Vincotech

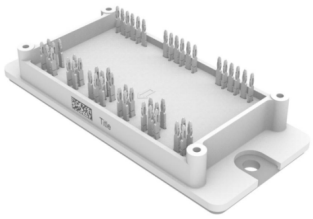
30-P2126PA150NB-L280F69Y
datasheet

flow PACK 2 — **1200 V / 150 A**

Features

- Mitsubishi Generation 6.1 (1200V) technology for low saturation losses and improved EMC behavior
- Compact and low inductive design
- Integrated temperature sensor

flow 2 17mm housing



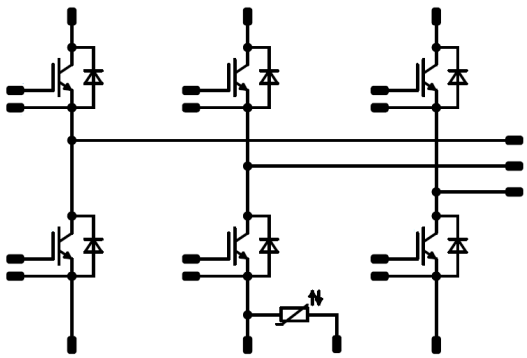
Target applications

- Industrial Drives

Types

- 30-P2126PA150NB-L280F69Y

Schematic



Maximum Ratings

T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Condition	Value	Unit
Inverter Switch				
Collector-emitter voltage	V_{CES}		1200	V
Collector current	I_C	$T_j = T_{jmax}$ T_s = 80 °C	150	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}	300	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ T_s = 80 °C	319	W
Gate-emitter voltage	V_{GES}		±20	V
Short circuit ratings	t_{SC} V_{CC}	$T_j \leq$ 150°C V_{GE} = 15V	10 850	µs V
Maximum Junction Temperature	T_{jmax}		175	°C

Maximum Ratings

Parameter	Symbol	Condition	Value	Unit
Inverter Diode				
Peak Repetitive Reverse Voltage	V_{RRM}		1200	V
Continuous (direct) forward current	I_F	$T_j = T_{jmax}$ $T_s = 80°C$	110	A
Repetitive peak forward current	I_{FRM}		300	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80°C$	197	W
Maximum Junction Temperature	T_{jmax}		175	°C
Module Properties				
Thermal Properties				
Storage temperature	T_{stg}		-40…+125	°C
Operation temperature under switching condition	T_{jop}		-40…+(T_{jmax} - 25)	°C
Isolation Properties				
Isolation voltage	V_{isol}	DC Voltage $t_p = 2s$	4000	V
Creepage distance			min. 12,7	mm
Clearance			min. 12,7	mm
Comparative Tracking Index	CTI		> 200	

Characteristic Values

Parameter	Symbol	Conditions					Value			Unit
			V_{GE} [V] V_{GS} [V]	V_{CE} [V] V_{GS} [V] V_r [V]	I_C [A] I_D [A] I_F [A]	T_j[°C]	Min	Typ	Max	
Inverter Switch										
Static										
Gate-emitter threshold voltage	$V_{GE(th)}$	V_{GE}=V_{CE}			0,014	25	5,4	6	6,6	V
Collector-emitter saturation voltage	V_{CEsat}		15		150	25 0 150	1,35	1,70 1,97 2,02	2,15	V
Collector-emitter cut-off current	I_{CES}		0	1200		25			520	µA
Gate-emitter leakage current	I_{GES}		15	0		25			1000	nA
Internal gate resistance	r_g							none		Ω
Input capacitance	C_{ies}	f=1 MHz	0	10		25			15000	pF
Output capacitance	C_{oes}								3000	
Reverse transfer capacitance	C_{res}								260	
Gate charge	Q_g		15	600	150	25		315		nC
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	phase-change material λ=3,4W/mK						0,30		K/W
IGBT Switching										
Turn-on delay time	$t_{d(on)}$	R_{goff} = 4 Ω R_{gon} = 4 Ω	±15	600	150	25 125 150		93 93 93		ns
Rise time	t_r					25 125 150		12 14 14		
Turn-off delay time	$t_{d(off)}$					25 125 150		164 206 217		
Fall time	t_f					25 125 150		54 84 94		
Turn-on energy (per pulse)	E_{on}	Q_{rFWD} = 9,8 µC Q_{rFWD} = 22,5 µC Q_{rFWD} = 27,7 µC				25 125 150		3,275 5,448 6,152		mWs
Turn-off energy (per pulse)	E_{off}					25 125 150		8,195 12,580 13,972		

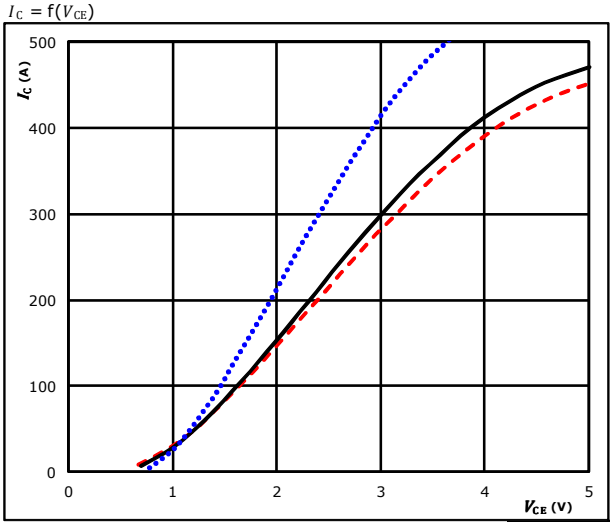
Characteristic Values

Parameter	Symbol	Conditions					Value			Unit
			V_{GE} [V] V_{GS} [V]	V_{CE} [V] V_{GS} [V] V_r [V]	I_C [A] I_D [A] I_F [A]	T_j[°C]	Min	Typ	Max	
Inverter Diode										
Static										
Forward voltage	V_F				150	25 125 150		2,65 2,33 2,21	3,3	V
Reverse leakage current	I_r			1200		25			50	µA
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	phase-change material λ = 3,4 W/mK						0,48		K/W
FWD Switching										
Peak recovery current	I_{RRM}	di/dt = 11991 A/µs di/dt = 9881 A/µs di/dt = 9919 A/µs	±15	600	150	25 125 150		193 231 239		A
Reverse recovery time	t_{rr}					25 125 150		118 149 298		ns
Recovered charge	Q_r					25 125 150		9,779 22,517 27,727		µC
Reverse recovered energy	E_{rec}					25 125 150		4,514 11,033 13,728		mWs
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 125 150		14448 6217 5397		A/µs
Thermistor										
Rated resistance	R					25		22		kΩ
Deviation of R100	$\Delta_{R/R}$	R100=1486 Ω				100	-12		+14	%
Power dissipation	P					25		200		mW
Power dissipation constant						25		2		mW/K
B-value	$B_{(25/50)}$	Tol. ±3%				25		3950		K
B-value	$B_{(25/100)}$	Tol. ±3%				25		3998		K
Vincotech NTC Reference									B	

