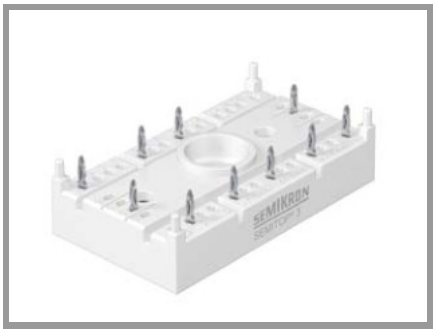


SEMITOP® 3 Press-Fit

SiC MOSFET Module

SK45MAHT12SCp

Features

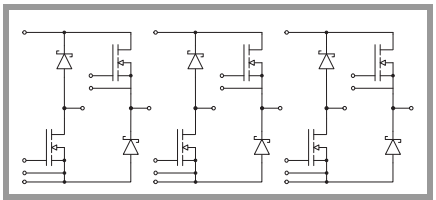
- One screw mounting module
- Fully compatible with other SEMITOP® Press-Fit types
- Improved thermal performance by aluminum oxide substrate
- Three phase inverter topology with split output
- Ultra Low inductance design
- SiC 1200V Planar MOSFET
- SiC 1200V Schottky FWD
- Extremely fast switching
- UL recognized, file no. E63532

Typical Applications*

- Solar inverter
- UPS
- Power Supply

Remarks

Diode1 = SiC Schottky FWD

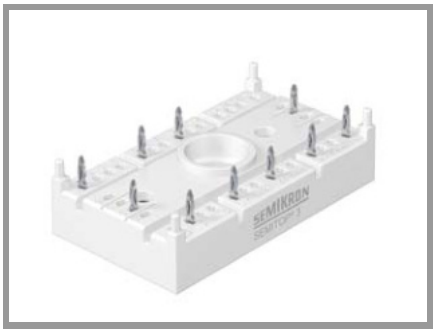


MAHT

Absolute Maximum Ratings				
Symbol	**Conditions**		**Values**	**Unit**
MOSFET 1				
V_{DSS}			1200	V
I_D	T_j = 175 °C	T_s = 25 °C	39	A
		T_s = 70 °C	32	A
I_{DM}	PW≤10µs, duty cycle≤1%		160	A
I_{DRM}			113	A
V_{GS}			-6 ... 22	V
T_j			-40 ... 175	°C
Integrated body diode				
I_{FM}	PW≤10µs, duty cycle≤1%		160	A
I_{FRM}			113	A

Absolute Maximum Ratings				
Symbol	**Conditions**		**Values**	**Unit**
Diode 1				
V_{RRM}	T_j = 25 °C		1200	V
I_F	T_j = 175 °C	T_s = 25 °C	56	A
		T_s = 70 °C	45	A
I_{Fnom}			50	A
I_{FRM}			113	A
I_{FSM}	8.3 ms sin 180°	T_j = 25 °C	207	A
		T_j = 150 °C	156	A
T_j			-40 ... 175	°C

Absolute Maximum Ratings			
Symbol	**Conditions**	**Values**	**Unit**
Module			
$I_{t(RMS)}$	$T_{terminal}$ = 100 °C, T_S = 60°C, per pin	40	A
T_{stg}		-40 ... 125	°C
V_{isol}	AC, sinusoidal, t = 1 min	2500	V



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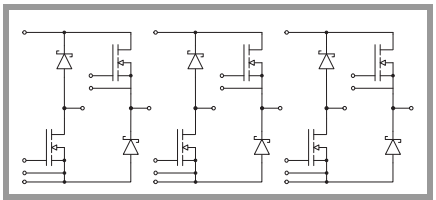


