Vincotech

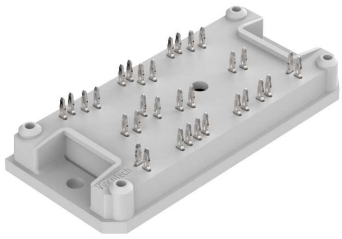
10-PY126PA040MR-L226F28Y
datasheet

***flow*PACK 1** **1200 V / 40 mΩ**

Features

- 3x half-bridge
- Thermistor

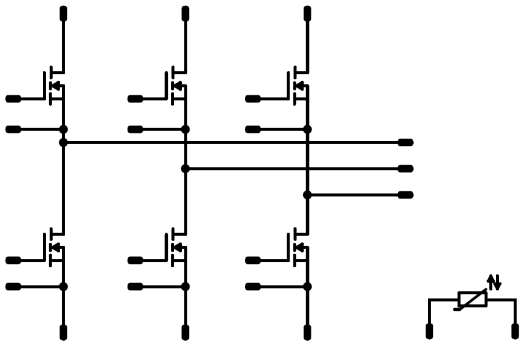
flow 1 12 mm housing



Target applications

- Power Supply

Schematic



Types

- 10-PY126PA040MR-L226F28Y

Maximum Ratings

T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Condition	Value	Unit
Inverter Switch				
Drain-source voltage	V_{DSS}		1200	V
Drain current	I_D	T_j = T_{jmax} T_s = 80 °C	28	A
Peak drain current	I_{DM}	t_p limited by T_{jmax}	137	A
Total power dissipation	P_{tot}	T_j = T_{jmax} T_s = 80 °C	61	W
Gate-source voltage	V_{GSS}		-4/22	V
Maximum Junction Temperature	T_{jmax}		175	°C

Maximum Ratings

T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Condition	Value	Unit
Module Properties				
Thermal Properties				
Storage temperature	T_{stg}		-40…+125	°C
Operation temperature under switching condition	T_{jop}		-40…(T_{jmax} - 25)	°C
Isolation Properties				
Isolation voltage	V_{isol}	DC Test Voltage* t_p = 2 s	6000	V
		AC Voltage t_p = 1 min	2500	V
Creepage distance			min. 12,7	mm
Clearance			11,89	mm
Comparative Tracking Index	CTI		> 200	

*100 % tested in production

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	
Inverter Switch										
Static										
Drain-source on-state resistance	$r_{DS(on)}$		18		20	25 125 150		39 52 60	50	mΩ
Gate-source threshold voltage	$V_{GS(th)}$			10	0,01	25	2,7		5,6	V
Gate to Source Leakage Current	I_{GSS}		-4/22	0		25			±100	nA
Zero Gate Voltage Drain Current	I_{DSS}		0	1200		25			10	µA
Internal gate resistance	r_g							7		Ω
Gate charge	Q_g							107		
Gate to source charge	Q_{GS}		18	600	20	25		22		nC
Gate to drain charge	Q_{GD}							41		
Short-circuit input capacitance	C_{iss}							1337		
Short-circuit output capacitance	C_{oss}	f= 1MHz	0	800		25		76		pF
Reverse transfer capacitance	C_{rss}							27		
Reverse Diode Static										
Diode forward voltage	V_{SD}		0		20	25		3,2		V
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						1,55		K/W

Characteristic Values

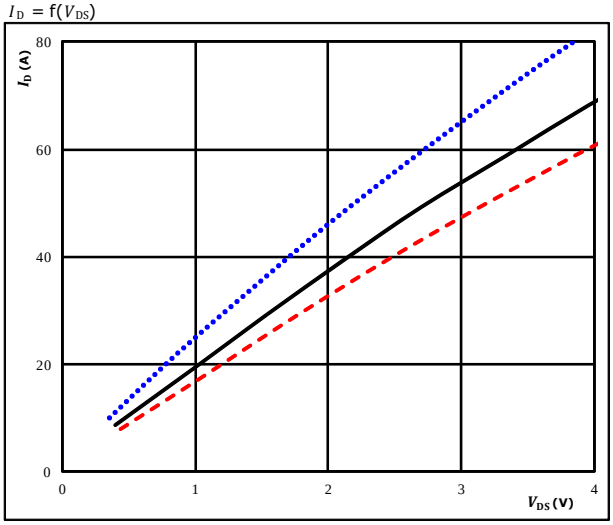
Parameter	Symbol	Conditions					Value			Unit
			V_{GE} [V] V_{GS} [V]	V_{CE} [V] V_{DS} [V] V_F [V]	I_C [A] I_D [A] I_F [A]	T_j [°C]	Min	Typ	Max	
Inverter Switch										
Dynamic										
Turn-on delay time	$t_{d(on)}$	R_{goff} = 4 Ω R_{gon} = 4 Ω	16/-4	700	32	25 125 150		18 18 17		ns
Rise time	t_r					25 125 150		7 8 7		
Turn-off delay time	$t_{d(off)}$					25 125 150		57 65 66		
Fall time	t_f					25 125 150		9 10 9		
Turn-on energy (per pulse)	E_{on}	Q_{rFWD} = 0,5 µC Q_{rFWD} = 0,5 µC Q_{rFWD} = 0,7 µC				25 125 150		0,619 0,649 0,698		mWs
Turn-off energy (per pulse)	E_{off}					25 125 150		0,197 0,219 0,222		
Peak recovery current	I_{RRM}	di/dt = 4760 A/µs di/dt = 4654 A/µs di/dt = 5136 A/µs	16/-4	700	32	25 125 150		38 37 45		A
Reverse recovery time	t_{rr}					25 125 150		19 21 23		ns
Recovered charge	Q_r					25 125 150		0,464 0,546 0,655		µC
Reverse recovered energy	E_{rec}					25 125 150		0,096 0,131 0,152		mWs
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 125 150		4997 8656 8100		A/µs
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	