Inverter Switch Characteristics

Typical output characteristics **IGBT**

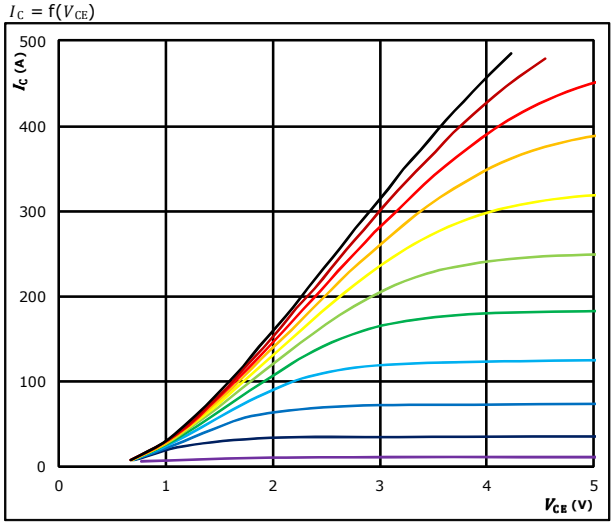
$I_C = f(V_{CE})$



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

Typical output characteristics **IGBT**

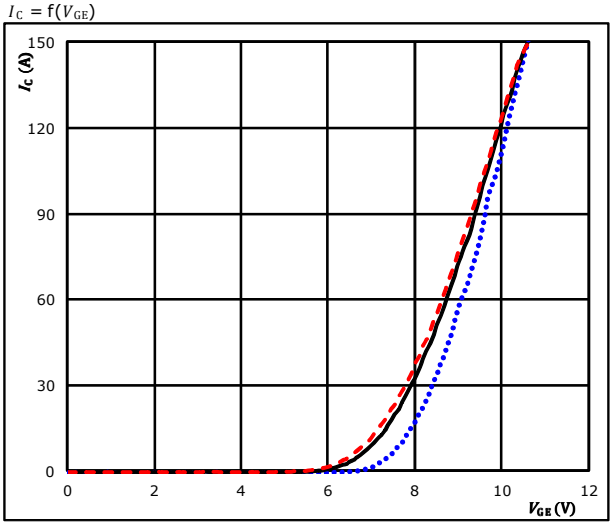
$I_C = f(V_{CE})$



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

Typical transfer characteristics **IGBT**

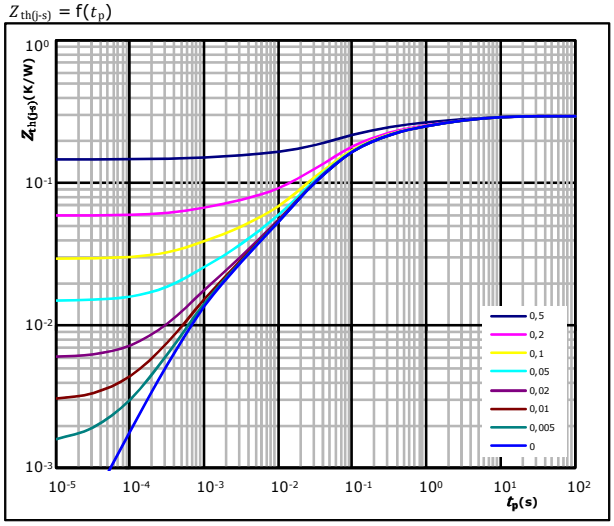
$I_C = f(V_{GE})$



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	
$R_{th(j-s)}$ =	0,30	K/W

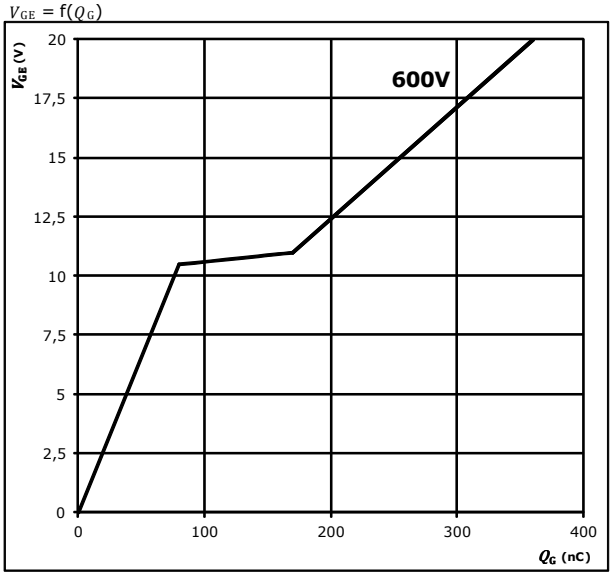
IGBT thermal model values

R (K/W)	τ (s)
3,25E-02	4,87E+00
4,48E-02	1,00E+00
8,25E-02	1,81E-01
1,03E-01	4,23E-02
2,08E-02	9,26E-03
1,39E-02	9,91E-04

