Vincotech

10-PY126PA020ME-L227F18Y
datasheet

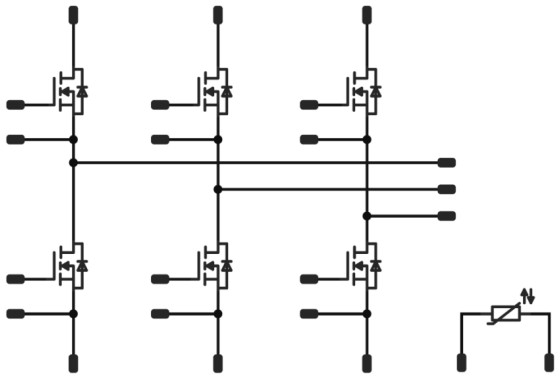
flow PACK 1 — **1200 V / 20 mΩ**

Features

- Wolfspeed(Cree)™ Silicon Carbide Power MOSFET, C2M™ MOSFET Technology
- Sixpack with three separated legs
- Solderless Press-fit Mounting Technology

flow 1 12mm housing

Schematic



Target applications

- Battery Charger

Types

- 10-PY126PA020ME-L227F18Y

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	$T_j = T_{jmax}$ Ts = 80 °C	53	A
Peak drain current	I_{DM}	t_p limited by T_{jmax}	320	A
Avalanche energy, single pulse	E_{AS}	I_D = 80 A V_{DD} = 50 V	4000	mJ
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ Ts = 80 °C	104	W
Gate-source voltage	V_{GSS}		-10/+25	V
Maximum Junction Temperature	T_{jmax}		150	°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_{isol}	DC voltage	t_p=2s	4000	V
Creepage distance				min 12,7	mm
Clearance				12,01	mm
Comparative Tracking Index	CTI			>200	

Characteristic Values

Inverter Switch

Parameter	Symbol	Conditions					Value			Unit
			V_{GS} [V]	V_{DS} [V]	I_D [A]	T_j[°C]	Min	Typ	Max	
Static										
Drain-source on-state resistance	$r_{DS(on)}$		20		80	25 125 150		22 33 35	26	mΩ
Gate-source threshold voltage	$V_{GS(th)}$	$V_{GS} = V_{DS}$			0,02	25 125	2,4	2,8		V
Gate to Source Leakage Current	I_{GSS}		20	0		25 125			500	nA
Zero Gate Voltage Drain Current	I_{DSS}		0	1200		25 125		2	200	µA
Internal gate resistance	r_g							0,9		Ω
Gate charge	Q_g		-5/20	800	80	25		230		nC
Gate to source charge	Q_{GS}							56		
Gate to drain charge	Q_{GD}							74		
Short-circuit input capacitance	C_{iss}	f=1MHz	0	1000		25		3786		pF
Short-circuit output capacitance	C_{oss}							300		
Reverse transfer capacitance	C_{rss}							20		
Reverse Diode Static										
Diode Forward Voltage	V_{SD}		-5		40	25 150		3,3 3,1		V
Continuous Diode Forward Current	I_S					T_C=25°C			120	A
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	phase-change material λ=3,4 W/mK						0,67		K/W

Inverter Switch

Parameter	Symbol	Conditions					Value			Unit
			V_{GE} [V]	V_r [V] or V_{CE} [V]	I_C [A] or I_F [A] or I_D [A]	T_j [°C]	Min	Typ	Max	
MOSFET Switching										
Turn-on delay time	$t_{d(on)}$	R_{goff} = 2 Ω R_{gon} = 2 Ω	-5/16	600	60	25 125		31 30		ns
Rise time	t_r					25 125		9 9		
Turn-off delay time	$t_{d(off)}$					25 125		64 67		
Fall time	t_f					25 125		20 18		
Turn-on energy (per pulse)	E_{on}	Q_{rFWD} = 0,9 µC Q_{rFWD} = 1,5 µC				25 125		0,518 0,509		mWs
Turn-off energy (per pulse)	E_{off}					25 125		0,212 0,177		
Reverse Diode Switching										
Peak recovery current	I_{RRM}	di/dt = 10171 A/µ di/dt = 9687 A/µs	-5/16	600	60	25 125		88 156		A
Reverse recovery time	t_{rr}					25 125		18 21		ns
Recovered charge	Q_r					25 125		0,871 1,479		µC
Reverse recovered energy	E_{rec}					25 125		0,200 0,296		mWs
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 125		15261 32554		A/µs

