10-E107L3A060ME-PM32L18Z
datasheet

***flow*3xNPFC 1** | **650 V / 60 mΩ**

Topology features

- 3xNeutral Boost PFC
- On-board Capacitors
- Temperature sensor

Component features

- High Blocking Voltage with low drain source on state resistance
- High speed SiC-MOSFET technology
- Resistant to Latch-up

Housing features

- Base isolation: Al_2O_3
- Convex shaped substrate for superior thermal contact
- Compact housing
- CTI600 housing material
- Thermo-mechanical push-and-pull force relief
- Solder pin

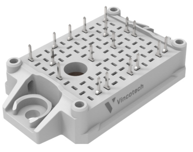
Target applications

- Embedded Drives
- Heat Pumps
- HVAC
- Industrial Drives

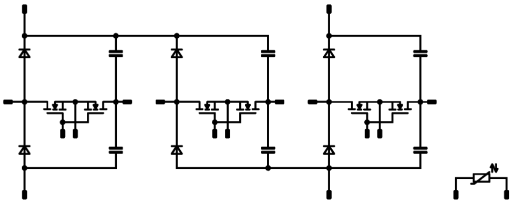
Types

- 10-E107L3A060ME-PM32L18Z

flow E1 12 mm housing



Schematic



Maximum Ratings

T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Conditions		Value	Unit
Boost Switch					
Drain-source voltage	V_{DSS}			650	V
Drain current (DC current)	I_D	$T_j = T_{jmax}$	T_s = 80 °C	22	A
Peak drain current	I_{DM}	t_p limited by T_{jmax}		99	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	47	W
Gate-source voltage	V_{GSS}			-4 / 15	V
		dynamic		-8 / 19	
Maximum Junction Temperature	T_{jmax}			175	°C
Boost Diode					
Peak repetitive reverse voltage	V_{RRM}			1200	V
Forward current (DC current)	I_F	$T_j = T_{jmax}$	T_s = 80 °C	30	A
Repetitive peak forward current	I_{FRM}	t_p limited by T_{jmax}		51	A
Surge (non-repetitive) forward current	I_{FSM}	Single Half Sine Wave, t_p = 10 ms	T_j = 110 °C	129	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	63	W
Maximum junction temperature	T_{jmax}			175	°C
Capacitor (PFC)					
Maximum DC voltage	V_{MAX}			630	V
Operation Temperature	T_{op}			-55 ... 150	°C

Maximum Ratings

T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Conditions		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
Creepage distance				>12,7	mm
Clearance				9,12	mm
Comparative Tracking Index	CTI			≥ 600	

*100 % tested in production

Characteristic Values

Parameter	Symbol	Conditions	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	Unit
Boost Switch										
Static										
Drain-source on-state resistance	$r_{DS(on)}$		15		13,2	25 125 150	42	77 84,3 87,3	79(1)	mΩ
Gate-source threshold voltage	$V_{GS(th)}$				0,005	25	1,8	2,6	3,6	V
Gate to Source Leakage Current	I_{GSS}		15	0		25		10	100	nA
Zero Gate Voltage Drain Current	I_{DSS}		0	650		25		1	50	μA
Internal gate resistance	r_g							3		Ω
Gate charge	Q_g		-4/15	400	13,2	25		46		nC
Short-circuit input capacitance	C_{iss}	f = 1 Mhz	0	600	0	25		1000		pF
Short-circuit output capacitance	C_{oss}							80		
Reverse transfer capacitance	C_{rss}							9		
Diode forward voltage	V_{SD}		0		6,6	25		5,1		V
Thermal										
Thermal resistance junction to sink(2)	$R_{th(j-s)}$	λ_{paste} = 5,2 W/mK (PTM)						2,04		K/W
Dynamic										
Turn-on delay time	$t_{d(on)}$	R_{gon} = 8 Ω R_{goff} = 8 Ω	-4/15	350	16	25 125 150		17,38 16,02 15,71		ns
Rise time	t_r					25 125 150		12,32 11,32 11,13		ns
Turn-off delay time	$t_{d(off)}$					25 125 150		47,28 51,5 52,95		ns
Fall time	t_f					25 125 150		23,05 27,21 21,61		ns
Turn-on energy (per pulse)	E_{on}	Q_{rFWD}=0,157 μC Q_{rFWD}=0,165 μC Q_{rFWD}=0,167 μC				25 125 150		0,118 0,117 0,115		mWs
Turn-off energy (per pulse)	E_{off}					25 125 150		0,022 0,026 0,026		mWs

Characteristic Values

Parameter	Symbol	Conditions					Values			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	
Boost Diode										
Static										
Forward voltage	V_F				20	25 125 150		1,33 1,54 1,62	2(1)	V
Reverse leakage current	I_R	V_r = 1200 V				25		5	500	µA
Thermal										
Thermal resistance junction to sink(2)	$R_{th(j-s)}$	λ_{paste} = 5,2 W/mK (PTM)						1,51		K/W
Dynamic										
Peak recovery current	I_{RM}	di/dt=1482 A/µs di/dt=1577 A/µs di/dt=1609 A/µs	-4/15	350	16	25 125 150		12,69 13,59 13,92		A
Reverse recovery time	t_{rr}					25 125 150		21,5 20,38 20,1		ns
Recovered charge	Q_r					25 125 150		0,157 0,165 0,167		µC
Reverse recovered energy	E_{rec}					25 125 150		0,025 0,028 0,028		mWs
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 125 150		1057,62 1074,77 1165,22		A/µs