Inverter Switch Characteristics

figure 1. **MOSFET**

Typical output characteristics

$I_D = f(V_{DS})$

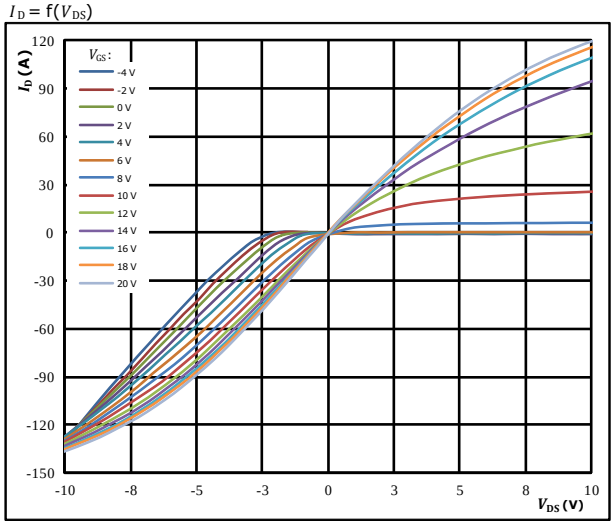


t_p =	250	µs		25 °C	
V_{GS} =	18	V	T_j:	125 °C	
				150 °C	

figure 2. **MOSFET**

Typical output characteristics

$I_D = f(V_{DS})$

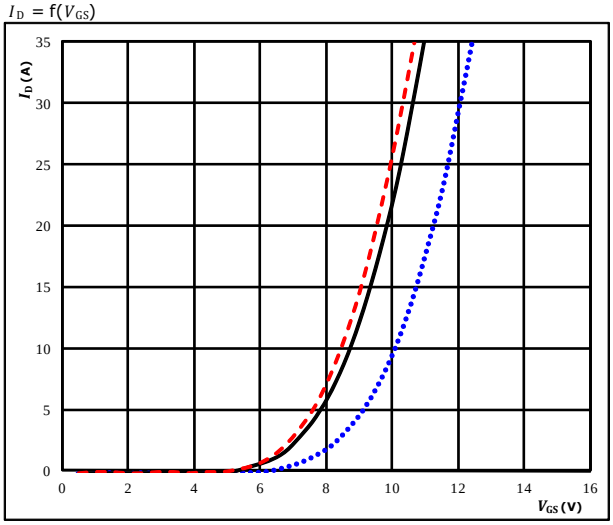


t_p =	250	µs
T_j =	150	°C
V_{GS} from	-4 V to 20 V in steps of 2 V	

figure 3. **MOSFET**

Typical transfer characteristics

$I_D = f(V_{GS})$

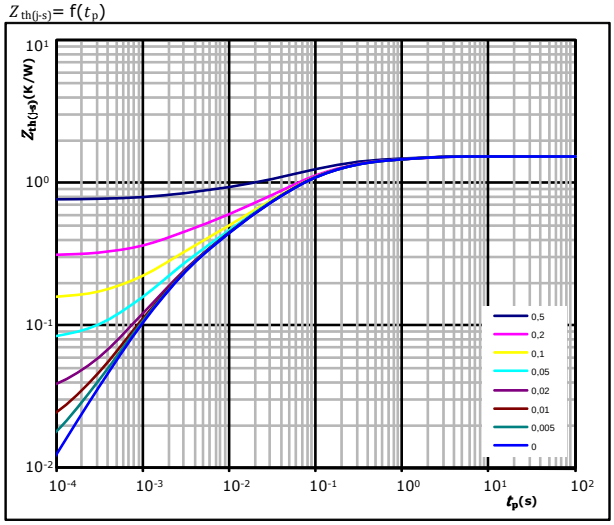


t_p =	100	µs		25 °C	
V_{DS} =	10	V	T_j:	125 °C	
				150 °C	

figure 4. **MOSFET**

Transient thermal impedance as a function of pulse width

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



D =	t_p / T	
$R_{th(j-s)}$ =	1,55	K/W

MOSFET thermal model values

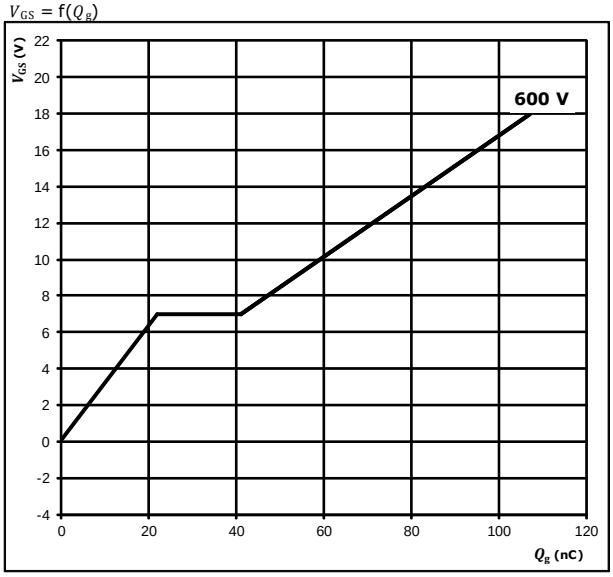
R (K/W)	τ (s)
1,78E-01	1,04E+00
4,55E-01	1,44E-01
5,31E-01	4,34E-02
2,36E-01	8,88E-03
1,48E-01	1,76E-03