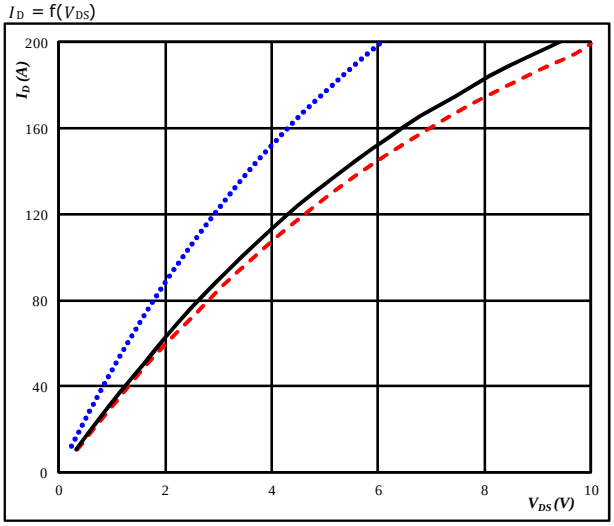
Thermistor

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	

Inverter Switch Characteristics

Typical output characteristics **MOSFET**

$I_D = f(V_{DS})$



t_p =	250	µs		25 °C
V_{GS}=	20	V	T_j:	125 °C
				150 °C

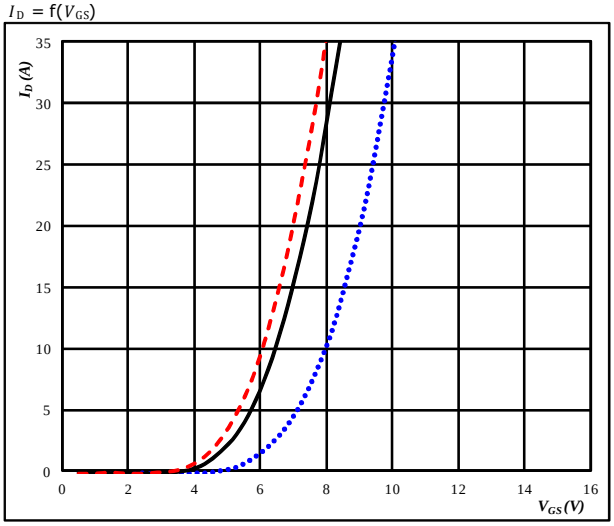
Typical output characteristics **MOSFET**

