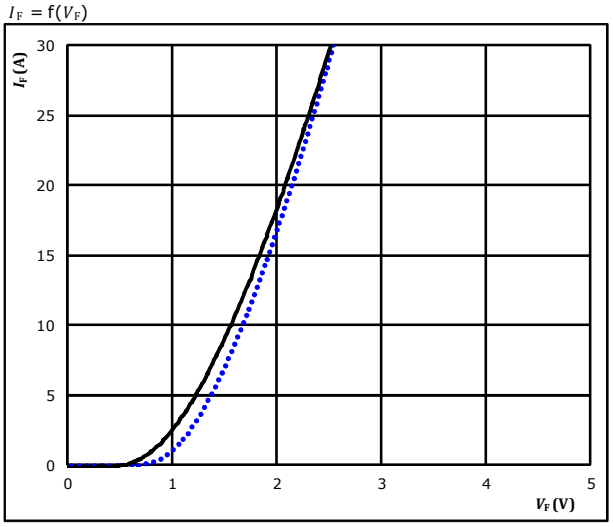
Diode thermal model values

R (K/W)	τ (s)
7,42E-02	3,64E+00
1,41E-01	5,85E-01
3,41E-01	1,04E-01
1,94E-01	2,64E-02
9,09E-02	6,04E-03
5,85E-02	5,72E-04

Boost Sw. Protection Diode Characteristics

figure 1. **FWD**

Typical forward characteristics

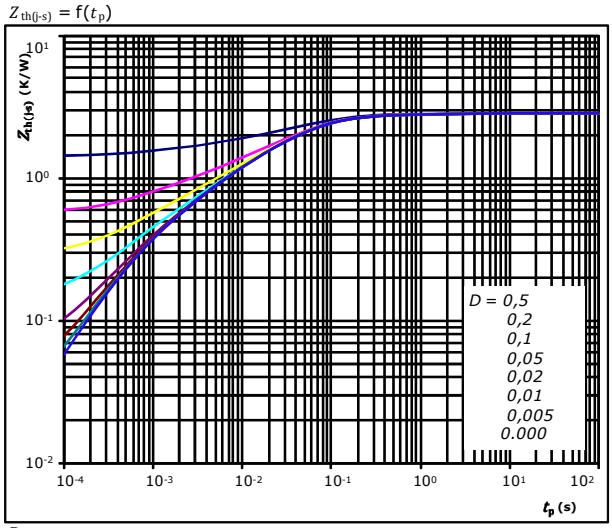


t_p = 250 µs

T_j: 25 °C, 125 °C

figure 2. **FWD**

Transient thermal impedance as a function of pulse width



D = t_p / T

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

FWD thermal model values

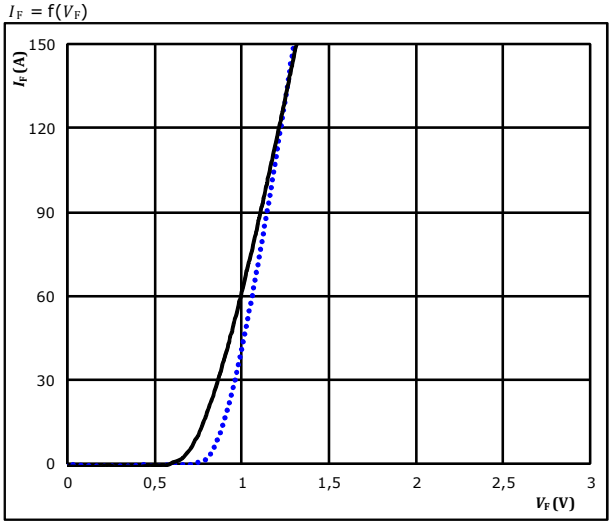
R (K/W)	τ (s)
6,5290E-02	3,9390E+00
1,4760E-01	4,4830E-01
1,3130E+00	5,9640E-02
7,3180E-01	1,3610E-02
4,0440E-01	2,7940E-03
2,1060E-01	5,3720E-04

Rectifier Diode Characteristics

figure 1. **Rectifier Diode**

Typical forward characteristics

$I_F = f(V_F)$



t_p = 250 µs

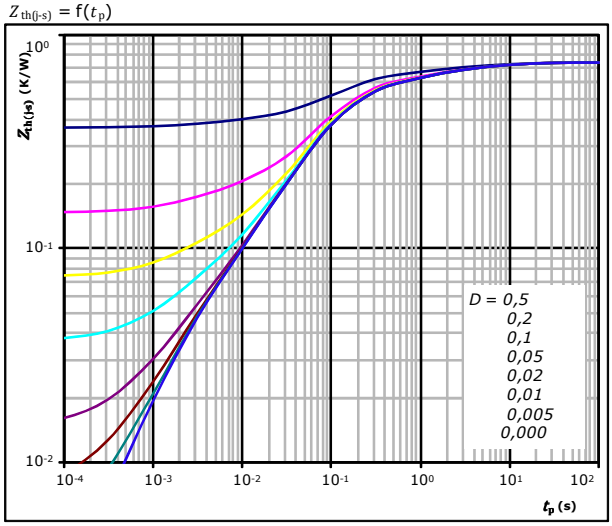
T_j: 25 °C

125 °C

figure 2. **Rectifier Diode**

Transient thermal impedance as a function of pulse width

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



D = t_p / T

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

Diode thermal model values

R (K/W)	τ (s)
6,95E-02	7,08E+00
1,21E-01	1,15E+00
2,75E-01	1,52E-01
2,24E-01	5,48E-02
3,60E-02	4,07E-03
1,01E-02	1,33E-03

