Vincotech

10-EY124PA016ME-LP49F18T
datasheet

fastPACK E2 SiC | **1200 V / 16 mΩ**

Features

- Compact and low inductive design
- High frequency SiC MOSFET
- Integrated NTC

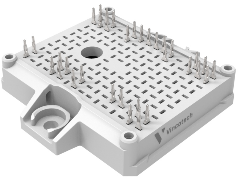
Target applications

- Charging Stations
- Power Supply
- Welding & Cutting

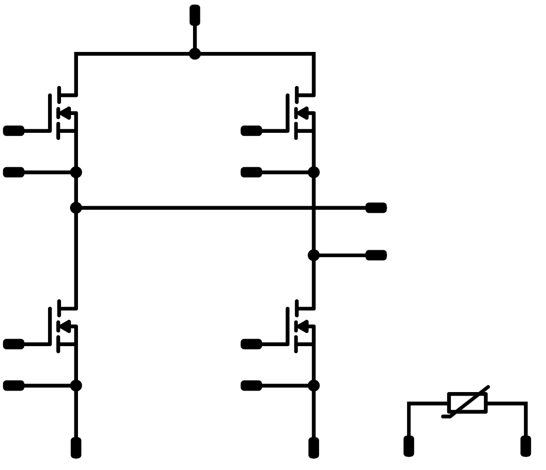
Types

- 10-EY124PA016ME-LP49F18T

flow E2 12 mm housing



Schematic



Maximum Ratings

T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Conditions		Value	Unit
H-Bridge Switch - Lo side					
Drain-source voltage	V_{DSS}			1200	V
Drain current	I_D	$T_j = T_{jmax}$	T_s = 80 °C	71	A
Peak drain current	I_{DM}	t_p limited by T_{jmax}		240	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	126	W
Gate-source voltage	V_{GSS}			-4 / 15	V
Maximum Junction Temperature	T_{jmax}			175	°C
H-Bridge Switch - Hi side					
Drain-source voltage	V_{DSS}			1200	V
Drain current	I_D	$T_j = T_{jmax}$	T_s = 80 °C	71	A
Peak drain current	I_{DM}	t_p limited by T_{jmax}		240	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	126	W
Gate-source voltage	V_{GSS}			-4 / 15	V
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 Test Voltage*	t_p = 2 s	6000	V
Isolation voltage	V_{isol}	AC Voltage	t_p = 1 min	2500	V
Creepage distance				min. 12,7	mm
Clearance				9,14	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
H-Bridge Switch - Lo side										
Static										
Drain-source on-state resistance	$r_{DS(on)}$		15		80	25 125 150	11,2	17 21 23	20,8	mΩ
Gate-source threshold voltage	$V_{GS(th)}$		0		0,02	25	1,8	2,5	3,6	V
Gate to Source Leakage Current	I_{GSS}		15	0		25		20	500	nA
Zero Gate Voltage Drain Current	I_{DSS}		0	0	0	25		2	38	µA
Internal gate resistance	r_g							0,85		Ω
Gate charge	Q_g		-4/15	800	80	25		236		nC
Short-circuit input capacitance	C_{iss}	f = 100 kHz	0	1000	0	25		6714		pF
Short-circuit output capacitance	C_{oss}							258		
Reverse transfer capacitance	C_{rss}							16		
Diode forward voltage	V_{SD}		0		40	25		4,6		V
Thermal										
Thermal resistance junction to sink*	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						0,75		K/W

*Only valid with pre-applied Vincotech thermal interface material.

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
Dynamic										
Turn-on delay time	$t_{d(on)}$	R_{gon} = 2 Ω R_{goff} = 2 Ω	-4/15	600	64	25 125 150		19,84 18,88 18,56		ns
Rise time	t_r					25 125 150		6,72 6,4 6,4		ns
Turn-off delay time	$t_{d(off)}$					25 125 150		42,24 44,8 45,76		ns
Fall time	t_f					25 125 150		9,4 9,22 9,44		ns
Turn-on energy (per pulse)	E_{on}	Q_{rFWD}=0,776 µC Q_{rFWD}=1,06 µC Q_{rFWD}=1,17 µC				25 125 150		0,365 0,35 0,366		mWs
Turn-off energy (per pulse)	E_{off}					25 125 150		0,125 0,118 0,129		mWs

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
H-Bridge Switch - Hi side										
Static										
Drain-source on-state resistance	$r_{DS(on)}$		15		80	25 125 150	11,2	17 21 23	20,8	mΩ
Gate-source threshold voltage	$V_{GS(th)}$		0		0,02	25	1,8	2,5	3,6	V
Gate to Source Leakage Current	I_{GSS}		15	0		25		20	500	nA
Zero Gate Voltage Drain Current	I_{DSS}		0	0	0	25		2	38	µA
Internal gate resistance	r_g							0,85		Ω
Gate charge	Q_g		-4/15	800	80	25		236		nC
Short-circuit input capacitance	C_{iss}	f = 100 kHz	0	1000	0	25		6714		pF
Short-circuit output capacitance	C_{oss}							258		
Reverse transfer capacitance	C_{rss}							16		
Diode forward voltage	V_{SD}		0		40	25		4,6		V
Thermal										
Thermal resistance junction to sink*	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						0,75		K/W

*Only valid with pre-applied Vincotech thermal interface material.

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
Dynamic										
Turn-on delay time	$t_{d(on)}$	R_{gon} = 2 Ω R_{goff} = 2 Ω	-4/15	600	64	25 125 150		19,84 18,88 18,56		ns
Rise time	t_r					25 125 150		6,72 6,4 6,4		ns
Turn-off delay time	$t_{d(off)}$					25 125 150		42,24 44,8 45,76		ns
Fall time	t_f					25 125 150		9,4 9,22 9,44		ns
Turn-on energy (per pulse)	E_{on}	Q_{rFWD}=0,776 µC Q_{rFWD}=1,06 µC Q_{rFWD}=1,17 µC				25 125 150		0,365 0,35 0,366		mWs
Turn-off energy (per pulse)	E_{off}					25 125 150		0,125 0,118 0,129		mWs

Characteristic Values

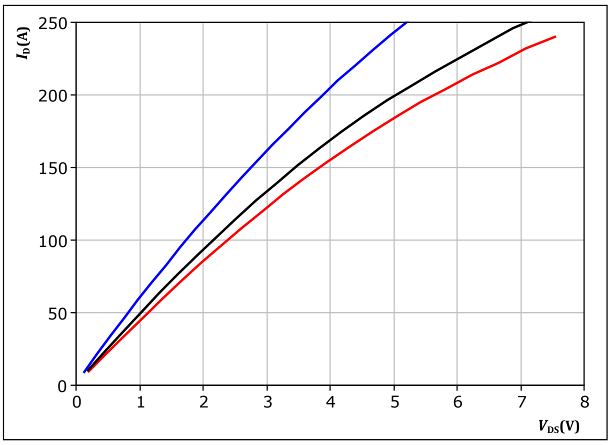
Parameter	Symbol	Conditions					Values			Unit
			V_{GE} [V] V_{GS} [V]	V_{CE} [V] V_{DS} [V] V_F [V]	I_C [A] I_D [A] I_F [A]	T_j [°C]	Min	Typ	Max	
Thermistor										
Static										
Rated resistance	R					25		5		kΩ
Deviation of R_{100}	$\Delta_{R/R}$	R_{100} = 493 Ω				100	-5		5	%
Power dissipation	P							245		mW
Power dissipation constant	d					25		1,4		mW/K
B-value	$B_{(25/50)}$	Tol. ±2 %						3375		K
B-value	$B_{(25/100)}$	Tol. ±2 %						3437		K
Vincotech Thermistor Reference									K	

