



flowANPC E3BP

1200 V / 2,83 mΩ

Topology features

- Kelvin Emitter for improved switching performance
- Temperature sensor
- Advanced Neutral Point Clamped topology
- Gate Resistor

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: Al₂O₃
- Cu baseplate
- Convex shaped baseplate for superior thermal contact
- CTI600 housing material
- Baseplate with rough surface
- Thermo-mechanical push-and-pull force relief
- Solder pin

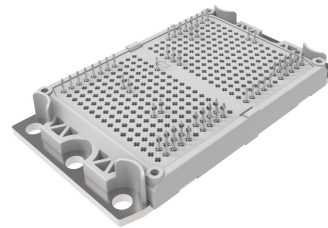
Target applications

- Energy Storage Systems

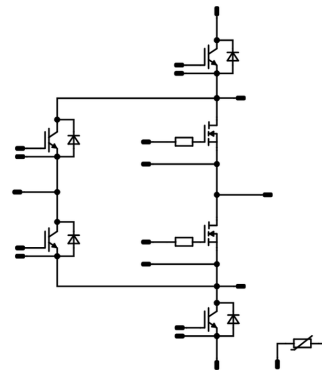
Types

- 30-E312NAA003MS13-PS48F75Z

flow E3BP 12 mm housing



Schematic





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30-E312NAA003MS13-PS48F75Z
datasheet

Maximum Ratings

$T_j = 25\text{ °C}$, unless otherwise specified

Parameter	Symbol	Conditions	Value	Unit
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AC Switch

Drain-source voltage	V_{DS}		1200	V
Drain current (DC current)	I_D	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	331	A
Peak drain current	I_{DM}	t_p limited by T_{jmax}	1704	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	400	W
Gate-source voltage	V_{GSS}	static	-5 / 18	V
		dynamic	-10 / 22	V
Maximum Junction Temperature	T_{jmax}		175	°C

Neutral Point Switch

Collector-emitter voltage	V_{CES}		1200	V
Collector current (DC current)	I_C	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	251	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}	600	A
Turn off safe operating area		$T_j = 150\text{ °C}$, $V_{CE} = 1200\text{ V}$	600	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	452	W
Gate-emitter voltage	V_{GES}		±20	V
Short circuit ratings	t_{SC}	$V_{GE} = 15\text{ V}$, $V_{CC} = 800\text{ V}$ $T_j = 175\text{ °C}$	7	µs
Maximum junction temperature	T_{jmax}		175	°C

DC-Link Diode

Peak repetitive reverse voltage	V_{RRM}		1200	V
Forward current (DC current)	I_F	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	246	A
Repetitive peak forward current	I_{FRM}	t_p limited by T_{jmax}	800	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	376	W
Maximum junction temperature	T_{jmax}		175	°C



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datasheet

Maximum Ratings

$T_j = 25\text{ °C}$, unless otherwise specified

Parameter	Symbol	Conditions	Value	Unit
DC-Link Switch				
Collector-emitter voltage	V_{CES}		950	V
Collector current (DC current)	I_C	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	298	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}	800	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	375	W
Gate-emitter voltage	V_{GES}		±20	V
Maximum junction temperature	T_{jmax}		175	°C

Neutral Point Diode

Peak repetitive reverse voltage	V_{RRM}		1200	V
Forward current (DC current)	I_F	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	179	A
Repetitive peak forward current	I_{FRM}	t_p limited by T_{jmax}	600	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	286	W
Maximum junction temperature	T_{jmax}		175	°C

Resistor (Gate)

DC current	I	terminal temperature $T_k = 90\text{ °C}$	2121	mA
Power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	1,5	W
Operation Temperature	T_{op}		-55 ... 155	°C

Module Properties

Thermal Properties

Storage temperature	T_{stg}		-40...+125	°C
Operation temperature under switching condition	T_{jop}		-40...+175 *	°C

Isolation Properties

Isolation voltage	V_{isol}	DC Test Voltage** $t_p = 2\text{ s}$	6800	V
Creepage distance			>12,7	mm
Clearance			>12,7	mm
Comparative Tracking Index	CTI		≥ 600	

* The chip temperature under switching has an impact on the total lifetime. Please request a lifetime calculation for your mission profile.

** 100 % tested in production



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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	

AC Switch

Static

Drain-source on-state resistance	$r_{DS(on)}$		18		426	25 125 150		2,83 3,48 3,83	4,17 ⁽¹⁾	mΩ
Gate-source threshold voltage	$V_{GS(th)}$				0,0426	25	1,7	2,25	2,75	V
Gate to Source Leakage Current	I_{GSS}		22	0		25			600	nA
Zero Gate Voltage Drain Current	I_{DSS}		0	1200		25			60	μA
Internal gate resistance	r_g							0,167		Ω
Gate charge	Q_g		-5/18	800	426	25		1128		nC
Short-circuit input capacitance	C_{iss}	$f = 500$ kHz	0	800	0	25		28080		pF
Short-circuit output capacitance	C_{oss}							1410		
Reverse transfer capacitance	C_{rss}							48		
Diode forward voltage	V_{SD}		0		426	25		4,1		V

Thermal

Thermal resistance junction to sink ⁽²⁾	$R_{th(j-s)}$	$\lambda_{paste} = 5,2$ W/mK (PTM)						0,24		K/W
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30-E312NAA003MS13-PS48F75Z

datasheet

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					
Dynamic														
Turn-on delay time	$t_{d(on)}$	$R_{gon} = 2 \Omega$ $R_{goff} = 2 \Omega$	-5/18	600	400	25		59,94		ns				
						125		52,47						
						150		51,36						
Rise time	t_r									25		37,88		ns
										125		30,82		
										150		29,53		
Turn-off delay time	$t_{d(off)}$									25		113,21		ns
										125		128,62		
										150		132,73		
Fall time	t_f									25		20,72		ns
										125		18,66		
										150		18,8		
Turn-on energy (per pulse)	E_{on}	$Q_{rFWD}=2,52 \mu C$ $Q_{rFWD}=6,1 \mu C$ $Q_{rFWD}=7,07 \mu C$				25		5,99		mWs				
						125		4,93						
						150		4,6						
Turn-off energy (per pulse)	E_{off}					25		6,4		mWs				
						125		7,31						
						150		7,36						
Peak recovery current	I_{RRM}	$di/dt=13993 A/\mu s$ $di/dt=14740 A/\mu s$ $di/dt=14128 A/\mu s$				25		150,6		A				
							125		272,81					
							150		299,6					
Reverse recovery time	t_{rr}						25		27,31		ns			
							125		36,23					
							150		37,56					
Recovered charge	Q_r						25		2,52		μC			
							125		6,1					
							150		7,07					
Reverse recovered energy	E_{rec}						25		0,96		mWs			
							125		2,69					
							150		3,19					
Peak rate of fall of recovery current	$(di_{rr}/dt)_{max}$					25		17986,91		A/ μs				
						125		33857,42						
						150		38345,27						



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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	

Neutral Point Switch

Static

Gate-emitter threshold voltage	$V_{GE(th)}$	$V_{CE} = V_{GE}$			0,0068	25	5,15	5,8	6,45	V
Collector-emitter saturation voltage	V_{CEsat}		15		300	25 125 150	1,3	1,65 1,88 1,93	1,7 ⁽¹⁾	V
Collector-emitter cut-off current	I_{CES}		0	1200		25			31,2	µA
Gate-emitter leakage current	I_{GES}		20	0		25			400	nA
Internal gate resistance	r_g							0,5		Ω
Input capacitance	C_{ies}	$f = 100 \text{ kHz}$	0	25		25		60400		pF
Reverse transfer capacitance	C_{res}							216		pF
Gate charge	Q_g	$V_{CC} = 600 \text{ V}$	±15		300	25		5000		nC

Thermal

Thermal resistance junction to sink ⁽²⁾	$R_{th(j-s)}$	$\lambda_{paste} = 5,2 \text{ W/mK}$ (PTM)						0,21		K/W
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DC-Link Diode

Static

Forward voltage	V_F				400	25 125 150	1,45	1,9 1,9 1,88	1,95 ⁽¹⁾	V
Reverse leakage current	I_R	$V_r = 1200 \text{ V}$				25			4	µA

Thermal

Thermal resistance junction to sink ⁽²⁾	$R_{th(j-s)}$	$\lambda_{paste} = 5,2 \text{ W/mK}$ (PTM)						0,25		K/W
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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	