Inverter Switch Characteristics

Gate voltage vs Gate charge **IGBT**

$V_{GE} = f(Q_G)$

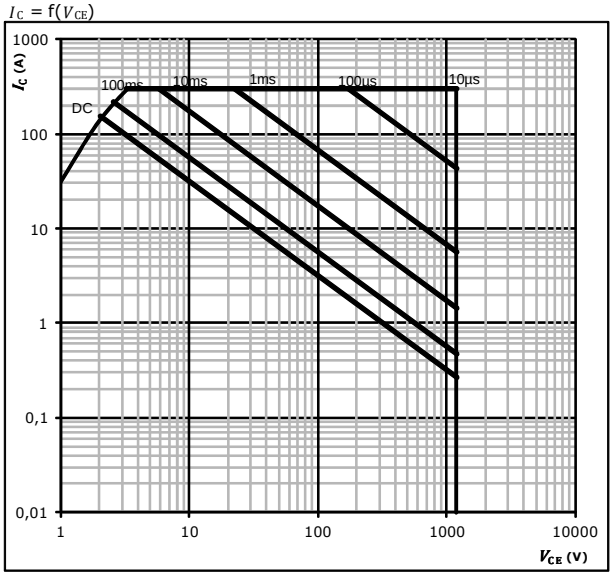


At

I_C=	150	A

Safe operating area **IGBT**

$I_C = f(V_{CE})$

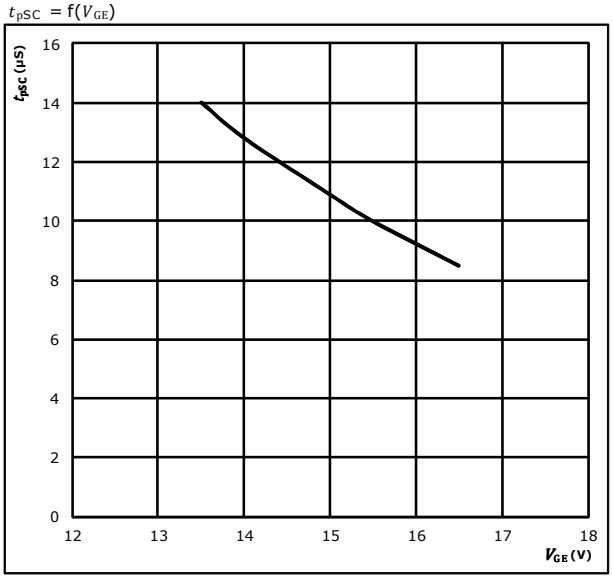


At

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

Short circuit duration as a function of V_{GE} **IGBT**

$t_{pSC} = f(V_{GE})$

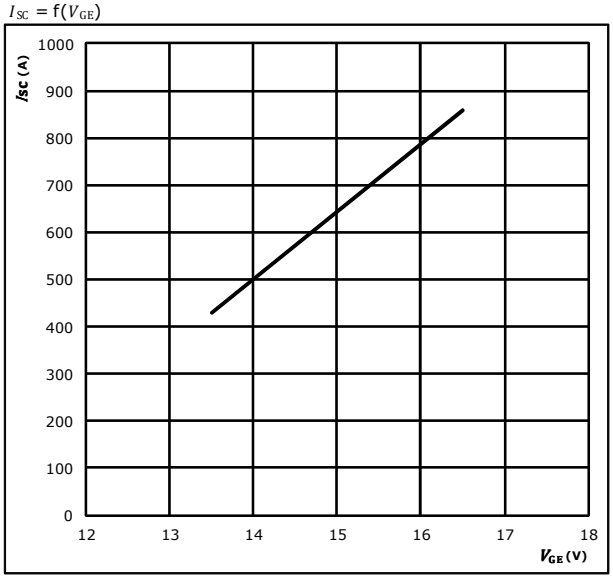


At

V_{CE} =	850	V
T_j ≤	150	ºC

Typical short circuit current as a function of V_{GE} **IGBT**

$I_{SC} = f(V_{GE})$



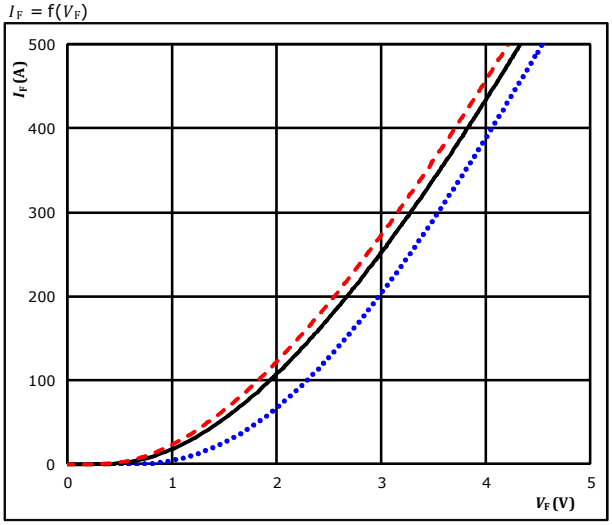
At

V_{CE} ≤	850	V
T_j ≤	150	ºC

Inverter Diode Characteristics

Typical forward characteristics **FWD**

$I_F = f(V_F)$

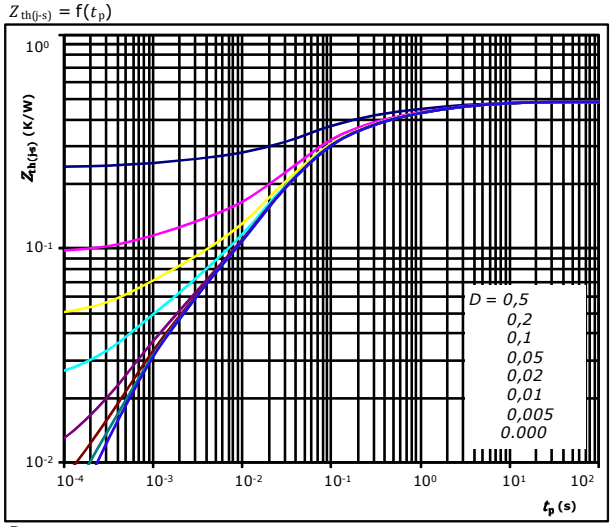


t_p = 250 µs

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

$R_{th(j-s)}$ = 0,48 K/W

FWD thermal model values

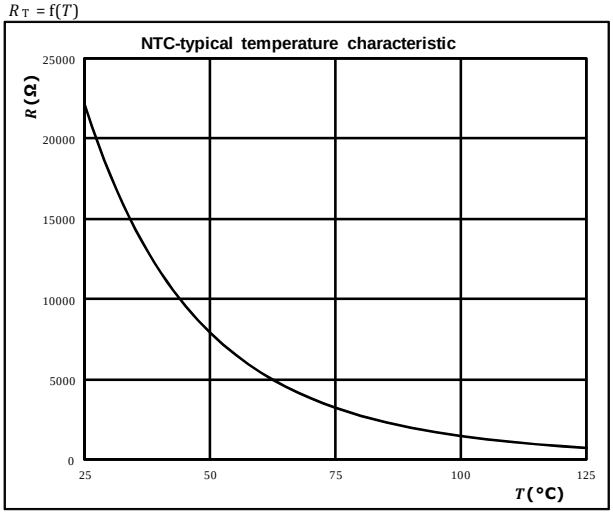
R (K/W)	τ (s)
3,3940E-02	5,9820E+00
6,7470E-02	9,9750E-01
9,7960E-02	2,1040E-01
1,7660E-01	5,1180E-02
6,2590E-02	1,7090E-02
2,4720E-02	2,4350E-03
1,9140E-02	6,5960E-04