MAHT

Characteristics

Symbol	Conditions		min.	typ.	max.	Unit
MOSFET 1						
$V_{(BR)DSS}$	V_{GS} = 0 V, I_D = 1 mA, T_j = 25 °C		1200			V
$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = 8.9 mA, T_j = 25 °C		1.6		4	V
I_{DSS}	V_{GS} = 0 V, V_{DS} = 1200 V, T_j = 25 °C				1	mA
I_{GSS}	V_{DS} = 0 V, V_{GS} = 22 V, T_j = 25 °C				100	nA
$R_{DS(on)}$	V_{GS} = 18 V	T_j = 25 °C		45	56	mΩ
	I_D = 22 A	T_j = 150 °C		76	89	mΩ
C_{iss}	V_{GS} = 0 V, V_{DS} = 800 V, f = 1 MHz			4310		pF
C_{oss}	V_{GS} = 0 V, V_{DS} = 800 V, f = 1 MHz			137		pF
C_{rss}	V_{GS} = 0 V, V_{DS} = 800 V, f = 1 MHz			19		pF
R_{Gint}	T_j = 25 °C			4.7		Ω
Q_G	V_{DS}=600V, V_{GS}=-5V...+20V, I_D = 45 A			215		nC
$t_{d(on)}$	V_{DD} = 600 V V_{GS} = 20/-5 V I_D = 45 A R_G = 0.5 Ω di/dt_{off} = 2.2 kA/µs di/dt_{on} = 3.9 kA/µs	T_j = 150 °C		12		ns
$t_{d(off)}$		T_j = 150 °C		64		ns
t_r		T_j = 150 °C		17		ns
t_f		T_j = 150 °C		16		ns
E_{on}		T_j = 150 °C		0.16		mJ
E_{off}		T_j = 150 °C		0.37		mJ
$R_{th(j-s)}$	per MOSFET			1.04		K/W
Integrated body diode						
$V_F = V_{SD}$	$-I_D$ = 50 A V_{GS} = 0 V chiplevel	T_j = 25 °C		6.40		V
		T_j = 150 °C		5.20		V
$V_{F0} = V_{SD0}$	chiplevel	T_j = 25 °C		3.90		V
		T_j = 150 °C		3.40		V
$r_F = r_{SD}$	chiplevel	T_j = 25 °C		50		mΩ
		T_j = 150 °C		36		mΩ
t_{rr}	V_{DD} = 600 V $-I_D$ = 45 A V_{GS} = -5 V			-		ns
Q_{rr}				-		µC
I_{rr}				-		A
E_{rr}				-		mJ

Characteristics

Symbol	Conditions		min.	typ.	max.	Unit
Diode 1						
V_F	I_F = 50 A	T_j = 25 °C		1.40	1.60	V
	chiplevel	T_j = 150 °C		1.80	2.10	V
V_{F0}	chiplevel	T_j = 25 °C		0.95	1.05	V
		T_j = 150 °C		0.80	0.90	V
r_F	chiplevel	T_j = 25 °C		9.0	11	mΩ
		T_j = 150 °C		20	24	mΩ
C_j	V_R = 800 V, f = 1 MHz, T_j = 25 °C			0.210		nF
Q_c	V_R = 800 V, di/dt_{off} = 500 A/µs, T_j = 25 °C			0.17		µC
$R_{th(j-s)}$	per Diode			1.14		K/W

Characteristics

Symbol	Conditions	min.	typ.	max.	Unit
Module					
M_s	to heatsink	2.25		2.5	Nm
w	weight		30		g