DC-Link Switch

Static

Gate-emitter threshold voltage	$V_{GE(th)}$	$V_{CE} = V_{GE}$			0,0065	25	4,15	4,85	5,65	V
Collector-emitter saturation voltage	$V_{CE(sat)}$		15		400	25 125 150		1,31 1,37 1,38	1,4 ⁽¹⁾	V
Collector-emitter cut-off current	I_{CES}		0	950		25			8	μA
Gate-emitter leakage current	I_{GES}		20	0		25			200	nA
Internal gate resistance	r_g							0,75		Ω
Input capacitance	C_{ies}	$f = 100 \text{ kHz}$	0	25		25		49200		pF
Output capacitance	C_{oes}							530		pF
Reverse transfer capacitance	C_{res}							220		pF
Gate charge	Q_g		±15		0	25		4100		nC

Thermal

Thermal resistance junction to sink ⁽²⁾	$R_{th(j-s)}$	$\lambda_{paste} = 5,2 \text{ W/mK}$ (PTM)						0,25		K/W
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Neutral Point Diode

Static

Forward voltage	V_F				300	25 125 150		2 2,03 2,03	2 ⁽¹⁾	V
Reverse leakage current	I_R	$V_r = 1200 \text{ V}$				25			15	μA

Thermal

Thermal resistance junction to sink ⁽²⁾	$R_{th(j-s)}$	$\lambda_{paste} = 5,2 \text{ W/mK}$ (PTM)						0,33		K/W
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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	

Resistor (Gate)

Static

Resistance	R							0,333		Ω
Tolerance							-1		1	%
Temperature coefficient	tc							100		ppm/K

Thermistor

Static

Rated resistance	R					25		5		k Ω
Deviation of R100	$A_{R/R}$	$R_{100} = 499 \Omega$				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. $\pm 1 \%$						3380		K
Vincotech Thermistor Reference									V	

⁽¹⁾ Value at chip level

⁽²⁾ Only valid with pre-applied Vincotech thermal interface material.



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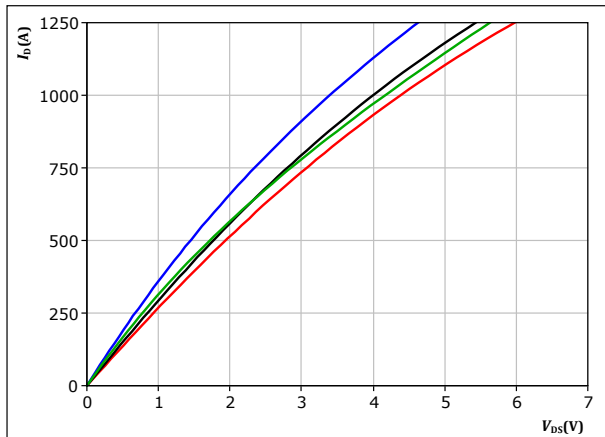
30-E312NAA003MS13-PS48F75Z
datasheet

AC Switch Characteristics

figure 1. MOSFET

Typical output characteristics

$$I_D = f(V_{DS})$$



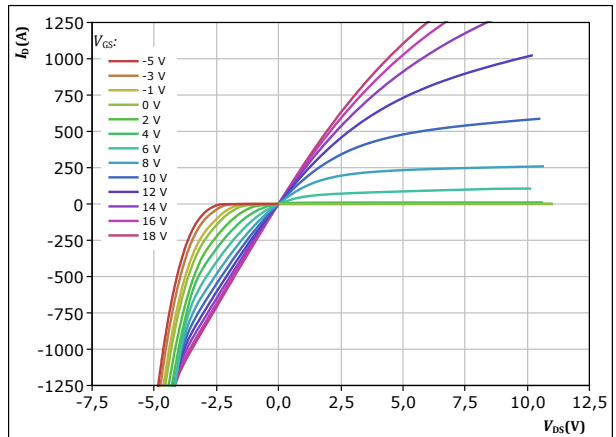
$t_p = 250 \mu s$
 $V_{GS} = 18 V$

T_j :
-40 °C
25 °C
125 °C
150 °C

figure 2. MOSFET

Typical output characteristics

$$I_D = f(V_{DS})$$

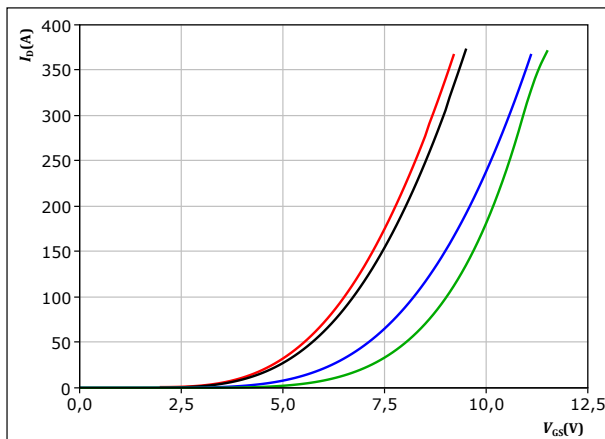


$t_p = 250 \mu s$
 $T_j = 150 ^\circ C$
 V_{GS} from -5 V to 18 V in steps of 2 V

figure 3. MOSFET

Typical transfer characteristics

$$I_D = f(V_{GS})$$



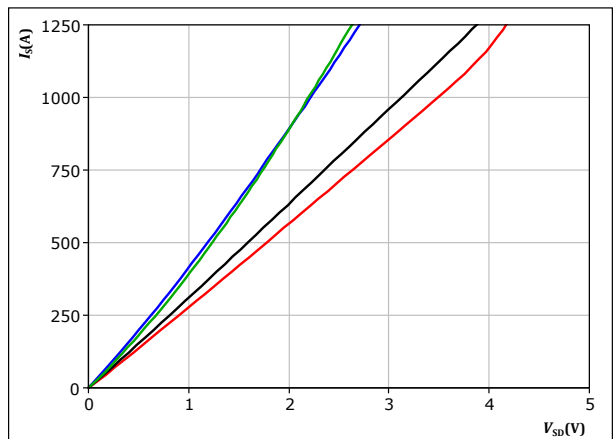
$t_p = 250 \mu s$
 $V_{DS} = 8 V$

T_j :
-40 °C
25 °C
125 °C
150 °C

figure 4. MOSFET

Typical reverse drain current characteristics

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



$t_p = 250 \mu s$
 $V_{GS} = 18 V$

T_j :
-40 °C
25 °C
125 °C
150 °C



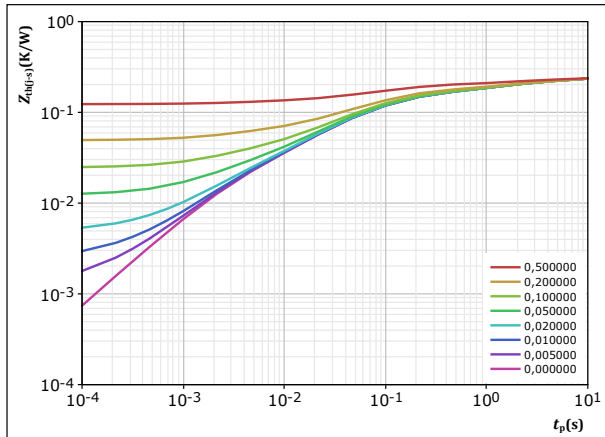
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AC Switch Characteristics