$I_D = f(V_{DS})$

t_p =	250	µs
T_j =	150	°C
V_{GS} from	0 V to 20 V in steps of 2 V	

Typical transfer characteristics **MOSFET**

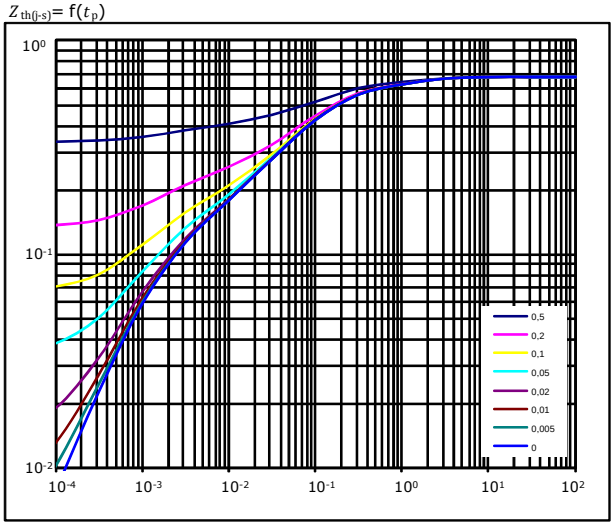
$I_D = f(V_{GS})$



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

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

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



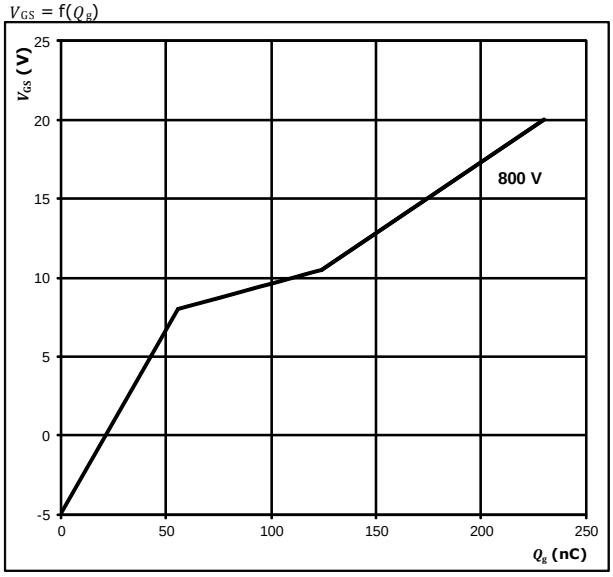
D =	t_p / T	
$R_{th(j-s)}$ =	0,67	K/W

R (K/W)	Tau(s)
1,01E-01	1,43E+00
2,02E-01	1,77E-01
2,13E-01	6,03E-02
7,84E-02	8,37E-03
7,99E-02	1,21E-03

Inverter Switch Characteristics

Gate voltage vs Gate charge **MOSFET**

$V_{GS} = f(Q_g)$



At

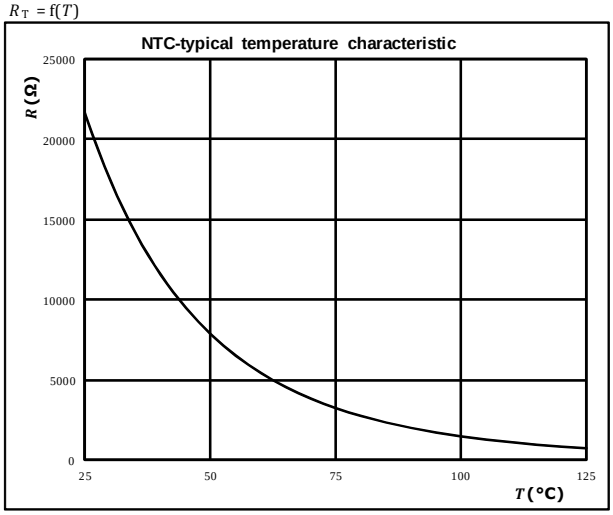
I_C= 80 A

Thermistor

Thermistor typical temperature characteristic

Typical NTC characteristic
as a function of temperature

$R_T = f(T)$

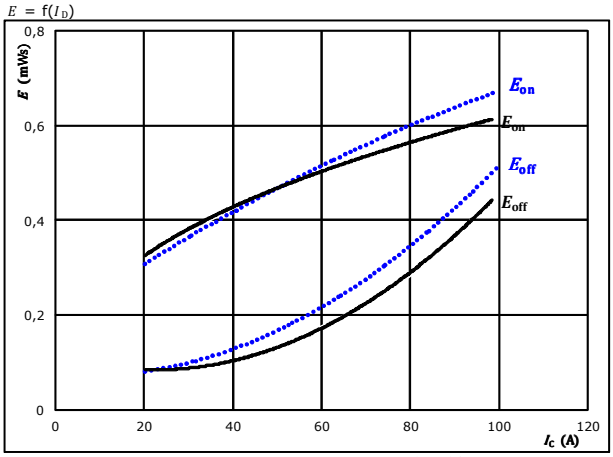


Inverter Switching Characteristics

Figure 1. MOSFET

Typical switching energy losses as a function of collector current

$E = f(I_D)$



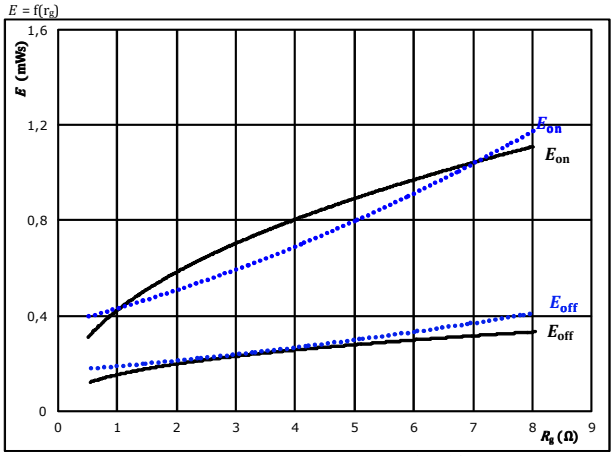
With an inductive load at — 25 °C ••••••••••••••••

V_{DS} =	600	V	T_j:	125 °C	————
V_{GS} =	-5/16	V			
R_{gon} =	2	Ω			
R_{goff} =	2	Ω			

Figure 2. MOSFET

Typical switching energy losses as a function of gate resistor

$E = f(r_g)$



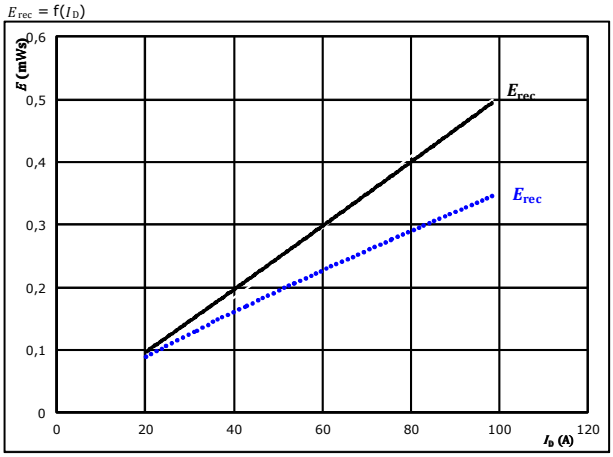
With an inductive load at — 25 °C ••••••••••••••••

V_{DS} =	600	V	T_j:	125 °C	————
V_{GS} =	-5/16	V			
I_D =	60	A			

Figure 3. FWD

Typical reverse recovered energy loss as a function of collector current

$E_{rec} = f(I_D)$



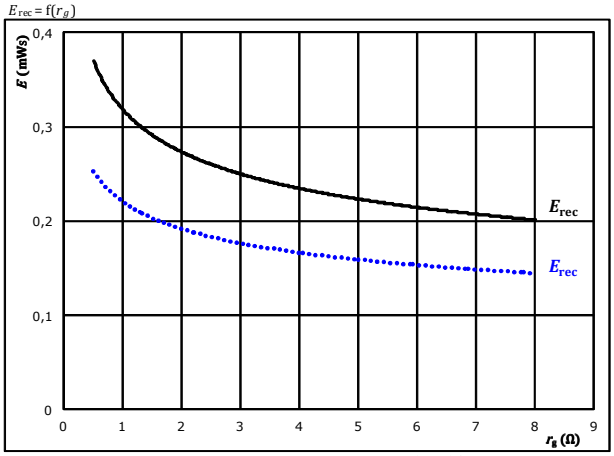
With an inductive load at — 25 °C ••••••••••••••••

V_{DS} =	600	V	T_j:	125 °C	————
V_{GS} =	-5/16	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 ••••••••••••••••

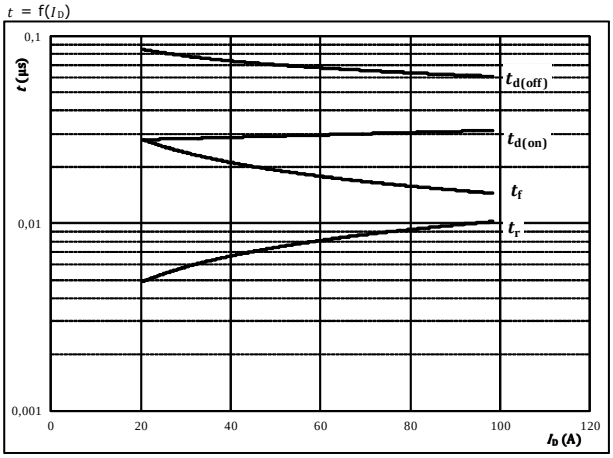
V_{DS} =	600	V	T_j:	125 °C	————
V_{GS} =	-5/16	V			
I_D =	60	A			