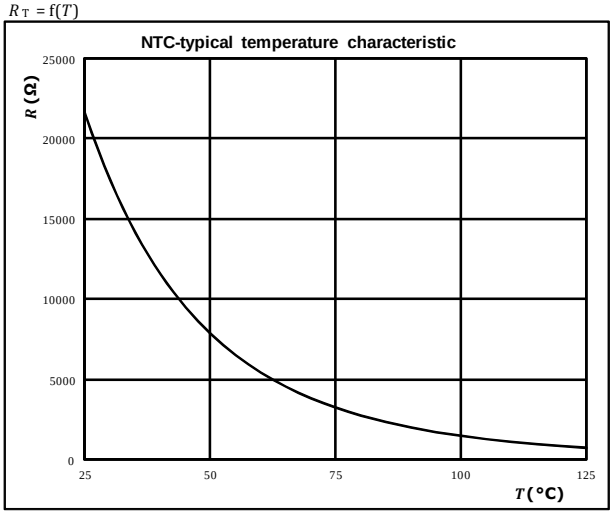
Thermistor Characteristics

Thermistor typical temperature characteristic

Typical NTC characteristic

as a function of temperature

$R_T = f(T)$

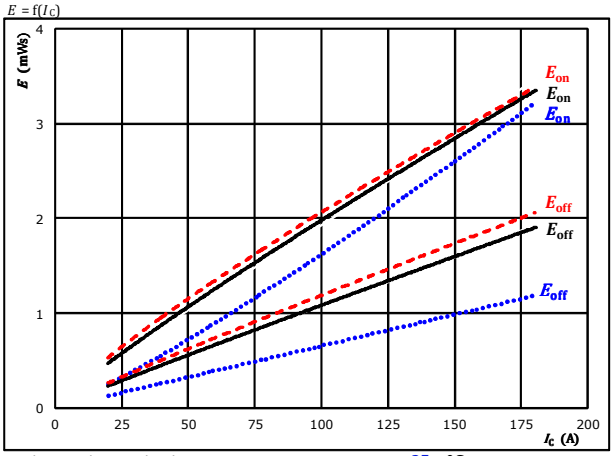


Boost Switching Characteristics

figure 1. **IGBT**

Typical switching energy losses as a function of collector current

$E = f(I_C)$



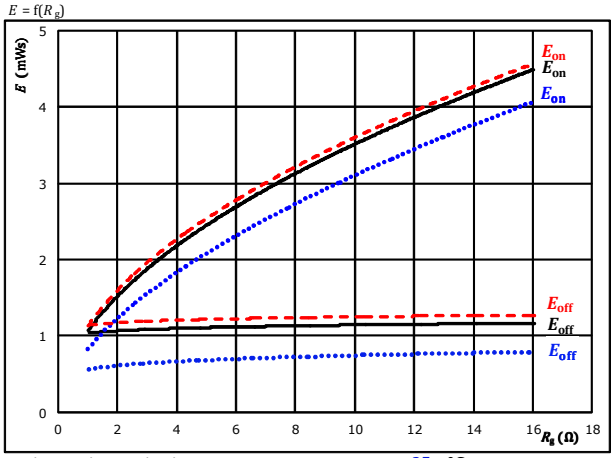
With an inductive load at

V_{CE} =	350	V	T_J:	25 °C	·····
V_{GE} =	-5/15	V		125 °C	———
R_{gon} =	4	Ω		150 °C	- - -
R_{goff} =	4	Ω			