figure 5. MOSFET

Transient thermal impedance as a function of pulse width

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



$$D = \frac{t_p}{T}$$

$$R_{th(j-a)} = 0,237 \text{ K/W}$$

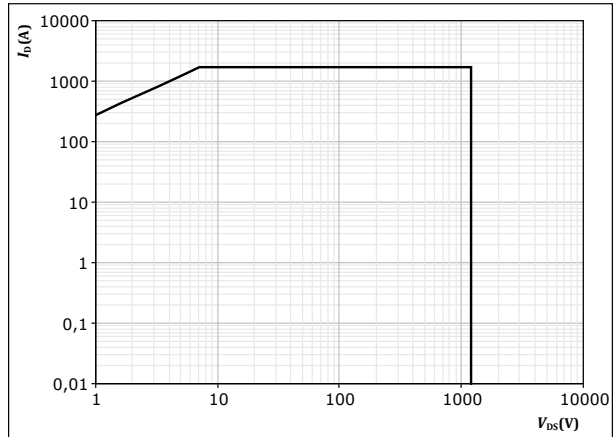
MOSFET thermal model values

R (K/W)	τ (s)
4,75E-02	6,67E+00
5,01E-02	1,05E+00
9,16E-02	1,01E-01
4,48E-02	2,49E-02
1,22E-02	2,57E-03

figure 6. MOSFET

Safe operating area

$$I_D = f(V_{DS})$$



$D = \text{single pulse}$

$$T_a = 80 \text{ } ^\circ\text{C}$$

$$V_{GS} = 18 \text{ V}$$

$$T_j = T_{jmax}$$



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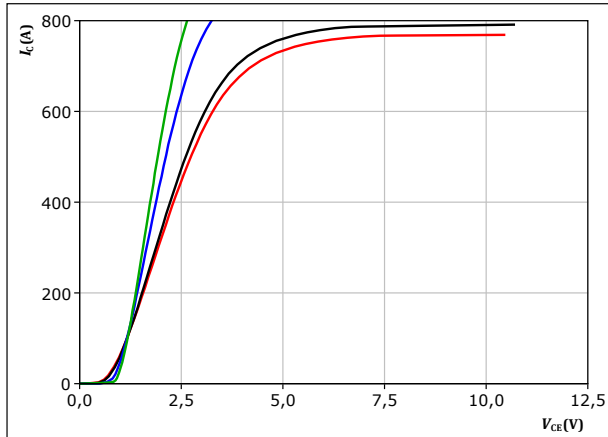
30-E312NAA003MS13-PS48F75Z datasheet

Neutral Point Switch Characteristics

figure 7. IGBT

Typical output characteristics

$$I_C = f(V_{CE})$$

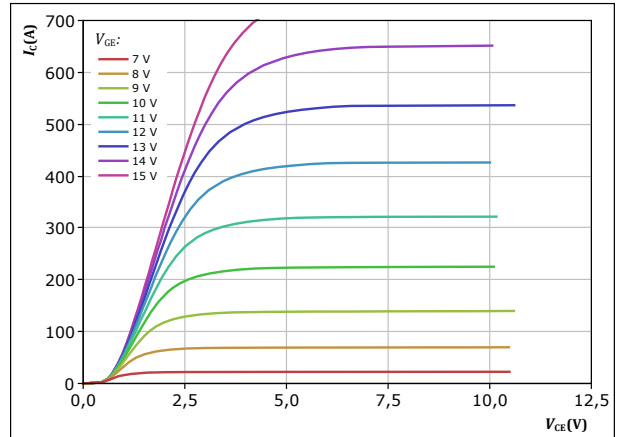


$t_p = 250 \mu s$
 $V_{GE} = 15 V$
 T_j :
-40 °C
25 °C
125 °C
150 °C

figure 8. IGBT

Typical output characteristics

$$I_C = f(V_{CE})$$

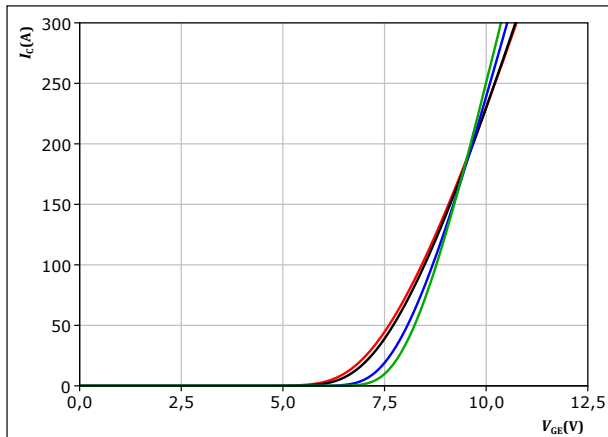


$t_p = 250 \mu s$
 $T_j = 150 \text{ °C}$
 V_{GE} from 7 V to 15 V in steps of 1 V

figure 9. IGBT

Typical transfer characteristics

$$I_C = f(V_{GE})$$

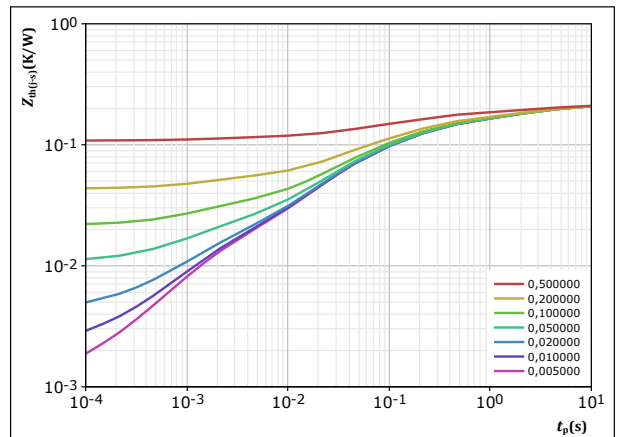


$t_p = 250 \mu s$
 $V_{CE} = 30 V$
 T_j :
-40 °C
25 °C
125 °C
150 °C

figure 10. IGBT

Transient thermal impedance as a function of pulse width

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



$D = t_p / T$
 $R_{th(j-s)} = 0,21 \text{ K/W}$
IGBT thermal model values

R (K/W)	τ (s)
3,69E-02	6,50E+00
4,35E-02	1,26E+00
7,76E-02	1,57E-01
4,77E-02	2,97E-02
1,07E-02	1,42E-03



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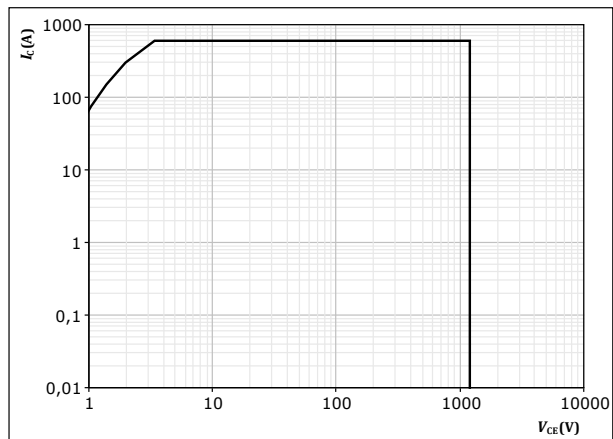
datasheet

Neutral Point Switch Characteristics

figure 11. IGBT

Safe operating area

$$I_C = f(V_{CE})$$

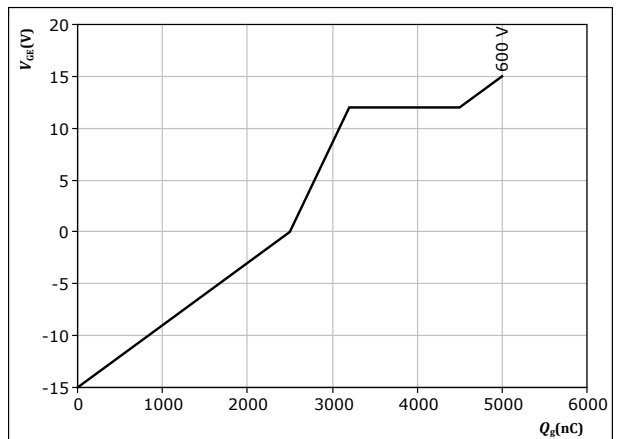


$D = \text{single pulse}$
 $T_s = 80 \text{ } ^\circ\text{C}$
 $V_{GE} = 15 \text{ V}$
 $T_j = T_{jmax}$

figure 12. IGBT

Gate voltage vs gate charge

$$V_{GE} = f(Q_g)$$



$I_C = 300 \text{ A}$
 $T_j = 25 \text{ } ^\circ\text{C}$



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DC-Link Diode Characteristics

figure 13.

