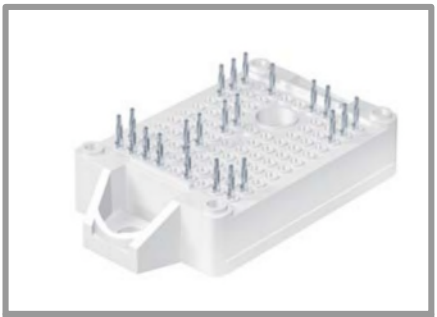
SK40MD120CR03ETE1



SEMITOP®E1

Sixpack Open Emitter

(Full SiC)

SK40MD120CR03ETE1

Features*

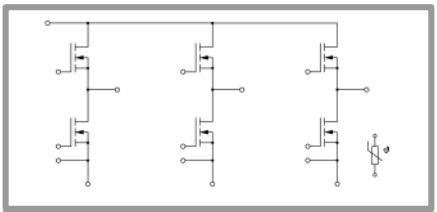
- Optimized design for superior thermal performance
- Low inductance design
- Press-Fit contact technology
- 1200V Planar Gen3 SiC MOSFET
- Simple to drive with +15V gate voltage
- Integrated NTC temperature sensor
- UL recognized file no. E 63 532

Typical Applications

- Switched Mode Power Supplies
- Energy Storage Systems
- Electric Vehicle charging
- UPS
- Motor Drives

Remarks

- Recommended T_{jop} = -40°C...+150°C
- Recommended turn-off / turn-on gate voltage V_{GS} = -4...0/+15V

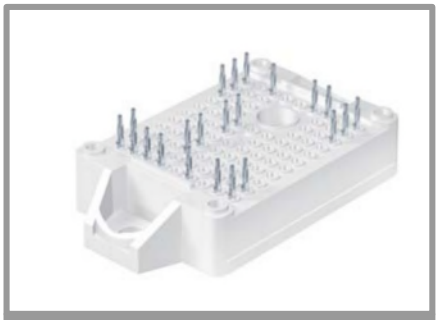


MD-ET

Absolute Maximum Ratings				
Symbol	**Conditions**		**Values**	**Unit**
MOSFET				
V_{DSS}	T_j = 25 °C		1200	V
I_D	HPTP / HP-PCM Tj = 175 °C	T_s = 25 °C	51	A
		T_s = 70 °C	42	A
I_{DM}	Pulse width t_p limited by T_{jmax}		120	A
V_{GS}	Transient Gate - Source voltage (t<100ns)		-8 ... 19	V
T_j			-40 ... 175	°C
Integrated body diode				
I_{SM}	Pulse width t_p limited by T_{jmax}		120	A
I_{FSM}	t_p = 10 ms, sin 180°, T_j = 150 °C		232	A

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

SK40MD120CR03ETE1



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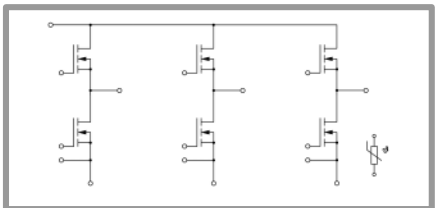


