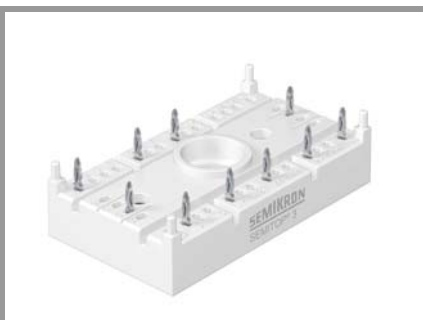


SK45MLET12SCp



SEMITOP® 3 Press-Fit

SiC MOSFET Module

SK45MLET12SCp

Features*

- One screw mounting module
- Fully compatible with other SEMITOP® Press-Fit types
- Improved thermal performance by aluminum oxide substrate
- Three separated Boost legs in very compact solution
- Ultra Low inductance design
- SiC 1200V Planar MOSFET
- SiC 1200V Schottky FWD
- By-pass Rectifier diodes
- Extremely high switching frequency
- UL recognized, file no. E63 532

Typical Applications

- Interleaved PFC
- Solar inverter
- UPS
- Power Supply

Remarks

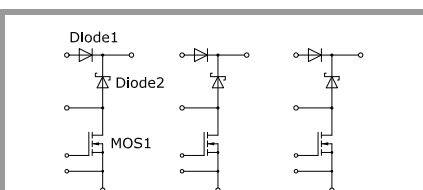
By-pass diode = Diode1
FWD = Diode2

Absolute Maximum Ratings				
Symbol	Conditions	Values	Unit	
MOSFET 1				
V_{DSS}		1200	V	
I_D	$T_j = 175\text{ °C}$	$T_s = 25\text{ °C}$	39	A
		$T_s = 70\text{ °C}$	32	A
I_{DM}	$PW \leq 10\mu s$, Duty cycle $\leq 1\%$	160	A	
$I_{DM,replicative}$		113	A	
V_{GS}		-6 ... 22	V	
T_j		-40 ... 175	°C	
Integrated body diode				
I_{FM}	$PW \leq 10\mu s$, Duty cycle $\leq 1\%$	160	A	
$I_{FM,replicative}$		113	A	

Absolute Maximum Ratings				
Symbol	Conditions	Values	Unit	
Diode 1				
V_{RRM}	$T_j = 25\text{ °C}$	1600	V	
I_F	$T_j = 150\text{ °C}$	$T_s = 25\text{ °C}$	43	A
		$T_s = 70\text{ °C}$	32	A
I_{FSM}	10 ms, $T_j = 150\text{ °C}$	270	A	
i^2t	10 ms, $T_j = 150\text{ °C}$	364	A ² s	
T_j		-40 ... 150	°C	

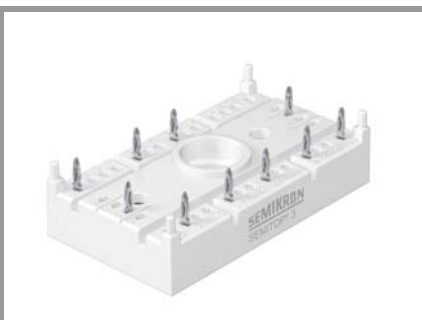
Absolute Maximum Ratings				
Symbol	Conditions	Values	Unit	
Diode 2				
V_{RRM}	$T_j = 25\text{ °C}$	1200	V	
I_F	$T_j = 175\text{ °C}$	$T_s = 25\text{ °C}$	56	A
		$T_s = 70\text{ °C}$	44	A
I_{FRM}		113	A	
I_{FSM}	10 ms sin 180°	$T_j = 25\text{ °C}$	190	A
		$T_j = 150\text{ °C}$	140	A
T_j		-40 ... 175	°C	

Absolute Maximum Ratings			
Symbol	Conditions	Values	Unit
Module			
$I_{t(RMS)}$	$\Delta T_{terminal}$ at PCB joint = 30 K, per pin	35	A
T_{stg}	module without TIM	-40 ... 125	°C
V_{isol}	AC, sinusoidal, t = 1 min	2500	V