figure 2. **IGBT**

Typical switching energy losses as a function of gate resistor

$E = f(R_g)$



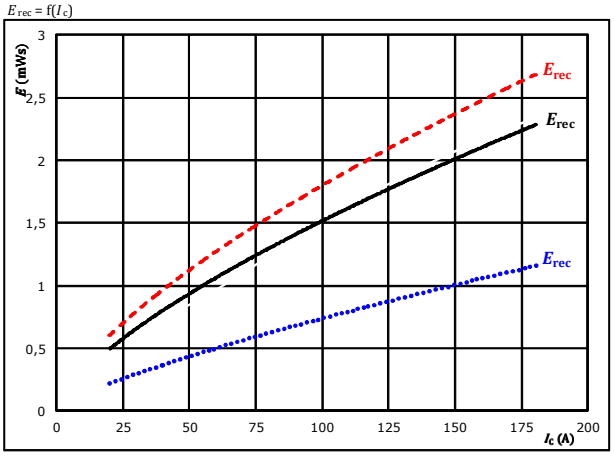
With an inductive load at

V_{CE} =	350	V	T_J:	25 °C	·····
V_{GE} =	-5/15	V		125 °C	———
I_C =	99	A		150 °C	- - -

figure 3. **FWD**

Typical reverse recovered energy loss as a function of collector current

$E_{rec} = f(I_C)$



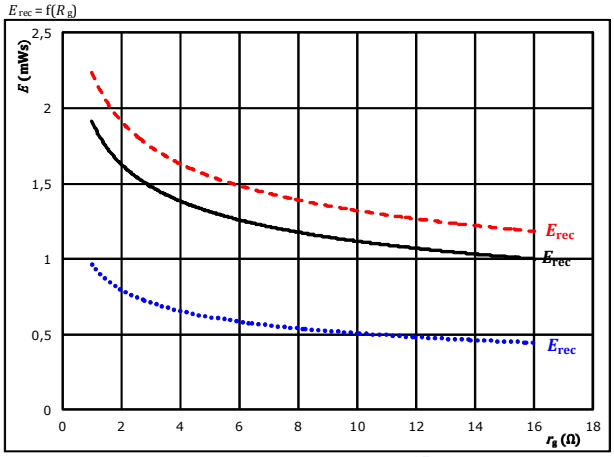
With an inductive load at

V_{CE} =	350	V	T_J:	25 °C	·····
V_{GE} =	-5/15	V		125 °C	———
R_{gon} =	4	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

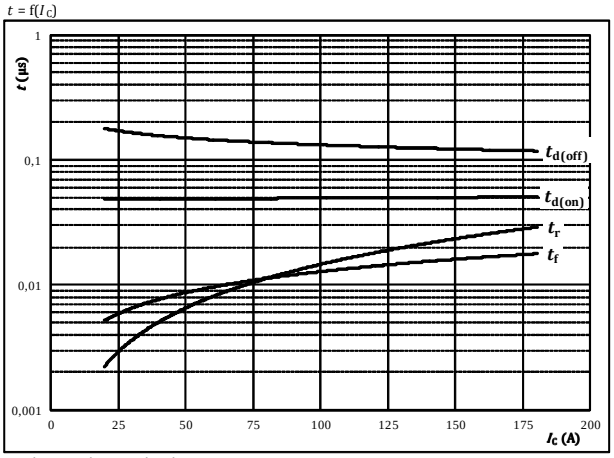
V_{CE} =	350	V	T_J:	25 °C	·····
V_{GE} =	-5/15	V		125 °C	———
I_C =	99	A		150 °C	- - -