H-Bridge Switch - Lo side Characteristics

figure 1. **MOSFET**

Typical output characteristics

$I_D = f(V_{DS})$



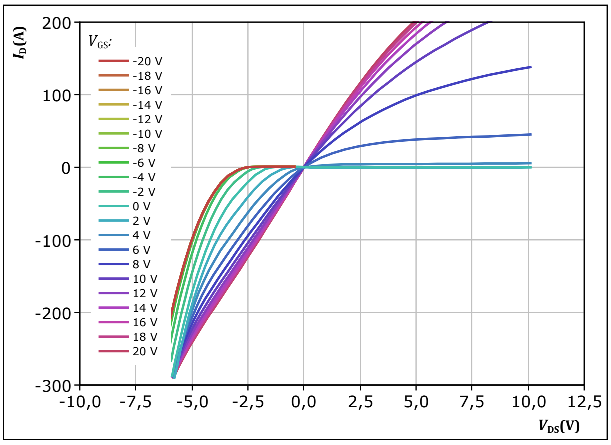
t_p = 250 µs
V_{GS} = 14 V

T_j: 25 °C, 125 °C, 150 °C

figure 2. **MOSFET**

Typical output characteristics

$I_D = f(V_{DS})$

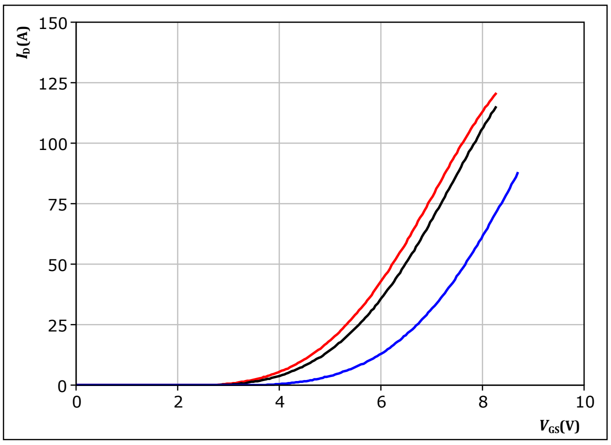


t_p = 250 µs
T_j = 150 °C
V_{GS} from -20 V to 20 V in steps of 2 V

figure 3. **MOSFET**

Typical transfer characteristics

$I_D = f(V_{GS})$



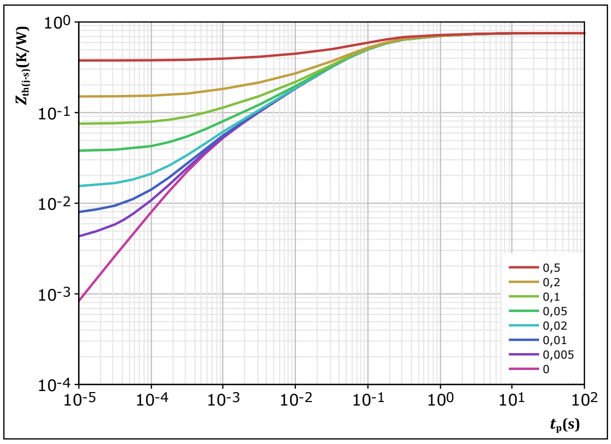
t_p = 250 µs
V_{DS} = 10 V

T_j: 25 °C, 125 °C, 150 °C

figure 4. **MOSFET**

Transient thermal impedance as a function of pulse width

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



D = t_p / T
$R_{th(j-s)}$ = 0,752 K/W

IGBT thermal model values

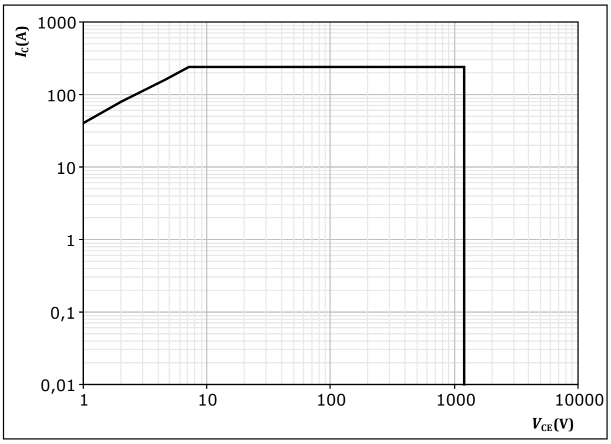
R (K/W)	τ (s)
5,19E-02	2,61E+00
9,26E-02	5,45E-01
3,53E-01	9,51E-02
1,55E-01	2,37E-02
6,57E-02	3,84E-03
3,38E-02	5,95E-04

H-Bridge Switch - Lo side Characteristics

figure 5.	MOSFET

Safe operating area

I_C = f(V_{CE})



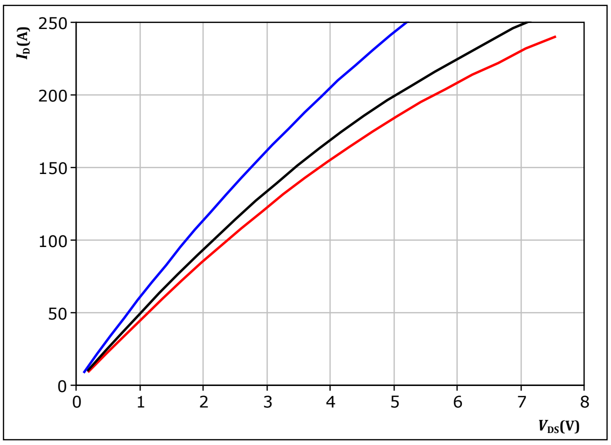
D = single pulse
T_s = 80 °C
V_{GE} = 14 V
T_j = T_{jmax}