Inverter Switching Characteristics

Figure 5. **MOSFET**

Typical switching times as a function of collector current

$t = f(I_D)$



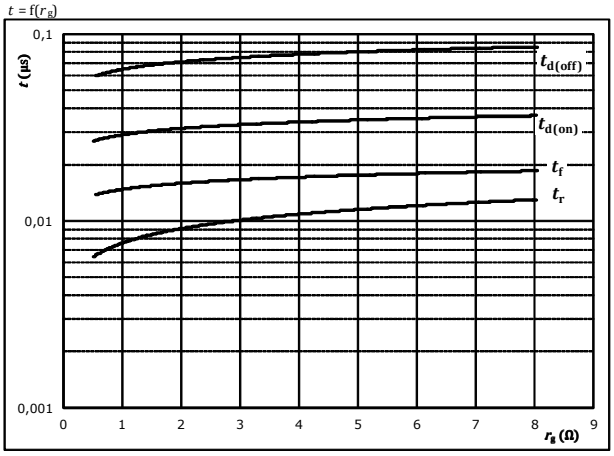
With an inductive load at

T_j =	125	°C
V_{DS} =	600	V
V_{GS} =	-5/16	V
R_{gon} =	2	Ω
R_{goff} =	2	Ω

Figure 6. **MOSFET**

Typical switching times as a function of gate resistor

$t = f(r_g)$



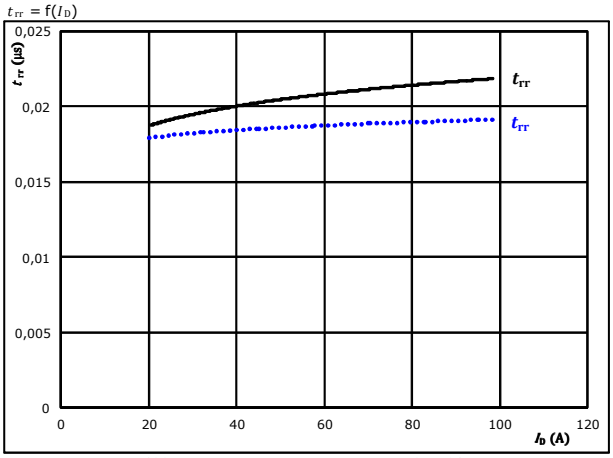
With an inductive load at

T_j =	125	°C
V_{DS} =	600	V
V_{GS} =	-5/16	V
I_D =	60	A

Figure 7. **FWD**

Typical reverse recovery time as a function of collector current

$t_{rr} = f(I_D)$

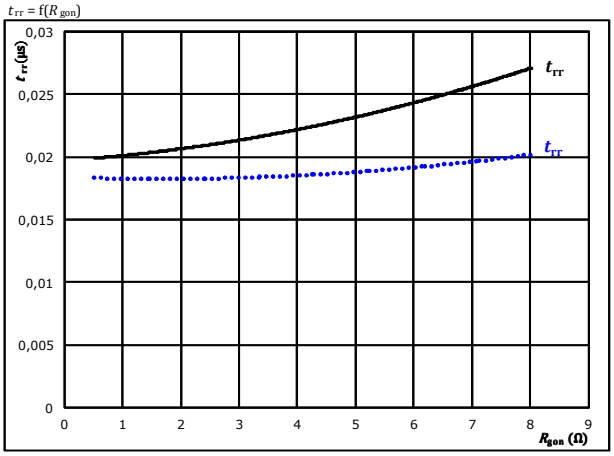


At	V_{DS}=	600	V	25 °C	·····
	V_{GS} =	-5/16	V	T_j: 125 °C	———
	R_{gon} =	2	Ω		

Figure 8. **FWD**

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

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



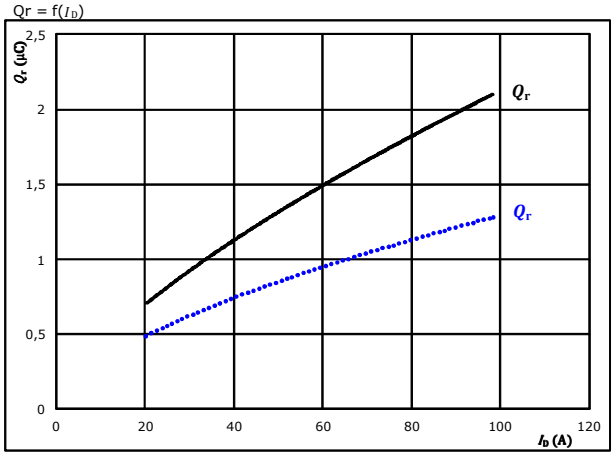
At	V_{DS} =	600	V	25 °C	·····
	V_{GS} =	-5/16	V	T_j: 125 °C	———
	I_D =	60	A		

Inverter Switching Characteristics

Figure 9. **FWD**

Typical recovered charge as a function of collector current

Qr = f(I_D)