Boost Switching Characteristics

figure 5. **IGBT**

Typical switching times as a function of collector current

$t = f(I_C)$



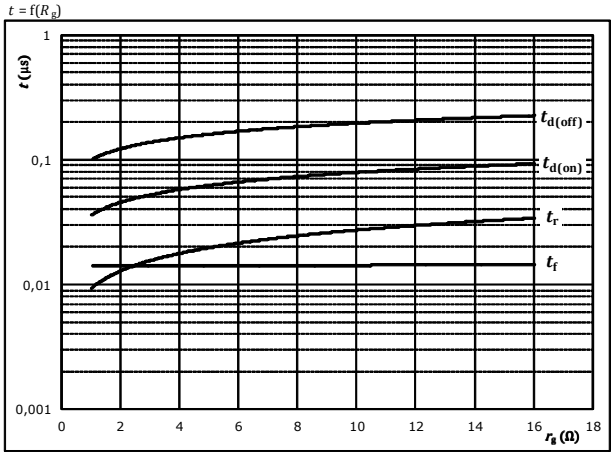
With an inductive load at

T_j =	150	°C
V_{CE} =	350	V
V_{GE} =	-5/15	V
R_{gon} =	4	Ω
R_{goff} =	4	Ω

figure 6. **IGBT**

Typical switching times as a function of gate resistor

$t = f(R_g)$



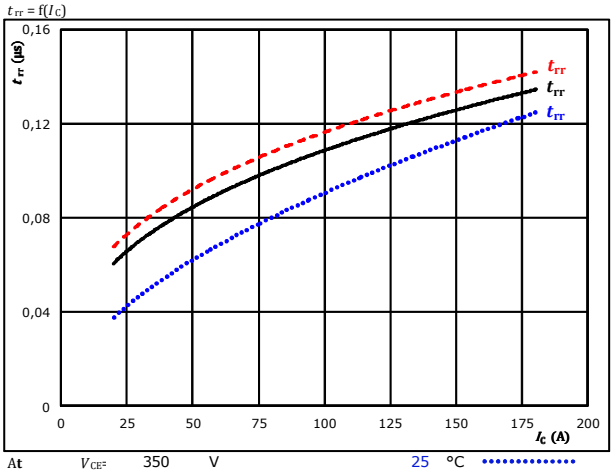
With an inductive load at

T_j =	150	°C
V_{CE} =	350	V
V_{GE} =	-5/15	V
I_C =	99	A

figure 7. **FWD**

Typical reverse recovery time as a function of collector current

$t_{rr} = f(I_C)$



At

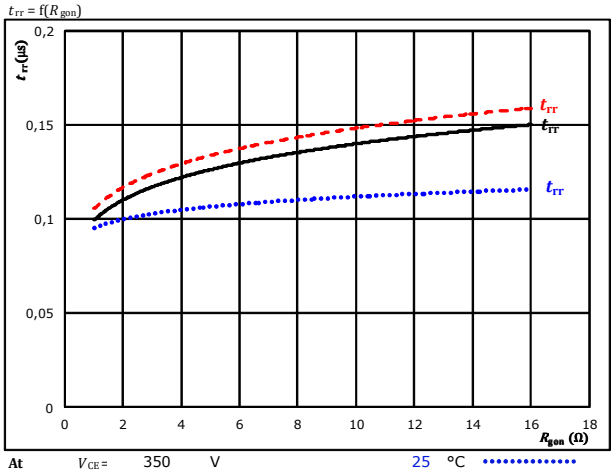
V_{CE} =	350	V
V_{GE} =	-5/15	V
R_{gon} =	4	Ω

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} =	-5/15	V
I_C =	99	A

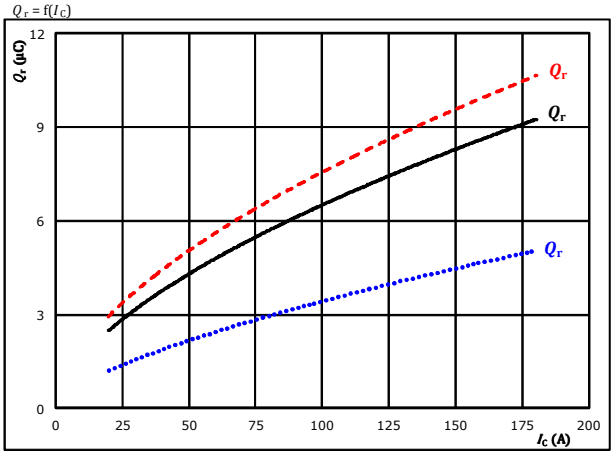
T_j: 25 °C, 125 °C, 150 °C

Boost Switching Characteristics

figure 9. FWD

Typical recovered charge as a function of collector current

$Q_r = f(I_C)$

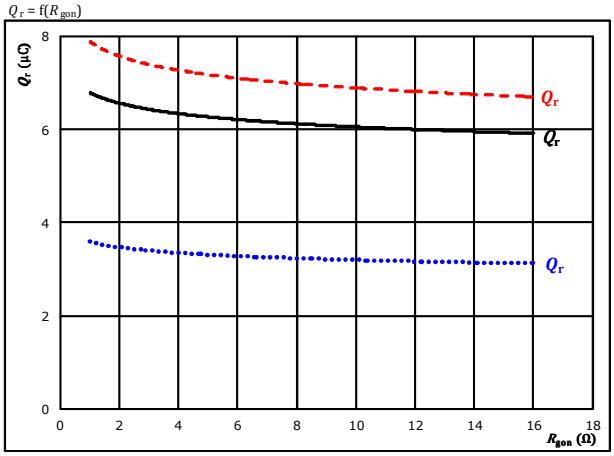


At						
	V_{CE} =	350	V		25 °C	
	V_{GE} =	-5/15	V	T_j:	125 °C	
	R_{gon} =	4	Ω		150 °C	

figure 10. FWD

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

$Q_r = f(R_{gon})$

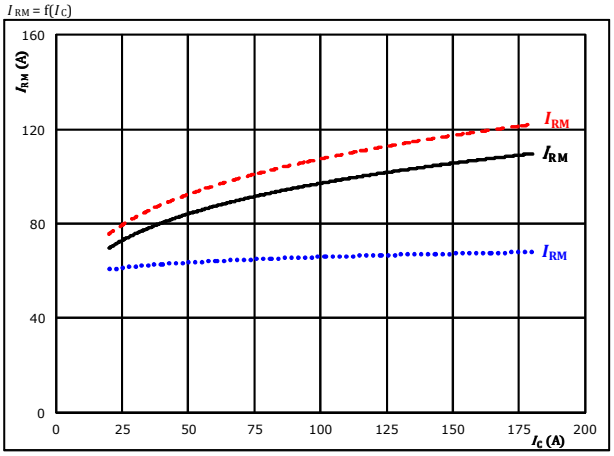


At						
	V_{CE}=	350	V		25 °C	
	V_{GE} =	-5/15	V	T_j:	125 °C	
	I_C=	99	A		150 °C	

figure 11. FWD

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

$I_{RM} = f(I_C)$

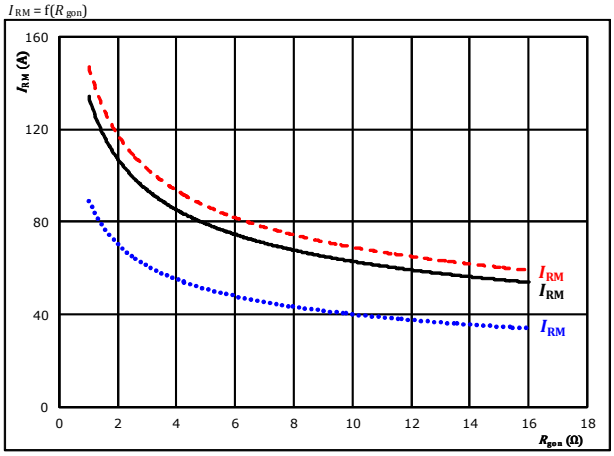


At						
	V_{CE}:	350	V		25 °C	
	V_{GE} =	-5/15	V	T_j:	125 °C	
	R_{gon} =	4	Ω		150 °C	