Characteristic Values

Parameter	Symbol	Conditions					Values			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	
Capacitor (PFC)										
Static										
Capacitance	C	DC bias voltage = 0 V				25		33		nF
Tolerance							-5		5	%
Thermistor										
Static										
Rated resistance	R					25		5		kΩ
Deviation of R100	$\Delta_{R/R}$	R_{100} = 499 Ω				100	3,2		3,3	%
Power dissipation	P					25		130		mW
Power dissipation constant	d					25		1,3		mW/K
B-value	$B_{(25/50)}$	Tol. ±1 %						3380		K
Vincotech Thermistor Reference									V	

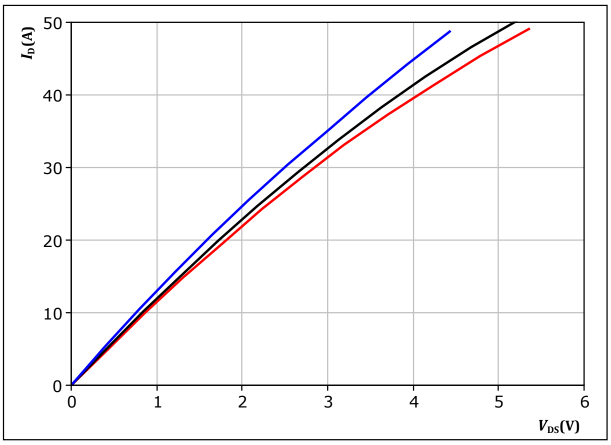
(1) Value at chip level
(2) Only valid with pre-applied Vincotech thermal interface material.

Boost Switch Characteristics

figure 1. **MOSFET**

Typical output characteristics

$I_D = f(V_{DS})$

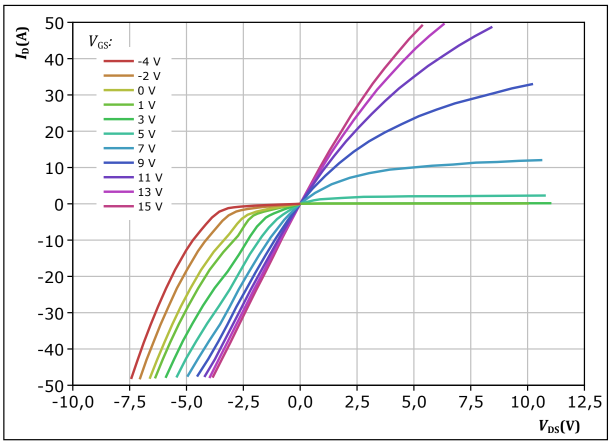


t_p = 250 µs
V_{GS} = 15 V
T_j: 25 °C, 125 °C, 150 °C

figure 2. **MOSFET**

Typical output characteristics

$I_D = f(V_{DS})$

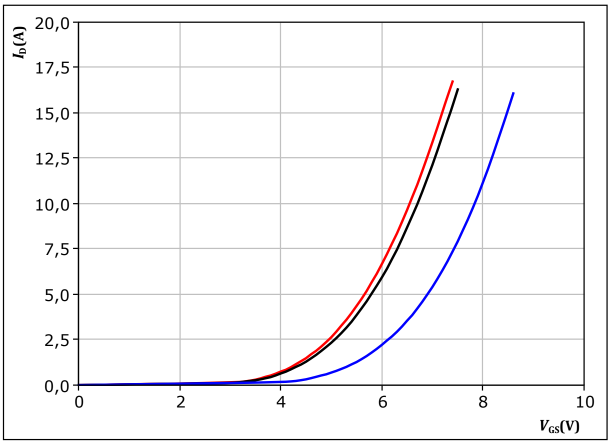


t_p = 250 µs
T_j = 150 °C
V_{GS} from -4 V to 15 V in steps of 2 V

figure 3. **MOSFET**

Typical transfer characteristics

$I_D = f(V_{GS})$

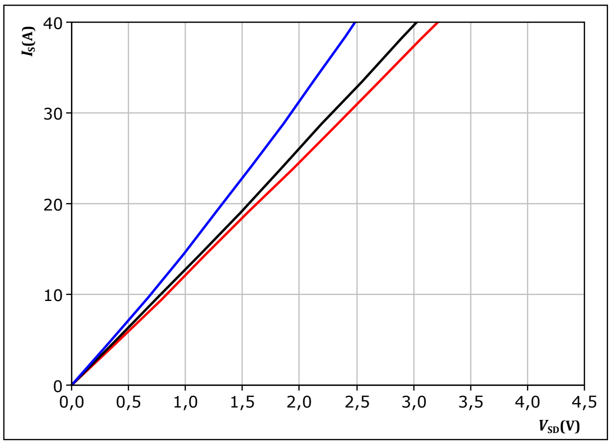


t_p = 250 µs
V_{DS} = 10 V
T_j: 25 °C, 125 °C, 150 °C

figure 4. **MOSFET**

Typical reverse drain current characteristics

$I_{SD} = f(V_{SD})$



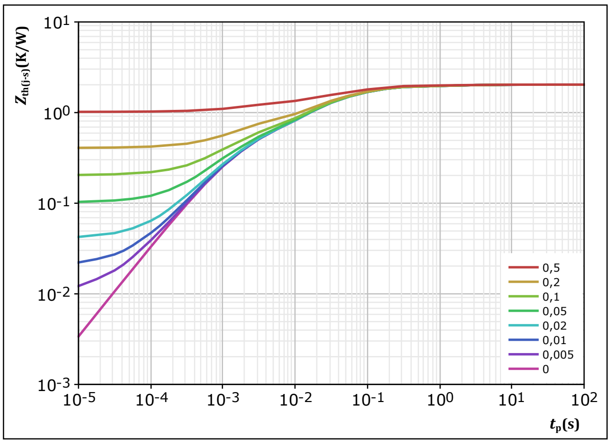
t_p = 250 µs
V_{GS} = 15 V
T_j: 25 °C, 125 °C, 150 °C