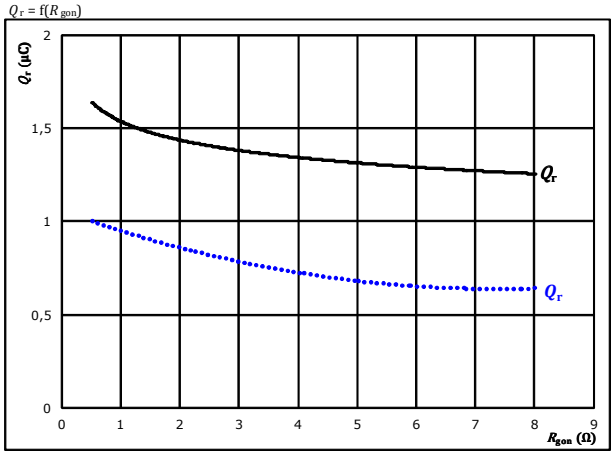


A	V_{DS} =	600	V		**25** **°C**	
	V_{GS} =	-5/16	V	T_j:	**125 °C**	
	R_{gon} =	2	Ω			

Figure 10. **FWD**

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

$Q_r = f(R_{gon})$

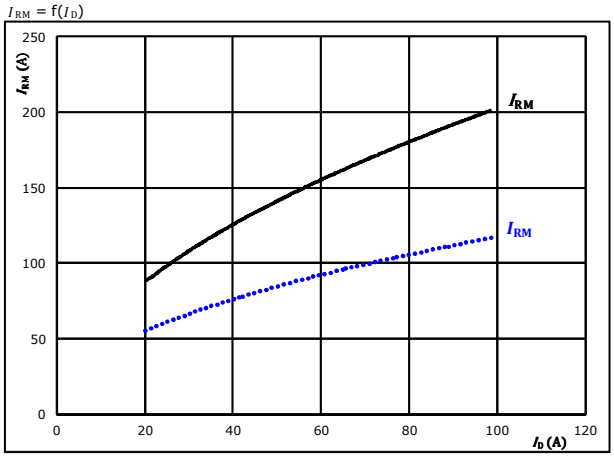


At	V_{DS} =	600	V		**25** **°C**	
	V_{GS} =	-5/16	V	T_j:	**125 °C**	
	I_D =	60	A			

Figure 11. **FWD**

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

$I_{RM} = f(I_D)$

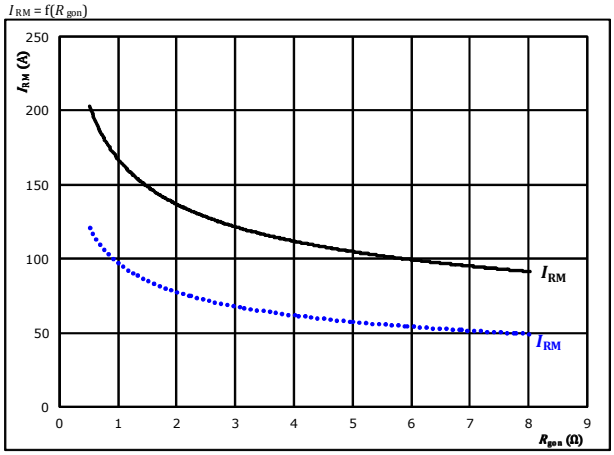


At	V_{DS} =	600	V		**25** **°C**	
	V_{GS} =	-5/16	V	T_j:	**125 °C**	
	R_{gon} =	2	Ω			

Figure 12. **FWD**

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

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



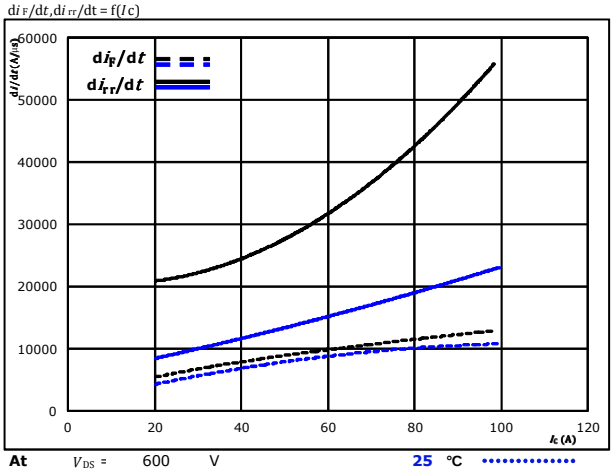
At	V_{DS} =	600	V		**25** **°C**	
	V_{GS} =	-5/16	V	T_j:	**125 °C**	
	I_D =	60	A			

Inverter Switching Characteristics

Figure 13. **FWD**

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

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

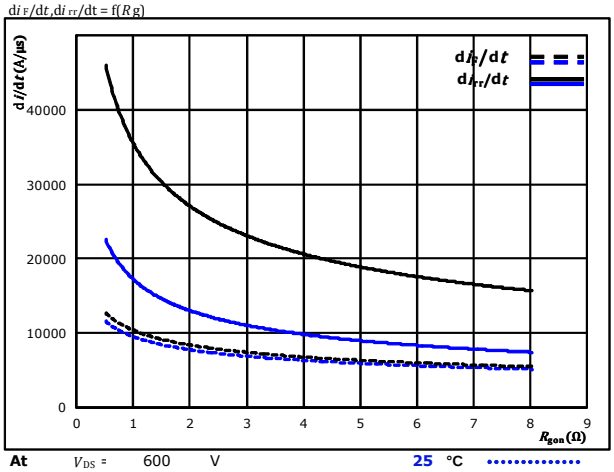


At	V_{DS} =	600	V	25 °C	•••••••••••••••
	V_{GS} =	-5/16	V	T_j: 125 °C	———————
	R_{gon} =	2	Ω		