figure 12. FWD

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

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



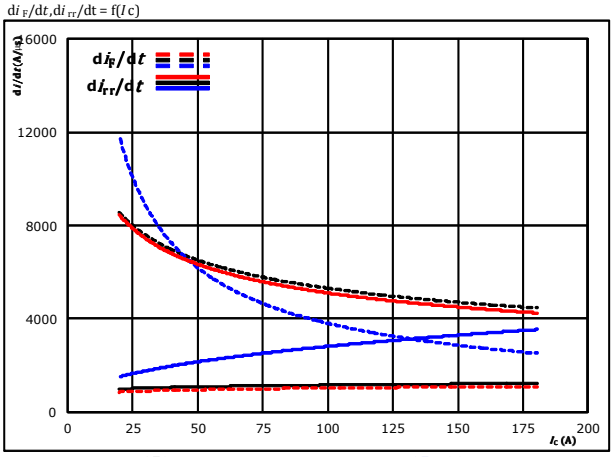
At						
	V_{CE} =	350	V		25 °C	
	V_{GE} =	-5/15	V	T_j:	125 °C	
	I_C =	99	A		150 °C	

Boost Switching Characteristics

figure 13. **FWD**

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

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

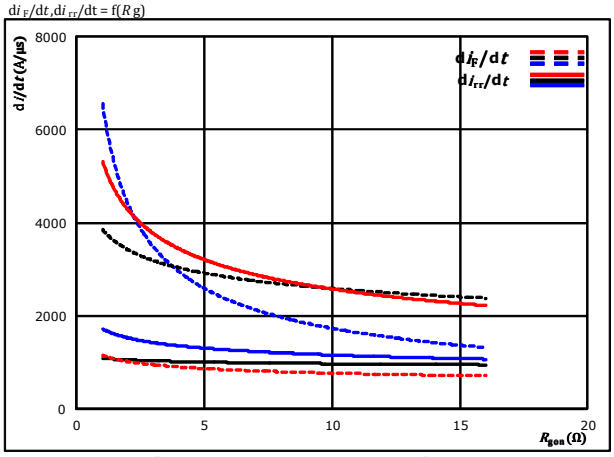


At	V_{CE} =	350	V	T_j:	25 °C	
	V_{GE} =	-5/15	V		125 °C	
	R_{gon} =	4	Ω		150 °C	

figure 14. **FWD**

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

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

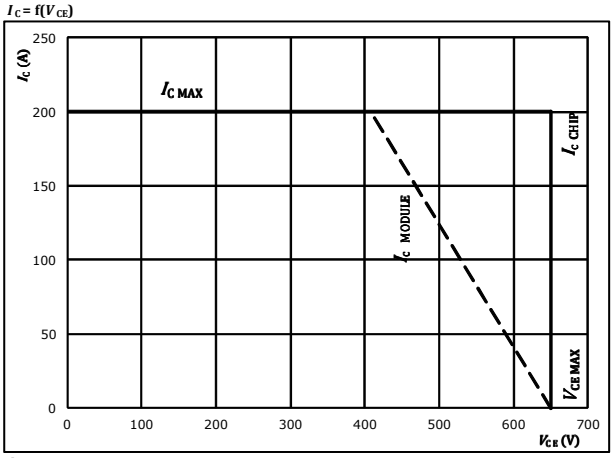


At	V_{CE} =	350	V	T_j:	25 °C	
	V_{GE} =	-5/15	V		125 °C	
	I_C=	99	A		150 °C	

figure 15. **IGBT**

Reverse bias safe operating area

$I_C = f(V_{CE})$



At

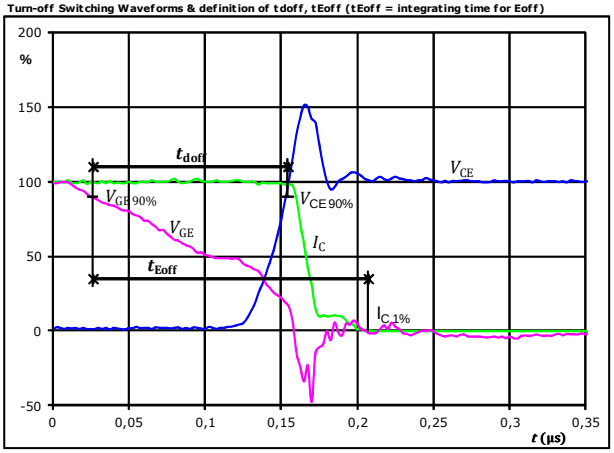
T_j =	175	°C	
R_{gon} =	4	Ω	
R_{goff} =	4	Ω	