Inverter Switch Characteristics

figure 5. **MOSFET**

Gate voltage vs Gate charge

$V_{GS} = f(Q_g)$



At

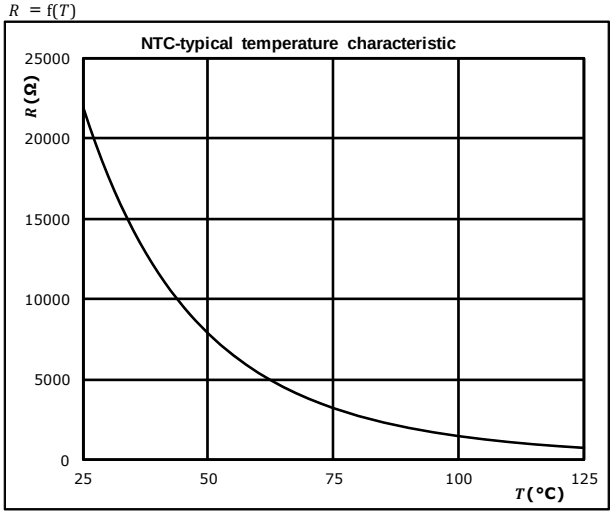
I_C = 20 A

Thermistor Characteristics

figure 1. **Thermistor**

Typical NTC characteristic as a function of temperature

$R = f(T)$

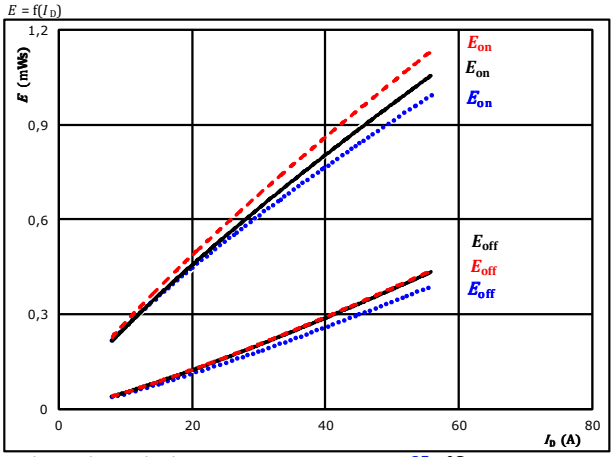


Inverter Switching Characteristics

figure 1. **MOSFET**

Typical switching energy losses as a function of drain current

$E = f(I_D)$



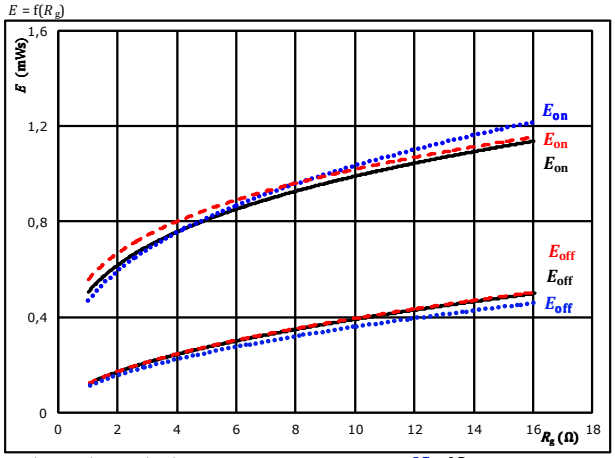
With an inductive load at

V_{DS} =	700	V	T_J:	25 °C	·····
V_{GS} =	16/-4	V		125 °C	———
R_{gon} =	4	Ω		150 °C	– – –
R_{goff} =	4	Ω			

figure 2. **MOSFET**

Typical switching energy losses as a function of gate resistor

$E = f(R_g)$



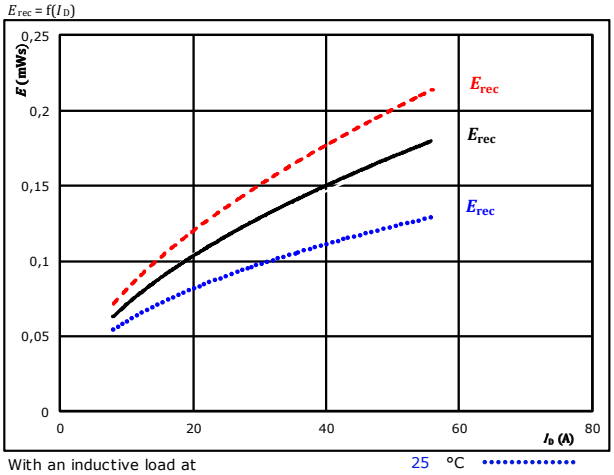
With an inductive load at

V_{DS} =	700	V	T_J:	25 °C	·····
V_{GS} =	16/-4	V		125 °C	———
I_D =	32	A		150 °C	– – –

figure 3. **FWD**

Typical reverse recovered energy loss as a function of drain current

$E_{rec} = f(I_D)$



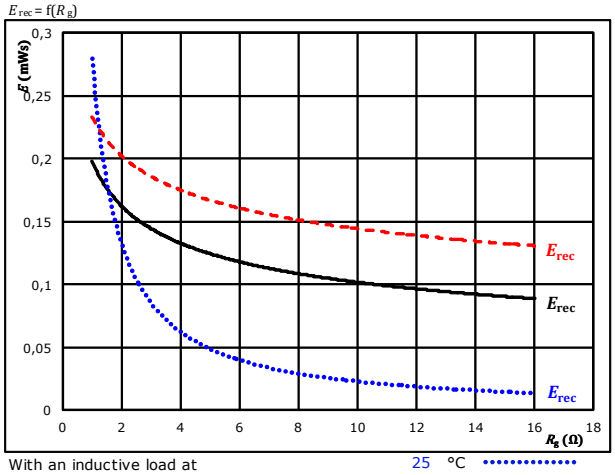
With an inductive load at

V_{DS} =	700	V	T_J:	25 °C	·····
V_{GS} =	16/-4	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