FWD

Typical forward characteristics

$$I_F = f(V_F)$$

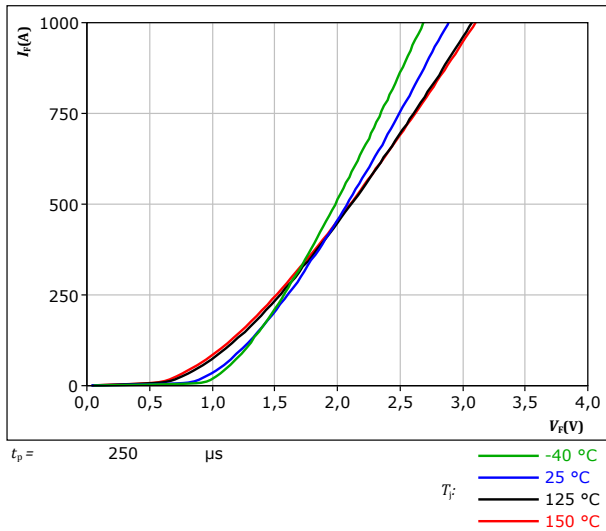
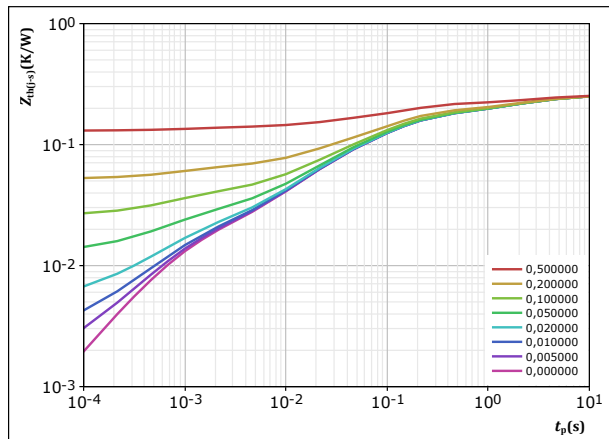


figure 14.

FWD

Transient thermal impedance as a function of pulse width

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



$D =$	t_p / T	
$R_{th(j-s)} =$	0,253	K/W
FWD thermal model values		
R (K/W)	τ (s)	
3,53E-02	7,73E+00	
5,84E-02	1,56E+00	
1,11E-01	1,14E-01	
4,15E-02	1,86E-02	
1,41E-02	8,13E-04	



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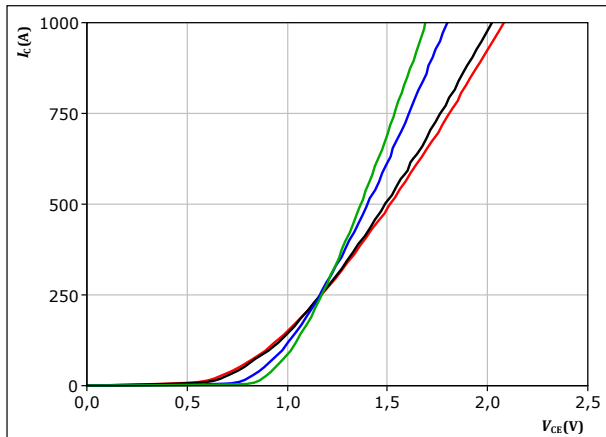
30-E312NAA003MS13-PS48F75Z datasheet

DC-Link Switch Characteristics

figure 15. IGBT

Typical output characteristics

$$I_C = f(V_{CE})$$



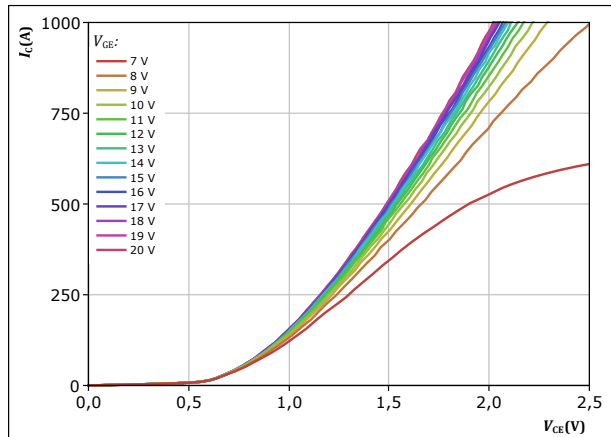
$t_p = 250 \mu s$
 $V_{GE} = 15 V$

T_j :
-40 °C
25 °C
125 °C
150 °C

figure 16. IGBT

Typical output characteristics

$$I_C = f(V_{CE})$$

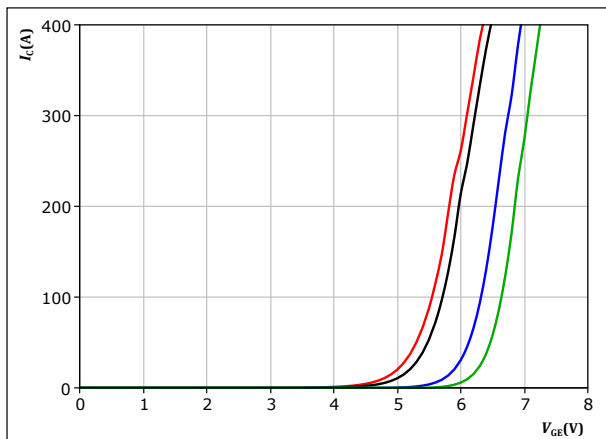


$t_p = 250 \mu s$
 $T_j = 150 ^\circ C$
 V_{GE} from 7 V to 20 V in steps of 1 V

figure 17. IGBT

Typical transfer characteristics

$$I_C = f(V_{GE})$$



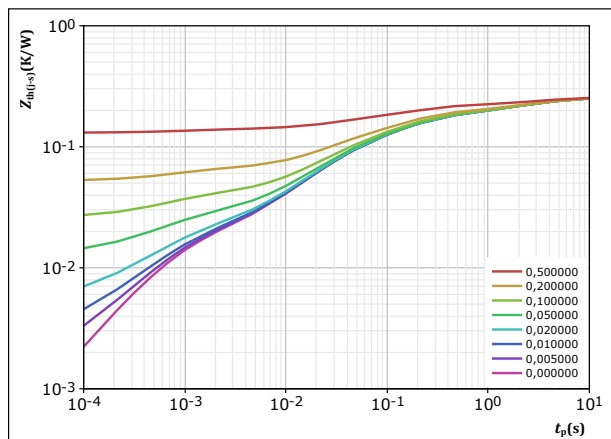
$t_p = 250 \mu s$
 $V_{CE} = 29 V$

T_j :
-40 °C
25 °C
125 °C
150 °C

figure 18. IGBT

Transient thermal impedance as a function of pulse width

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



$D = t_p / T$
 $R_{th(j-s)} = 0,253 K/W$
IGBT thermal model values

R (K/W)	τ (s)
3,53E-02	7,73E+00
5,58E-02	1,63E+00
9,70E-02	1,38E-01
5,85E-02	2,48E-02
1,45E-02	7,05E-04



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30-E312NAA003MS13-PS48F75Z
datasheet

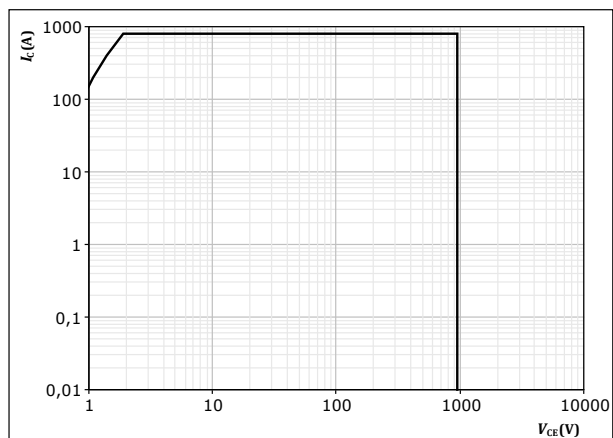
DC-Link Switch Characteristics

figure 19.