H-Bridge Switch - Hi side Characteristics

figure 6. **MOSFET**

Typical output characteristics

$I_D = f(V_{DS})$

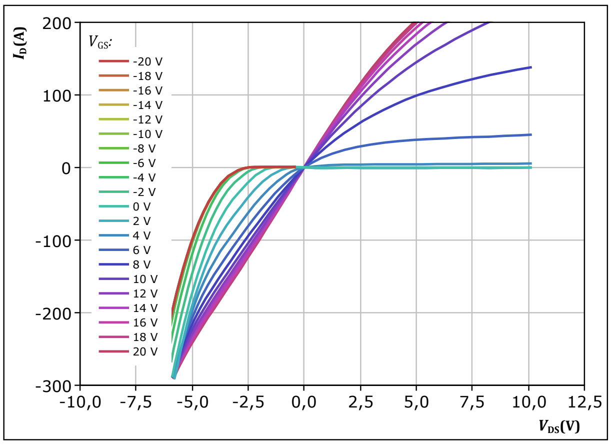


t_p =	250	µs		25 °C
V_{GS} =	14	V	T_j:	125 °C
				150 °C

figure 7. **MOSFET**

Typical output characteristics

$I_D = f(V_{DS})$



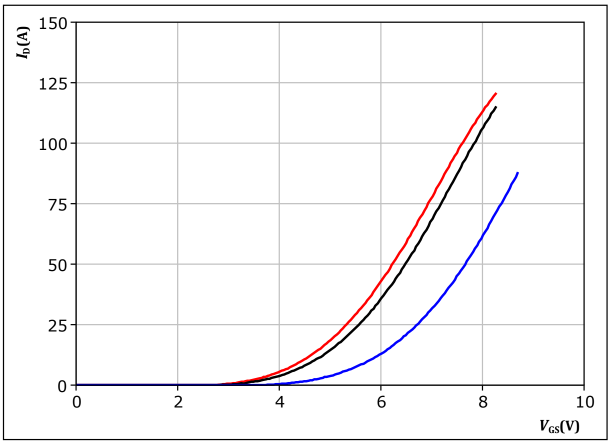
t_p =	250	µs
T_j =	150	°C

V_{GS} from -20 V to 20 V in steps of 2 V

figure 8. **MOSFET**

Typical transfer characteristics

$I_D = f(V_{GS})$

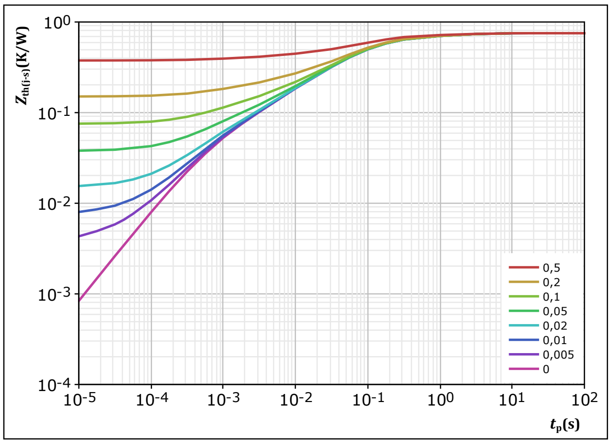


t_p =	250	µs		25 °C
V_{DS} =	10	V	T_j:	125 °C
				150 °C

figure 9. **MOSFET**

Transient thermal impedance as a function of pulse width

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



D =	t_p / T	
$R_{th(j-s)}$ =	0,752	K/W

IGBT thermal model values

R (K/W)	τ (s)
5,19E-02	2,61E+00
9,26E-02	5,45E-01
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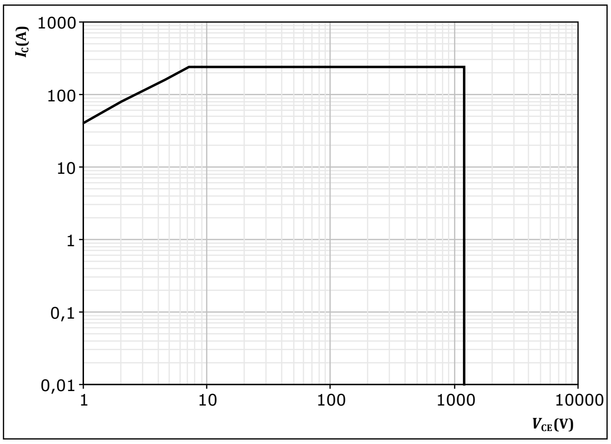
6,57E-02	3,84E-03
3,38E-02	5,95E-04

H-Bridge Switch - Hi side Characteristics

figure 10.	**MOSFET**

Safe operating area

$I_C = f(V_{CE})$



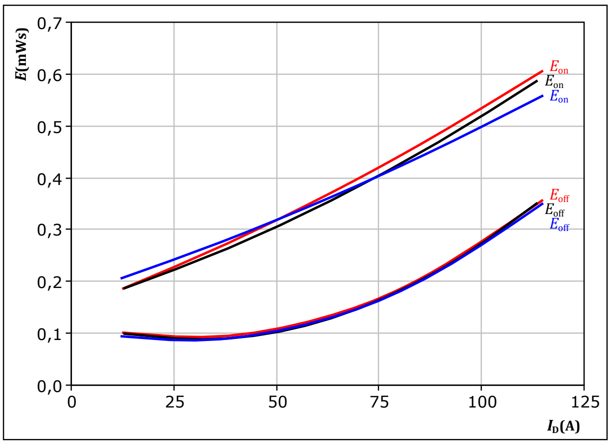
D =	single pulse	
T_s =	80	°C
V_{GE} =	14	V
T_j =	T_{jmax}	

H-Bridge Switching Characteristics - Lo side

figure 11. **MOSFET**

Typical switching energy losses as a function of drain current

$E = f(I_D)$



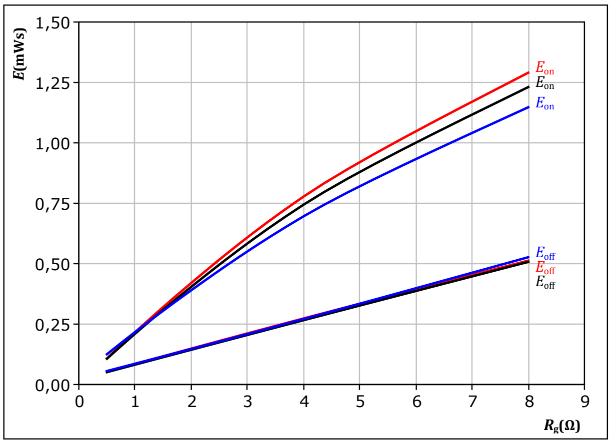
With an inductive load at

V_{DS} =	600	V	T_j:	25 °C
V_{GS} =	-4/15	V		125 °C
R_{gon} =	2	Ω		150 °C
R_{goff} =	2	Ω		

figure 12. **MOSFET**

Typical switching energy losses as a function of gate resistor

$E = f(R_g)$



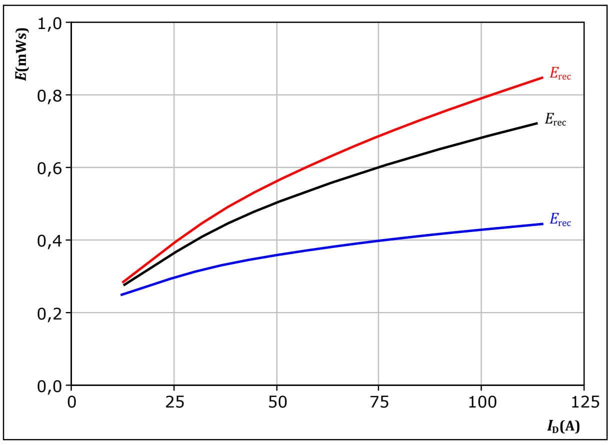
With an inductive load at

V_{DS} =	600	V	T_j:	25 °C
V_{GS} =	-4/15	V		125 °C
I_D =	64	A		150 °C

figure 13. **MOSFET**

Typical reverse recovered energy loss as a function of drain current

$E_{rec} = f(I_D)$



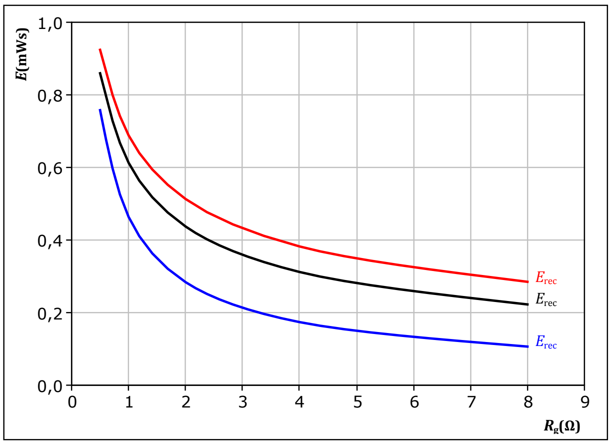
With an inductive load at

V_{DS} =	600	V	T_j:	25 °C
V_{GS} =	-4/15	V		125 °C
R_{gon} =	2	Ω		150 °C

figure 14. **MOSFET**

Typical reverse recovered energy loss as a function of gate resistor

$E_{rec} = f(R_g)$



With an inductive load at

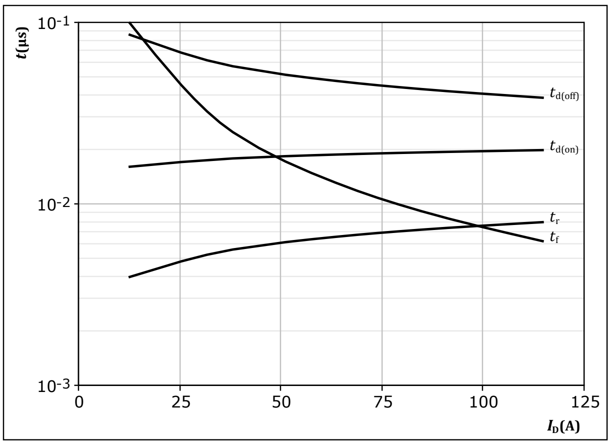
V_{DS} =	600	V	T_j:	25 °C
V_{GS} =	-4/15	V		125 °C
I_D =	64	A		150 °C

H-Bridge Switching Characteristics - Lo side

figure 15. **MOSFET**

Typical switching times as a function of drain current

t = f(I_D)



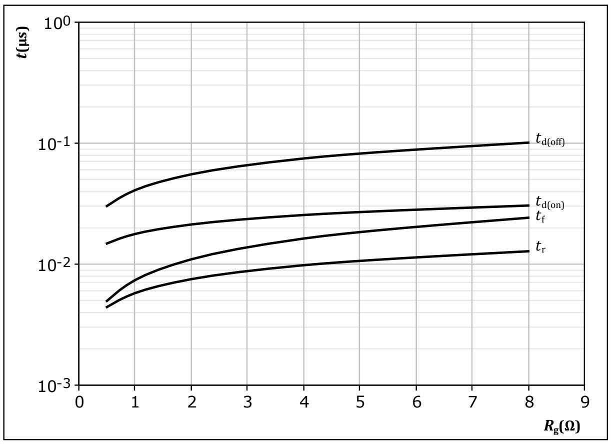
With an inductive load at

T_j =	150	°C
V_{DS} =	600	V
V_{GS} =	-4/15	V
R_{gon} =	2	Ω
R_{goff} =	2	Ω

figure 16. **MOSFET**

Typical switching times as a function of gate resistor

t = f(R_g)