Boost Switching Characteristics

T_j	=	**125 °C**
R_{gon}	=	**4 Ω**
R_{goff}	=	**4 Ω**

figure 1. **IGBT**

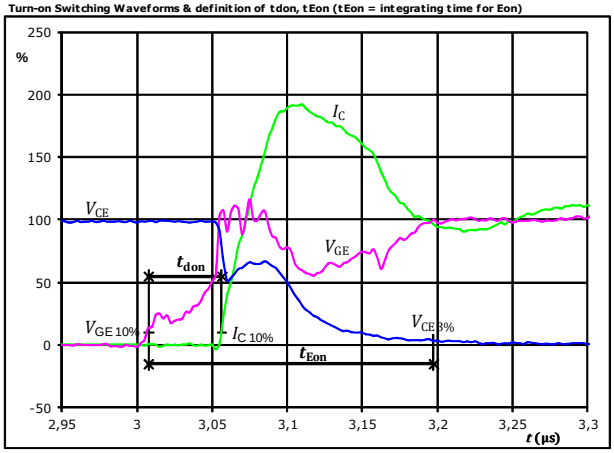
Turn-off Switching Waveforms & definition of tdoff, tEoff (tEoff = integrating time for Eoff)



$V_{GE}(0\%)$ =	-5	V
$V_{GE}(100\%)$ =	15	V
$V_C(100\%)$ =	350	V
$I_C(100\%)$ =	101	A
t_{doff} =	0,130	µs
t_{Eoff} =	0,181	µs

figure 2. **IGBT**

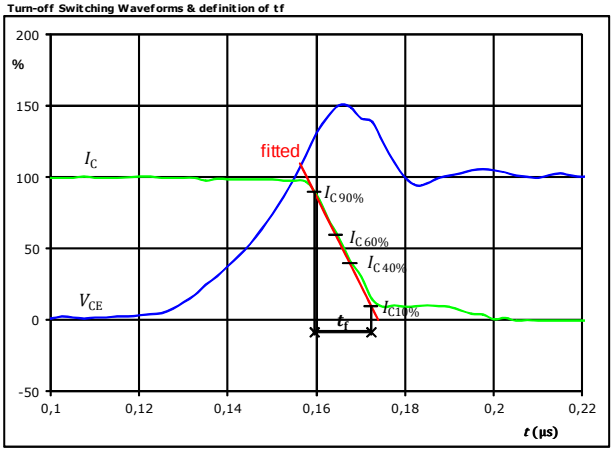
Turn-on Switching Waveforms & definition of tdon, tEon (tEon = integrating time for Eon)



$V_{GE}(0\%)$ =	-5	V
$V_{GE}(100\%)$ =	15	V
$V_C(100\%)$ =	350	V
$I_C(100\%)$ =	101	A
t_{don} =	0,049	µs
t_{Eon} =	0,190	µs

figure 3. **IGBT**

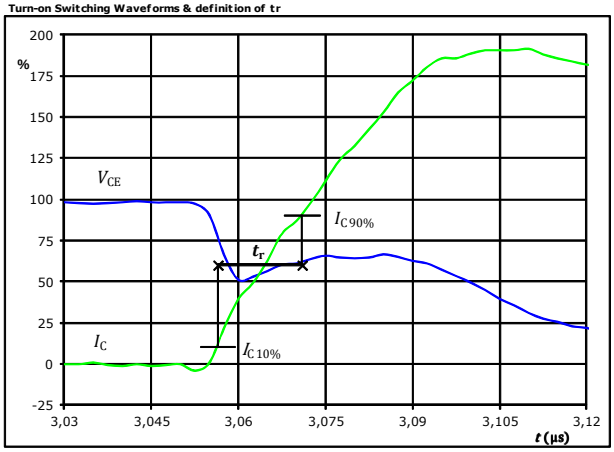
Turn-off Switching Waveforms & definition of tf