Thermistor Characteristics

Thermistor typical temperature characteristic

Typical NTC characteristic
as a function of temperature

$R_T = f(T)$

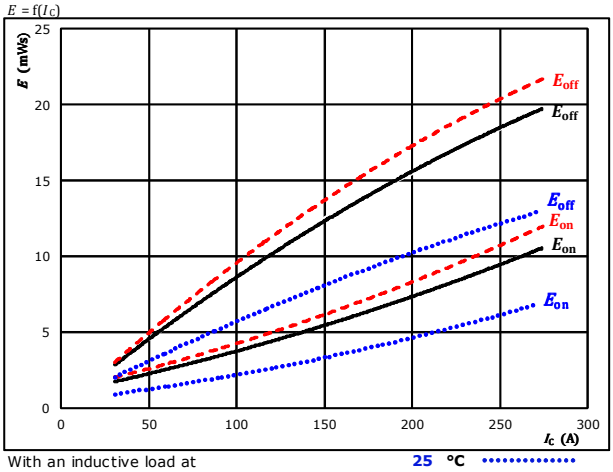


Inverter Switching Characteristics

Figure 1. **IGBT**

Typical switching energy losses as a function of collector current

$E = f(I_C)$



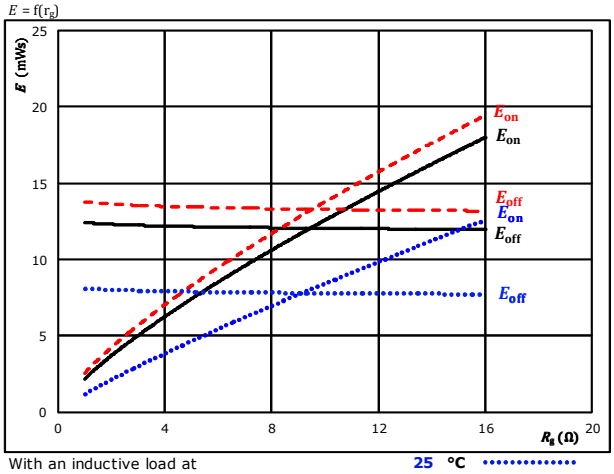
With an inductive load at

V_{CE} =	600	V	T_J:	25 °C
V_{GE} =	±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

$E = f(r_g)$



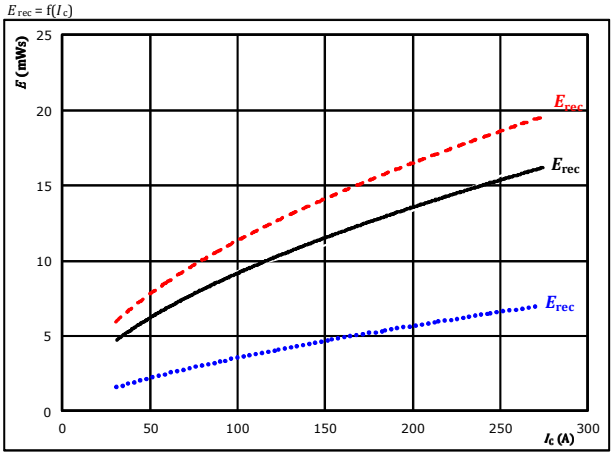
With an inductive load at

V_{CE} =	600	V	T_J:	25 °C
V_{GE} =	±15	V		125 °C
I_C =	150	A		150 °C

Figure 3. **FWD**

Typical reverse recovered energy loss as a function of collector current

$E_{rec} = f(I_C)$



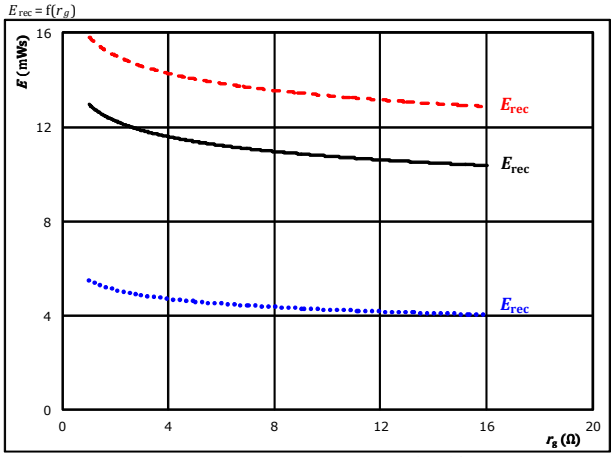
With an inductive load at

V_{CE} =	600	V	T_J:	25 °C
V_{GE} =	±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

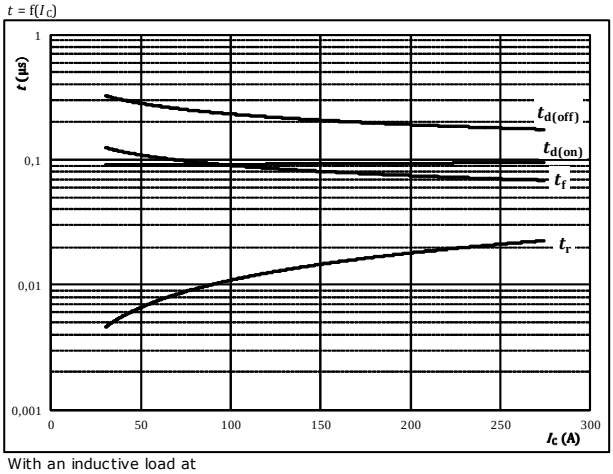
V_{CE} =	600	V	T_J:	25 °C
V_{GE} =	±15	V		125 °C
I_C =	150	A		150 °C

