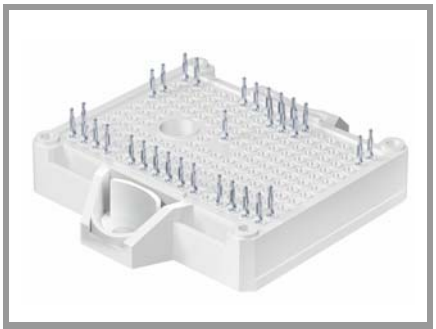
# SK100MH120RM04ETE2



**SEMITOP®E2**

H-Bridge Open Source
(Full SiC)

**SK100MH120RM04ETE2**

### Features*

- Optimized design for superior thermal performance
- Low inductance design
- Press-Fit contact technology
- 1200V Trench Gen4 SiC MOSFET
- Unipolar gate control
- Optimized switching stability thanks to module integrated gate resistors
- Integrated NTC temperature sensor
- UL recognized file no. E 63 532

### Typical Applications

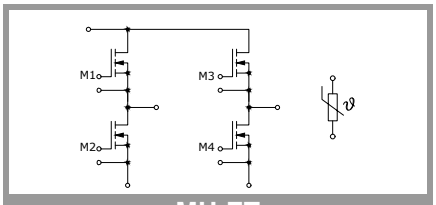
- Electric Vehicle charging
- Energy Storage Systems
- Solar
- UPS

### Remarks

- Recommended $T_{j,op}$=-40 ...+150 °C
- Recommended turn-off / turn-on gate voltage $V_{GS}$ = 0/+18V

### Footnotes

[1)] Short Circuit events may have impact on product lifetime




**MH-ET**

| Absolute Maximum Ratings | | | | |
|---|---|---|---|---|
| **Symbol** | **Conditions** | | **Values** | **Unit** |
| **MOSFET 1** | | | | |
| $V_{DSS}$ | $T_j$ = 25 °C | | 1200 | V |
| $I_D$ | $T_j$ = 175 °C | $T_s$ = 70 °C | 99 | A |
| | | $T_s$ = 100 °C | 84 | A |
| $I_{DM}$ | PW ≤ 10µs, Duty cycle ≤ 1% | | 322 | A |
| $V_{GS}$ | Transient Gate - Source voltage (t < 300ns) | | -4 ... 23 | V |
| $T_j$ | | | -40 ... 175 | °C |
| **Integrated body diode** | | | | |
| $I_{SM}$ | PW ≤ 500ns, Duty cycle ≤ 5% | | 146 | A |
| $I_{FSM}$ | PW ≤ 10µs | | 322 | 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 |

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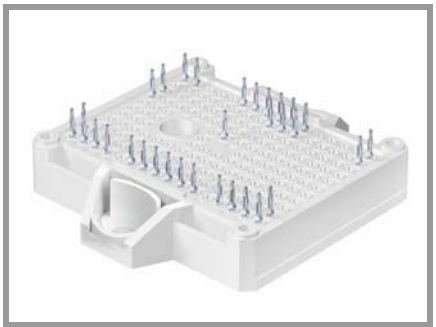

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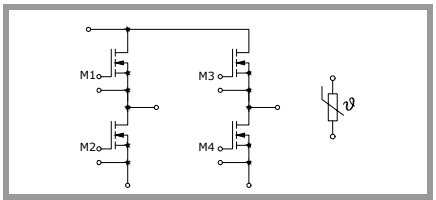