MD-ET

Characteristics

Symbol	Conditions		min.	typ.	max.	Unit
MOSFET						
$V_{(BR)DSS}$	V_{GS} = 0 V, I_D = 0.1 mA, T_j = 25 °C chiplevel		1200			V
$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = 11.5 mA, T_j = 25 °C		1.8	2.5	3.6	V
I_{DSS}	V_{GS} = 0 V, V_{DS} = 1200 V, T_j = 25 °C				0.2	mA
I_{GSS}	V_{DS} = 0 V, V_{GS} = 15 V, T_j = 25 °C				400	nA
$R_{DS(on)}$	V_{GS} = 15 V, I_D = 41 A, chiplevel	T_j = 25 °C		32	43	mΩ
		T_j = 150 °C		50		mΩ
C_{iss}	V_{GS} = 0 V, V_{DS} = 1000 V, T_j = 25 °C	f = 0.1 MHz		3400		pF
C_{oss}		f = 0.1 MHz		130		pF
C_{rss}		f = 0.1 MHz		10		pF
Q_G	V_{DD} = 800 V, V_{GS} = -4 V ... 15 V, I_D = 41 A			118		nC
R_{Gint}	T_j = 25 °C			1.7		Ω
$t_{d(on)}$	V_{DD} = 600 V I_D = 40 A V_{GS} = -4/+15 V R_{Gon} = 10 Ω R_{Goff} = 10 Ω di/dt_{off} = 2.7 kA/µs di/dt_{on} = 3.8 kA/µs dv/dt = 33 kV/µs L_s = 20 nH	T_j = 150 °C		18		ns
t_r		T_j = 150 °C		10		ns
$t_{d(off)}$		T_j = 150 °C		94		ns
t_f		T_j = 150 °C		13		ns
E_{on}		T_j = 150 °C		0.6		mJ
E_{off}		T_j = 150 °C		0.3		mJ
$R_{th(j-s)}$	per MOSFET, HPTP / HP-PCM			0.97		K/W
Integrated body diode						
$V_F = V_{SD}$	$-I_D$ = 21 A V_{GS} = -4 V chiplevel	T_j = 25 °C		4.6		V
		T_j = 150 °C		4.3		V
$V_{F0} = V_{SD0}$	chiplevel	T_j = 25 °C		3.8		V
		T_j = 150 °C		3.6		V
$r_F = r_{SD}$	chiplevel	T_j = 25 °C		39		mΩ
		T_j = 150 °C		34		mΩ
t_{rr}	V_{DD} = 600 V I_{SD} =40 A V_{GS} =-4 V R_{Gon} = 10 Ω di/dt_{off} = 3.8 kA/µs	T_j = 150 °C		25		µs
Q_{rr}		T_j = 150 °C		0.3		µC
I_{rr}		T_j = 150 °C		21		A
E_{rr}		T_j = 150 °C		0.2		mJ

Characteristics

Symbol	Conditions	min.	typ.	max.	Unit
Module					
L_{CE}			18		nH
M_s	to heatsink	1.6		2.3	Nm
w	weight		25		g

Characteristics

Symbol	Conditions	min.	typ.	max.	Unit
Temperature Sensor					
R_{100}	T_r = 100 °C (R_{25} = 5 kΩ)		493 ± 5%		Ω
$B_{100/125}$	$R_{(T)}=R_{100}\exp[B_{100/125}(1/T-1/T_{100})]$; T[K];		3550 (± 2%)		K