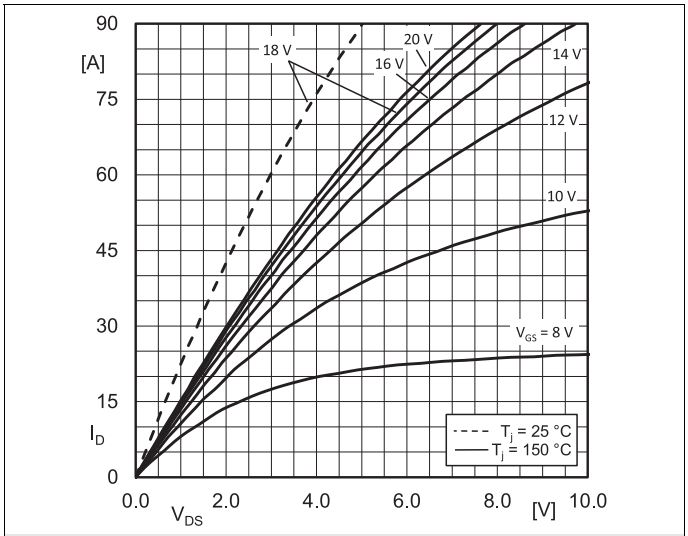


Fig.1: Typ. MOSFET forward output characteristic, incl. $R_{DD'+SS'}$

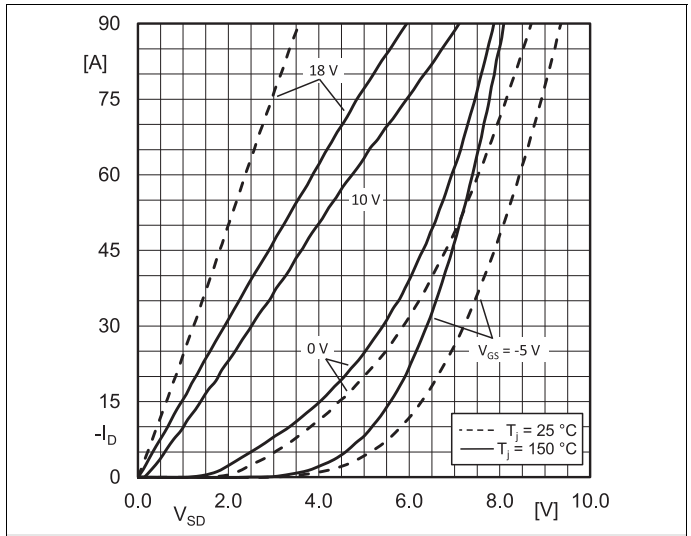


Fig. 2: Typ. MOSFET reverse output characteristic, incl. $R_{DD'+SS'}$

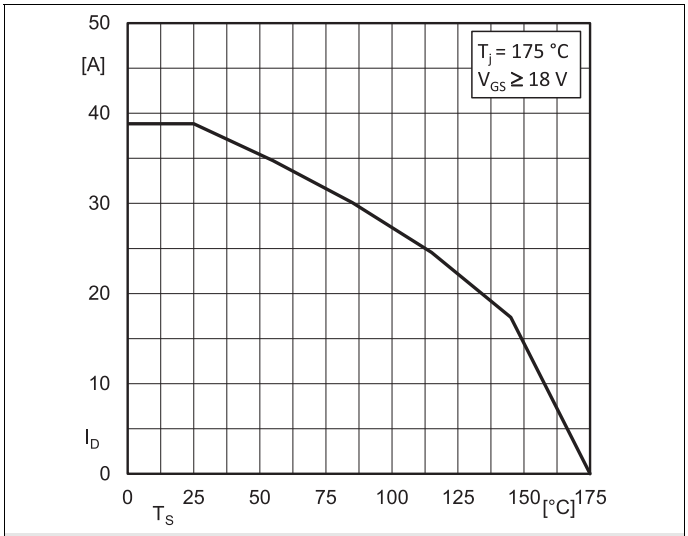