Inverter Switching Characteristics

Figure 5. **IGBT**

Typical switching times as a function of collector current

$t = f(I_C)$



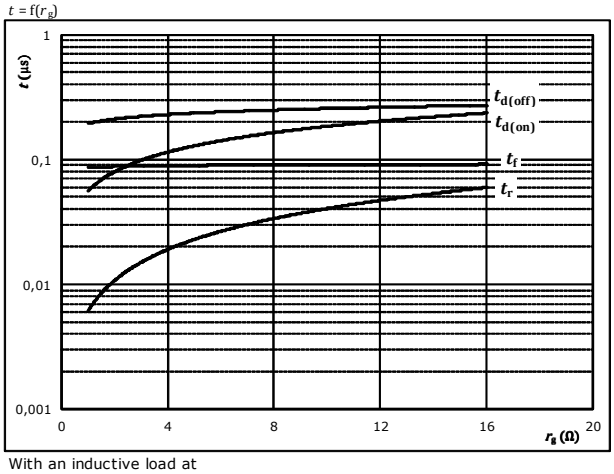
With an inductive load at

T_j =	150	°C
V_{CE} =	600	V
V_{GE} =	±15	V
R_{gon} =	4	Ω
R_{goff} =	4	Ω

Figure 6. **IGBT**

Typical switching times as a function of gate resistor

$t = f(r_g)$



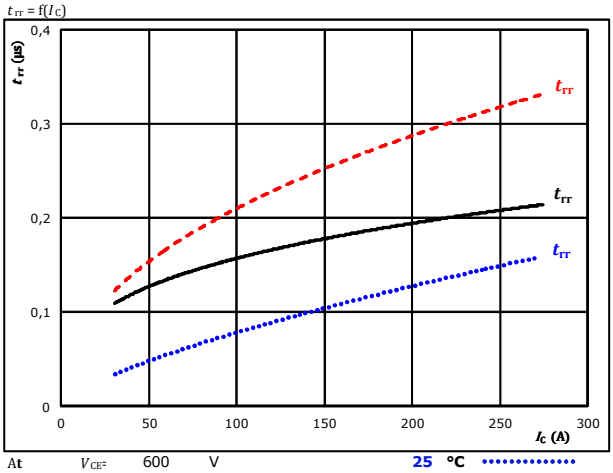
With an inductive load at

T_j =	150	°C
V_{CE} =	600	V
V_{GE} =	±15	V
I_C =	150	A

Figure 7. **FWD**

Typical reverse recovery time as a function of collector current

$t_{rr} = f(I_C)$

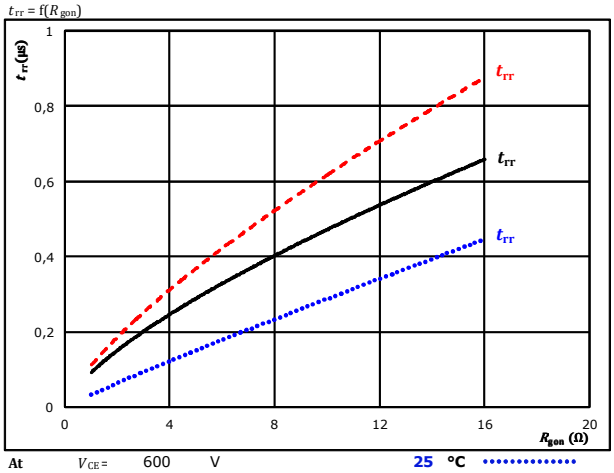


At	V_{CE}=	600	V	T_j:	25 °C
	V_{GE} =	±15	V		125 °C
	R_{gon} =	4	Ω		150 °C

Figure 8. **FWD**

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

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



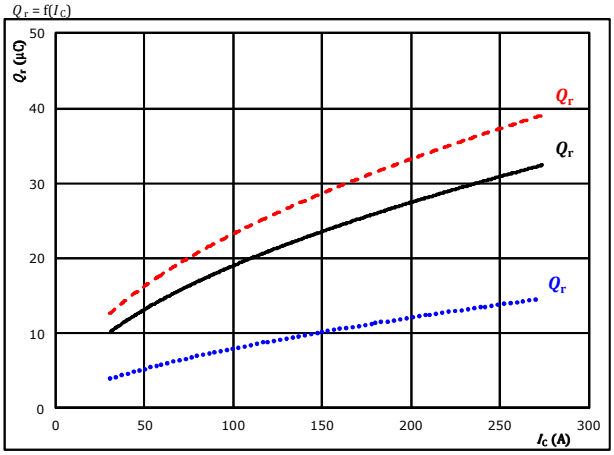
At	V_{CE} =	600	V	T_j:	25 °C
	V_{GE} =	±15	V		125 °C
	I_C =	150	A		150 °C

Inverter Switching Characteristics

Figure 9. **FWD**

Typical recovered charge as a function of collector current

$Q_r = f(I_C)$

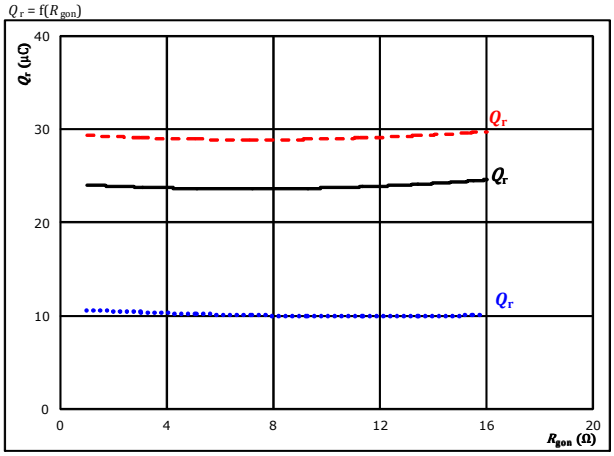


At						
	V_{CE} =	600	V		25 °C	
	V_{GE} =	±15	V	T_j:	125 °C	
	R_{gon} =	4	Ω		150 °C	

Figure 10. **FWD**

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

$Q_r = f(R_{gon})$

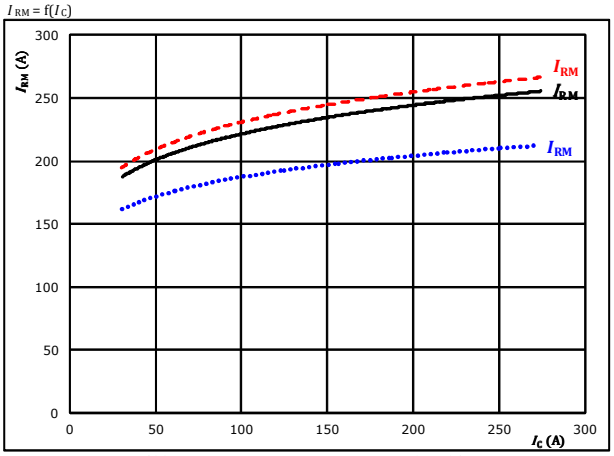


At						
	V_{CE}=	600	V		25 °C	
	V_{GE} =	±15	V	T_j:	125 °C	
	I_C=	150	A		150 °C	

Figure 11. **FWD**

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

$I_{RM} = f(I_C)$

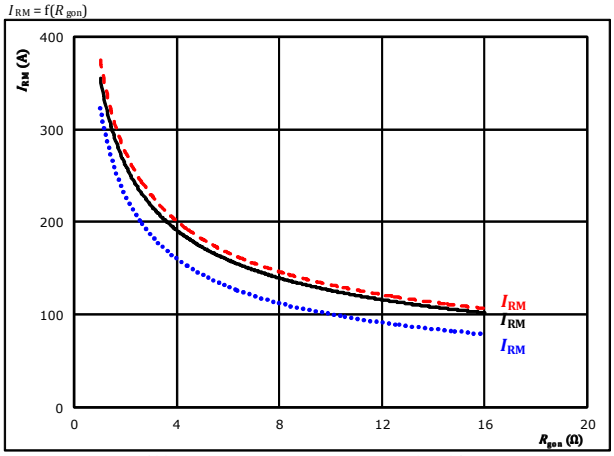


At						
	V_{CE} =	600	V		25 °C	
	V_{GE} =	±15	V	T_j:	125 °C	
	R_{gon} =	4	Ω		150 °C	

Figure 12. **FWD**

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

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



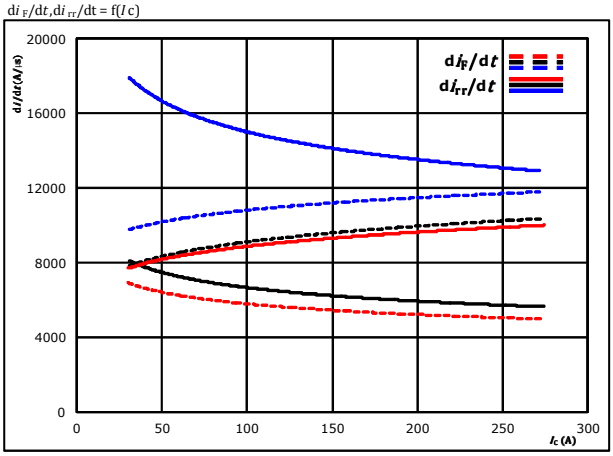
At						
	V_{CE} =	600	V		25 °C	
	V_{GE} =	±15	V	T_j:	125 °C	
	I_C =	150	A		150 °C	