MLET

SK45MLET12SCp



SEMIPRESS® 3 Press-Fit

SiC MOSFET Module

SK45MLET12SCp

Features*

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- Three separated Boost legs in very compact solution
- Ultra Low inductance design
- SiC 1200V Planar MOSFET
- SiC 1200V Schottky FWD
- By-pass Rectifier diodes
- Extremely high switching frequency
- UL recognized, file no. E63 532

Typical Applications

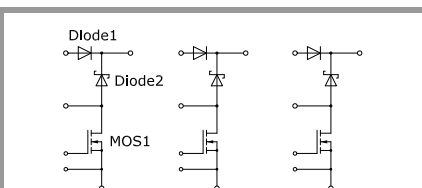
- Interleaved PFC
- Solar inverter
- UPS
- Power Supply

Remarks

By-pass diode = Diode1
FWD = Diode2

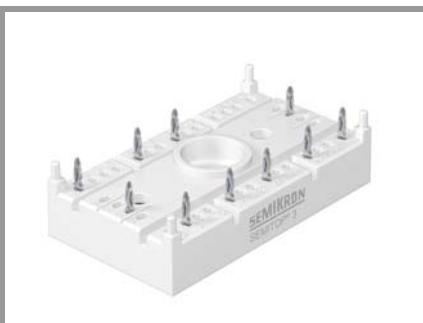
Characteristics					
Symbol	Conditions	min.	typ.	max.	Unit
MOSFET 1					
$V_{(BR)DSS}$	$V_{GS} = 0\text{ V}, I_D = 1\text{ mA}, T_j = 25\text{ °C}$	1200			V
$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 8.9\text{ mA}, T_j = 25\text{ °C}$	1.6		4	V
I_{DSS}	$V_{GS} = 0\text{ V}, V_{DS} = 1200\text{ V}, T_j = 25\text{ °C}$			1	mA
I_{GSS}	$V_{DS} = 0\text{ V}, V_{GS} = 22\text{ V}, T_j = 25\text{ °C}$			100	nA
$R_{DS(on)}$	$V_{GS} = 18\text{ V}$		45	56	mΩ
	$I_D = 22\text{ A}$ chipelevel	$T_j = 25\text{ °C}$			
			76		mΩ
					$T_j = 150\text{ °C}$
C_{iss}	$V_{GS} = 0\text{ V}, V_{DS} = 800\text{ V}, f = 1\text{ MHz}$		4310		pF
C_{oss}	$V_{GS} = 0\text{ V}, V_{DS} = 800\text{ V}, f = 1\text{ MHz}$		137		pF
C_{rss}	$V_{GS} = 0\text{ V}, V_{DS} = 800\text{ V}, f = 1\text{ MHz}$		19		pF
R_{Gint}	$T_j = 25\text{ °C}$		4.7		Ω
Q_G	$V_{DS} = 600\text{ V}, V_{GS} = -5\text{ V} \dots +20\text{ V}, I_D = 45\text{ A}$		215		nC
$t_{d(on)}$	$V_{DD} = 600\text{ V}$		12		ns
$t_{d(off)}$	$V_{GS} = 20/-5\text{ V}$	$T_j = 150\text{ °C}$			
	$I_D = 45\text{ A}$	$T_j = 150\text{ °C}$	64		ns
t_r	$R_{Gon} = 0.5\text{ Ω}$	$T_j = 150\text{ °C}$	17		ns
t_f	$R_{Goff} = 0.5\text{ Ω}$	$T_j = 150\text{ °C}$	16		ns
E_{on}	$di/dt_{off} = 2.2\text{ kA}/\mu\text{s}$	$T_j = 150\text{ °C}$	0.16		mJ
E_{off}	$di/dt_{on} = 3.9\text{ kA}/\mu\text{s}$	$T_j = 150\text{ °C}$	0.37		mJ
$R_{th(j-s)}$	per MOSFET		1.04		K/W
Integrated body diode					
$V_F = V_{SD}$	$-I_D = 22\text{ A}$	$T_j = 25\text{ °C}$	4.10		V
	$V_{GS} = 0\text{ V}$ chipelevel	$T_j = 150\text{ °C}$	3.90		V
$V_{F0} = V_{SD0}$	chipelevel	$T_j = 25\text{ °C}$	2.60		V
		$T_j = 150\text{ °C}$	2.10		V
$r_F = r_{SD}$	chipelevel	$T_j = 25\text{ °C}$	68		mΩ
		$T_j = 150\text{ °C}$	82		mΩ
t_{rr}	$V_{DD} = 600\text{ V}$	$T_j = 150\text{ °C}$	-		ns
Q_{rr}	$-I_D = 45\text{ A}$	$T_j = 150\text{ °C}$	-		μC
I_{rr}	$V_{GS} = -5\text{ V}$	$T_j = 150\text{ °C}$	-		A
E_{rr}	$R_{Gon} = 0.5\text{ Ω}$	$T_j = 150\text{ °C}$	-		mJ