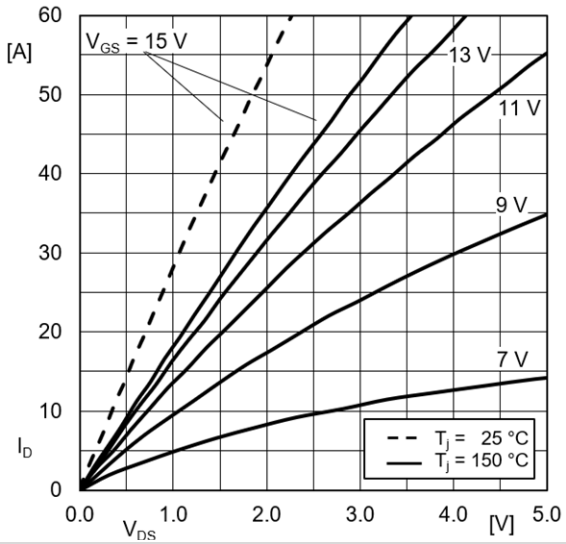


Fig.1: Typ. MOSFET forward output characteristic, incl. $R_{DD'+SS'}$

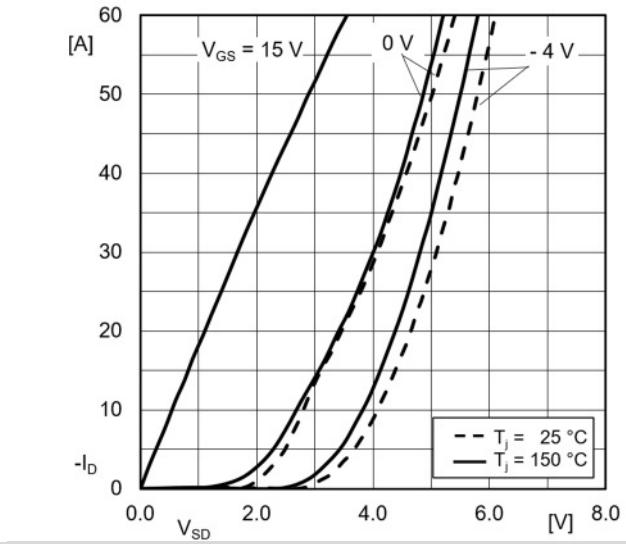


Fig. 1a: Typ. MOSFET reverse output characteristic, incl. $R_{DD'+SS'}$

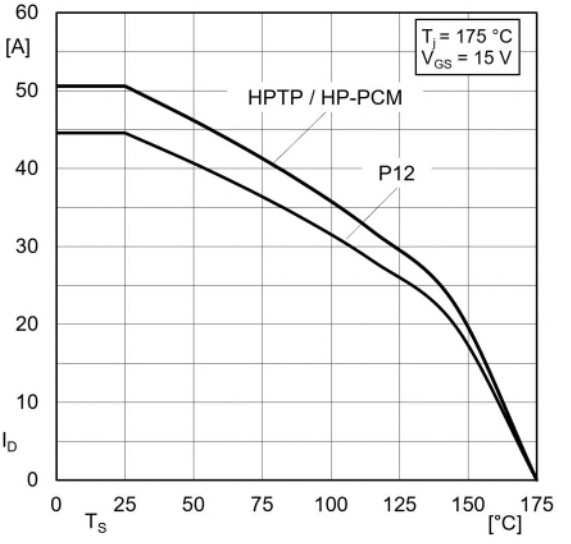


Fig. 2: MOSFET Rated current vs. temperature $I_D = f(T_S)$

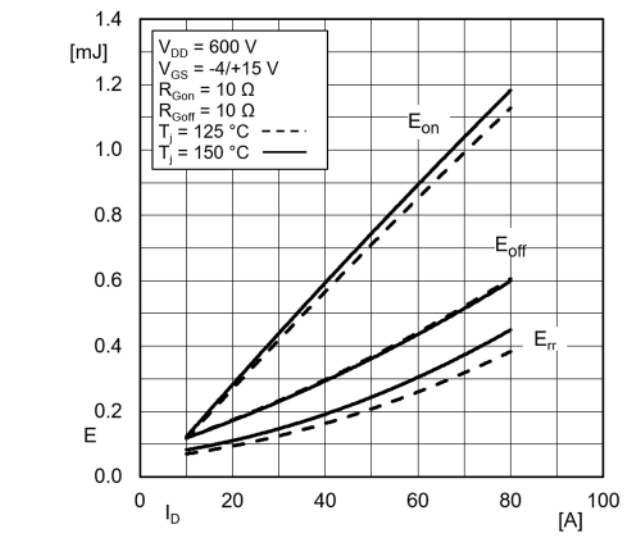