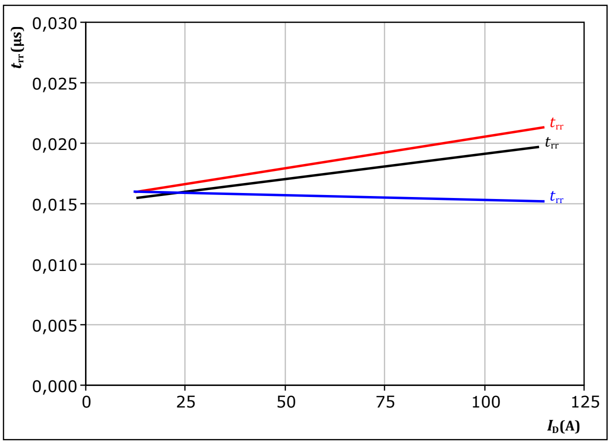
With an inductive load at

T_j =	150	°C
V_{DS} =	600	V
V_{GS} =	-4/15	V
I_D =	64	A

figure 17. **MOSFET**

Typical reverse recovery time as a function of drain current

t_{rr} = f(I_D)



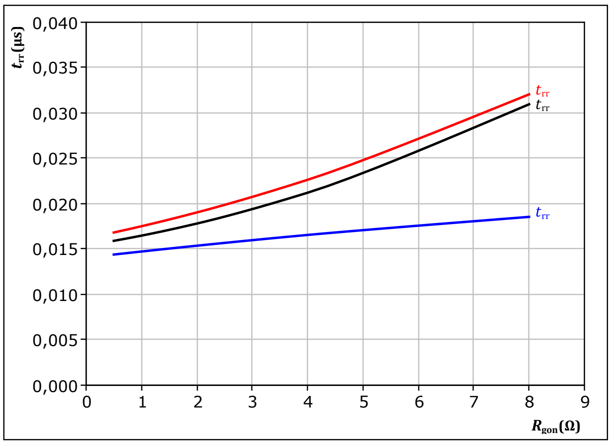
At			
	V_{DS} =	600	V
	V_{GS} =	-4/15	V
	R_{gon} =	2	Ω

T_j: 25 °C / 125 °C / 150 °C

figure 18. **MOSFET**

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

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



At			
	V_{DS} =	600	V
	V_{GS} =	-4/15	V
	I_D =	64	A

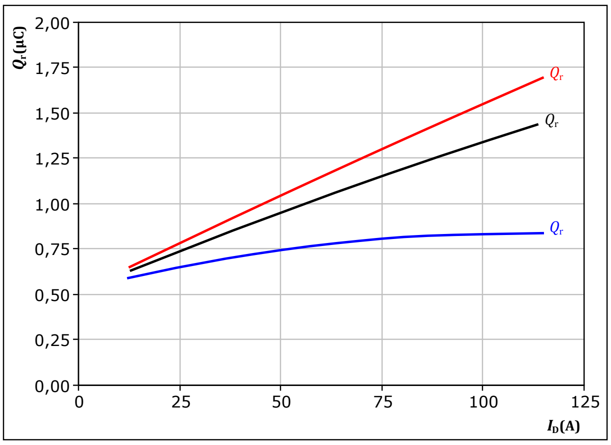
T_j: 25 °C / 125 °C / 150 °C

H-Bridge Switching Characteristics - Lo side

figure 19. **MOSFET**

Typical recovered charge as a function of drain current

Q_r = f(I_D)

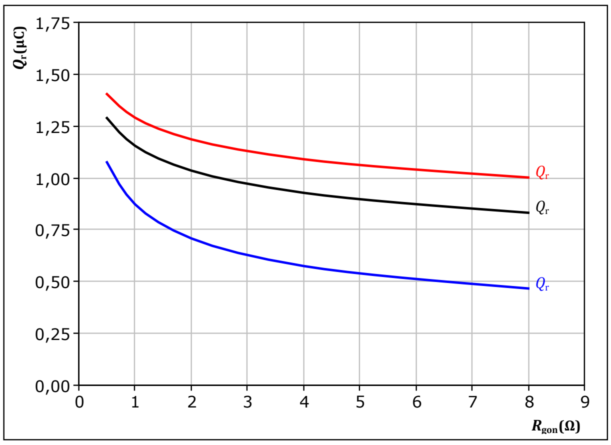


At				T_j:	
	V_{DS} =	600	V		25 °C
	V_{GS} =	-4/15	V		125 °C
	R_{gon} =	2	Ω		150 °C

figure 20. **MOSFET**

Typical recovered charge as a function of turn on gate resistor

Q_r = f(R_{gon})

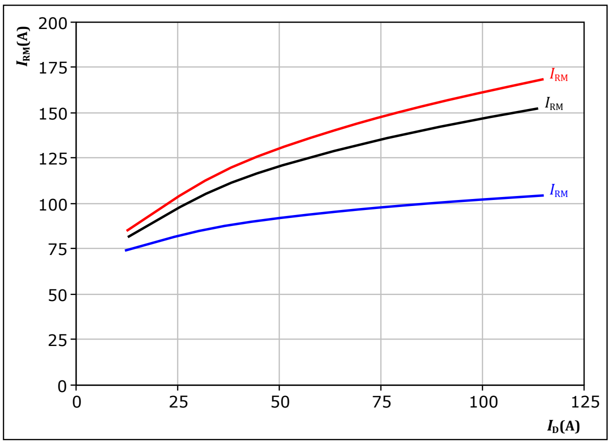


At				T_j:	
	V_{DS} =	600	V		25 °C
	V_{GS} =	-4/15	V		125 °C
	I_D =	64	A		150 °C

figure 21. **MOSFET**

Typical peak reverse recovery current as a function of drain current

I_{RM} = f(I_D)

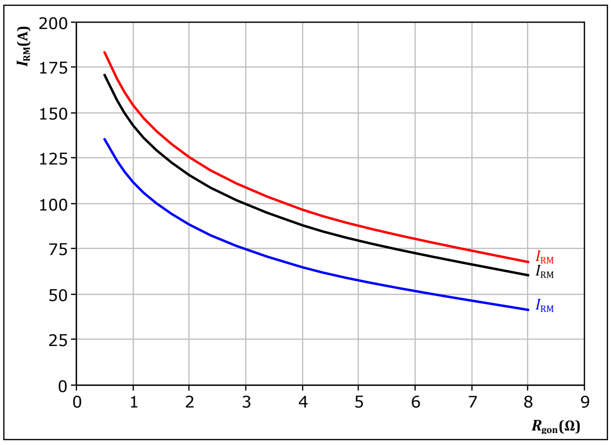


At				T_j:	
	V_{DS} =	600	V		25 °C
	V_{GS} =	-4/15	V		125 °C
	R_{gon} =	2	Ω		150 °C

figure 22. **MOSFET**

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

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



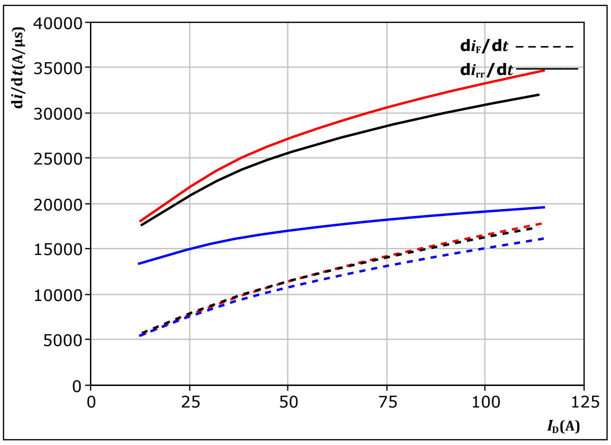
At				T_j:	
	V_{DS} =	600	V		25 °C
	V_{GS} =	-4/15	V		125 °C
	I_D =	64	A		150 °C