Boost Switch Characteristics

figure 5. **MOSFET**

Transient thermal impedance as a function of pulse width

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



D =	t_p / T	
$R_{th(j-s)}$ =	2,036	K/W

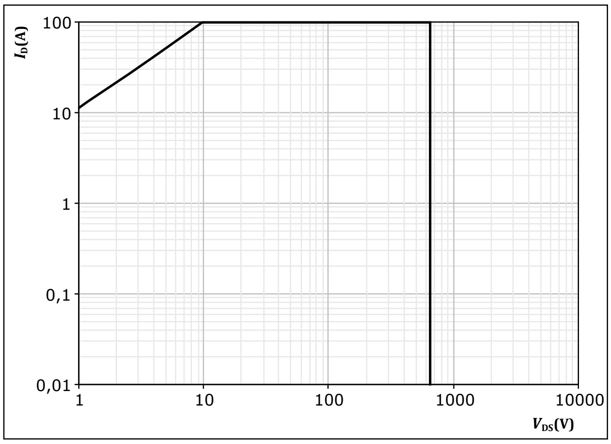
MOSFET thermal model values

R (K/W)	τ (s)
1,74E-02	8,78E+00
1,01E-01	1,50E+00
6,98E-01	9,13E-02
8,28E-01	1,78E-02
3,92E-01	1,37E-03

figure 6. **MOSFET**

Safe operating area

I_D = f(V_{DS})

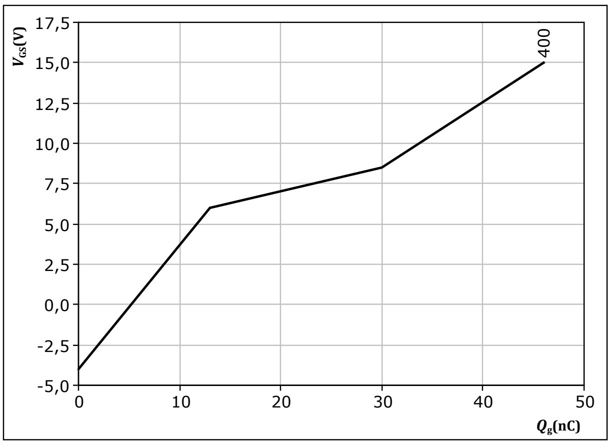


D =	single pulse	
T_s =	80	°C
V_{GS} =	15	V
T_j =	T_{jmax}	

figure 7. **MOSFET**

Gate voltage vs gate charge

V_{GS} = f(Q_g)



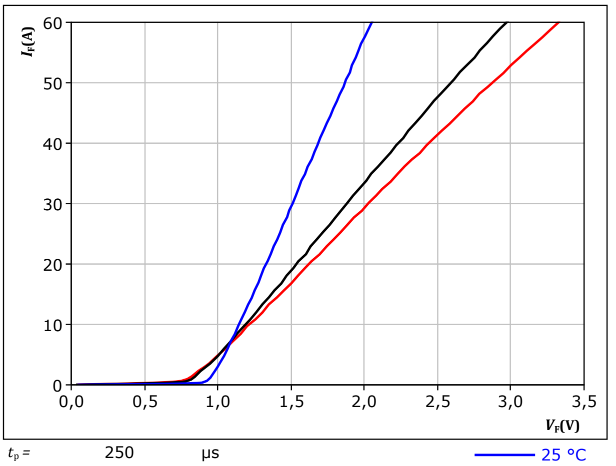
I_D =	13.2	A
T_j =	25	°C

Boost Diode Characteristics

figure 8. FWD

Typical forward characteristics

I_F = f(V_F)



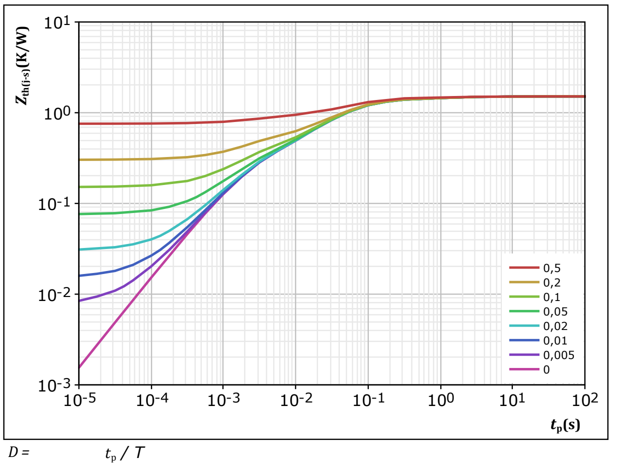
t_p = 250 μs

T_j: 25 °C, 125 °C, 150 °C

figure 9. FWD

Transient thermal impedance as a function of pulse width

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



D = t_p / T

$R_{th(j-s)}$ = 1,512 K/W

FWD thermal model values

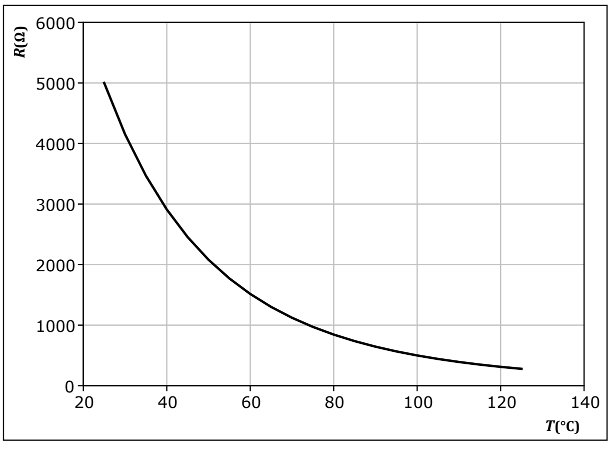
R (K/W)	τ (s)
1,90E-02	7,99E+00
1,12E-01	1,12E+00
4,92E-01	9,11E-02
6,45E-01	2,72E-02
2,44E-01	1,93E-03