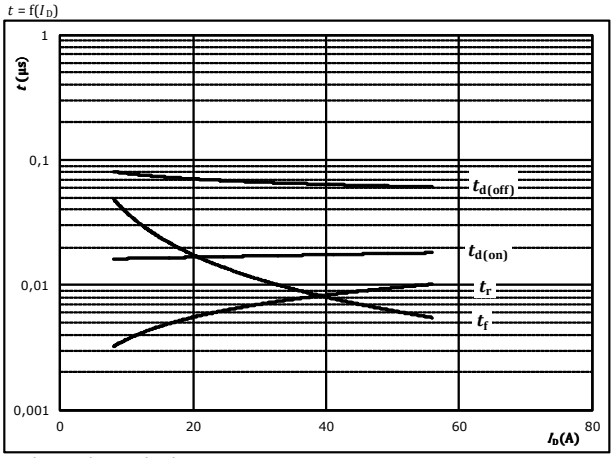
V_{DS} =	700	V	T_J:	25 °C	·····
V_{GS} =	16/-4	V		125 °C	———
I_D =	32	A		150 °C	– – –

Inverter Switching Characteristics

figure 5. **MOSFET**

Typical switching times as a function of drain current

$t = f(I_D)$



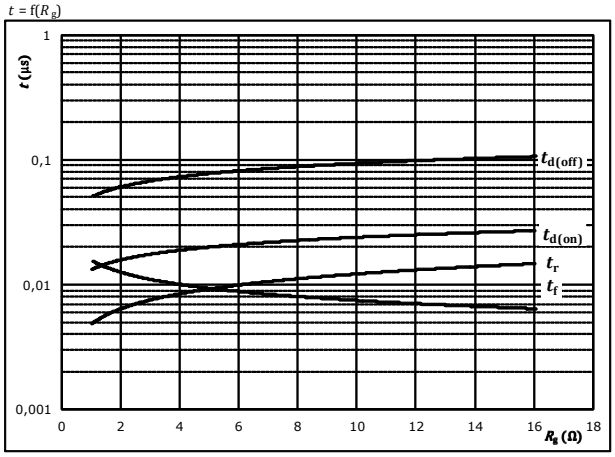
With an inductive load at

T_j =	150	°C
V_{DS} =	700	V
V_{GS} =	16/-4	V
R_{gon} =	4	Ω
R_{goff} =	4	Ω

figure 6. **MOSFET**

Typical switching times as a function of gate resistor

$t = f(R_g)$



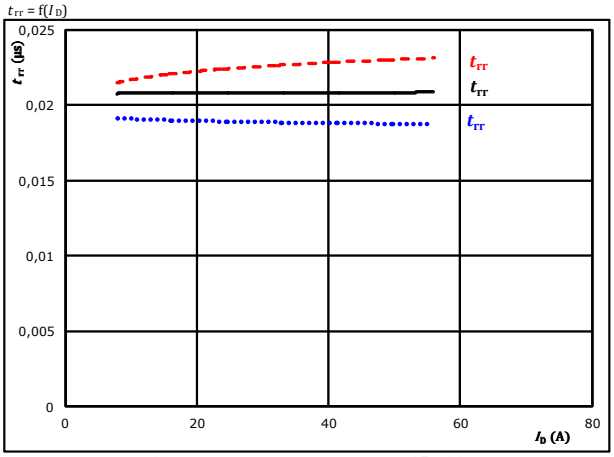
With an inductive load at

T_j =	150	°C
V_{DS} =	700	V
V_{GS} =	16/-4	V
I_D =	32	A

figure 7. **FWD**

Typical reverse recovery time as a function of drain current

$t_{rr} = f(I_D)$

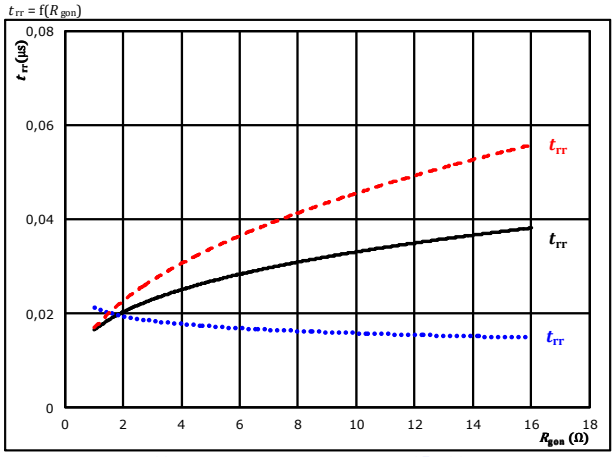


At	V_{DS} =	700	V		25 °C
	V_{GS} =	16/-4	V	T_j:	125 °C
	R_{gon} =	4	Ω		150 °C

figure 8. **FWD**

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

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



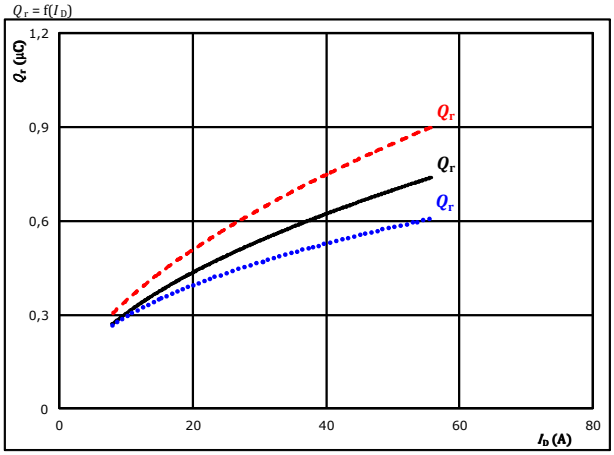
At	V_{DS} =	700	V		25 °C
	V_{GS} =	16/-4	V	T_j:	125 °C
	I_D =	32	A		150 °C