H-Bridge Switching Characteristics - Lo side

figure 23. MOSFET

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

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

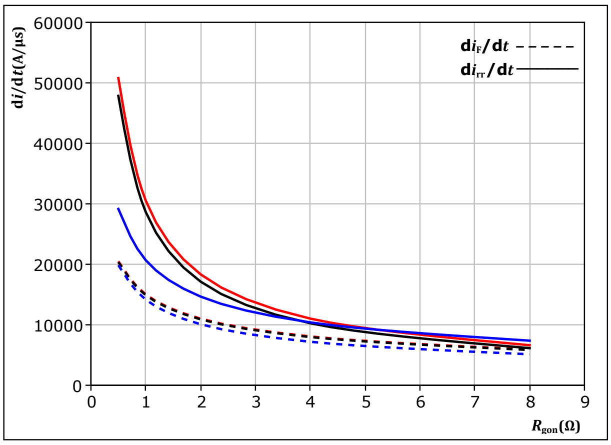


At			
V_{DS} =	600	V	
V_{GS} =	-4/15	V	T_j: 25 °C / 125 °C / 150 °C
R_{gon} =	2	Ω	

figure 24. MOSFET

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

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

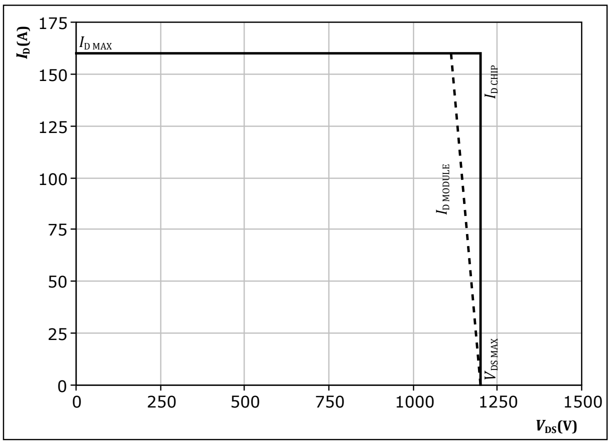


At			
V_{DS} =	600	V	
V_{GS} =	-4/15	V	T_j: 25 °C / 125 °C / 150 °C
I_D =	64	A	

figure 25. MOSFET

Reverse bias safe operating area

$I_D = f(V_{DS})$



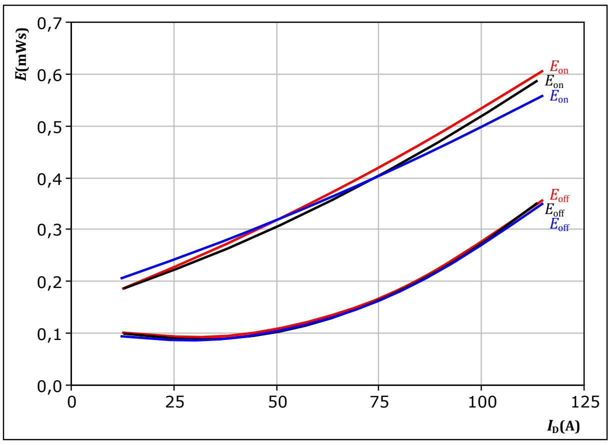
At		
T_j =	150	°C
R_{gon} =	2	Ω
R_{goff} =	2	Ω

H-Bridge Switching Characteristics - Hi side

figure 26. MOSFET

Typical switching energy losses as a function of drain current

$E = f(I_D)$



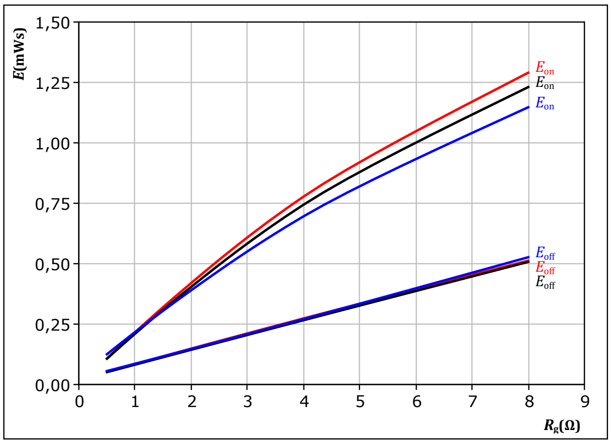
With an inductive load at

V_{DS} =	600	V	T_j:	25 °C
V_{GS} =	-4/15	V		125 °C
R_{gon} =	2	Ω		150 °C
R_{goff} =	2	Ω		

figure 27. MOSFET

Typical switching energy losses as a function of gate resistor

$E = f(R_g)$



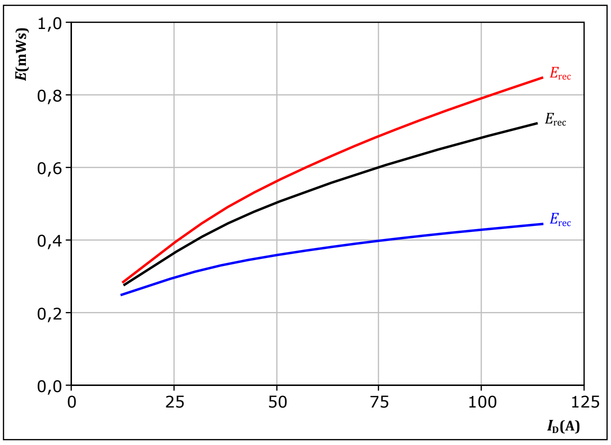
With an inductive load at

V_{DS} =	600	V	T_j:	25 °C
V_{GS} =	-4/15	V		125 °C
I_D =	64	A		150 °C

figure 28. MOSFET

Typical reverse recovered energy loss as a function of drain current

$E_{rec} = f(I_D)$



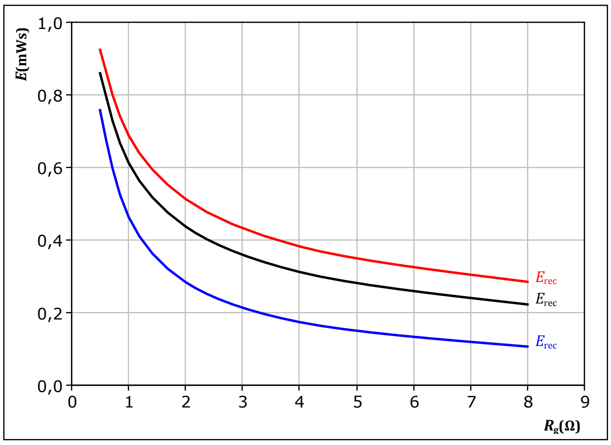
With an inductive load at

V_{DS} =	600	V	T_j:	25 °C
V_{GS} =	-4/15	V		125 °C
R_{gon} =	2	Ω		150 °C

figure 29. MOSFET

Typical reverse recovered energy loss as a function of gate resistor

$E_{rec} = f(R_g)$



With an inductive load at

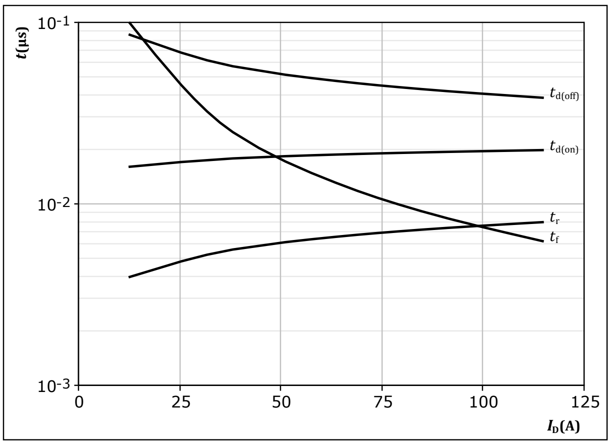
V_{DS} =	600	V	T_j:	25 °C
V_{GS} =	-4/15	V		125 °C
I_D =	64	A		150 °C