Characteristics					
Symbol	Conditions	min.	typ.	max.	Unit
Diode 1					
V_F	$I_F = 35\text{ A}$	$T_j = 25\text{ °C}$	1.20	1.60	V
	chipelevel	$T_j = 125\text{ °C}$	1.19	1.56	V
V_{F0}	chipelevel	$T_j = 25\text{ °C}$	0.88	0.98	V
		$T_j = 125\text{ °C}$	0.73	0.83	V
r_F	chipelevel	$T_j = 25\text{ °C}$	9.2	18	mΩ
		$T_j = 125\text{ °C}$	13	21	mΩ
I_R	$T_j = 145\text{ °C}, V_{RRM}$			1.1	mA
$R_{th(j-s)}$	per Diode, $\lambda_{paste} = 0.8\text{ W}/(\text{mK})$		1.7		K/W



MLET

SK45MLET12SCp



SEMITOP® 3 Press-Fit

SiC MOSFET Module

SK45MLET12SCp

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- Improved thermal performance by aluminum oxide substrate
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- SiC 1200V Planar MOSFET
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- By-pass Rectifier diodes
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Typical Applications

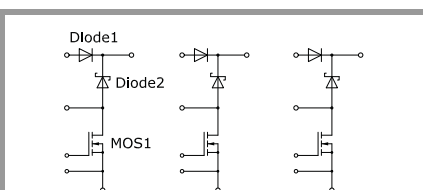
- Interleaved PFC
- Solar inverter
- UPS
- Power Supply

Remarks

By-pass diode = Diode1
FWD = Diode2

Characteristics						
Symbol	Conditions		min.	typ.	max.	Unit
Diode 2						
V_F	$I_F = 50 \text{ A}$	$T_j = 25 \text{ °C}$		1.40	1.60	V
	chipelevel	$T_j = 150 \text{ °C}$		1.80	2.10	V
V_{F0}	chipelevel	$T_j = 25 \text{ °C}$		0.95	1.05	V
		$T_j = 150 \text{ °C}$		0.80	0.90	V
r_F	chipelevel	$T_j = 25 \text{ °C}$		9.0	11	mΩ
		$T_j = 150 \text{ °C}$		20	24	mΩ
C_j	$V_R = 800 \text{ V}, f = 1 \text{ MHz}, T_j = 25 \text{ °C}$			0.210		nF
Q_c	$V_R = 800 \text{ V}, di/dt_{off} = 500 \text{ A}/\mu\text{s}, T_j = 25 \text{ °C}$			0.088		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