IGBT

Safe operating area

$I_C = f(V_{CE})$



$D = \text{single pulse}$

$T_s = 80 \text{ } ^\circ\text{C}$
 $V_{GE} = 15 \text{ V}$
 $T_j = T_{jmax}$



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Neutral Point Diode Characteristics

figure 20. FWD

Typical forward characteristics

$I_F = f(V_F)$

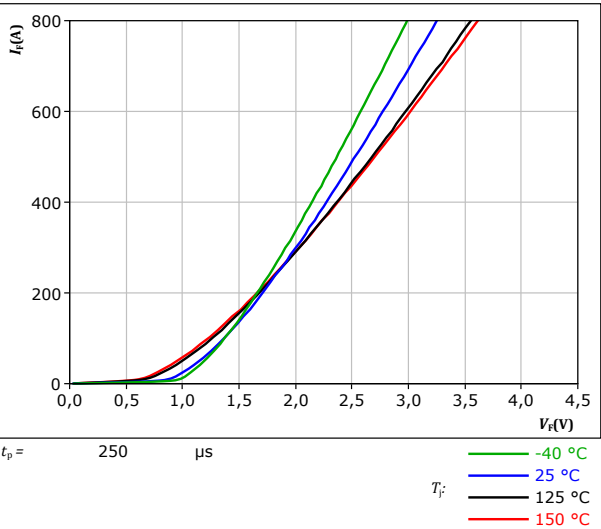
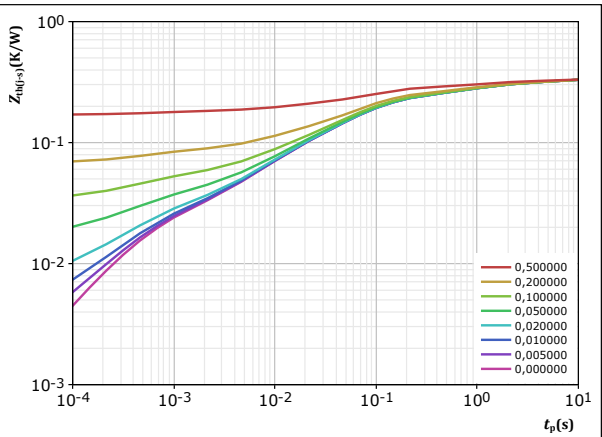


figure 21. FWD

Transient thermal impedance as a function of pulse width

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



$D =$	t_p / T	
$R_{th(j-s)} =$	0,332	K/W
FWD thermal model values		
R (K/W)	τ (s)	
4,39E-02	6,10E+00	
7,51E-02	7,61E-01	
1,59E-01	6,84E-02	
4,21E-02	8,78E-03	
1,93E-02	4,61E-04	



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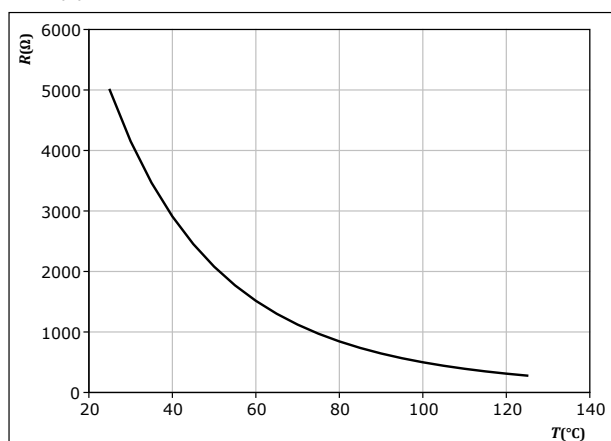
Thermistor Characteristics

figure 22.

Thermistor

Typical NTC characteristic as function of temperature

$$R_T = f(T)$$





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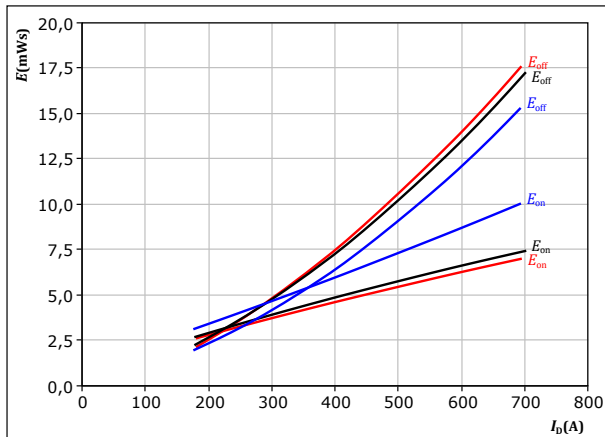
AC Switching Characteristics

figure 23.

MOSFET

Typical switching energy losses as a function of drain current

$$E = f(I_D)$$



With an inductive load at

$V_{DS} = 600 \text{ V}$
 $V_{GS} = -5/18 \text{ V}$
 $R_{gon} = 2 \text{ } \Omega$
 $R_{goff} = 2 \text{ } \Omega$

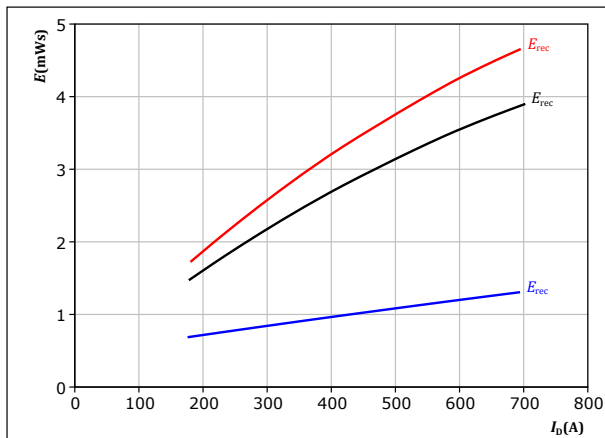
T_j : $25 \text{ } ^\circ\text{C}$
 $125 \text{ } ^\circ\text{C}$
 $150 \text{ } ^\circ\text{C}$

figure 25.

MOSFET

Typical reverse recovered energy loss as a function of drain current

$$E_{rec} = f(I_D)$$



With an inductive load at

$V_{DS} = 600 \text{ V}$
 $V_{GS} = -5/18 \text{ V}$
 $R_{gon} = 2 \text{ } \Omega$

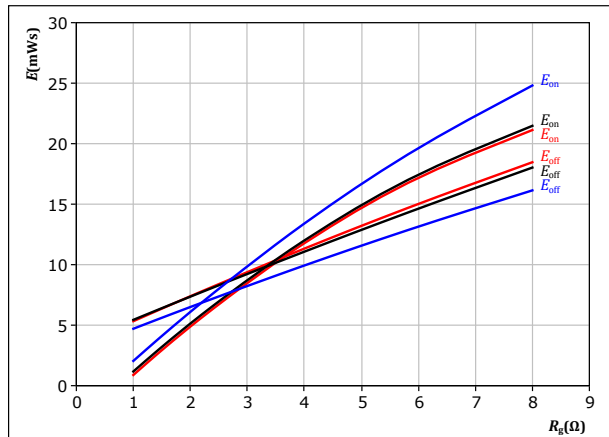
T_j : $25 \text{ } ^\circ\text{C}$
 $125 \text{ } ^\circ\text{C}$
 $150 \text{ } ^\circ\text{C}$

figure 24.

MOSFET

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

$$E = f(R_g)$$



With an inductive load at

$V_{DS} = 600 \text{ V}$
 $V_{GS} = -5/18 \text{ V}$
 $I_D = 400 \text{ A}$

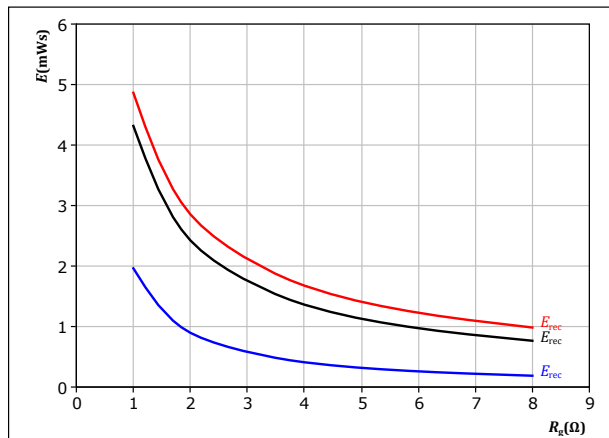
T_j : $25 \text{ } ^\circ\text{C}$
 $125 \text{ } ^\circ\text{C}$
 $150 \text{ } ^\circ\text{C}$

figure 26.

MOSFET

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

$$E_{rec} = f(R_g)$$



With an inductive load at

$V_{DS} = 600 \text{ V}$
 $V_{GS} = -5/18 \text{ V}$
 $I_D = 400 \text{ A}$

T_j : $25 \text{ } ^\circ\text{C}$
 $125 \text{ } ^\circ\text{C}$
 $150 \text{ } ^\circ\text{C}$



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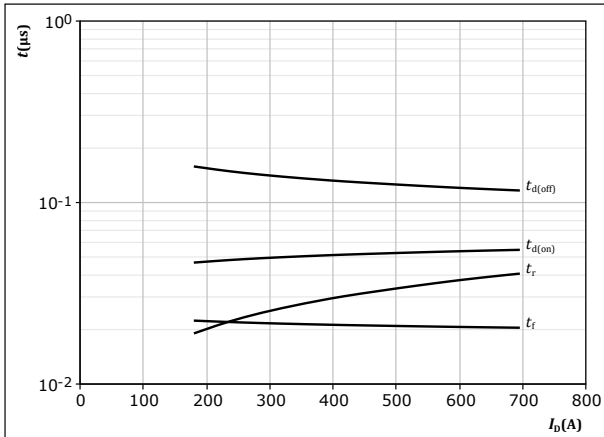
30-E312NAA003MS13-PS48F75Z datasheet

AC Switching Characteristics

figure 27.