Fig. 3: Typ. MOSFET switching energy $E = f(I_D)$

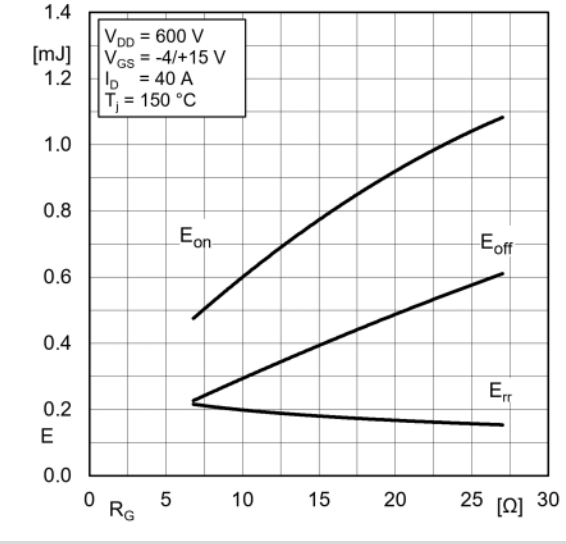


Fig. 4: Typ. MOSFET switching energy $E = f(R_G)$

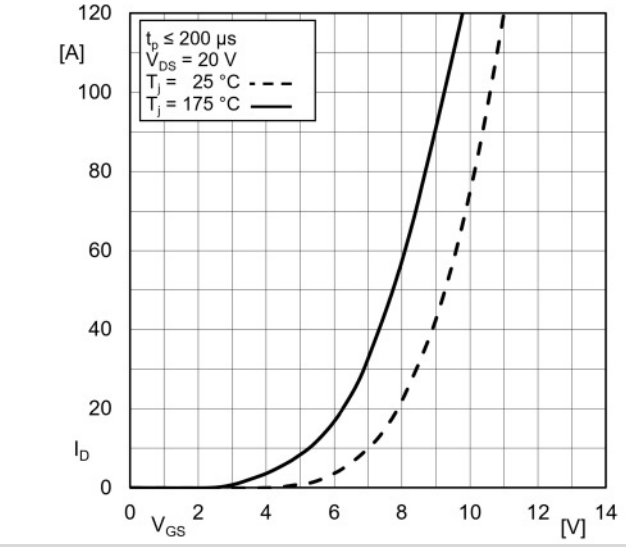


Fig. 5: Typ. MOSFET transfer characteristics

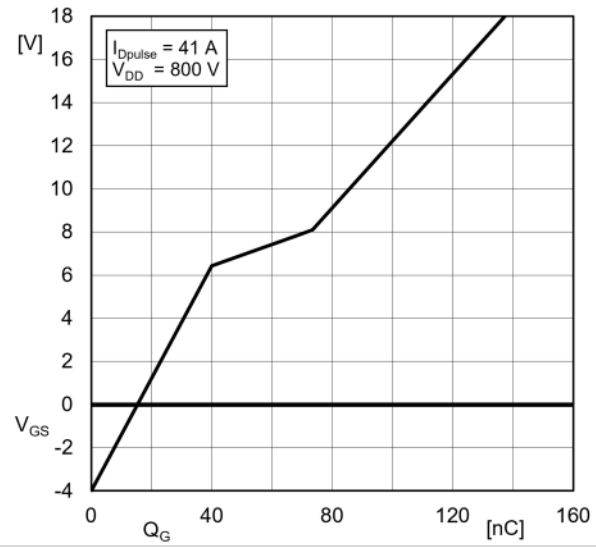


Fig. 6: Typ. MOSFET gate charge characteristic

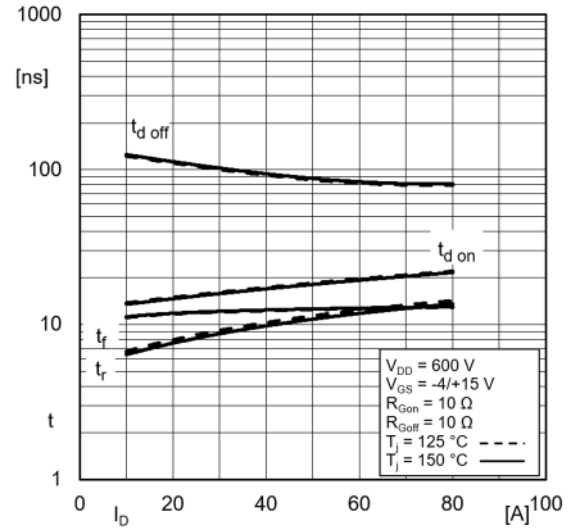


Fig. 7: Typ. MOSFET switching times t = f (I_D)