$V_C(100\%)$ =	350	V
$I_C(100\%)$ =	101	A
t_f =	0,013	µs

figure 4. **IGBT**

Turn-on Switching Waveforms & definition of tr

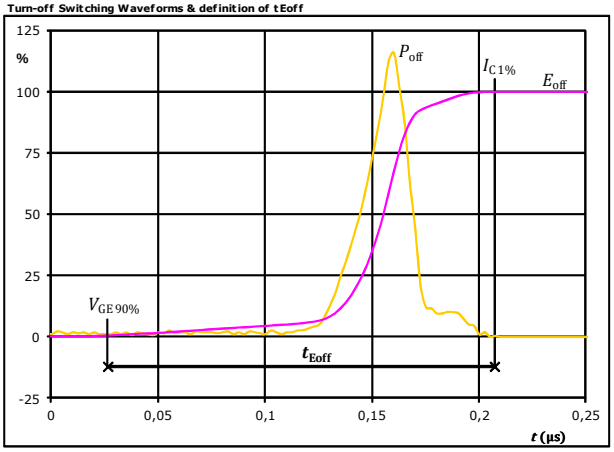


$V_C(100\%)$ =	350	V
$I_C(100\%)$ =	101	A
t_r =	0,015	µs

Boost Switching Characteristics

figure 5. **IGBT**

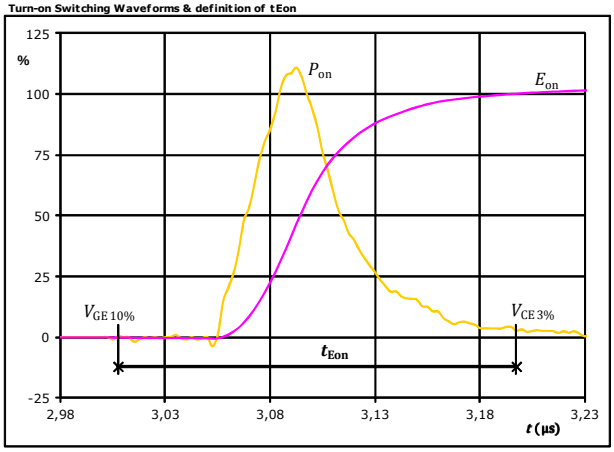
Turn-off Switching Waveforms & definition of tEoff



$P_{off}(100\%)$ =	35,26	kW
$E_{off}(100\%)$ =	1,08	mJ
t_{Eoff} =	0,18	µs

figure 6. **IGBT**

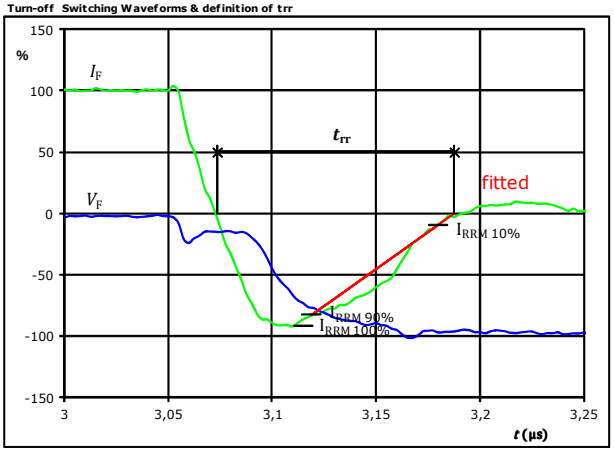
Turn-on Switching Waveforms & definition of tEon



$P_{on}(100\%)$ =	35,26	kW
$E_{on}(100\%)$ =	1,94	mJ
t_{Eon} =	0,19	µs

figure 7. **FWD**

Turn-off Switching Waveforms & definition of trr

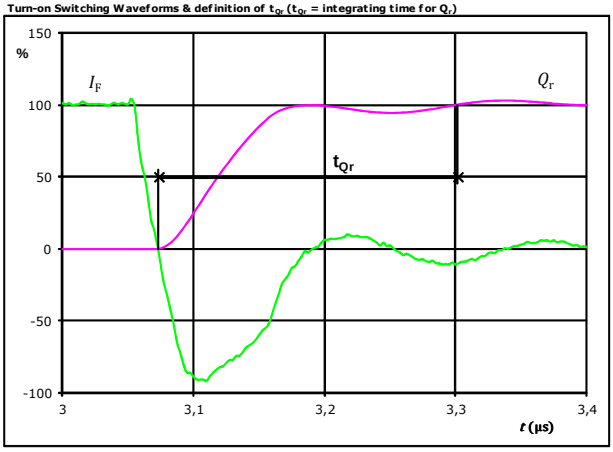


$V_F(100\%)$ =	350	V
$I_F(100\%)$ =	101	A
$I_{RRM}(100\%)$ =	-93	A
t_{rr} =	0,114	µs

Boost Switching Characteristics

figure 8. **FWD**

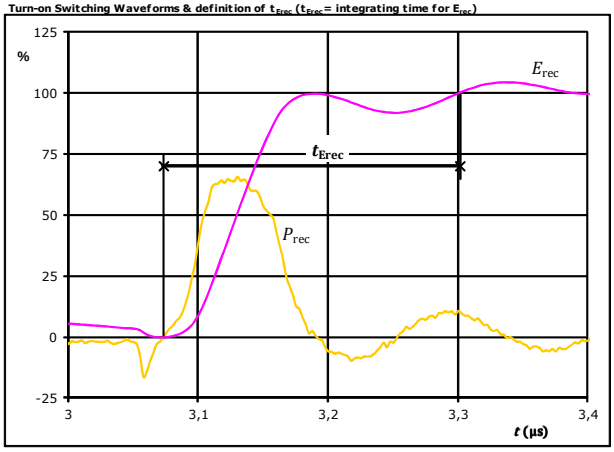
Turn-on Switching Waveforms & definition of t_{Qr} (t_{Qr} = integrating time for Q_r)