MOSFET

Typical switching times as a function of drain current
 $t = f(I_D)$



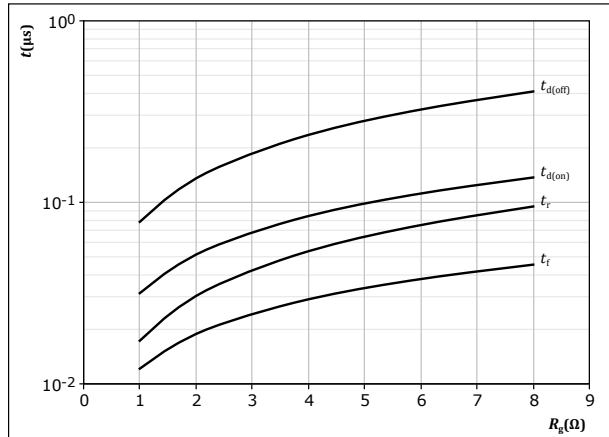
With an inductive load at

$T_j = 150$ °C
 $V_{DS} = 600$ V
 $V_{GS} = -5/18$ V
 $R_{gon} = 2$ Ω
 $R_{goff} = 2$ Ω

figure 28.

MOSFET

Typical switching times as a function of MOSFET turn on gate resistor
 $t = f(R_g)$



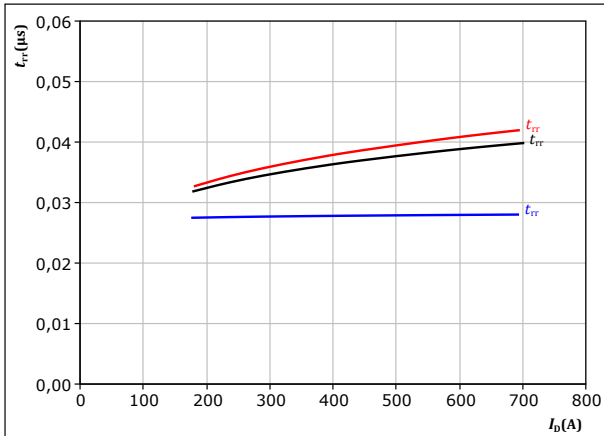
With an inductive load at

$T_j = 150$ °C
 $V_{DS} = 600$ V
 $V_{GS} = -5/18$ V
 $I_D = 400$ A

figure 29.

MOSFET

Typical reverse recovery time as a function of drain current
 $t_{rr} = f(I_D)$

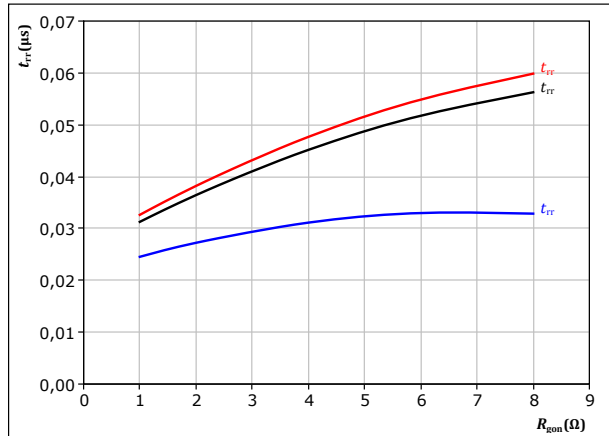


At $V_{DS} = 600$ V
 $V_{GS} = -5/18$ V
 $R_{gon} = 2$ Ω
 T_j : 25 °C (blue line)
125 °C (black line)
150 °C (red line)

figure 30.

MOSFET

Typical reverse recovery time as a function of MOSFET turn on gate resistor
 $t_{rr} = f(R_{gon})$



At $V_{DS} = 600$ V
 $V_{GS} = -5/18$ V
 $I_D = 400$ A
 T_j : 25 °C (blue line)
125 °C (black line)
150 °C (red line)



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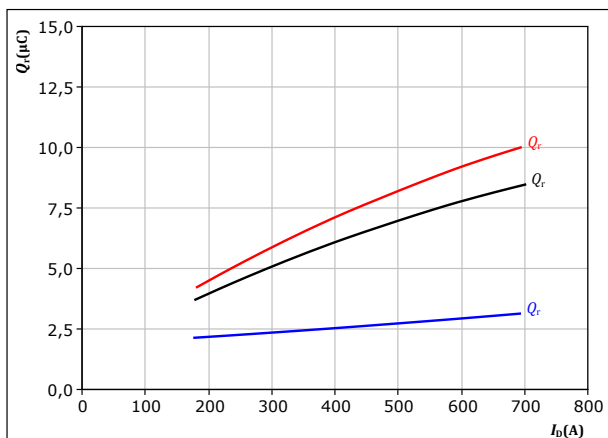
AC Switching Characteristics

figure 31.

MOSFET

Typical recovered charge as a function of drain current

$$Q_r = f(I_D)$$



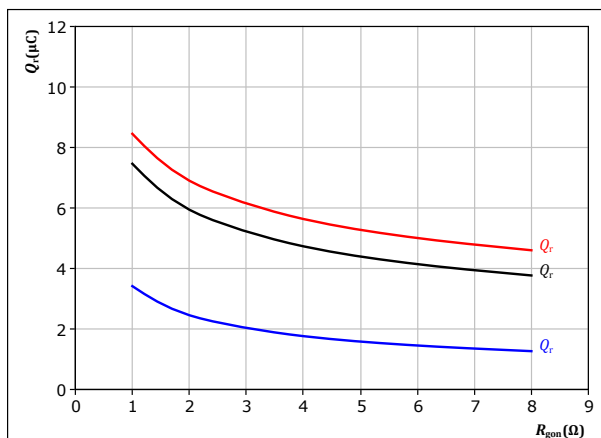
At $V_{DS} = 600$ V
 $V_{GS} = -5/18$ V
 $R_{gon} = 2$ Ω
 T_j : 25 °C
125 °C
150 °C

figure 32.

MOSFET

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

$$Q_r = f(R_{gon})$$



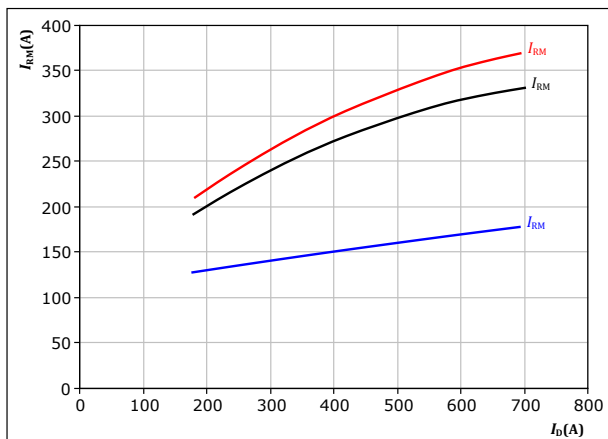
At $V_{DS} = 600$ V
 $V_{GS} = -5/18$ V
 $I_D = 400$ A
 T_j : 25 °C
125 °C
150 °C

figure 33.

MOSFET

Typical peak reverse recovery current as a function of drain current

$$I_{RM} = f(I_D)$$



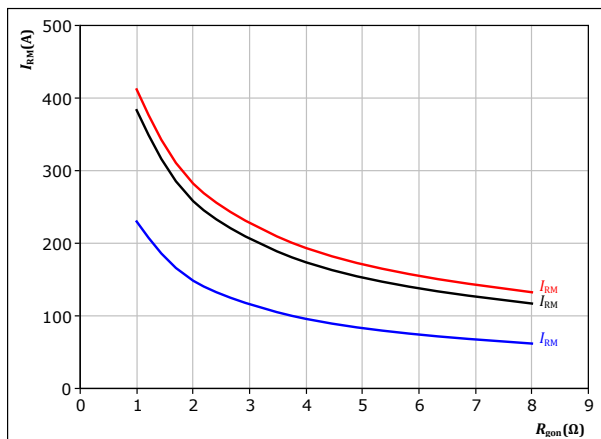
At $V_{DS} = 600$ V
 $V_{GS} = -5/18$ V
 $R_{gon} = 2$ Ω
 T_j : 25 °C
125 °C
150 °C

figure 34.