Thermistor Characteristics

figure 10. **Thermistor**

Typical NTC characteristic as function of temperature

R_T = f(T)

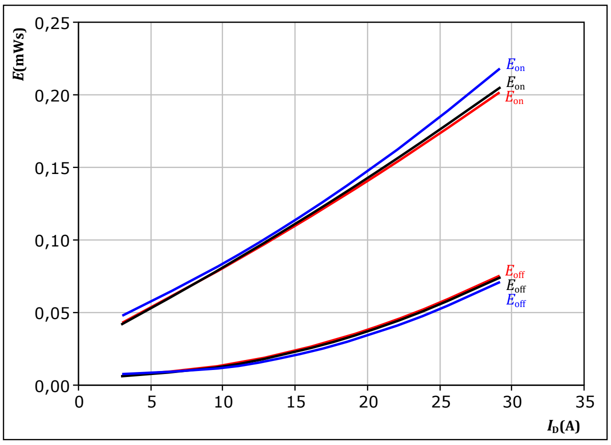


Boost Switching Characteristics

figure 11. **MOSFET**

Typical switching energy losses as a function of drain current

$E = f(I_D)$



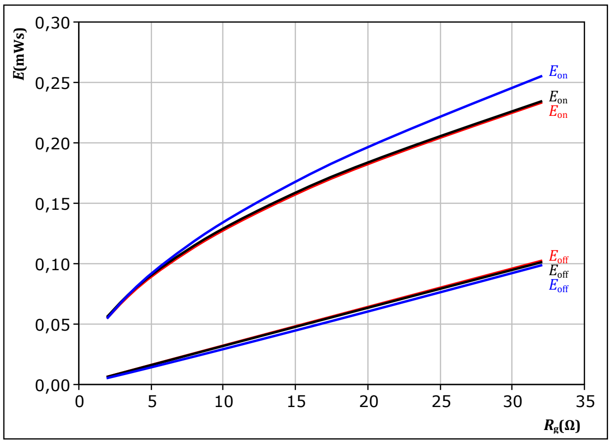
With an inductive load at

V_{DS} =	350	V	T_j:	25 °C
V_{GS} =	-4/15	V		125 °C
R_{gon} =	8	Ω		150 °C
R_{goff} =	8	Ω		

figure 12. **MOSFET**

Typical switching energy losses as a function of MOSFET turn on gate resistor

$E = f(R_g)$



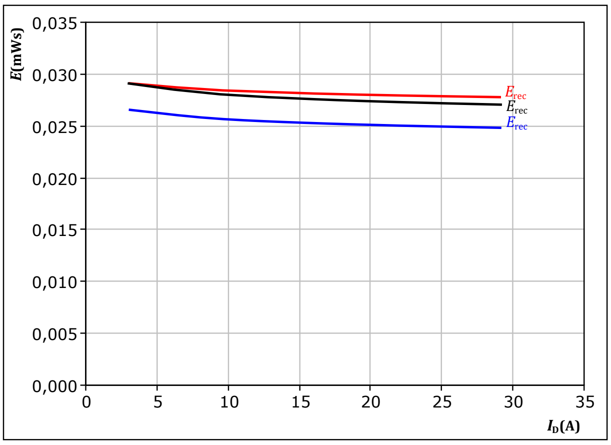
With an inductive load at

V_{DS} =	350	V	T_j:	25 °C
V_{GS} =	-4/15	V		125 °C
I_D =	16	A		150 °C

figure 13. **FWD**

Typical reverse recovered energy loss as a function of drain current

$E_{rec} = f(I_D)$



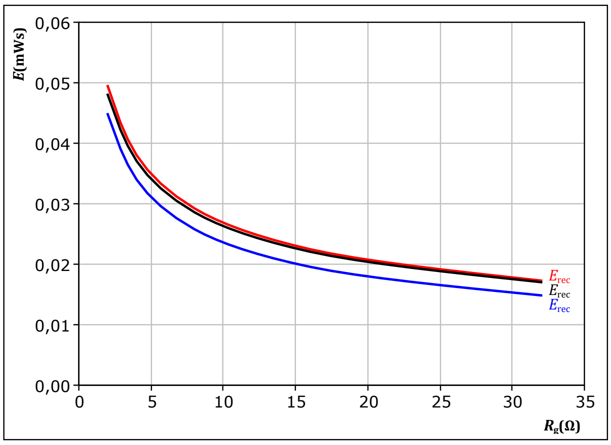
With an inductive load at

V_{DS} =	350	V	T_j:	25 °C
V_{GS} =	-4/15	V		125 °C
R_{gon} =	8	Ω		150 °C

figure 14. **FWD**

Typical reverse recovered energy loss as a function of MOSFET turn on gate resistor

$E_{rec} = f(R_g)$



With an inductive load at

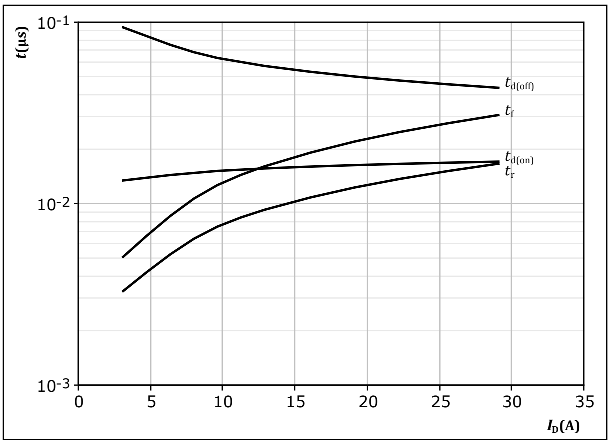
V_{DS} =	350	V	T_j:	25 °C
V_{GS} =	-4/15	V		125 °C
I_D =	16	A		150 °C