Inverter Switching Characteristics

Figure 13. **FWD**

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

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

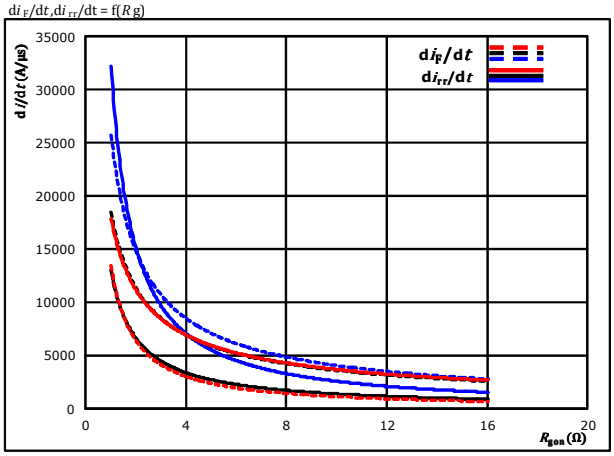


At					
V_{CE} =	600	V		25 °C	
V_{GE} =	±15	V	T_j:	125 °C	
R_{gon} =	4	Ω		150 °C	

Figure 14. **FWD**

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

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

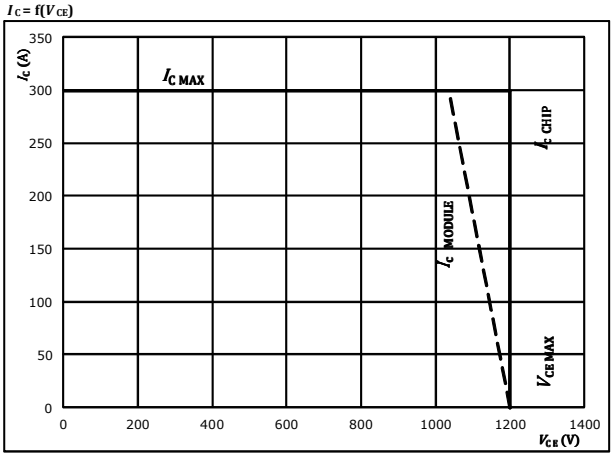


At					
V_{CE} =	600	V		25 °C	
V_{GE} =	±15	V	T_j:	125 °C	
I_C =	150	A		150 °C	

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

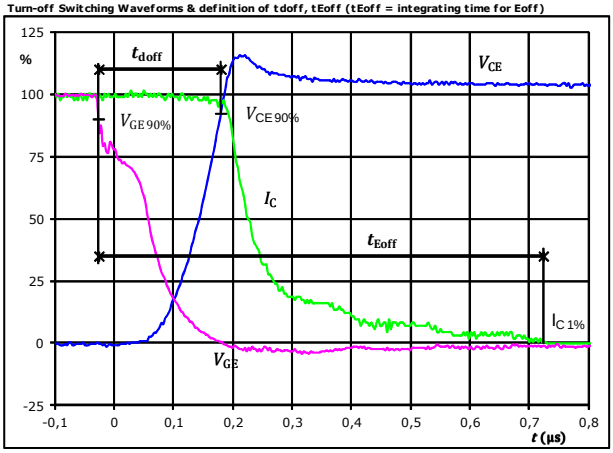
Inverter Switching Definitions

General conditions

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

Figure 1. IGBT

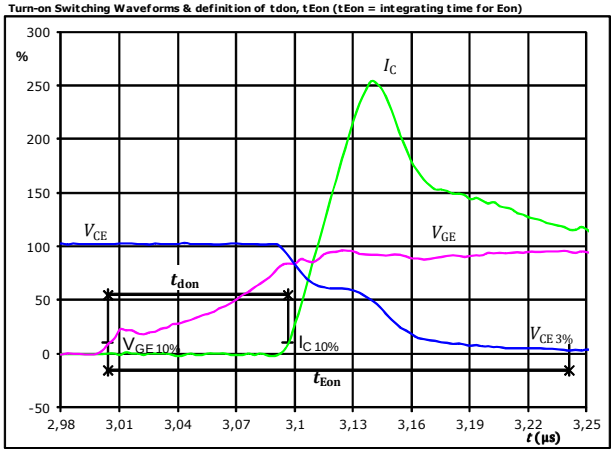
Turn-off Switching Waveforms & definition of tdoff, tEoff (tEoff = integrating time for Eoff)



$V_{GE}(0\%)$ =	-15	V
$V_{GE}(100\%)$ =	15	V
$V_C(100\%)$ =	600	V
$I_C(100\%)$ =	150	A
t_{doff} =	0,206	µs
t_{Eoff} =	0,751	µs

Figure 2. IGBT

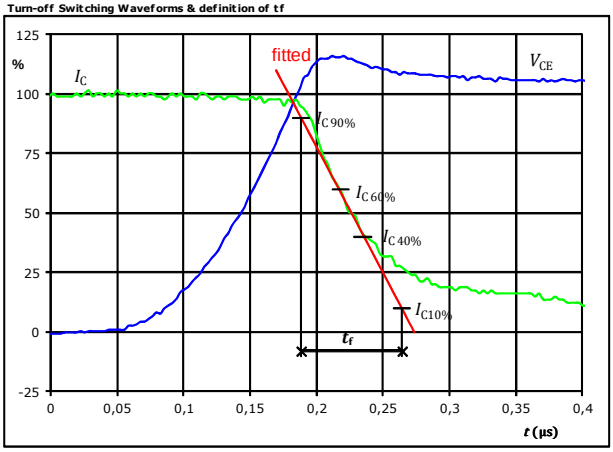
Turn-on Switching Waveforms & definition of tdon, tEon (tEon = integrating time for Eon)



$V_{GE}(0\%)$ =	-15	V
$V_{GE}(100\%)$ =	15	V
$V_C(100\%)$ =	600	V
$I_C(100\%)$ =	150	A
t_{don} =	0,093	µs
t_{Eon} =	0,237	µs

Figure 3. IGBT

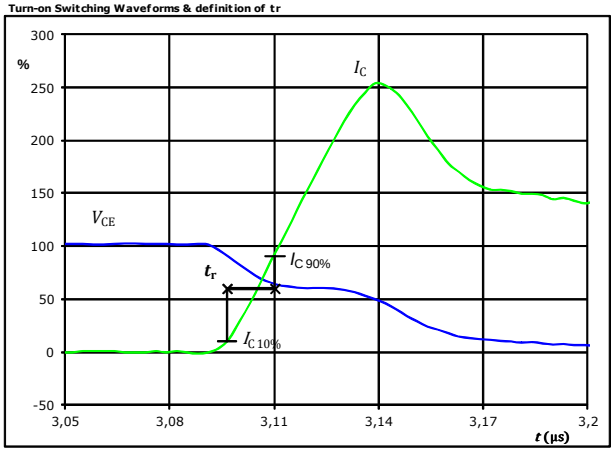
Turn-off Switching Waveforms & definition of tf