H-Bridge Switching Characteristics - Hi side

figure 30. **MOSFET**

Typical switching times as a function of drain current

$t = f(I_D)$



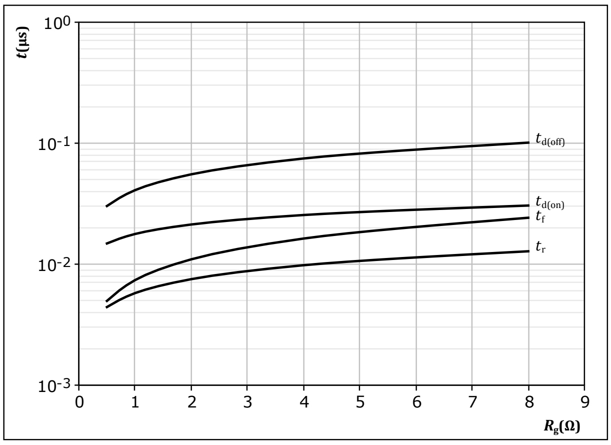
With an inductive load at

T_j =	150	°C
V_{DS} =	600	V
V_{GS} =	-4/15	V
R_{gon} =	2	Ω
R_{goff} =	2	Ω

figure 31. **MOSFET**

Typical switching times as a function of gate resistor

$t = f(R_g)$



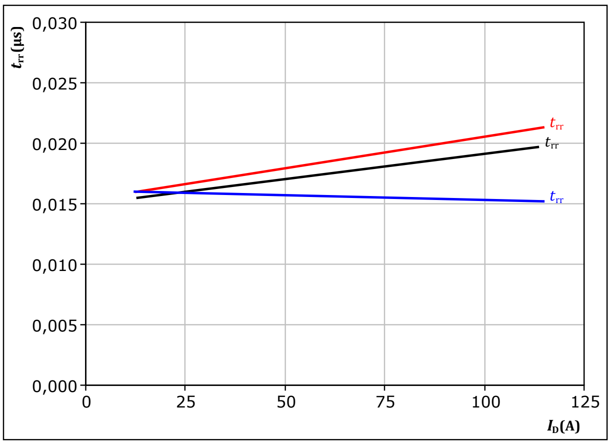
With an inductive load at

T_j =	150	°C
V_{DS} =	600	V
V_{GS} =	-4/15	V
I_D =	64	A

figure 32. **MOSFET**

Typical reverse recovery time as a function of drain current

$t_{rr} = f(I_D)$



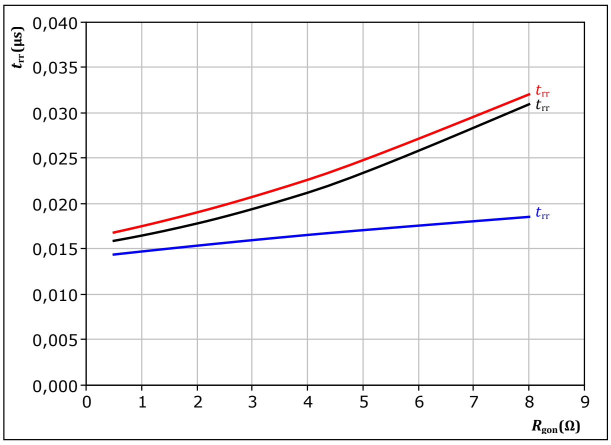
At			
	V_{DS} =	600	V
	V_{GS} =	-4/15	V
	R_{gon} =	2	Ω

T_j: 25 °C, 125 °C, 150 °C

figure 33. **MOSFET**

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

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



At			
	V_{DS} =	600	V
	V_{GS} =	-4/15	V
	I_D =	64	A

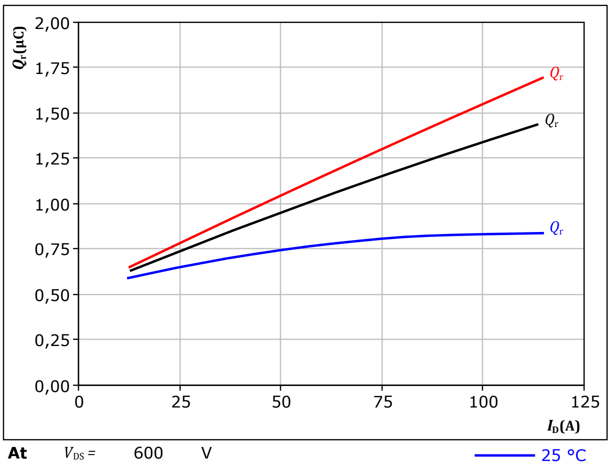
T_j: 25 °C, 125 °C, 150 °C

H-Bridge Switching Characteristics - Hi side

figure 34. **MOSFET**

Typical recovered charge as a function of drain current

$Q_r = f(I_D)$

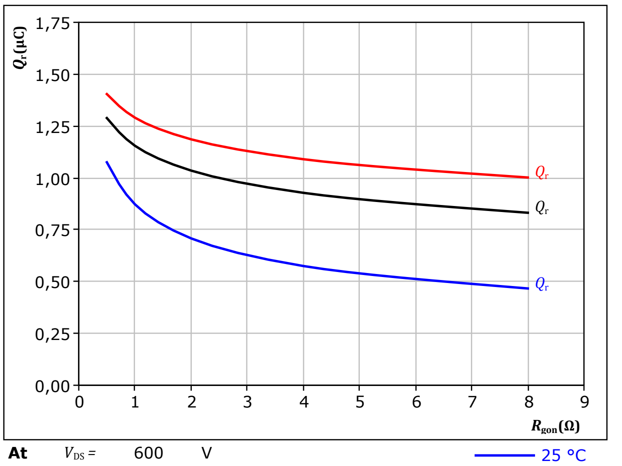


At				
	V_{DS} =	600	V	T_j: 25 °C (blue)
	V_{GS} =	-4/15	V	125 °C (black)
	R_{gon} =	2	Ω	150 °C (red)

figure 35. **MOSFET**

Typical recovered charge as a function of turn on gate resistor

$Q_r = f(R_{gon})$

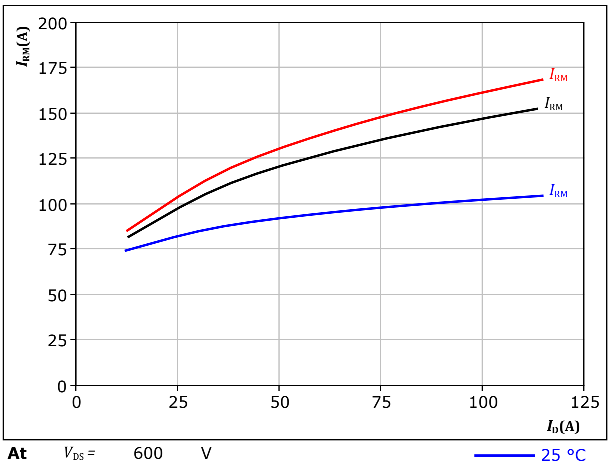


At				
	V_{DS} =	600	V	T_j: 25 °C (blue)
	V_{GS} =	-4/15	V	125 °C (black)
	I_D =	64	A	150 °C (red)

figure 36. **MOSFET**

Typical peak reverse recovery current as a function of drain current

$I_{RM} = f(I_D)$

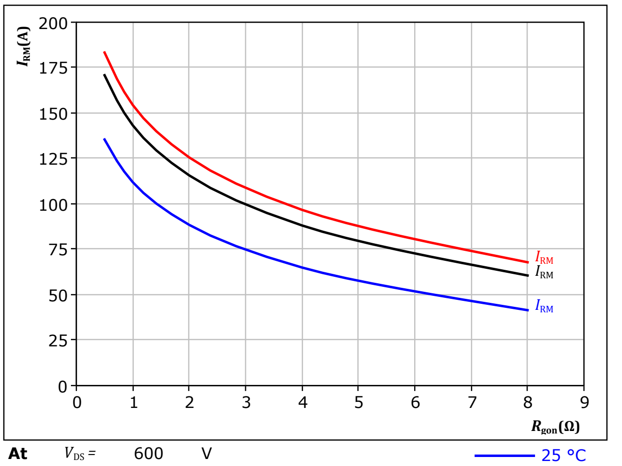


At				
	V_{DS} =	600	V	T_j: 25 °C (blue)
	V_{GS} =	-4/15	V	125 °C (black)
	R_{gon} =	2	Ω	150 °C (red)