Boost Switching Characteristics

figure 15. **MOSFET**

Typical switching times as a function of drain current

t = f(I_D)



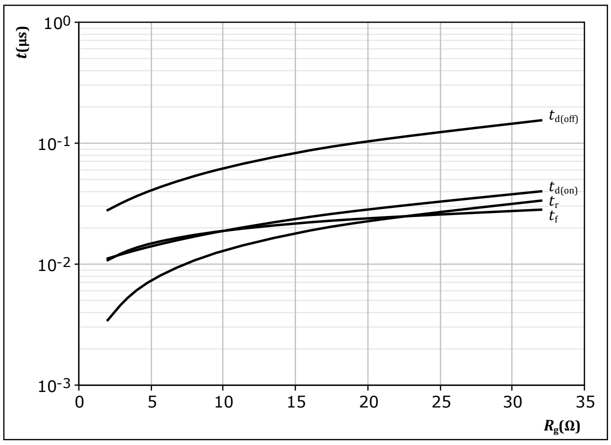
With an inductive load at

T_j =	150	°C
V_{DS} =	350	V
V_{GS} =	-4/15	V
R_{gon} =	8	Ω
R_{goff} =	8	Ω

figure 16. **MOSFET**

Typical switching times as a function of MOSFET turn on gate resistor

t = f(R_g)



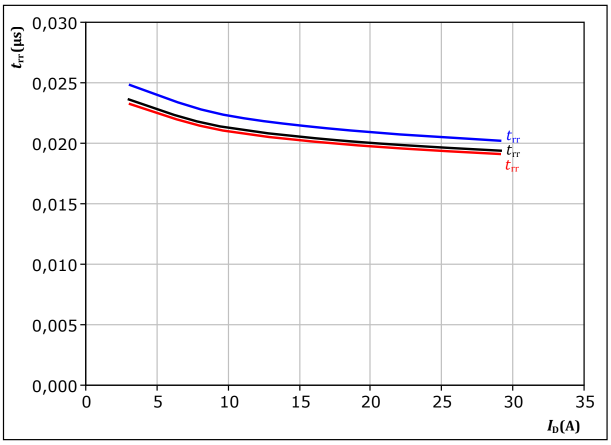
With an inductive load at

T_j =	150	°C
V_{DS} =	350	V
V_{GS} =	-4/15	V
I_D =	16	A

figure 17. **FWD**

Typical reverse recovery time as a function of drain current

t_{rr} = f(I_D)



At

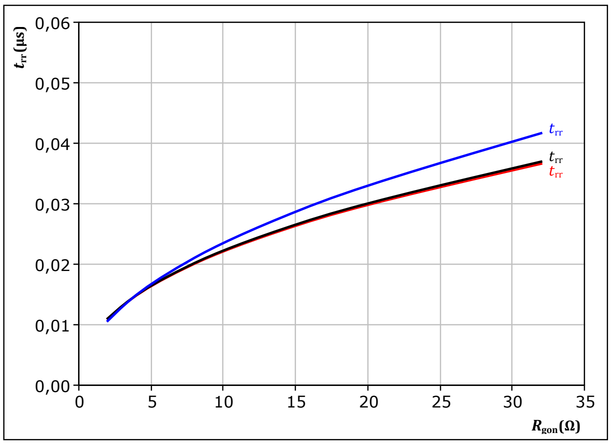
V_{DS} =	350	V
V_{GS} =	-4/15	V
R_{gon} =	8	Ω

T_j: 25 °C, 125 °C, 150 °C

figure 18. **FWD**

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

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



At

V_{DS} =	350	V
V_{GS} =	-4/15	V
I_D =	16	A

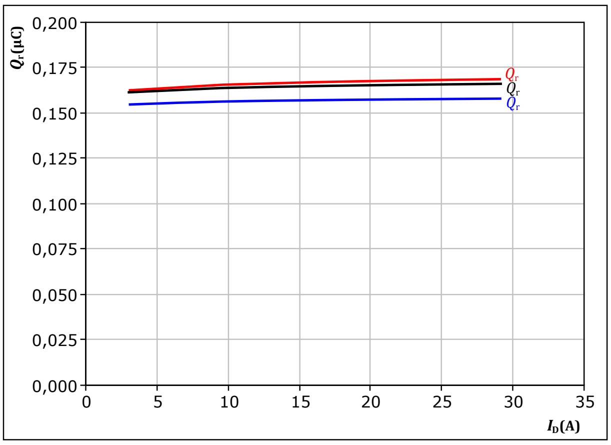
T_j: 25 °C, 125 °C, 150 °C

Boost Switching Characteristics

figure 19. **FWD**

Typical recovered charge as a function of drain current

Q_r = f(I_D)

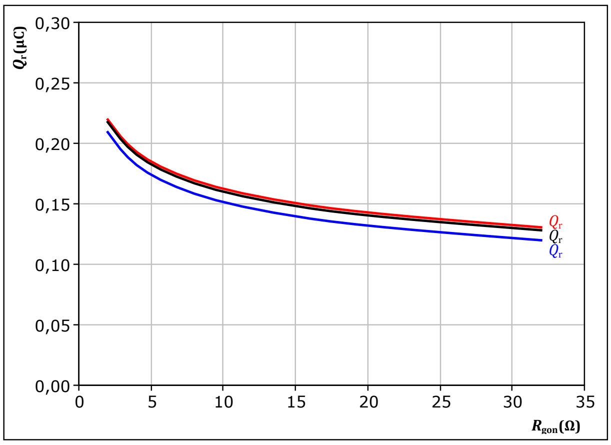


At					
	V_{DS} =	350	V		25 °C
	V_{GS} =	-4/15	V	T_j:	125 °C
	R_{gon} =	8	Ω		150 °C

figure 20. **FWD**

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

Q_r = f(R_{gon})