Figure 14. **FWD**

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

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



At	V_{DS} =	600	V	25 °C	•••••••••••••••
	V_{GS} =	-5/16	V	125 °C	———————
	I_D=	60	A		

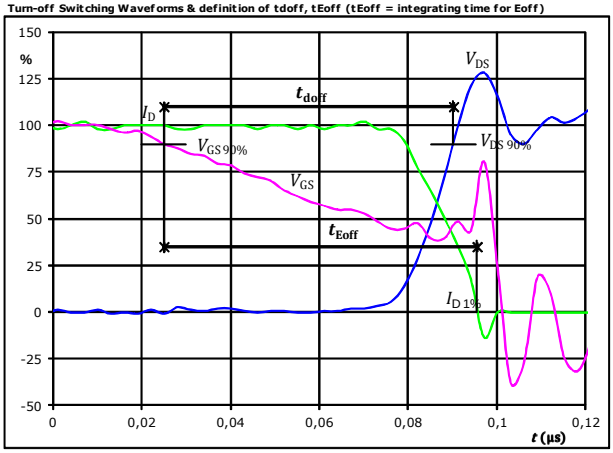
Inverter Switching Definitions

General conditions

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

Figure 1. **MOSFET**

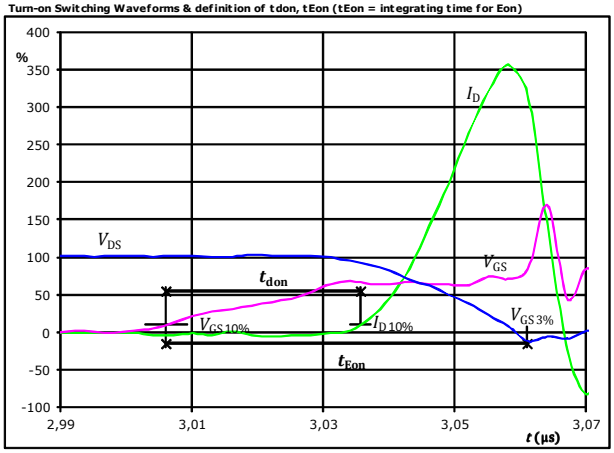
Turn-off Switching Waveforms & definition of tdoff, tEoff (tEoff = integrating time for Eoff)



V_{GS} (0%) =	-5	V
V_{GS} (100%) =	16	V
V_{DS} (100%) =	600	V
I_D (100%) =	60	A
t_{doff} =	0,067	µs
t_{Eoff} =	0,070	µs

Figure 2. **MOSFET**

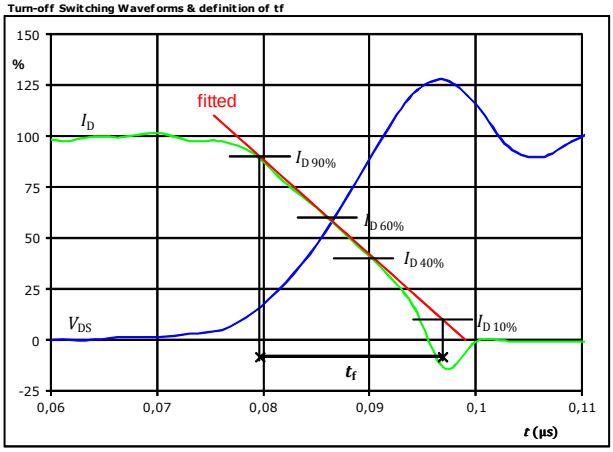
Turn-on Switching Waveforms & definition of tdon, tEon (tEon = integrating time for Eon)



V_{GS} (0%) =	-5	V
V_{GS} (100%) =	16	V
V_{DS} (100%) =	600	V
I_D (100%) =	60	A
t_{don} =	0,030	µs
t_{Eon} =	0,055	µs

Figure 3. **MOSFET**

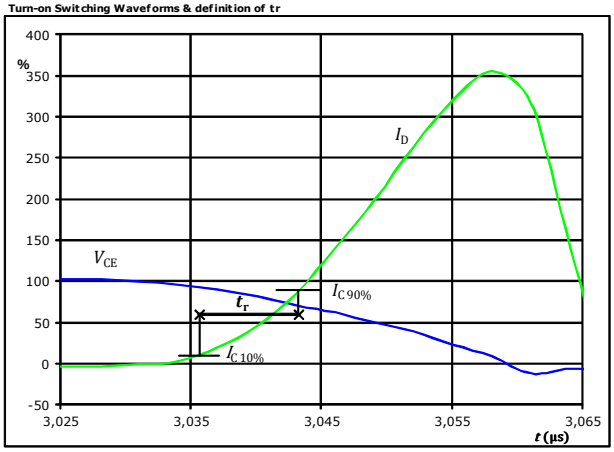
Turn-off Switching Waveforms & definition of tf