MLET

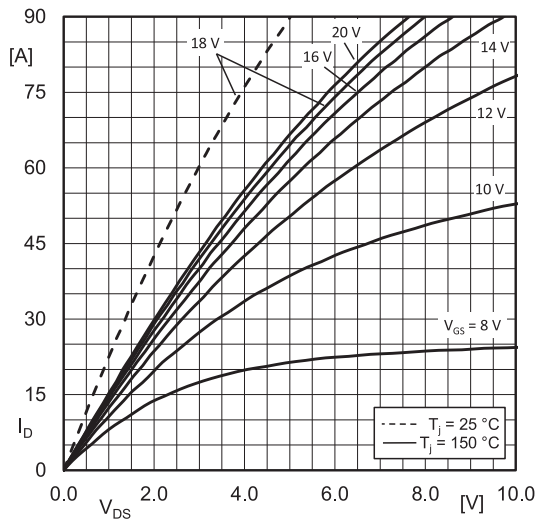


Fig. 1: Typ. MOSFET forward output characteristic, incl. $R_{DD'+SS'}$

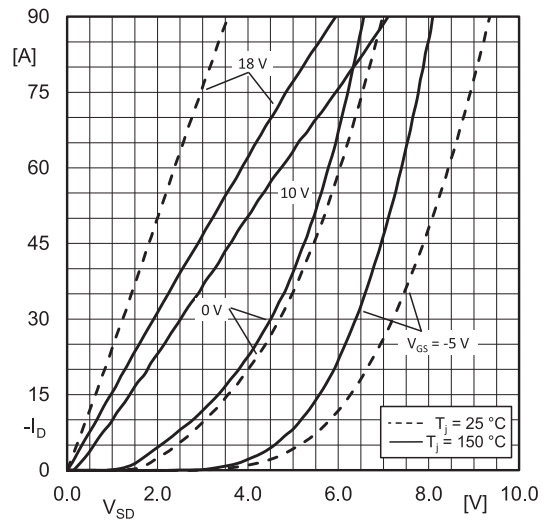


Fig. 2: Typ. reverse output characteristic, incl. $R_{DD'+SS'}$

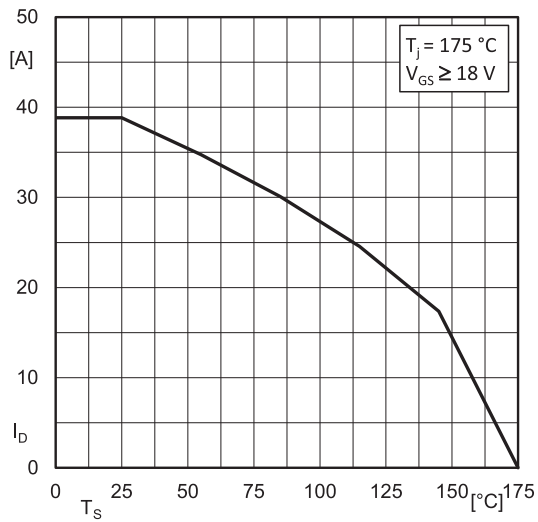


Fig. 3: Rated current vs. temperature $I_D = f(T_S)$

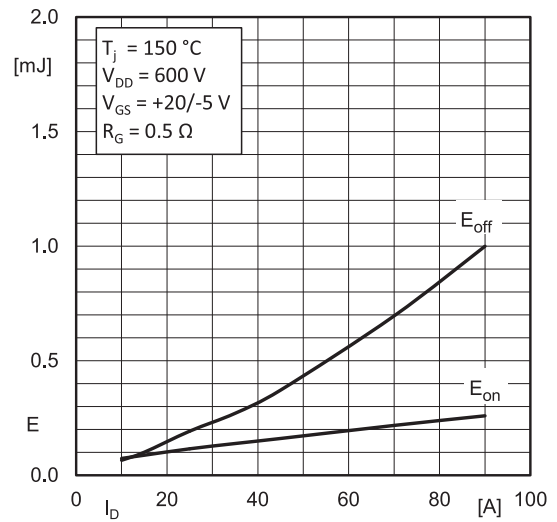