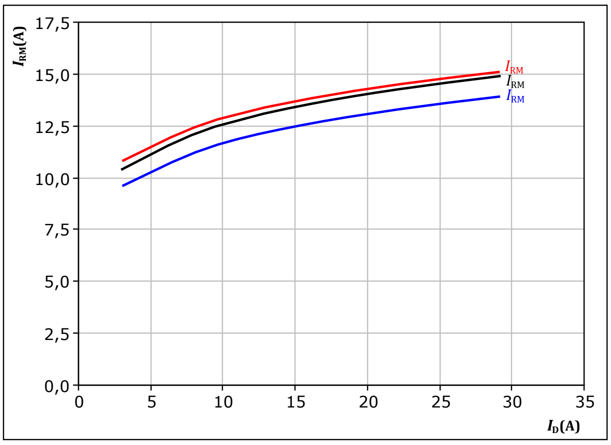


At					
	V_{DS} =	350	V		25 °C
	V_{GS} =	-4/15	V	T_j:	125 °C
	I_D =	16	A		150 °C

figure 21. **FWD**

Typical peak reverse recovery current as a function of drain current

I_{RM} = f(I_D)

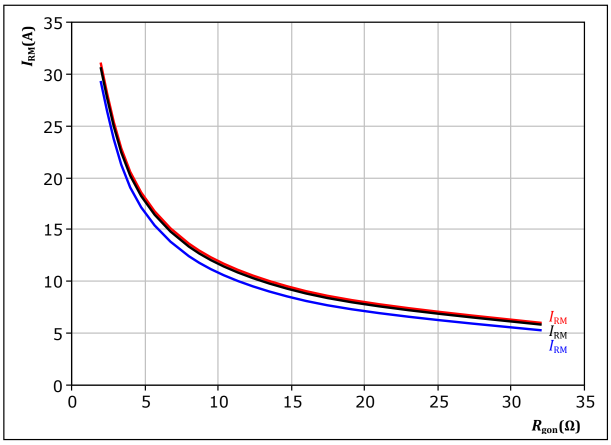


At					
	V_{DS} =	350	V		25 °C
	V_{GS} =	-4/15	V	T_j:	125 °C
	R_{gon} =	8	Ω		150 °C

figure 22. **FWD**

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

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



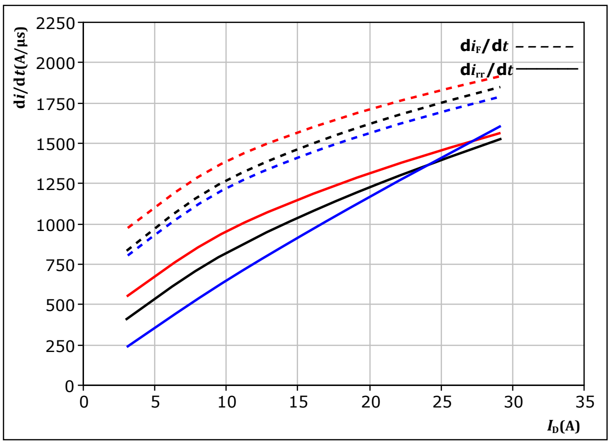
At					
	V_{DS} =	350	V		25 °C
	V_{GS} =	-4/15	V	T_j:	125 °C
	I_D =	16	A		150 °C

Boost Switching Characteristics

figure 23. FWD

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

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

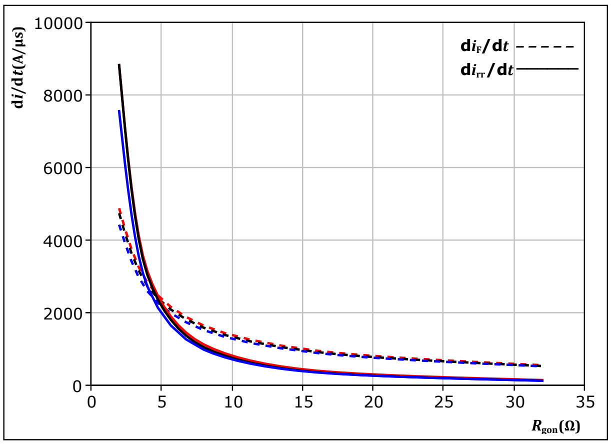


At					
	V_{DS} =	350	V		25 °C
	V_{GS} =	-4/15	V	T_j:	125 °C
	R_{gon} =	8	Ω		150 °C