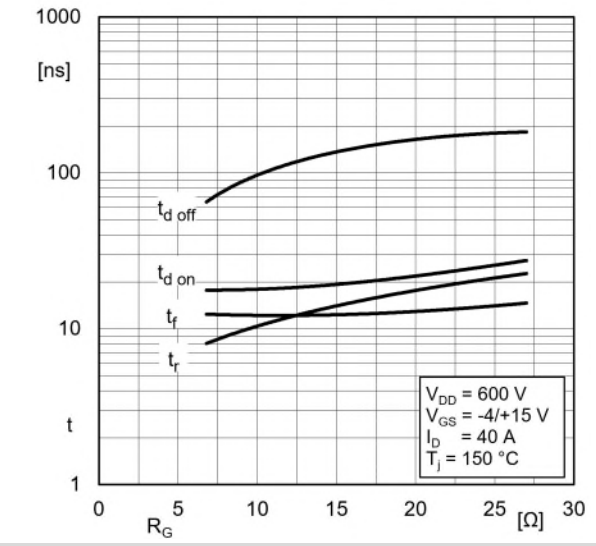


Fig. 8: Typ. MOSFET switching times t = f (R_G)

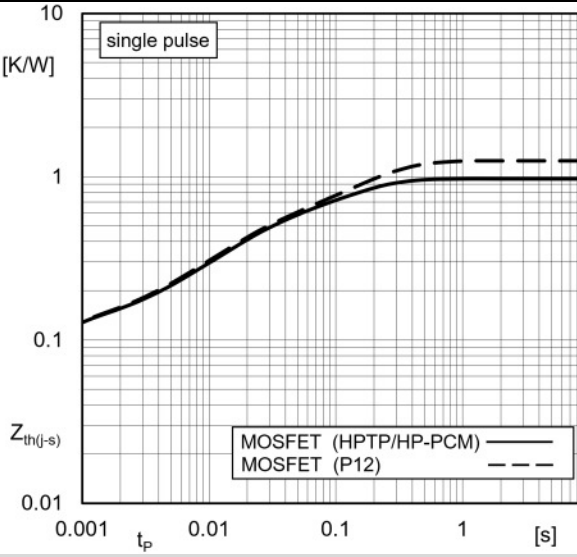


Fig. 9: Typ. transient thermal impedance

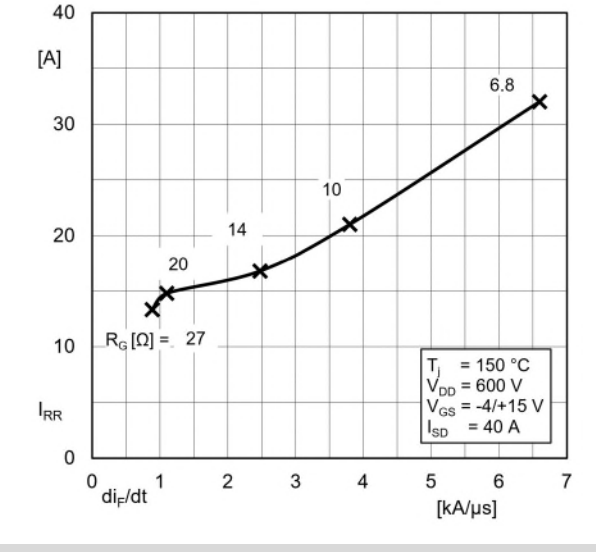


Fig. 10: Typ. body diode peak reverse recovery current I_{RR} = f (di_F/dt)