Inverter Switching Characteristics

figure 9. **FWD**

Typical recovered charge as a function of drain current

$Q_r = f(I_D)$

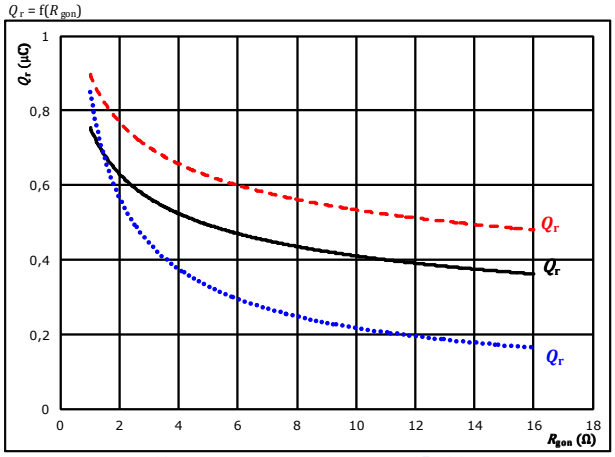


At	V_{DS} =	700	V		25 °C	
	V_{GS} =	16/-4	V	T_j:	125 °C	
	R_{gon} =	4	Ω		150 °C	

figure 10. **FWD**

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

$Q_r = f(R_{gon})$

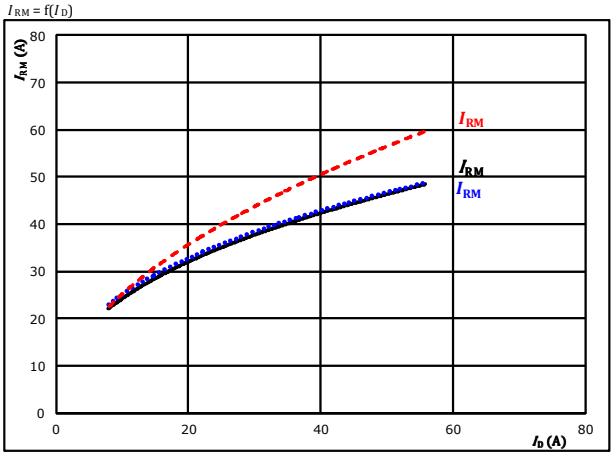


At	V_{DS} =	700	V		25 °C	
	V_{GS} =	16/-4	V	T_j:	125 °C	
	I_D =	32	A		150 °C	

figure 11. **FWD**

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

$I_{RM} = f(I_D)$

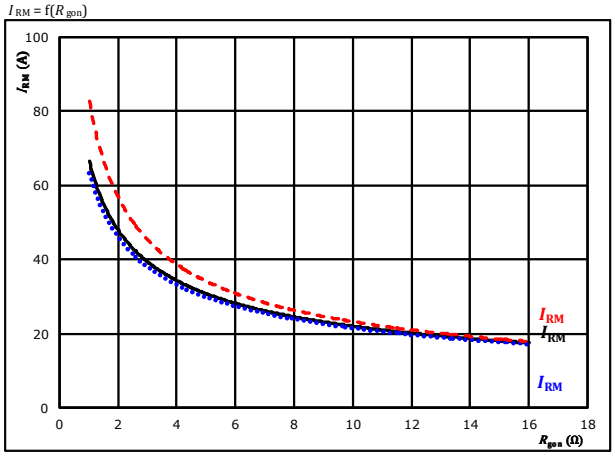


At	V_{DS} =	700	V		25 °C	
	V_{GS} =	16/-4	V	T_j:	125 °C	
	R_{gon} =	4	Ω		150 °C	

figure 12. **FWD**

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

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



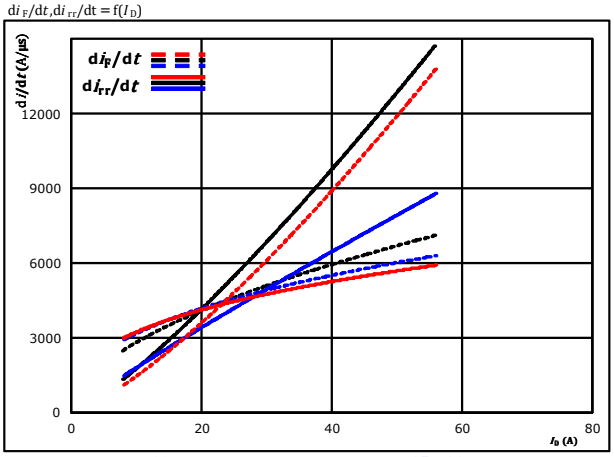
At	V_{DS} =	700	V		25 °C	
	V_{GS} =	16/-4	V	T_j:	125 °C	
	I_D =	32	A		150 °C	