figure 24. FWD

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

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

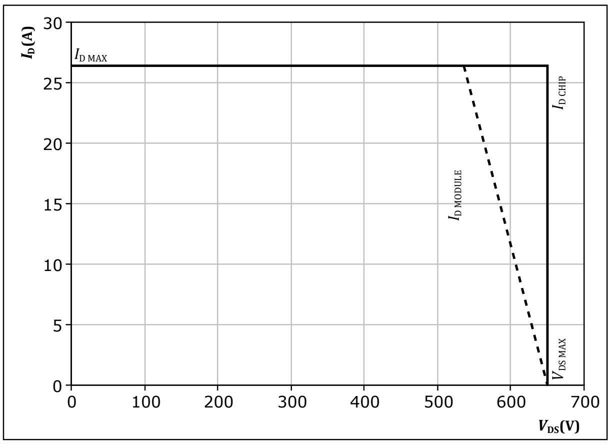


At					
	V_{DS} =	350	V		25 °C
	V_{GS} =	-4/15	V	T_j:	125 °C
	I_D =	16	A		150 °C

figure 25. MOSFET

Reverse bias safe operating area

$I_D = f(V_{DS})$



At			
	T_j =	150	°C
	R_{gon} =	8	Ω
	R_{goff} =	8	Ω

Boost Switching Definitions

figure 26. **MOSFET**

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

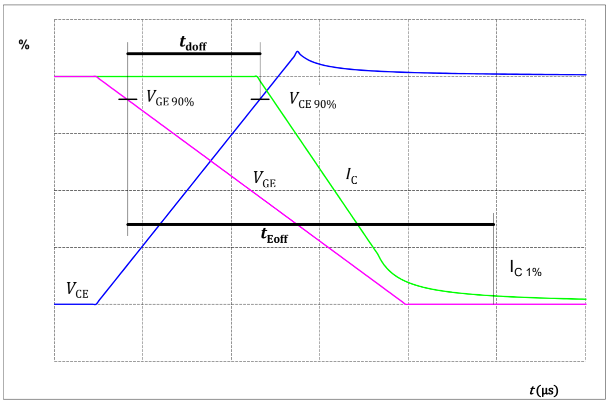


figure 27. **MOSFET**

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

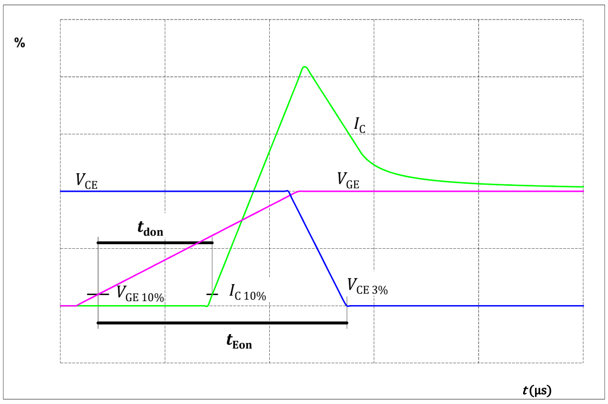


figure 28. **MOSFET**

Turn-off Switching Waveforms & definition of t_f

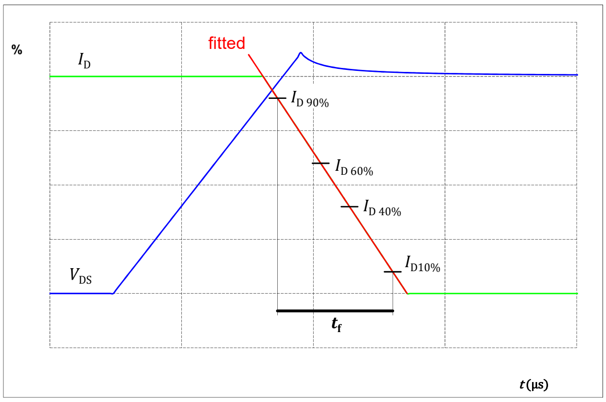
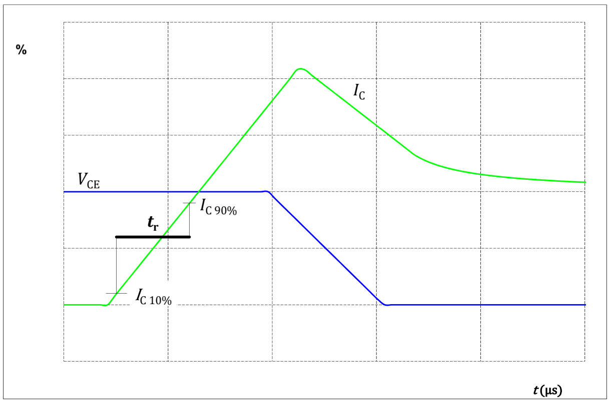


figure 29. **MOSFET**

Turn-on Switching Waveforms & definition of t_r



Boost Switching Definitions

figure 30. **FWD**

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

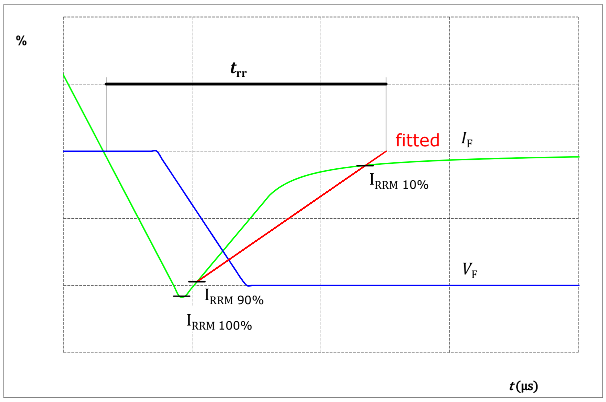


figure 31. **FWD**

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

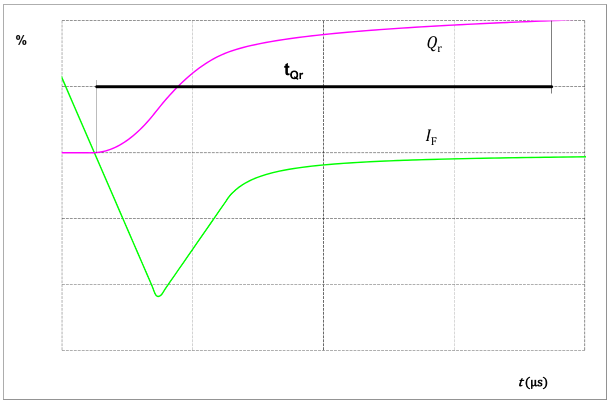
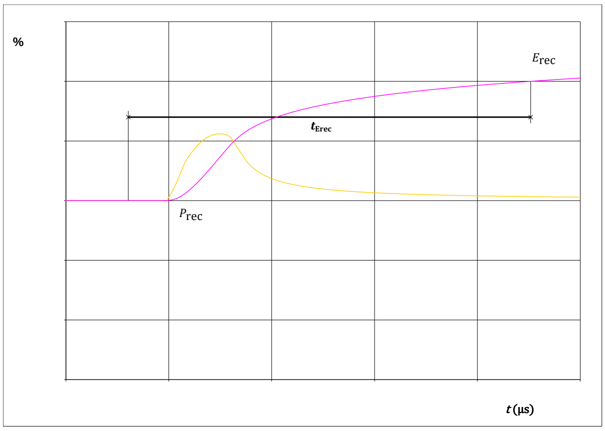