Fig. 4: Typ. turn-on/-off energy $E = f(I_D)$

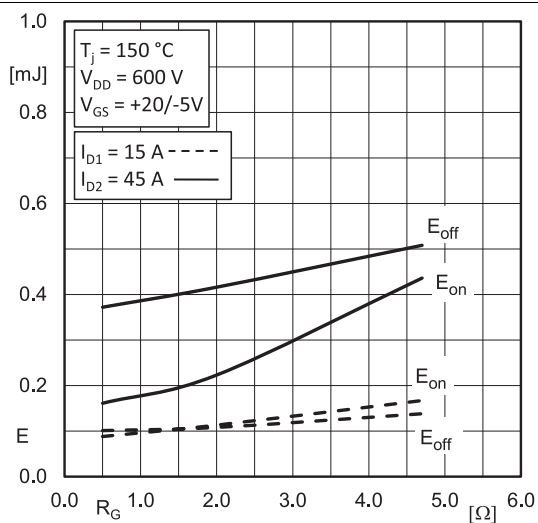


Fig. 5: Typ. turn-on /-off energy $E = f(R_G)$

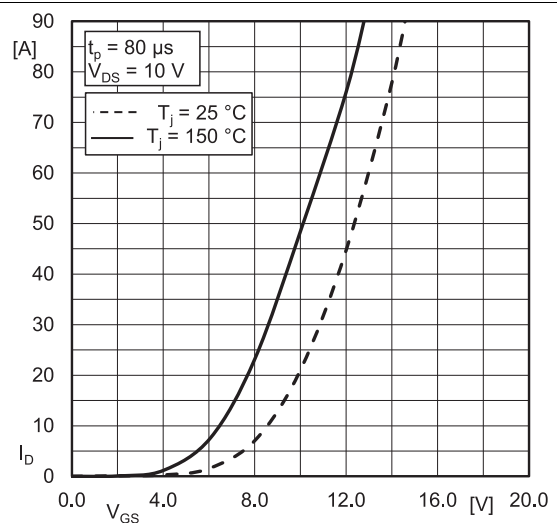


Fig. 6: Typ. MOSFET transfer characteristic

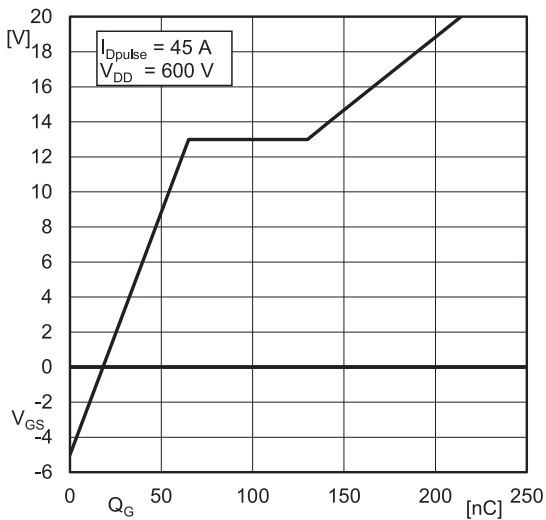


Fig 7: Typ. MOSFET gate charge characteristic

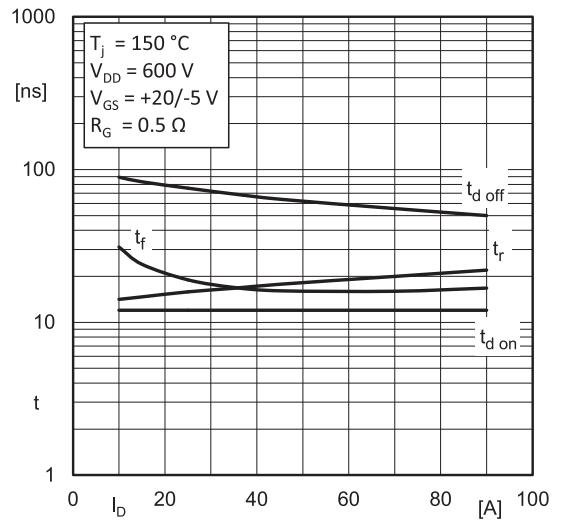


Fig. 8: Typ. switching times vs. I_D