**MH-ET**

**Characteristics**

| Symbol | Conditions | | min. | typ. | max. | Unit |
|---|---|---|---|---|---|---|
| **MOSFET 1** | | | | | | |
| $V_{GS(th)}$ | $V_{DS}$ = 10V, $I_D$ = 44.4 mA, $T_j$ = 25 °C | | 2.8 | | 4.8 | V |
| $I_{DSS}$ | $V_{GS}$ = 0 V, $V_{DS}$ = 1200 V, $T_j$ = 25 °C | | | | 0.2 | mA |
| $I_{GSS}$ | $V_{DS}$ = 0 V, $V_{GS}$ = 21 V, $T_j$ = 25 °C | | | | 400 | nA |
| $R_{DS(on)}$ | $V_{GS}$ = 18 V, $I_D$ = 84 A, chiplevel | $T_j$ = 25 °C | | 9.0 | 11 | mΩ |
| | | $T_j$ = 150 °C | | 18 | | mΩ |
| $C_{iss}$ | $V_{GS}$ = 0 V, $V_{DS}$ = 800 V, f = 1 MHz | | | 9064 | | pF |
| $C_{oss}$ | $V_{GS}$ = 0 V, $V_{DS}$ = 800 V, f = 1 MHz | | | 258 | | pF |
| $C_{rss}$ | $V_{GS}$ = 0 V, $V_{DS}$ = 800 V, f = 1 MHz | | | 18 | | pF |
| $R_{Gint}$ | $T_j$ = 25 °C | | | 3.3 | | Ω |
| $Q_G$ | $V_{GS}$ = 18V, $V_{DS}$ = 800V, $I_D$ = 84 A | | | 340 | | nC |
| $t_{d(on)}$ | $V_{DD}$ = 600 V, $V_{GS}$ = 0/18 V, $I_D$ = 100 A, $R_{Gon}$ = 0.5 Ω, $R_{Goff}$ = 0.5 Ω, $di/dt_{off}$ = 6.3 kA/µs, $di/dt_{on}$ = 6.1 kA/µs, dv/dt = 38 kV/µs, $L_s$ = 9 nH | $T_j$ = 150 °C | | 69 | | ns |
| $t_{d(off)}$ | | $T_j$ = 150 °C | | 162 | | ns |
| $t_r$ | | $T_j$ = 150 °C | | 26 | | ns |
| $t_f$ | | $T_j$ = 150 °C | | 23 | | ns |
| $E_{on}$ | | $T_j$ = 150 °C | | 1.42 | | mJ |
| $E_{off}$ | | $T_j$ = 150 °C | | 0.75 | | mJ |
| $t_{psc}$ [1)] | $V_{DD}$ ≤ 720 V, $V_{DSS}$ < 1200 V, $V_{GS}$ = 0/18 V, $E_{sc}$ ≤ 1090 mJ | $T_j$ = 150 °C | 2 | | | µs |
| $R_{th(j-s)}$ | per MOSFET, HPTP / HP-PCM | | | 0.42 | | K/W |
| **Integrated body diode** | | | | | | |
| $V_F = V_{SD}$ | $-I_D$ = 84 A, $V_{GS}$ = 0 V, chiplevel | $T_j$ = 25 °C | | 3.34 | | V |
| | | $T_j$ = 150 °C | | 3.61 | | V |
| $V_{F0} = V_{SD0}$ | chiplevel | $T_j$ = 25 °C | | 2.25 | | V |
| | | $T_j$ = 150 °C | | 2.10 | | V |
| $r_F = r_{SD}$ | chiplevel | $T_j$ = 25 °C | | 13 | | mΩ |
| | | $T_j$ = 150 °C | | 18 | | mΩ |
| $t_{rr}$ | $V_{DD}$ = 600 V, $-I_D$ = 100 A, $V_{GS}$ = 0 V, $R_{Gon}$ = 0.5 Ω | $T_j$ = 150 °C | | 33 | | ns |
| $Q_{rr}$ | | $T_j$ = 150 °C | | 1.1 | | µC |
| $I_{rr}$ | | $T_j$ = 150 °C | | 69 | | A |
| $E_{rr}$ | $di/dt_{off}$ = 5.9 kA/µs | $T_j$ = 150 °C | | 0.47 | | mJ |

**Characteristics**

| Symbol | Conditions | min. | typ. | max. | Unit |
|---|---|---|---|---|---|
| **Module** | | | | | |
| $L_{CE}$ | | | 12 | | nH |
| $M_s$ | to heatsink | 1.6 | | 2.3 | Nm |
| w | weight | | 35 | | g |

**Characteristics**

| Symbol | Conditions | min. | typ. | max. | Unit |
|---|---|---|---|---|---|
| **Temperature Sensor** | | | | | |
| $R_{100}$ | $T_c$=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 |

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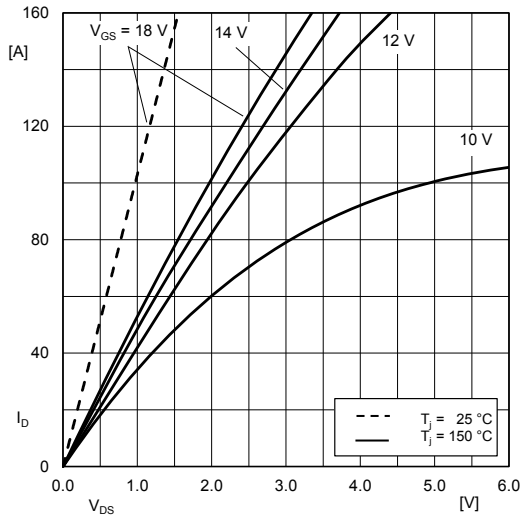