$V_C(100\%)$ =	600	V
$I_C(100\%)$ =	150	A
t_f =	0,084	µs

Figure 4. IGBT

Turn-on Switching Waveforms & definition of tr

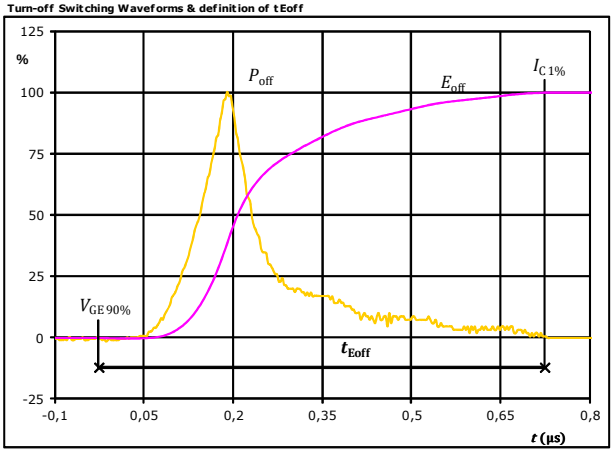


$V_C(100\%)$ =	600	V
$I_C(100\%)$ =	150	A
t_r =	0,014	µs

Inverter Switching Definitions

Figure 5. **IGBT**

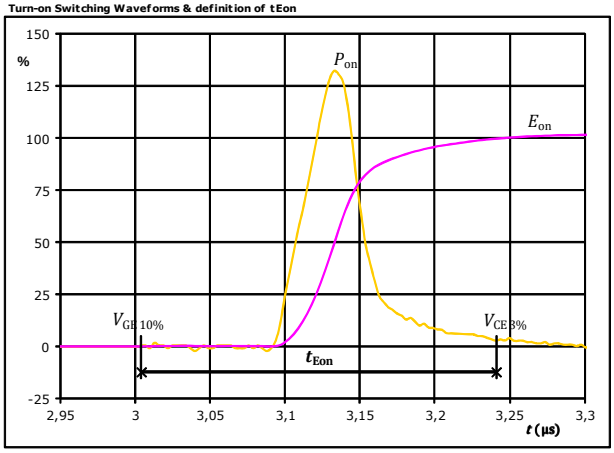
Turn-off Switching Waveforms & definition of tEoff



$P_{off}(100\%)$ =	90,12	kW
$E_{off}(100\%)$ =	12,58	mJ
t_{Eoff} =	0,75	µs

Figure 6. **IGBT**

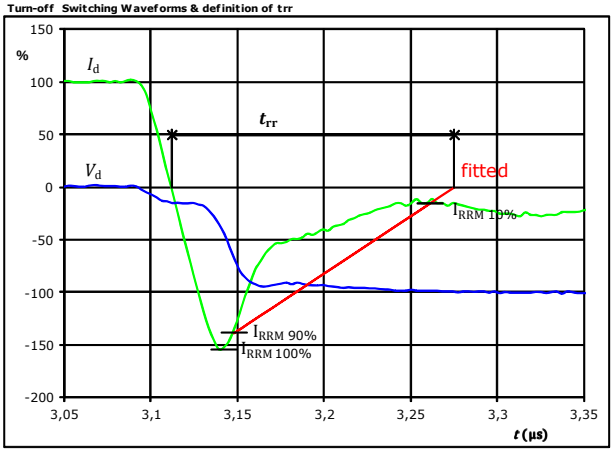
Turn-on Switching Waveforms & definition of tEon



$P_{on}(100\%)$ =	90,12	kW
$E_{on}(100\%)$ =	5,45	mJ
t_{Eon} =	0,24	µs

Figure 7. **FWD**

Turn-off Switching Waveforms & definition of trr

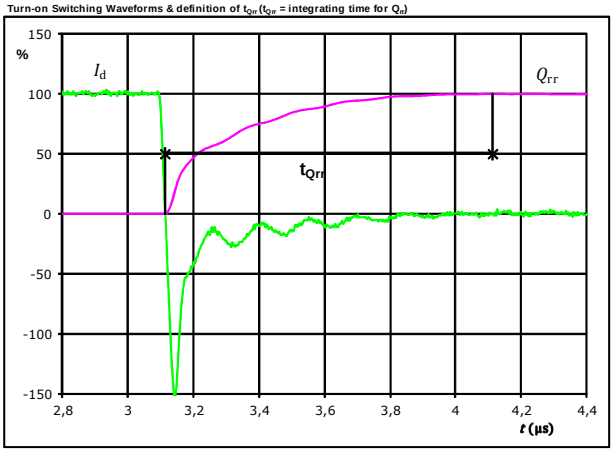


$V_d(100\%)$ =	600	V
$I_d(100\%)$ =	150	A
$I_{RRM}(100\%)$ =	-231	A
t_{rr} =	0,149	µs

Inverter Switching Definitions

Figure 8. **FWD**

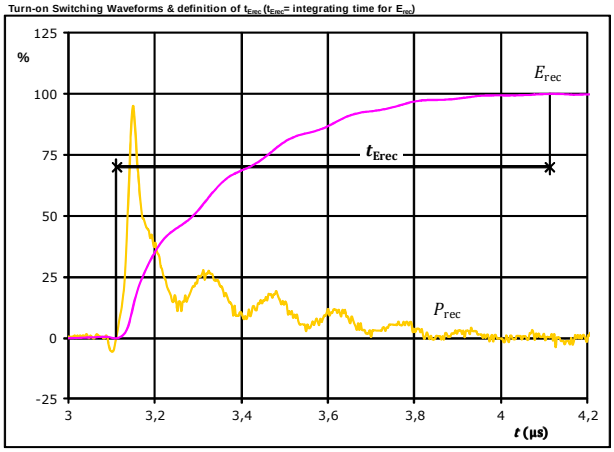
Turn-on Switching Waveforms & definition of t_{Qrr} (t_{Qrr} = integrating time for Q_{rr})



I_d (100%) =	150	A
Q_{rr} (100%) =	22,52	µC
t_{Qrr} =	1,00	µs

Figure 9. **FWD**

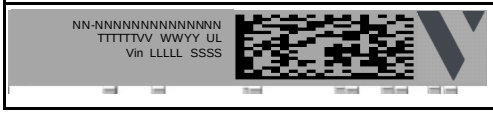
Turn-on Switching Waveforms & definition of t_{Erec} (t_{Erec}= integrating time for E_{rec})



P_{rec} (100%) =	90,12	kW
E_{rec} (100%) =	11,03	mJ
t_{Erec} =	1,00	µs

Ordering Code & Marking

Version	Ordering Code
with thermal paste 17mm housing with Press-fit pins	30-P2126PA150NB-L280F69Y-/3/