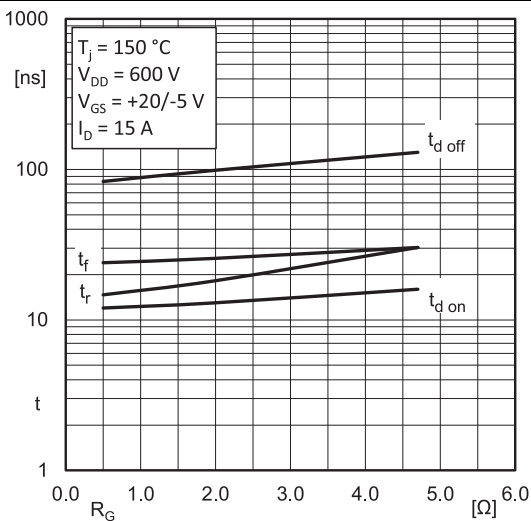


Fig. 9: Typ. switching times vs. gate resistor R_G at I_{D1}

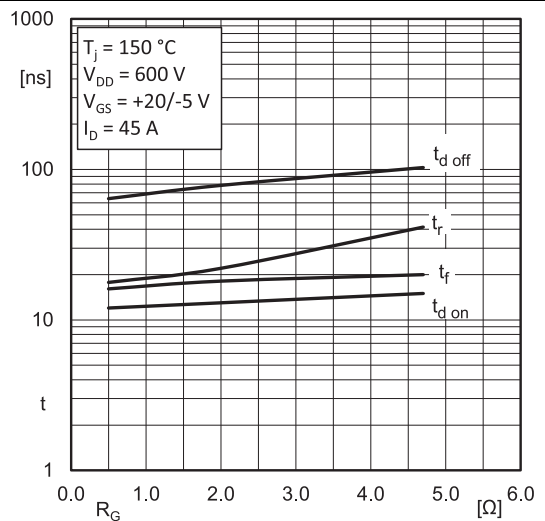


Fig. 10: Typ. switching times vs. gate resistor R_G at I_{D2}

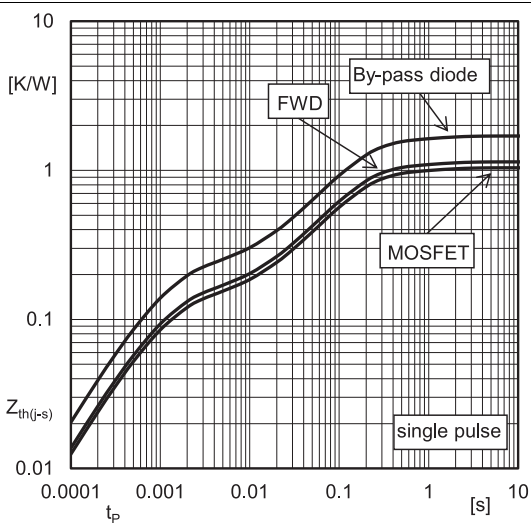


Fig. 11: Typ. transient thermal impedances

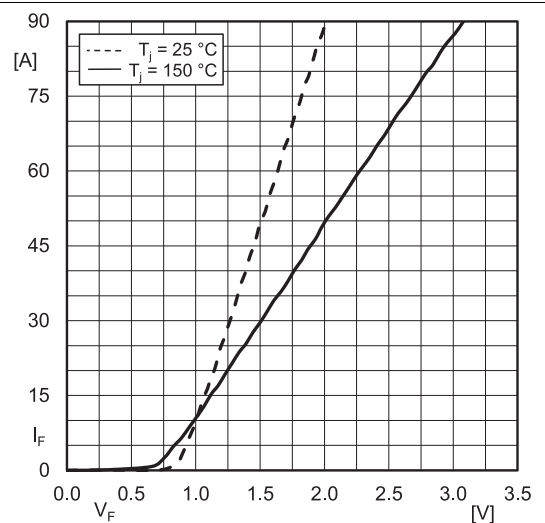
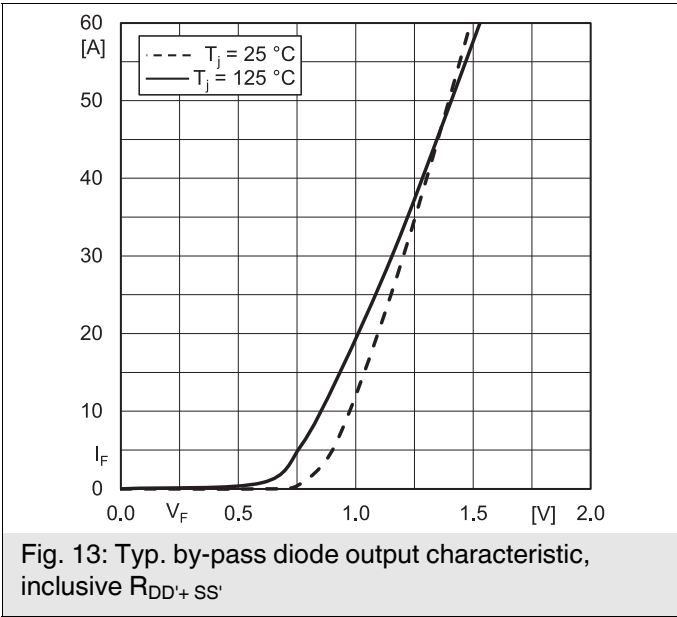