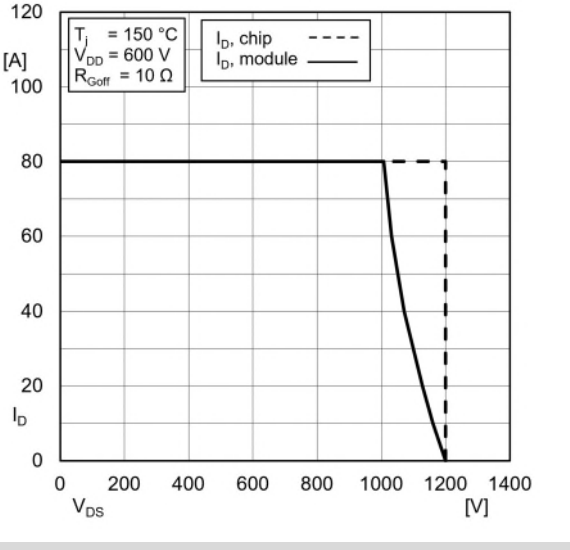
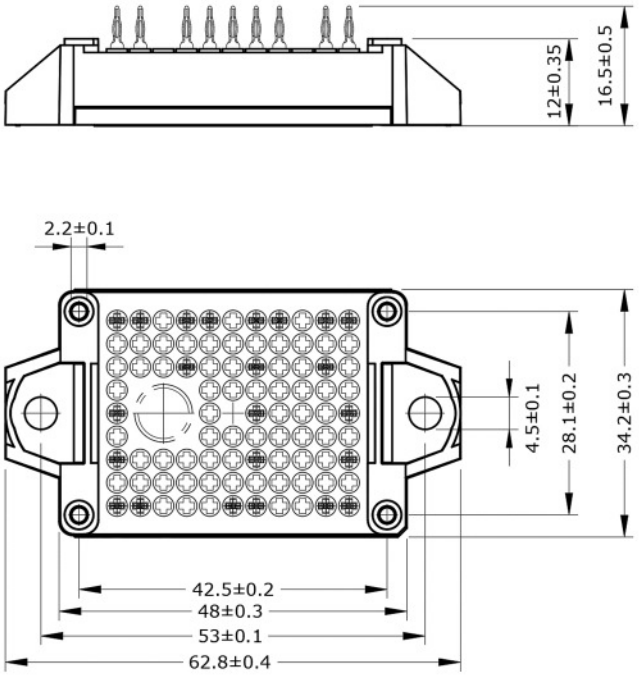
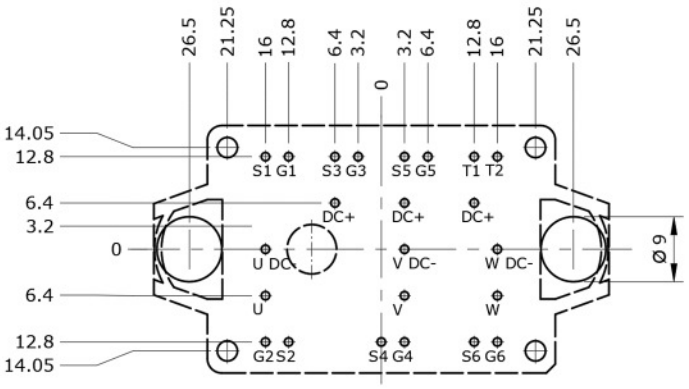


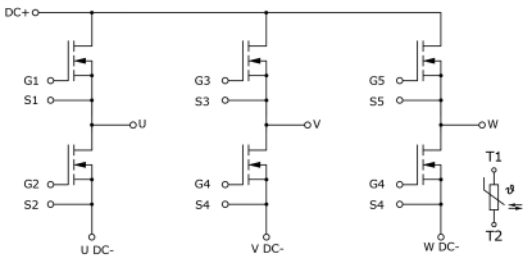
Fig. 11: MOSFET Reverse Bias Safe Operating Area (RBSOA)





- Pin-Grid 3.2 mm
- Tolerance of PCB hole pattern ⌖ 0.1
- Diameters of drill ∅ 1.15mm
- Copper thickness in hole 25 - 50 µm
- Hole specification for contacts:
  refer to SEMITOP E1/E2 Mounting Instruction

Pinout and Dimensions



MD-ET

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

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