MOSFET

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

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



At $V_{DS} = 600$ V
 $V_{GS} = -5/18$ V
 $I_D = 400$ A
 T_j : 25 °C
125 °C
150 °C



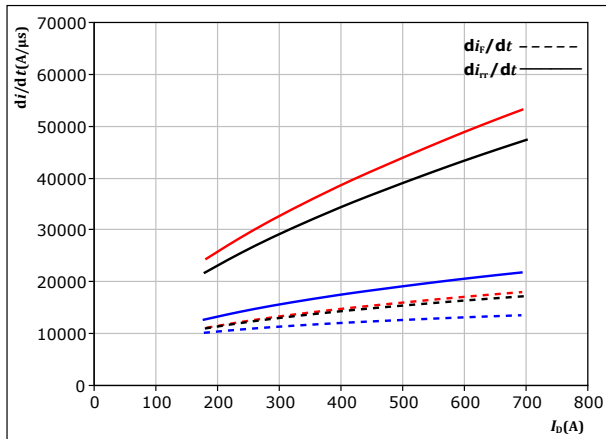
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datasheet

AC Switching Characteristics

figure 35. MOSFET

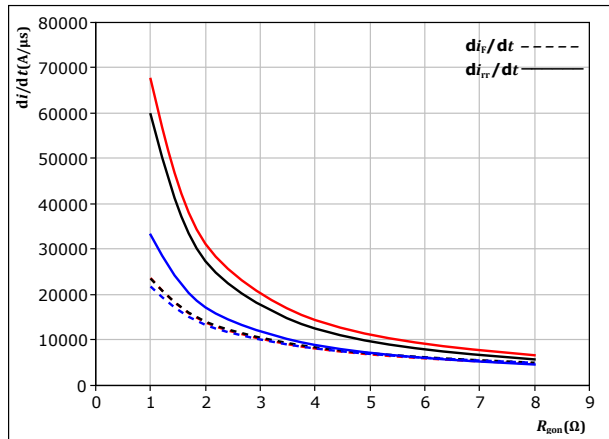
Typical rate of fall of forward and reverse recovery current as a function of drain current
 $di_f/dt, di_r/dt = f(I_D)$



At $V_{DS} = 600$ V
 $V_{GS} = -5/18$ V
 $R_{gon} = 2$ Ω
 $T_j = 25^\circ\text{C}$
 125°C
 150°C

figure 36. MOSFET

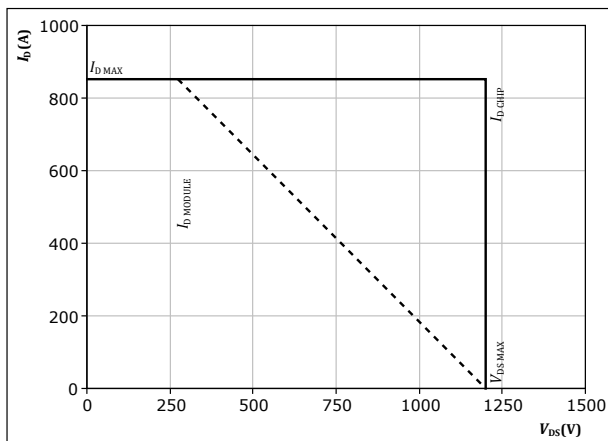
Typical rate of fall of forward and reverse recovery current as a function of turn on gate resistor
 $di_f/dt, di_r/dt = f(R_{gon})$



At $V_{DS} = 600$ V
 $V_{GS} = -5/18$ V
 $I_D = 400$ A
 $T_j = 25^\circ\text{C}$
 125°C
 150°C

figure 37. MOSFET

Reverse bias safe operating area
 $I_D = f(V_{DS})$



At $T_j = 150^\circ\text{C}$
 $R_{gon} = 2$ Ω
 $R_{goff} = 2$ Ω



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AC Switching Definitions

figure 38. MOSFET

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

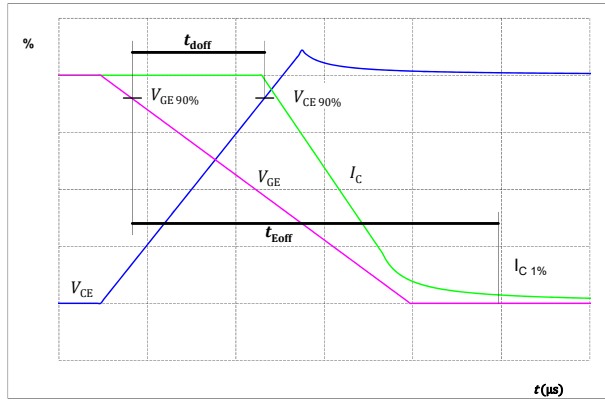


figure 39. MOSFET

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

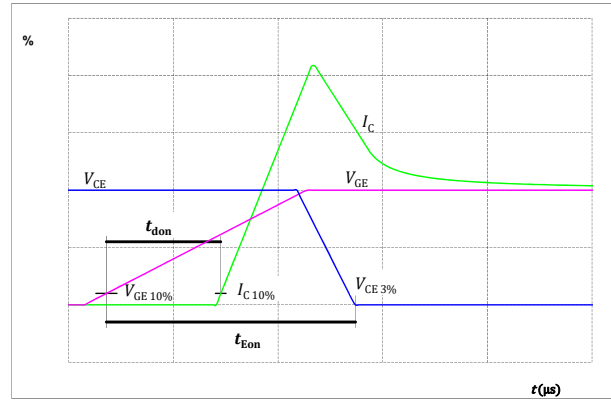


figure 40. MOSFET

Turn-off Switching Waveforms & definition of t_f

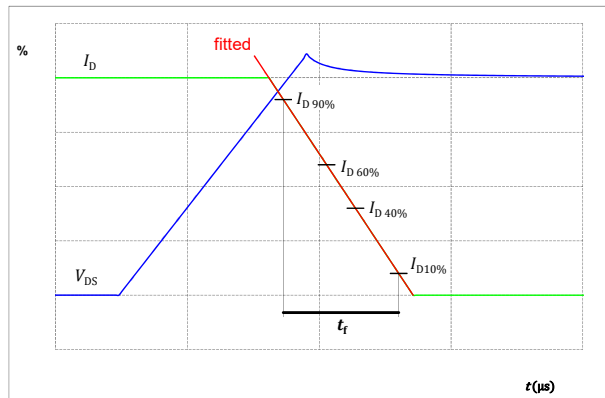
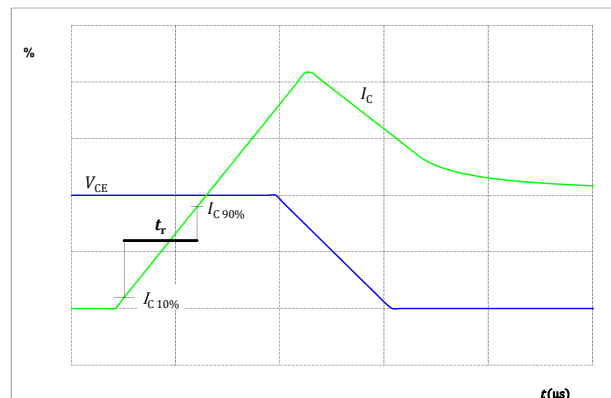