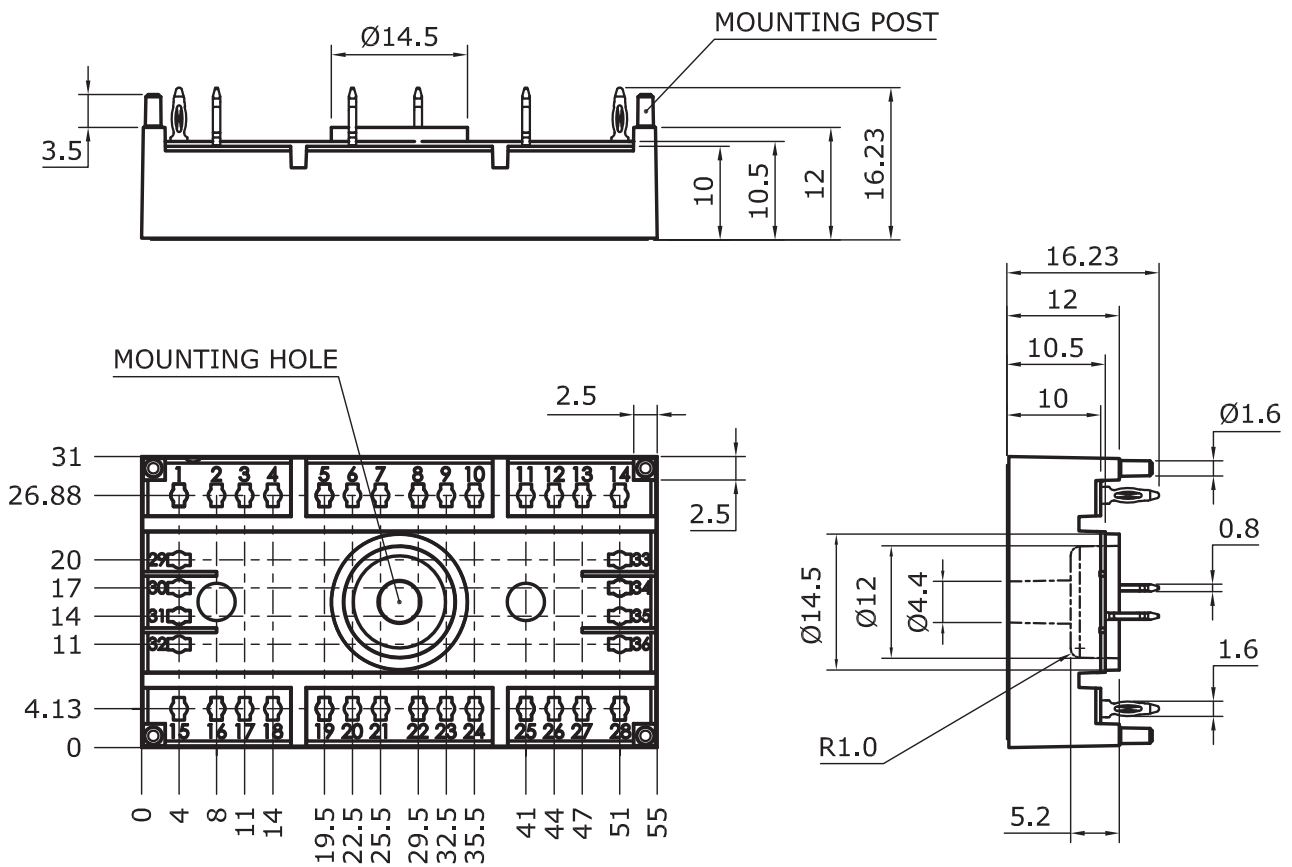
Fig. 12: Typ. FWD output characteristic, incl. R_{DD+ss}'



SK45MLET12SCp

Dimensions: mm

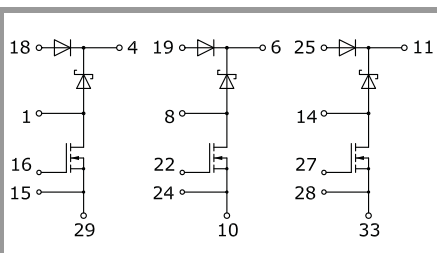
Tolerance system: ISO 2768-m



Suggested drilled hole diameter for terminal pins in the circuit board:
 - refer Mounting Instruction SEMITOP® Classic

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SEMITOP 3 Press-Fit



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This is an electrostatic discharge sensitive device (ESDS) due to international standard IEC 61340.

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