figure 37. **MOSFET**

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

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



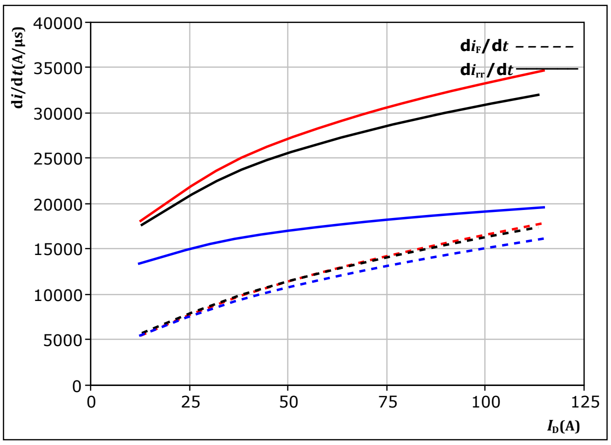
At				
	V_{DS} =	600	V	T_j: 25 °C (blue)
	V_{GS} =	-4/15	V	125 °C (black)
	I_D =	64	A	150 °C (red)

H-Bridge Switching Characteristics - Hi side

figure 38. **MOSFET**

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)

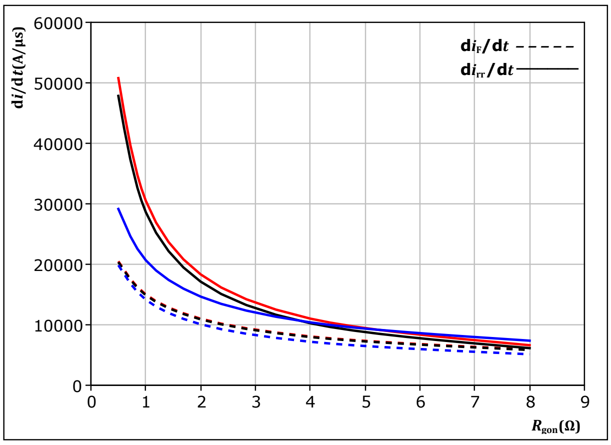


At					
	V_{DS} =	600	V		25 °C
	V_{GS} =	-4/15	V	T_j:	125 °C
	R_{gon} =	2	Ω		150 °C

figure 39. **MOSFET**

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})

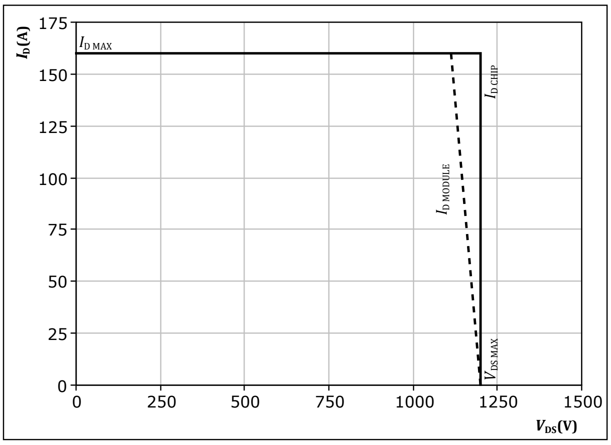


At					
	V_{DS} =	600	V		25 °C
	V_{GS} =	-4/15	V	T_j:	125 °C
	I_D =	64	A		150 °C

figure 40. **MOSFET**

Reverse bias safe operating area

I_D = f(V_{DS})



At			
	T_j =	150	°C
	R_{gon} =	2	Ω
	R_{goff} =	2	Ω

Switching Definitions

figure 41. **MOSFET**

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

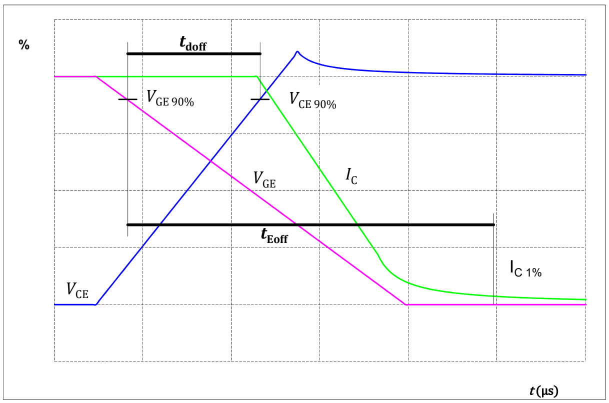


figure 42. **MOSFET**

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

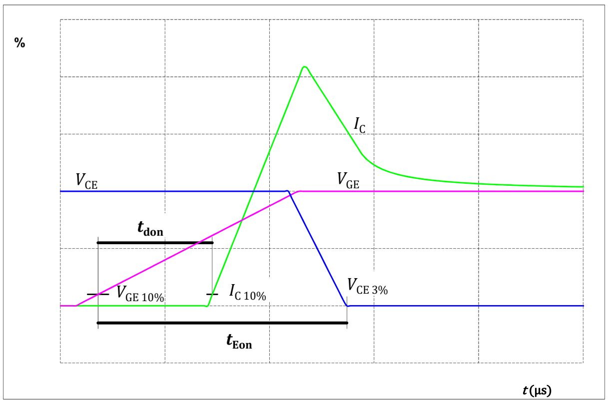


figure 43. **MOSFET**

Turn-off Switching Waveforms & definition of t_f

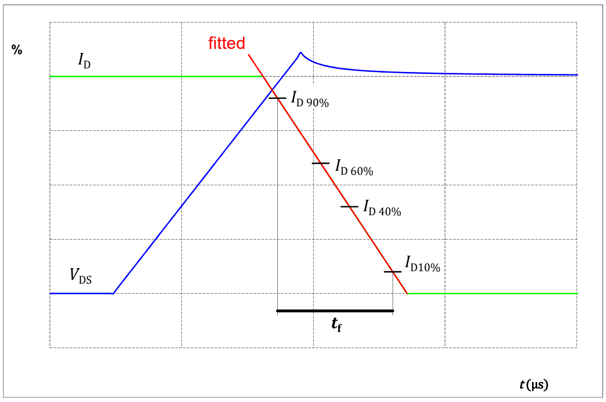
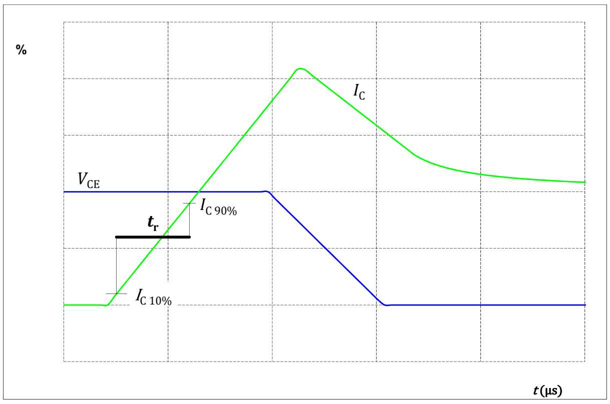