Fig. 3: Rated current vs. temperature $I_D = f(T_S)$

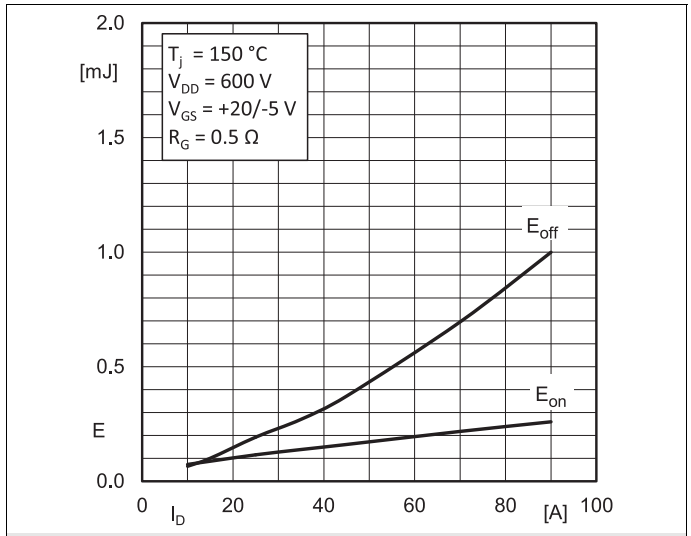


Fig. 4: Typ. turn-on/-off energy $E = f(I_D)$

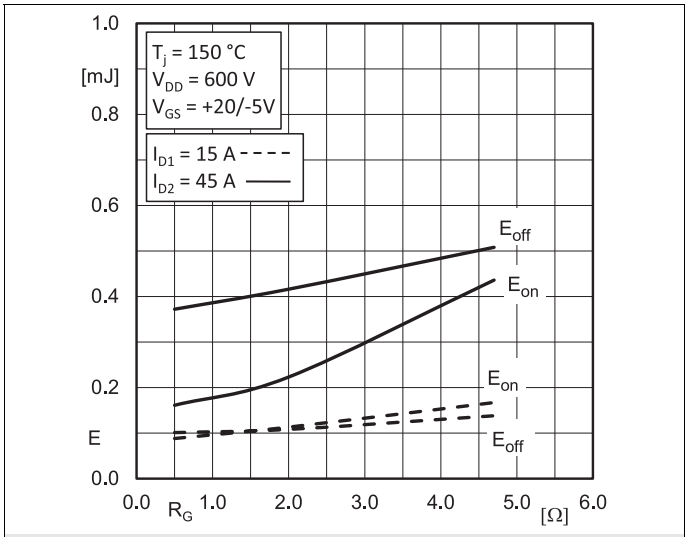


Fig. 5: Typ. turn-on /-off energy $E = f(R_G)$

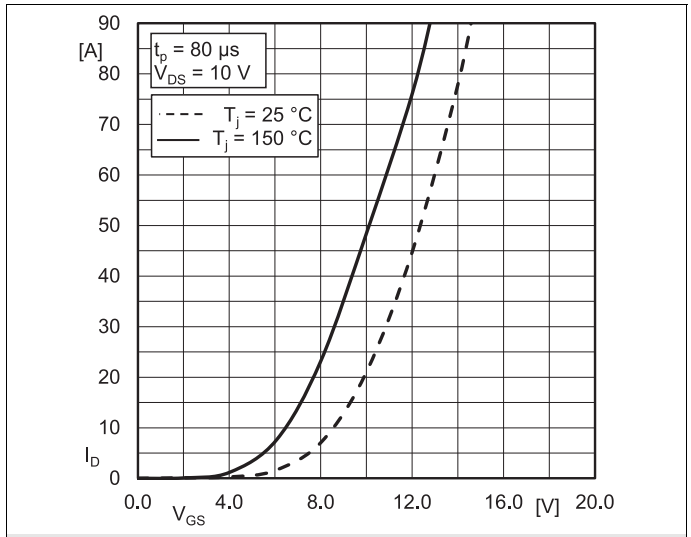
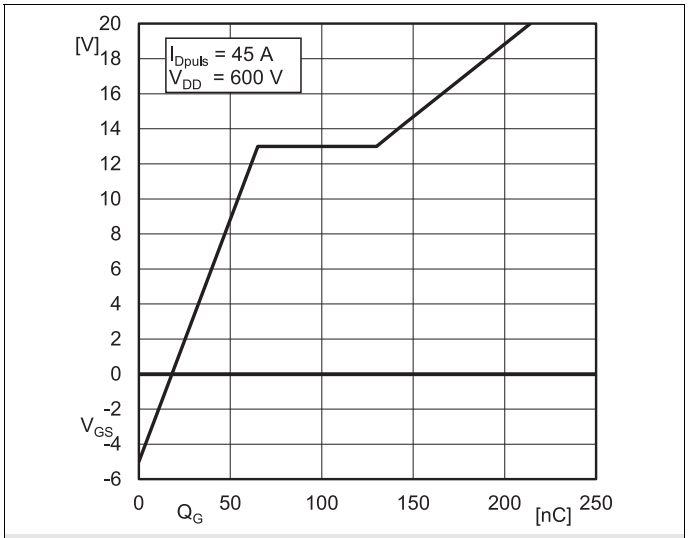