V_C (100%) =	600	V
I_D (100%) =	60	A
t_f =	0,017	µs

Figure 4. **MOSFET**

Turn-on Switching Waveforms & definition of tr

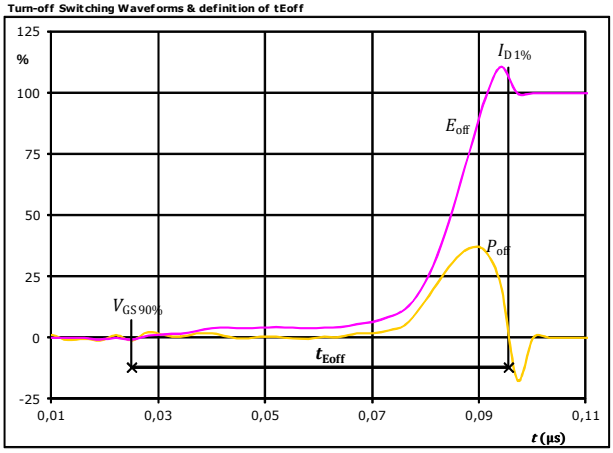


V_C (100%) =	600	V
I_D (100%) =	60	A
t_r =	0,009	µs

Inverter Switching Definitions

Figure 5. **MOSFET**

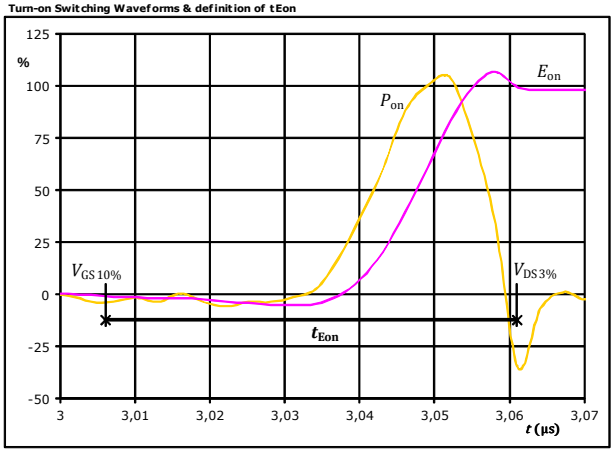
Turn-off Switching Waveforms & definition of tEoff



P_{off} (100%) =	36,02	kW
E_{off} (100%) =	0,18	mJ
t_{Eoff} =	0,07	µs

Figure 6. **MOSFET**

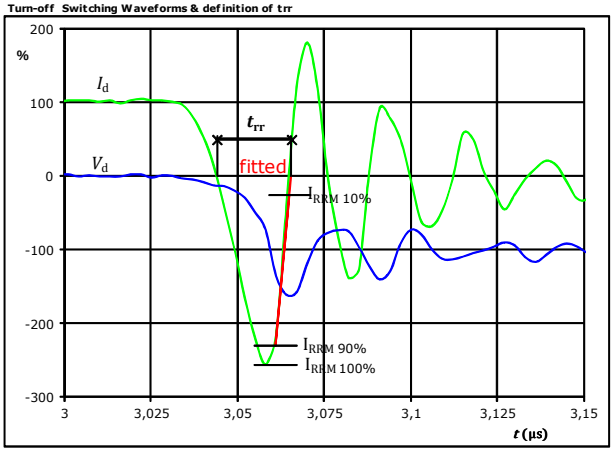
Turn-on Switching Waveforms & definition of tEon



P_{on} (100%) =	36,02	kW
E_{on} (100%) =	0,51	mJ
t_{Eon} =	0,05	µs

Figure 7. **FWD**

Turn-off Switching Waveforms & definition of trr

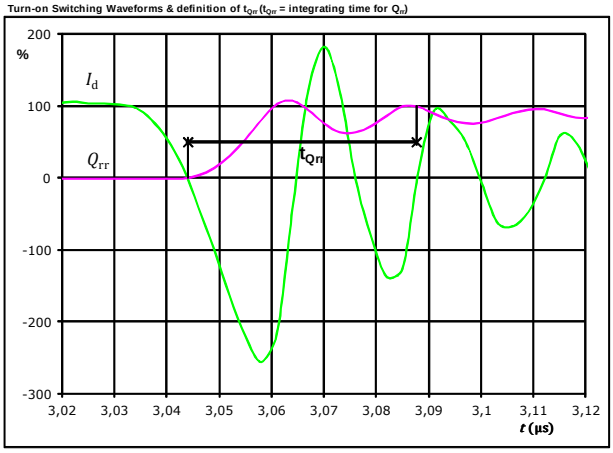


V_d (100%) =	600	V
I_d (100%) =	60	A
I_{RRM} (100%) =	-156	A
t_{rr} =	0,021	µs

Inverter Switching Definitions

Figure 8. **FWD**

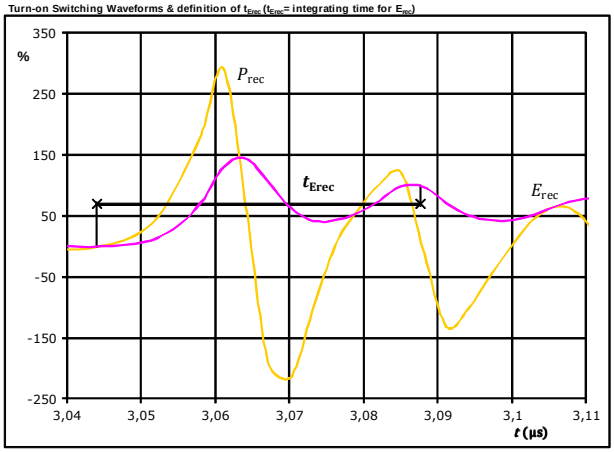
Turn-on Switching Waveforms & definition of t_{Qrr} (t_{Qrr} = integrating time for Q_{rr})