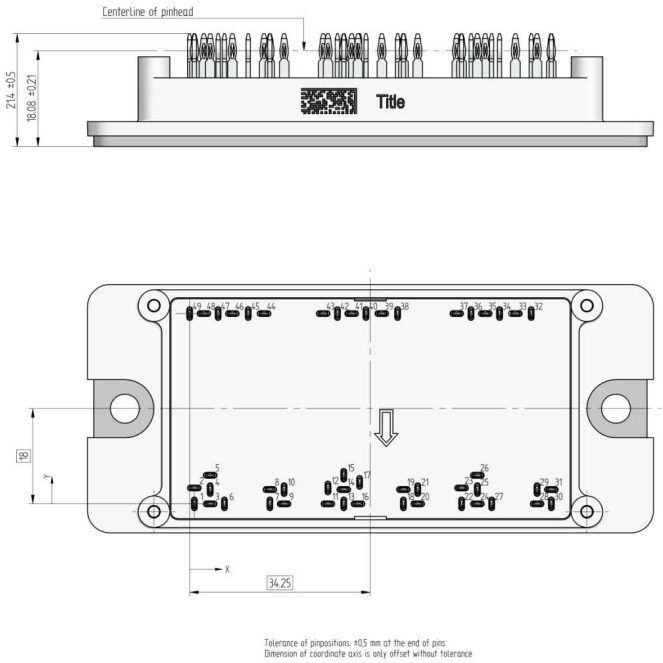


	Name	Date code	UL & VIN	Lot	Serial
Text	NN-NNNNNNNNNNNNN-TTTTTTVV	WWYY	UL VIN	LLLLL	SSSS

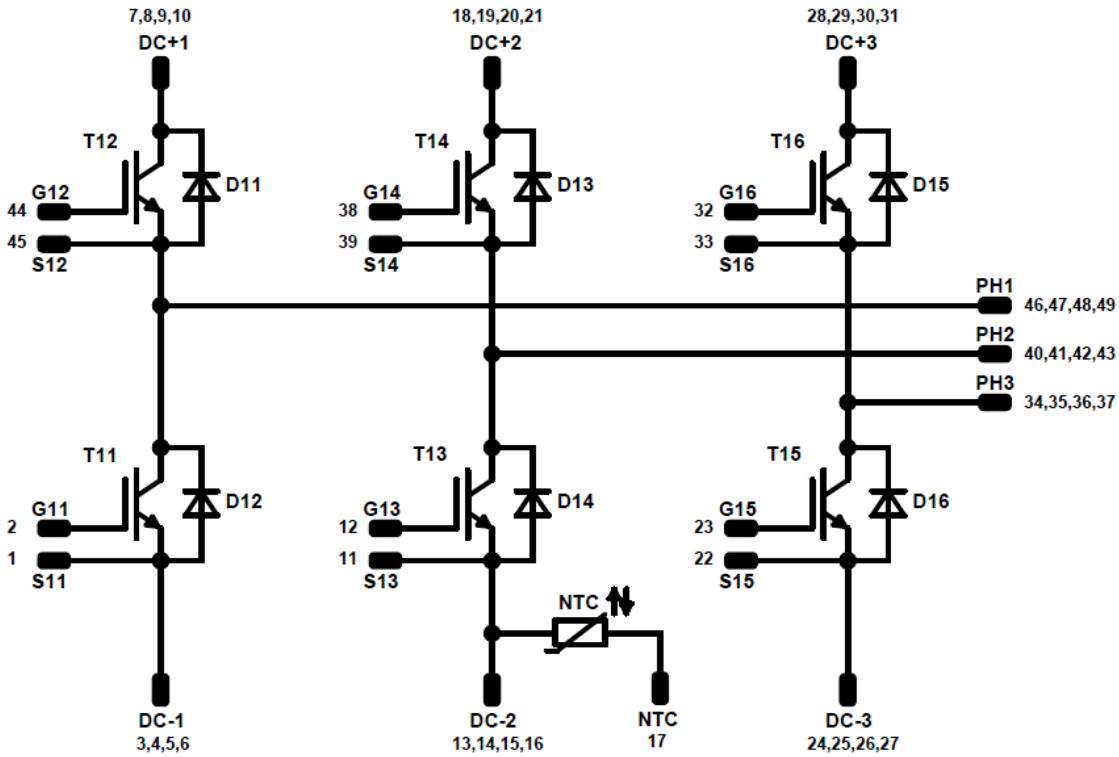
	Type&Ver	Lot number	Serial	Date code		
Datamatrix	TTTTTTTVV	LLLLL	SSSS	WWYY		

Outline

Pin table [mm]				Pin table [mm]			
Pin	X	Y	Function	Pin	X	Y	Function
1	0,9	0	S11	30	68,5	0	DC+3
2	0,9	3	G11	31	68,5	2,7	DC+3
3	3,9	0	DC-1	32	64,7	36	G16
4	3,9	2,7	DC-1	33	61,7	36	S16
5	3,9	5,4	DC-1	34	58,7	36	PH3
6	6,6	0	DC-1	35	56	36	PH3
7	15,2	0	DC+1	36	53,3	36	PH3
8	15,2	2,7	DC+1	37	50,6	36	PH3
9	17,9	0	DC+1	38	39,4	36	G14
10	17,9	3	DC+1	39	36,4	36	S14
11	26,2	0	S13	40	33,4	36	PH2
12	26,2	2,7	G13	41	30,7	36	PH2
13	29,2	0	DC-2	42	28	36	PH2
14	29,2	2,7	DC-2	43	25,3	36	PH2
15	29,2	5,4	DC-2	44	14,1	36	G12
16	31,9	0	DC-2	45	11,1	36	S12
17	32,2	4,05	NTC	46	8,1	36	PH1
18	40,5	0	DC+2	47	5,4	36	PH1
19	40,5	2,7	DC+2	48	2,7	36	PH1
20	43,2	0	DC+2	49	0	36	PH1
21	43,2	2,7	DC+2				
22	51,5	0	S15				
23	51,5	3	G15				
24	54,5	0	DC-3				
25	54,5	2,7	DC-3				
26	54,5	5,4	DC-3				
27	57,2	0	DC-3				
28	65,8	0	DC+3				
29	65,8	2,7	DC+3				



Pinout



Identification

ID	Component	Voltage	Current	Function	Comment
T11,T12,T13 T14,T15,T16	IGBT	1200 V	150 A	Inverter Switch	
D11,D12,D13 D14,D15,D16	FWD	1200 V	150 A	Inverter Diode	
NTC	NTC			Thermistor	

Packaging instruction					
Standard packaging quantity (SPQ)	42	>SPQ	Standard	<SPQ	Sample

Handling instruction
Handling instructions for *flow* 2 packages see vincotech.com website.

Package data
Package data for *flow* 2 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
30-P2126PA150NB-L280F69Y-D1-14	28 Jan. 2016		