Switching Characteristics

figure 13. **FWD**

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

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

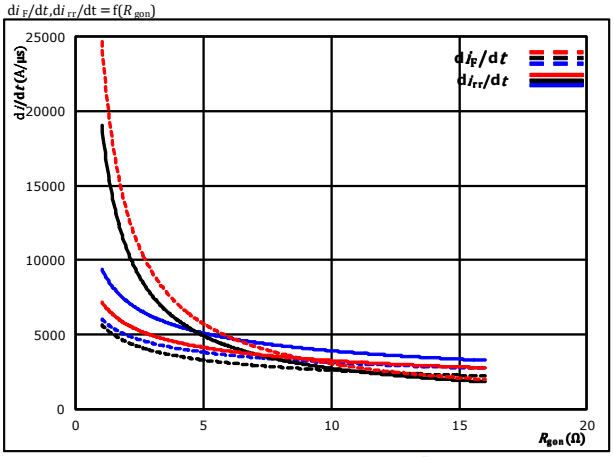


At	V_{DS} =	700	V		25 °C	
	V_{GS} =	16/-4	V	T_j:	125 °C	
	R_{gon} =	4	Ω		150 °C	

figure 14. **FWD**

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

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

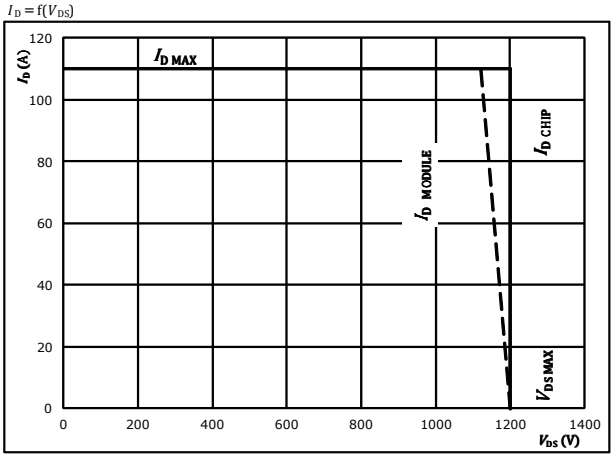


At	V_{DS} =	700	V		25 °C	
	V_{GS} =	16/-4	V	T_j:	125 °C	
	I_D =	32	A		150 °C	

figure 15. **MOSFET**

Reverse bias safe operating area

$I_D = f(V_{DS})$



At

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

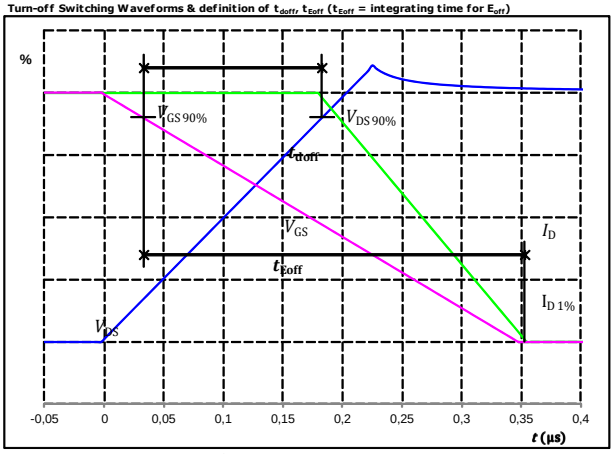
Inverter Switching Definitions

General conditions

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

figure 1. MOSFET

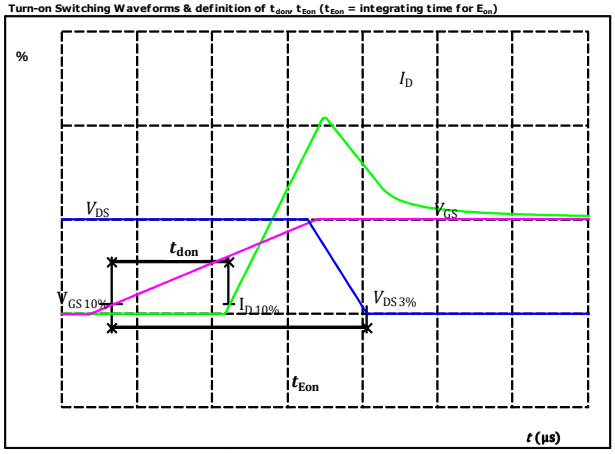
Turn-off Switching Waveforms & definition of t_{doff}, t_{Eoff} (t_{Eoff} = integrating time for E_{off})



$V_{GS}(0\%)$ =	-6	V
$V_{GS}(100\%)$ =	16	V
$V_{DS}(100\%)$ =	700	V
$I_D(100\%)$ =	32	A
t_{doff} =	0,065	µs

figure 2. MOSFET

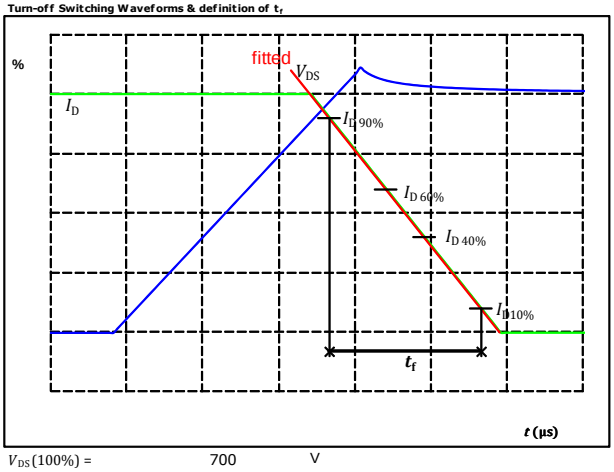
Turn-on Switching Waveforms & definition of t_{don}, t_{Eon} (t_{Eon} = integrating time for E_{on})