Fig. 6: Typ. MOSFET transfer characteristic



Flg. 7: Typ. MOSFET gate charge characteristic

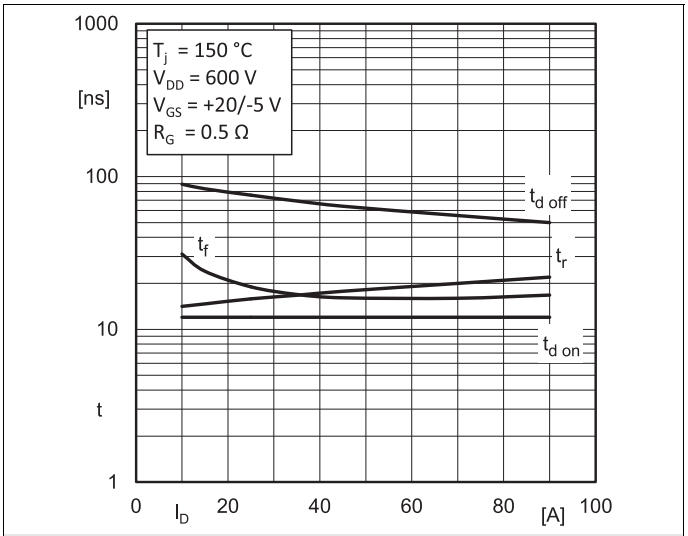


Fig. 8: Typ. switching times vs. I_D

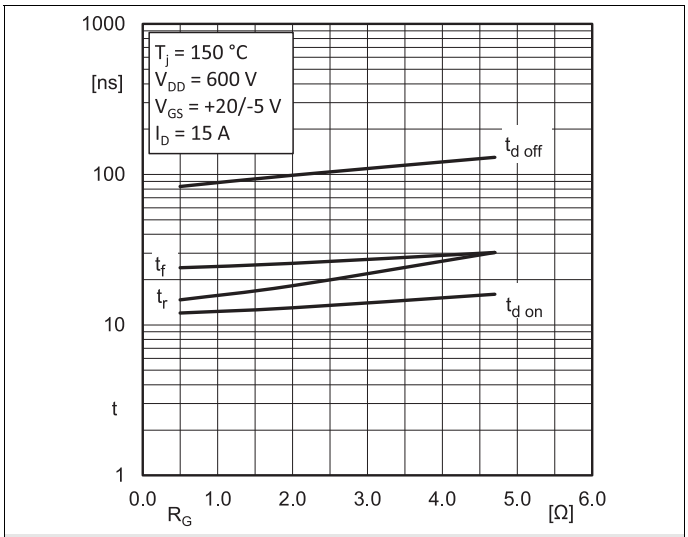


Fig. 9: Typ. switching times vs. gate resistor R_G at I_{D1}

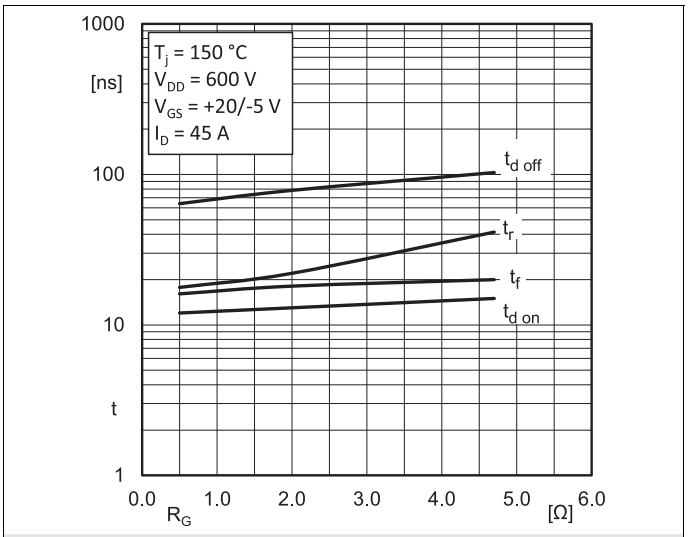


Fig. 10: Typ. switching times vs. gate resistor R_G at I_{D2}

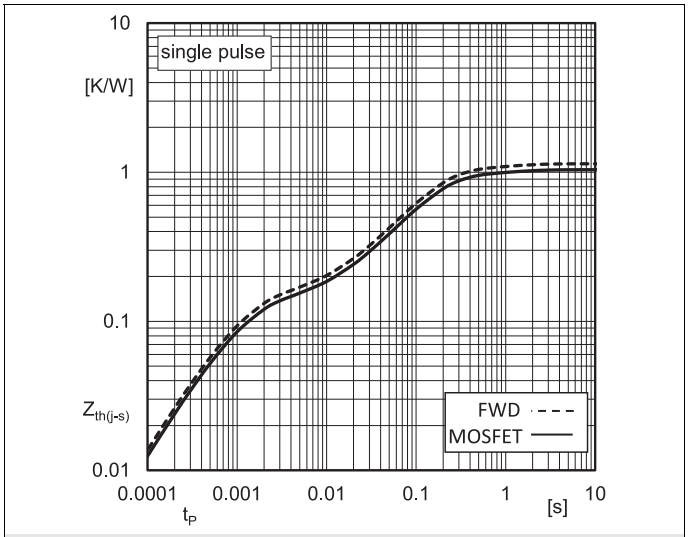


Fig. 11: Typ. transient thermal impedances

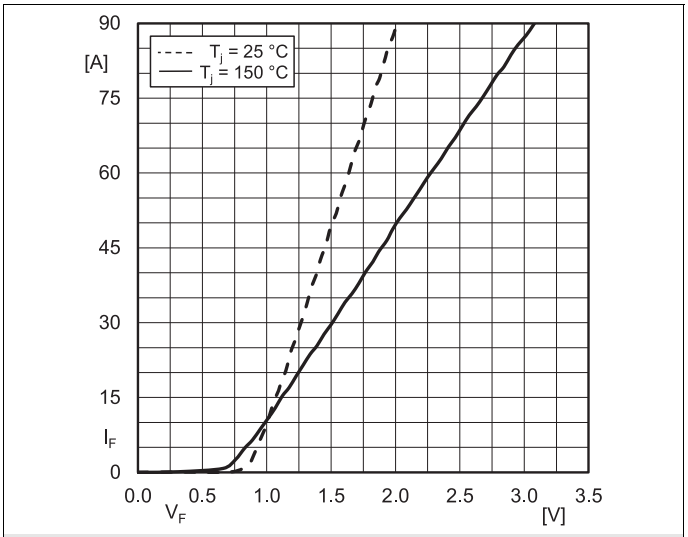
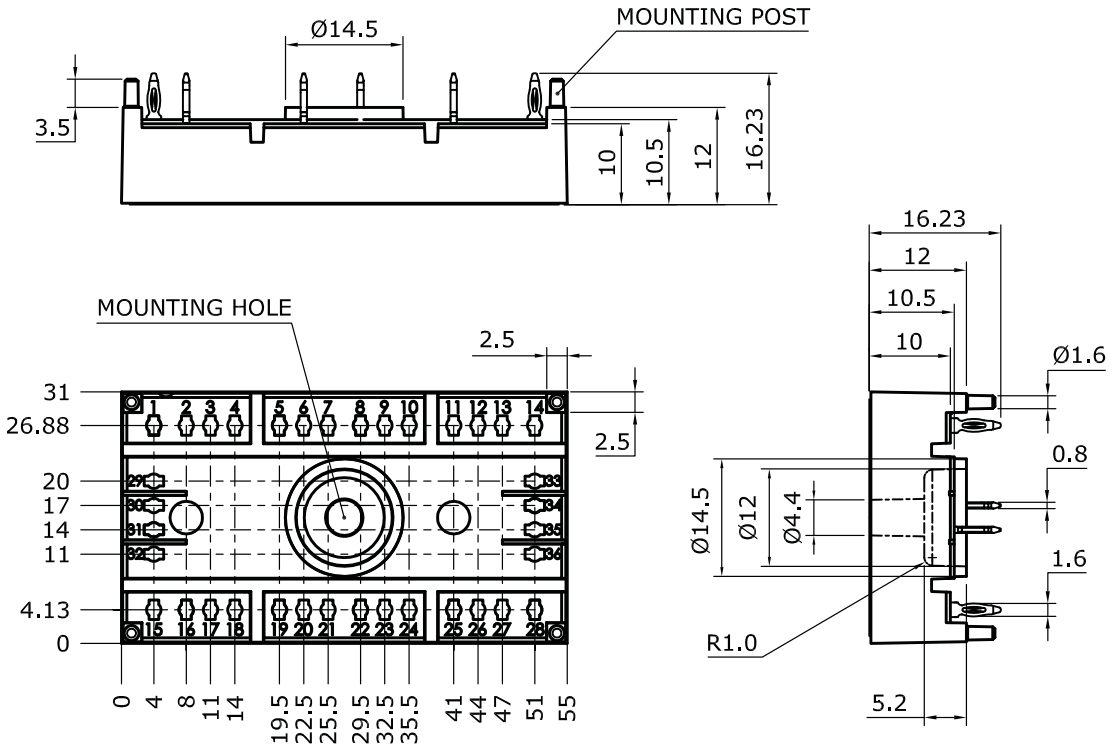


Fig. 12: Typ. FWD output characteristic, incl. $R_{DD'+\,SS'}$

Dimensions: mm
Tolerance system: ISO 2768-m



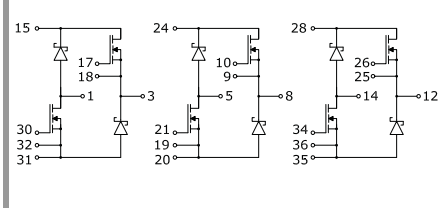
Suggested drilled hole diameter for terminal pins in the circuit board:

- minimum: 1.575 mm
- typical: 1.6 mm
- maximum: 1.625 mm

Suggested hole diameter for the mounting post in the circuit board:

- 2 mm

SEMITOP 3 Press-Fit



MAHT

This is an electrostatic discharge sensitive device (ESDS), international standard IEC 60747-1, chapter IX.

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