figure 44. **MOSFET**

Turn-on Switching Waveforms & definition of t_r



Switching Definitions

figure 45. **FWD**

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

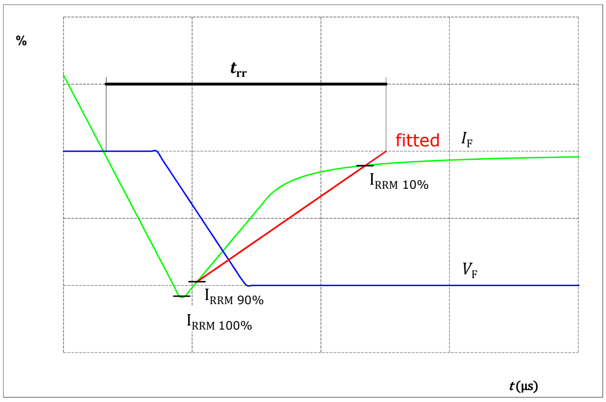


figure 46. **FWD**

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

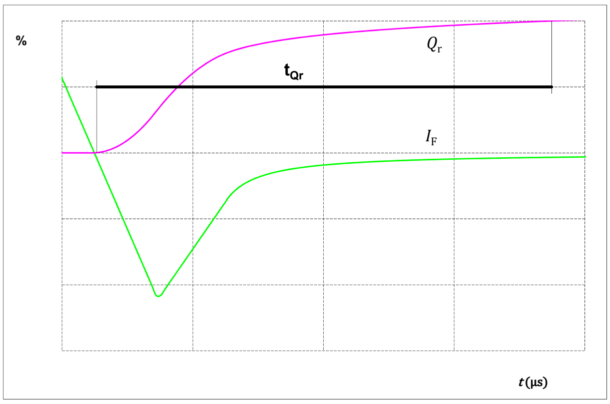
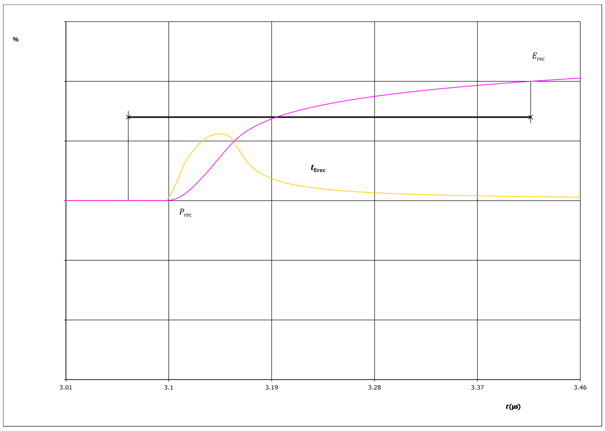


figure 47. **FWD**

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



10-EY124PA016ME-LP49F18T
datasheet

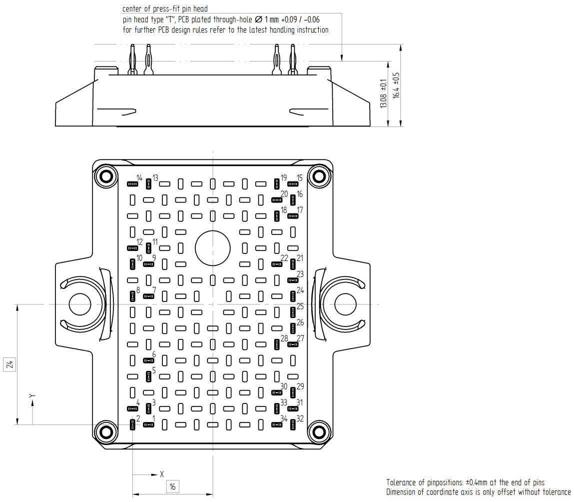
Vincotech

Ordering Code	
Version	**Ordering Code**
Without thermal paste	10-EY124PA016ME-LP49F18T
With thermal paste	10-EY124PA016ME-LP49F18T-/3/

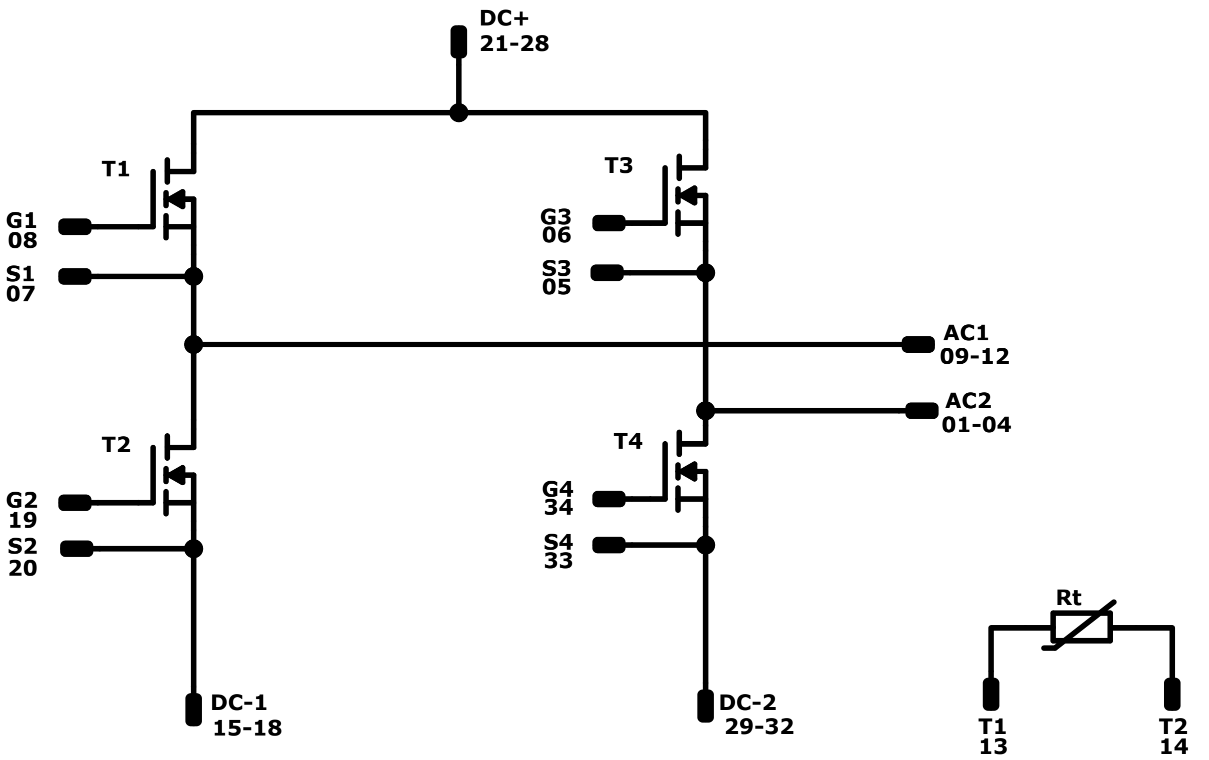
Marking							
	**Text**	**Name**		**Date code**	**UL & VIN**	**Lot**	**Serial**
		NN-NNNNNNNNNNNNNN-TTTTTTTVV		WWYY	UL VIN	LLLLL	SSSS
	Datamatrix	**Type&Ver**	**Lot number**	**Serial**	**Date code**		
		TTTTTTTVV	LLLLL	SSSS	WWYY		

Outline

Pin table [mm]			
Pin	X	Y	Function
1	3,2	0	AC2
2	0	0	AC2
3	3,2	3,2	AC2
4	0	3,2	AC2
5	3,2	9,6	S3
6	3,2	12,8	G3
7	3,2	25,6	S1
8	0	25,6	G1
9	3,2	32	AC1
10	0	32	AC1
11	3,2	35,2	AC1
12	0	35,2	AC1
13	3,2	48	T1
14	0	48	T2
15	32	48	DC-1
16	32	44,8	DC-1
17	32	41,6	DC-1
18	28,8	41,6	DC-1
19	28,8	48	G2
20	28,8	44,8	S2
21	32	32	DC+
22	28,8	32	DC+
23	32	28,8	DC+
24	32	25,6	DC+
25	32	22,4	DC+
26	32	19,2	DC+
27	32	16	DC+
28	28,8	16	DC+
29	32	6,4	DC-2
30	28,8	6,4	DC-2
31	32	3,2	DC-2
32	32	0	DC-2
33	28,8	3,2	S4
34	28,8	0	G4



Pinout



Identification

ID	Component	Voltage	Current	Function	Comment
T2, T4	MOSFET	1200 V	16 mΩ	H-Bridge Switch - Lo side	
T1, T3	MOSFET	1200 V	16 mΩ	H-Bridge Switch - Hi side	
Rt	Thermistor			Thermistor	

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

Handling instruction
Handling instructions for *flow* E2 packages see vincotech.com website.

Package data
Package data for *flow* E2 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-EY124PA016ME-LP49F18T-D1-14	31 Mar. 2020		