$V_{GS}(0\%)$ =	-6	V
$V_{GS}(100\%)$ =	16	V
$V_{DS}(100\%)$ =	700	V
$I_D(100\%)$ =	32	A
t_{don} =	0,018	µs

figure 3. MOSFET

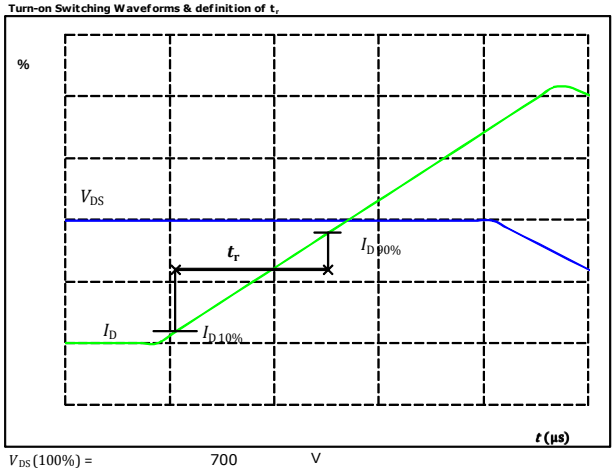
Turn-off Switching Waveforms & definition of t_f



$V_{DS}(100\%)$ =	700	V
$I_D(100\%)$ =	32	A
t_f =	0,010	µs

figure 4. MOSFET

Turn-on Switching Waveforms & definition of t_r

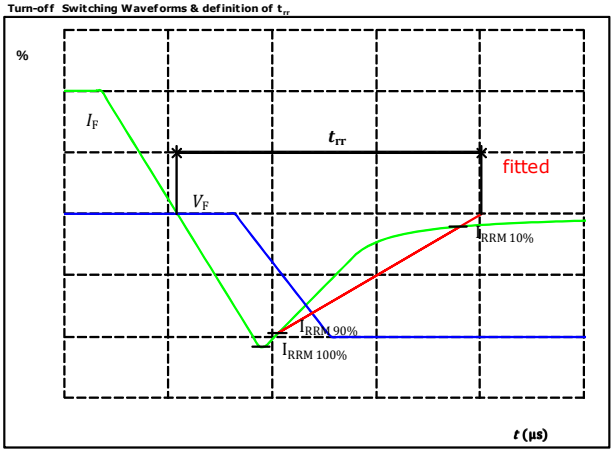


$V_{DS}(100\%)$ =	700	V
$I_D(100\%)$ =	32	A
t_r =	0,008	µs

Inverter Switching Definitions

figure 7. **FWD**

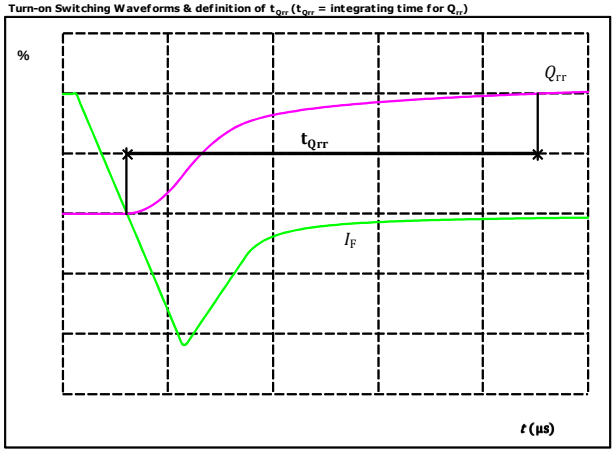
Turn-off Switching Waveforms & definition of t_{rr}



V_F (100%) =	700	V
I_F (100%) =	32	A
I_{RRM} (100%) =	37	A
t_{rr} =	0,021	µs

figure 8. **FWD**

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



I_F (100%) =	32	A
Q_{rr} (100%) =	0,55	µC

Vincotech

Ordering Code & Marking

Version	Ordering Code
without thermal paste 12 mm housing with press-fit pins	10-PY126PA040MR-L226F28Y
with thermal paste 12 mm housing with press-fit pins	10-PY126PA040MR-L226F28Y-/3/