I_F (100%) =	101	A
Q_r (100%) =	6,48	µC
t_{Qr} =	0,23	µs

figure 9. **FWD**

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



P_{rec} (100%) =	35,26	kW
E_{rec} (100%) =	1,52	mJ
t_{Erec} =	0,23	µs

Vincotech

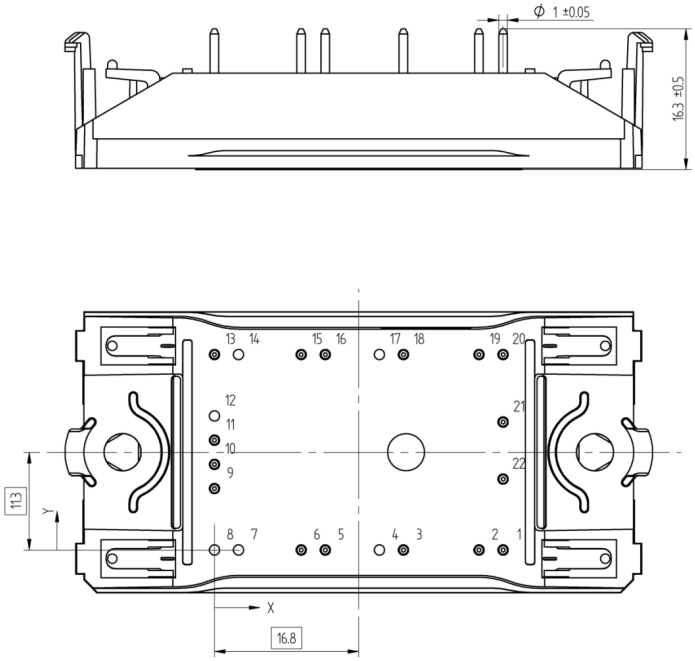
Ordering Code & Marking

Version	Ordering Code
without thermal paste 12mm housing with solder pins	10-FZ071SA100SM02-L526L18
with thermal paste 12mm housing with solder pins	10-FZ071SA100SM02-L526L18-/3/

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

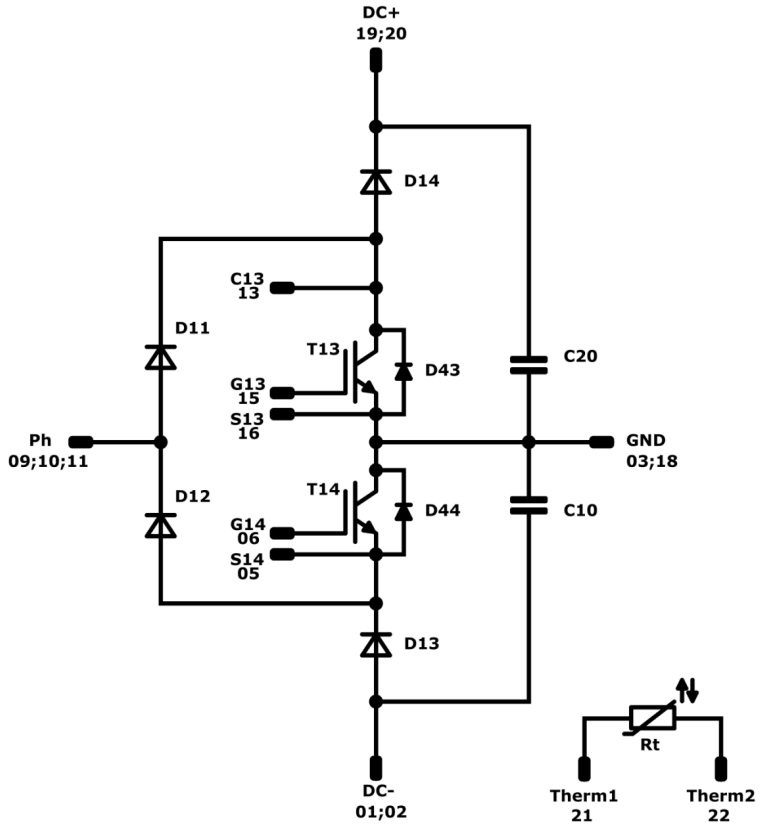
Outline

Pin table [mm]			
Pin	X	Y	Function
1	33,6	0	DC-
2	30,8	0	DC-
3	22	0	GND
4	not assembled		
5	12,9	0	S14
6	10,1	0	G14
7	not assembled		
8	not assembled		
9	0	7,1	Ph
10	0	9,9	Ph
11	0	12,7	Ph
12	not assembled		
13	0	22,6	C13
14	not assembled		
15	10,1	22,6	G13
16	12,9	22,6	S13
17	not assembled		
18	22	22,6	GND
19	30,8	22,6	DC+
20	33,6	22,6	DC+
21	33,6	14,8	Therm1
22	33,6	8,2	Therm2



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
T13, T14	IGBT	650 V	100 A	Boost Switch	
D13, D14	FWD	650 V	100 A	Boost Diode	
D43, D44	FWD	650 V	10 A	Boost Sw. Protection Diode	
D11, D12	FWD	1600 V	75 A	Rectifier Diode	
C10, C20	Capacitor	630 V		DC Link Capacitance	
Rt	Thermistor			Thermistor	

Packaging instruction				
Standard packaging quantity (SPQ) **135**	>SPQ	Standard	<SPQ	Sample

Handling instruction
Handling instructions for *flow* 0 packages see vincotech.com website.

Package data
Package data for *flow* 0 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-FZ071SA100SM02-L526L18-D1-14	14 Jun. 2016		