figure 32. **FWD**

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



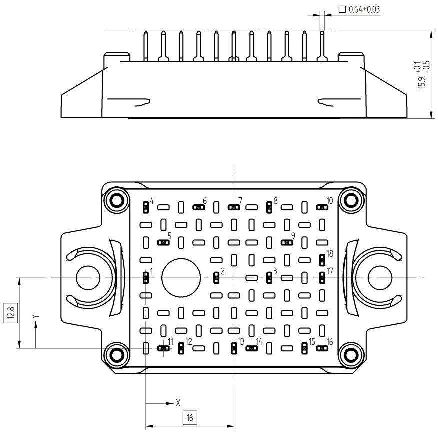
Ordering Code	
Version	**Ordering Code**
Without thermal paste	10-E107L3A060ME-PM32L18Z
With thermal paste (5,2 W/mK, PTM6000HV)	10-E107L3A060ME-PM32L18Z-/7/

Marking

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

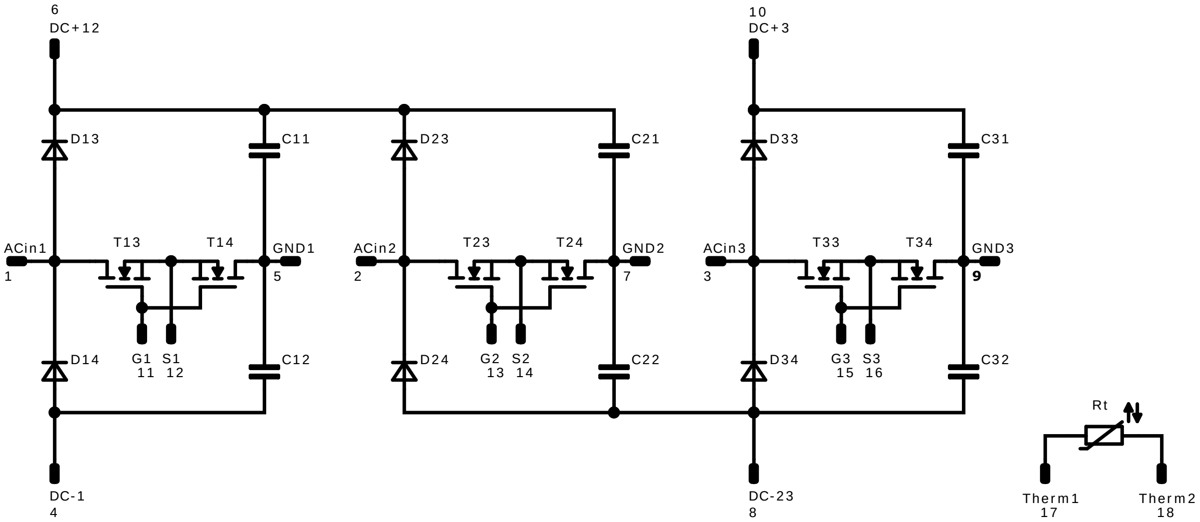
Outline

Pin table [mm]			
Pin	X	Y	Function
1	0	12,8	ACIn1
2	12,8	12,8	ACIn2
3	22,4	12,8	ACIn3
4	0	25,6	DC-1
5	3,2	19,2	GND1
6	9,6	25,6	DC+12
7	16	25,6	GND2
8	22,4	25,6	DC-23
9	25,6	19,2	GND3
10	32	25,6	DC+3
11	3,2	0	G1
12	6,4	0	S1
13	16	0	G2
14	19,2	0	S2
15	28,8	0	G3
16	32	0	S3
17	32	12,8	Therm1
18	32	16	Therm2



Tolerance of pinpositions: ±0.4mm at the end of pins
Dimension of coordinate axis is only offset without tolerance

Pinout



Identification

ID	Component	Voltage	Current	Function	Comment
C11, C12, C13, C14, C15, C16	Capacitor	630 V		Capacitor (PFC)	
T13, T14, T23, T24, T33, T34	MOSFET	650 V	60 mΩ	Boost Switch	
D13, D14, D23, D24, D33, D34	FWD	1200 V	20 A	Boost Diode	
Rt	Thermistor			Thermistor	

Packaging instruction				
Standard packaging quantity (SPQ) 100	>SPQ	Standard	<SPQ	Sample

Handling instruction
Handling instructions for *flow* E1 packages see vincotech.com website.

Package data
Package data for *flow* E1 packages see vincotech.com website.

Vincotech thermistor reference
See Vincotech thermistor reference table at vincotech.com website.

UL recognition and file number
This device is UL 1557 recognized under E192116 up to a junction temperature under switching condition $T_{j,op}$=175°C and up to 3500VAC/1min isolation voltage. For more information see vincotech.com website.

Document No.:	Date:	Modification:	Pages
10-E107L3A060ME-PM32L18Z-D1-14	13 Sep. 2024	Initial Release	

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2. A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.