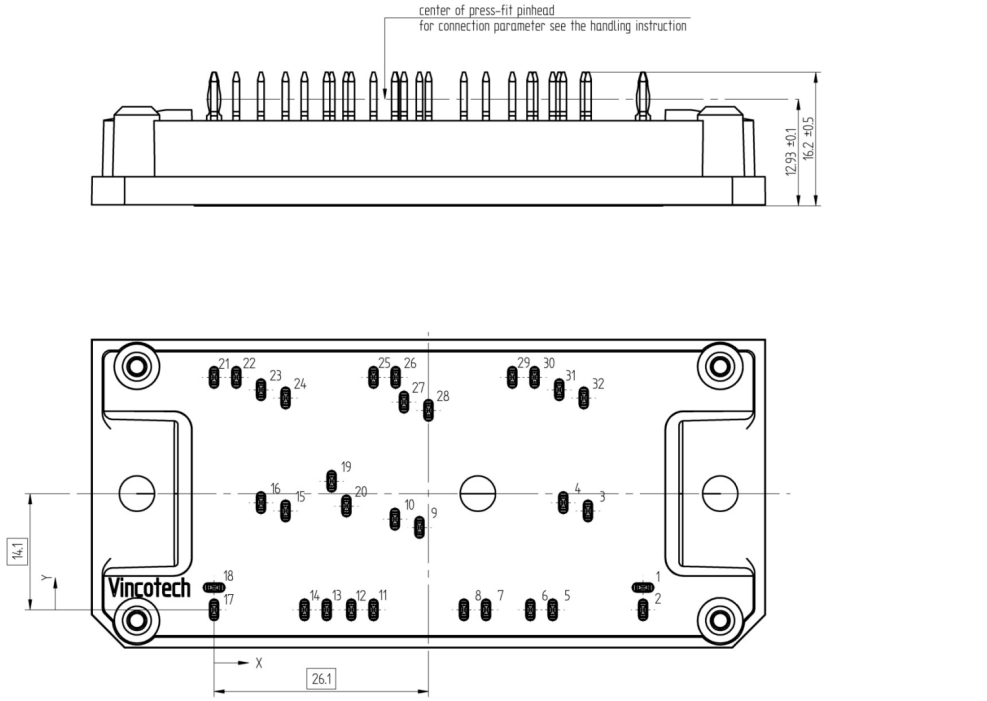
NN-NNNNNNNNNNNNNN
TTTTTTVV WWYY UL
VIN LLLLL SSSS

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

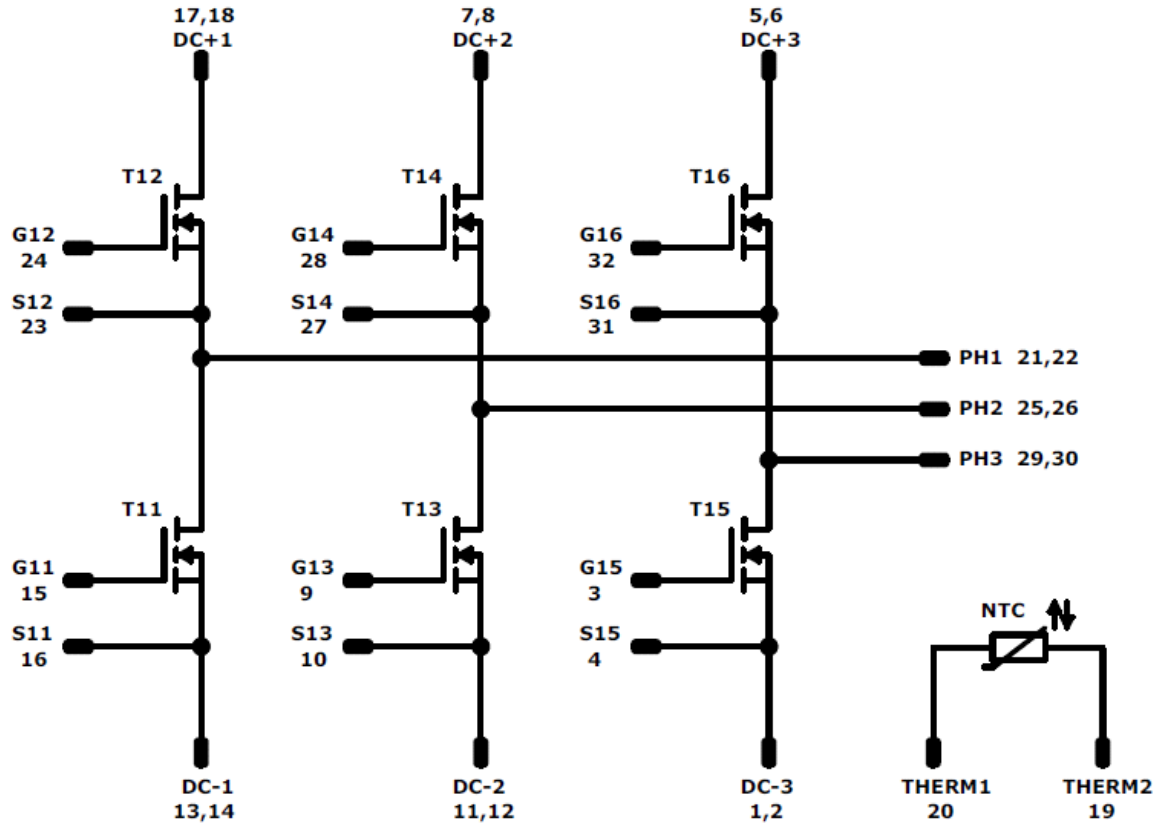
Outline

Pin table

Pin	X	Y	Functions
1	52,2	2,7	DC-3
2	52,2	0	DC-3
3	45,5	12	G15
4	42,5	13	S15
5	41,2	0	DC+3
6	38,5	0	DC+3
7	33,1	0	DC+2
8	30,4	0	DC+2
9	25	10	G13
10	22	11	S13
11	19,4	0	DC-2
12	16,7	0	DC-2
13	13,7	0	DC-1
14	11	0	DC-1
15	8,7	12	G11
16	5,7	13	S11
17	0	0	DC+1
18	0	2,7	DC+1
19	14,3	15,6	THERM2
20	16,1	12,6	THERM1
21	0	28,2	PH1
22	2,7	28,2	PH1
23	5,7	26,7	S12
24	8,7	25,7	G12
25	19,4	28,2	PH2
26	22,1	28,2	PH2
27	23,1	25,2	S14
28	26,1	24,2	G14
29	36,3	28,2	PH3
30	39	28,2	PH3
31	42	26,7	S16
32	45	25,7	G16



Pinout



Identification

ID	Component	Voltage	Current	Function	Comment
T11, T12, T13, T14, T15, T16	MOSFET	1200 V	40 mΩ	Inverter Switch	
NTC	Thermistor			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-PY126PA040MR-L226F28Y-D2-14	07 Aug. 2018	Product features has been updated	1