figure 41. MOSFET

Turn-on Switching Waveforms & definition of t_r





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AC Switching Definitions

figure 42. FWD

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

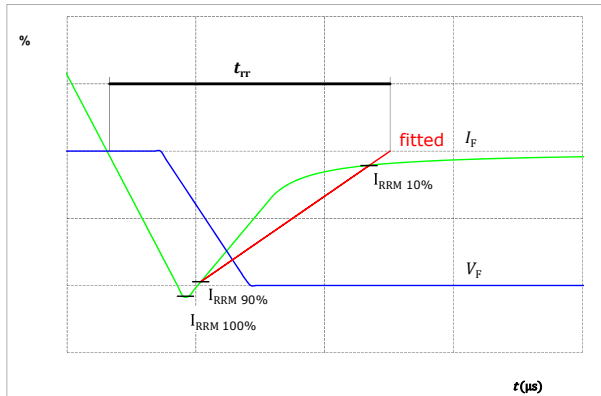


figure 43. FWD

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

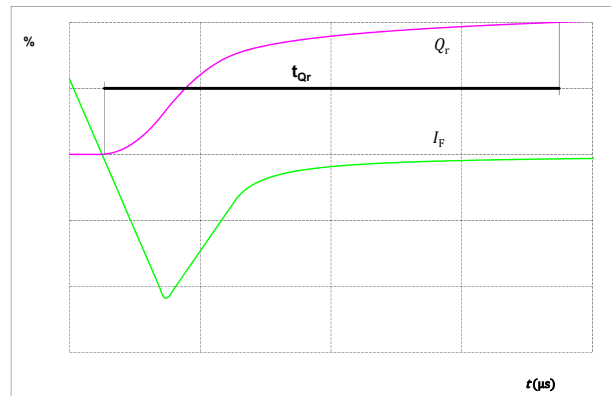
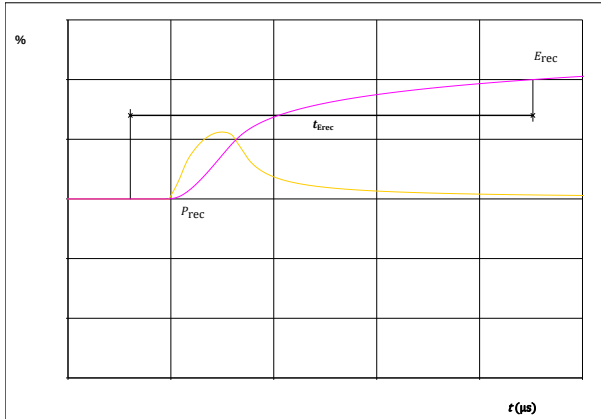


figure 44. FWD

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





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datasheet

Ordering Code	
Version	Ordering Code
Without thermal paste	30-E312NAA003MS13-PS48F75Z
With thermal paste (5,2 W/mK, PTM6000HV)	30-E312NAA003MS13-PS48F75Z-/7/

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

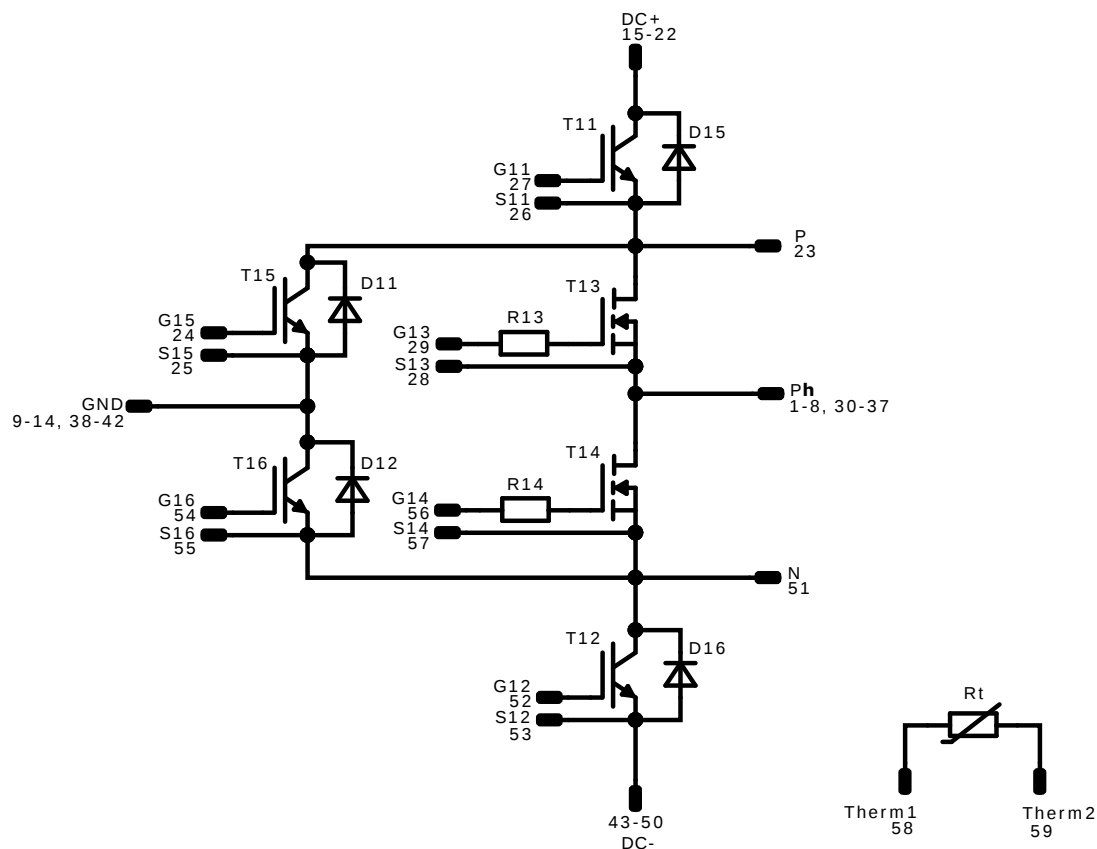
Outline							
Pin table [mm]							
Pin	X	Y	Function	31	52,96	48	Ph
1	0	48	Ph	32	56,16	48	Ph
2	3,2	48	Ph	33	59,36	48	Ph
3	6,4	48	Ph	34	62,56	48	Ph
4	9,6	48	Ph	35	65,76	48	Ph
5	12,8	48	Ph	36	68,96	48	Ph
6	16	48	Ph	37	72,16	48	Ph
7	19,2	48	Ph	38	40,16	0	GND
8	22,4	48	Ph	39	43,36	0	GND
9	19,2	3,2	GND	40	46,56	0	GND
10	19,2	0	GND	41	49,76	0	GND
11	22,4	3,2	GND	42	52,96	0	GND
12	22,4	0	GND	43	59,36	3,2	DC-
13	25,6	0	GND	44	59,36	0	DC-
14	28,8	0	GND	45	62,56	0	DC-
15	3,2	3,2	DC+	46	65,76	0	DC-
16	6,4	3,2	DC+	47	68,96	3,2	DC-
17	9,6	3,2	DC+	48	68,96	0	DC-
18	12,8	3,2	DC+	49	72,16	3,2	DC-
19	3,2	0	DC+	50	72,16	0	DC-
20	6,4	0	DC+	51	40,16	32	N
21	9,6	0	DC+	52	62,56	3,2	G12
22	12,8	0	DC+	53	65,76	3,2	S12
23	32	35,2	P	54	40,16	38,4	G16
24	25,6	3,2	G15	55	40,16	35,2	S16
25	28,8	3,2	S15	56	56,16	41,6	G14
26	16	16	S11	57	59,36	41,6	S14
27	12,8	16	G11	58	72,16	25,6	Therm1
28	16	35,2	S13	59	72,16	22,4	Therm2
29	16	32	G13				
30	49,76	48	Ph				



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Pinout



Identification

ID	Component	Voltage	Current	Function	Comment
T13, T14	MOSFET	1200 V	2,83 mΩ	AC Switch	
T15, T16	IGBT	1200 V	300 A	Neutral Point Switch	
D15, D16	FWD	1200 V	400 A	DC-Link Diode	
T11, T12	IGBT	950 V	400 A	DC-Link Switch	
D11, D12	FWD	1200 V	300 A	Neutral Point Diode	
R13, R14	Resistor			Resistor (Gate)	
Rt	Thermistor			Thermistor	



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Packaging instruction				
Standard packaging quantity (SPQ) 24	>SPQ	Standard	<SPQ	Sample
Handling instruction				
Handling instructions for <i>flow</i> E3BP packages see vincotech.com website.				
Package data				
Package data for <i>flow</i> E3BP 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 $T_{j,op}=175^{\circ}\text{C}$ and up to 4000VAC/1min isolation voltage. For more information see vincotech.com website.				

Document No.:	Date:	Modification:	Pages
30-E312NAA003MS13-PS48F75Z-D1-14	27 Mar. 2026	Initial Release	
30-E312NAA003MS13-PS48F75Z-D2-14	14 Aug. 2026	Add UL recognition	

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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.