I_d (100%) =	60	A
Q_{rr} (100%) =	1,48	µC
t_{Qrr} =	0,04	µs

Figure 9. **FWD**

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



P_{rec} (100%) =	36,02	kW
E_{rec} (100%) =	0,30	mJ
t_{Erec} =	0,04	µs

Vincotech

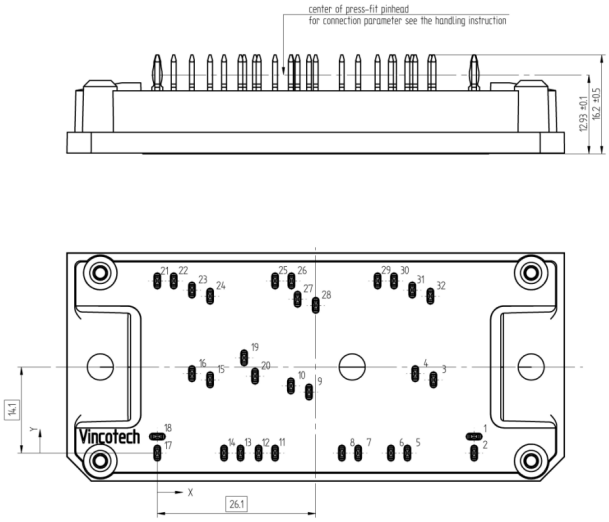
Ordering Code & Marking

Version	Ordering Code	in DataMatrix as	in packaging barcode as
without thermal paste 12mm housing	10-PY126PA020ME-L227F18Y	L227F18Y	L227F18Y
with thermal paste 12mm housing	10-PY126PA020ME-L227F18Y-/3/	L227F18Y	L227F18Y-/3/

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

Outline

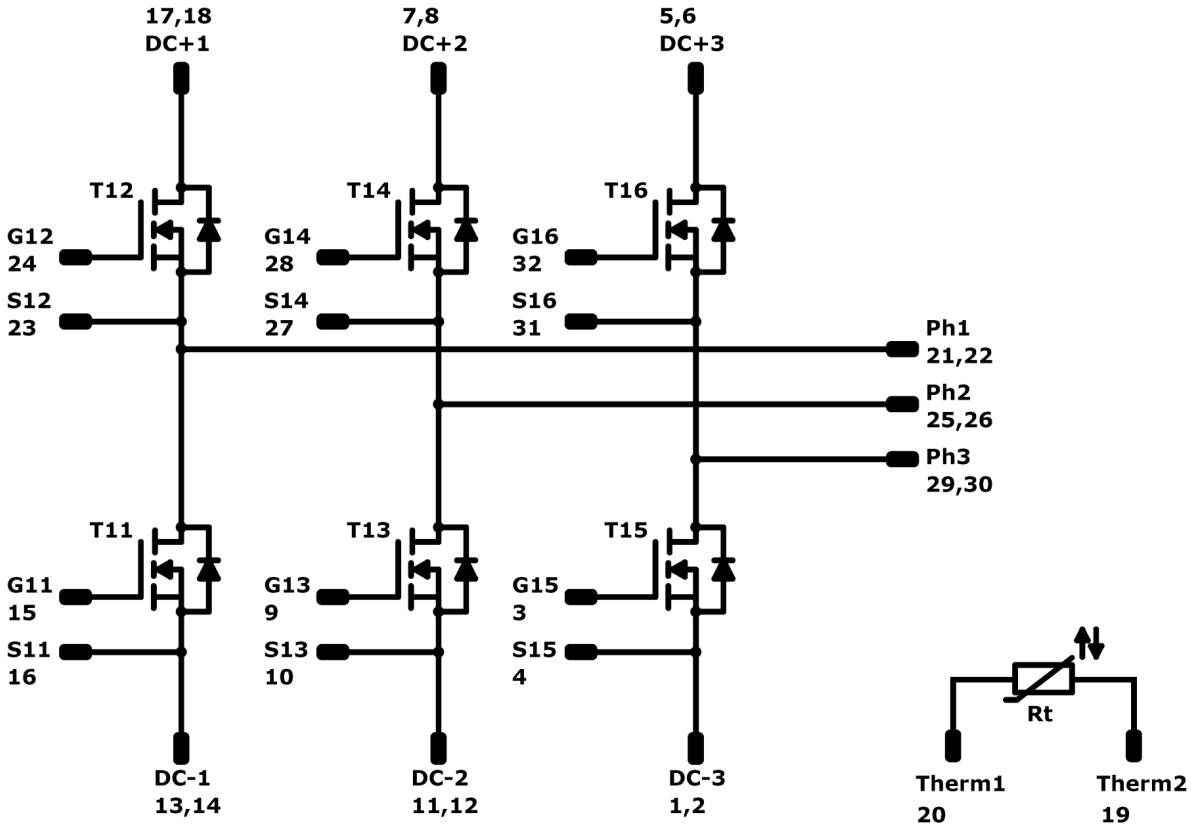
Pin table [mm]			
Pin	X	Y	Pos
1	52,2	2,7	DC-3
2	52,2	0	DC-3
3	45,5	12	G15
4	42,5	13	S15
5	41,2	0	DC+3
6	38,5	0	DC+3
7	33,1	0	DC+2
8	30,4	0	DC+2
9	25	10	G13
10	22	11	S13
11	19,4	0	DC-2
12	16,7	0	DC-2
13	13,7	0	DC-1
14	11	0	DC-1
15	8,7	12	G11
16	5,7	13	S11
17	0	0	DC+1
18	0	2,7	DC+1
19	14,3	15,6	Therm2
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



Tolerance of pinpositions ±0.5mm at the end of pins
Dimension of coordinate axis is only offset without tolerance

Pin table [mm]			
Pin	X	Y	Pos
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-T16	MOSFET	1200 V	20 mΩ	Inverter Switch	
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-PY126PA020ME-L227F18Y-D1-14	29 Sep. 2015		