Fig.1: Typ. MOSFET forward output characteristic, incl. $R_{DD'+SS'}$

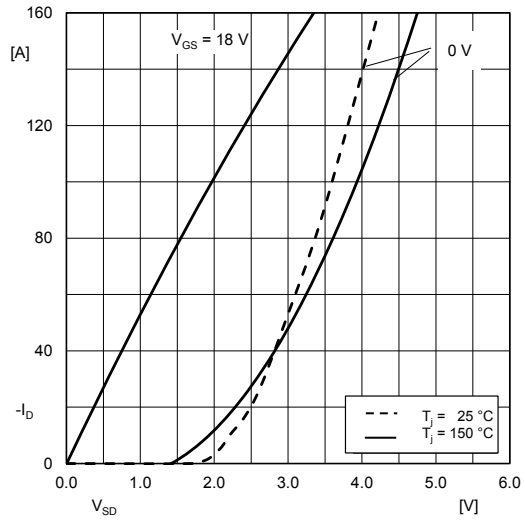


Fig. 1a: Typ. MOSFET reverse output characteristics, incl. $R_{DD'+SS'}$

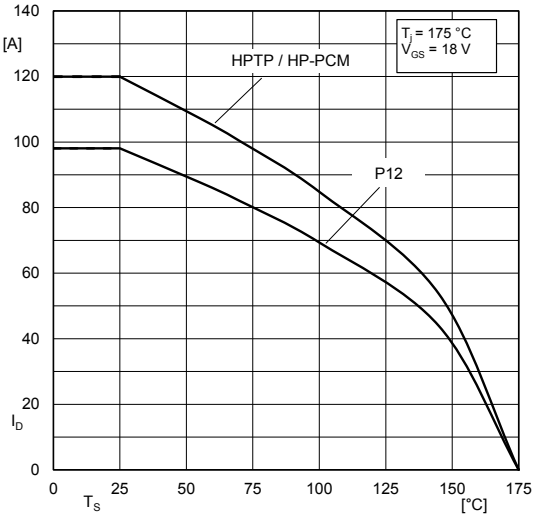


Fig. 2: Typ. MOSFET rated current vs. temperature $I_D$=f(Ts)

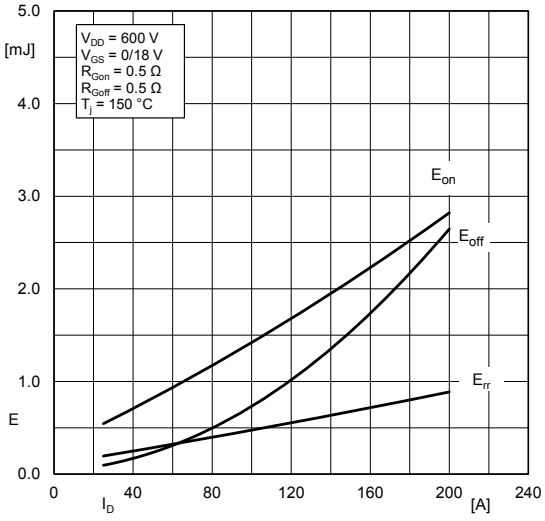


Fig. 3: Typ. MOSFET switching energy E = f ($I_D$)

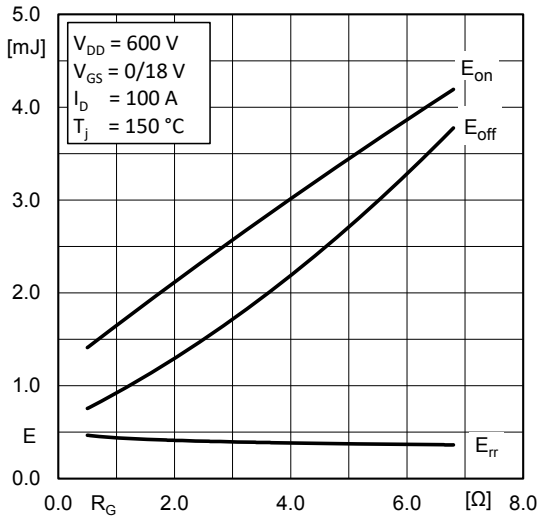


Fig. 4: Typ. MOSFET switching energy E = f ($R_G$)

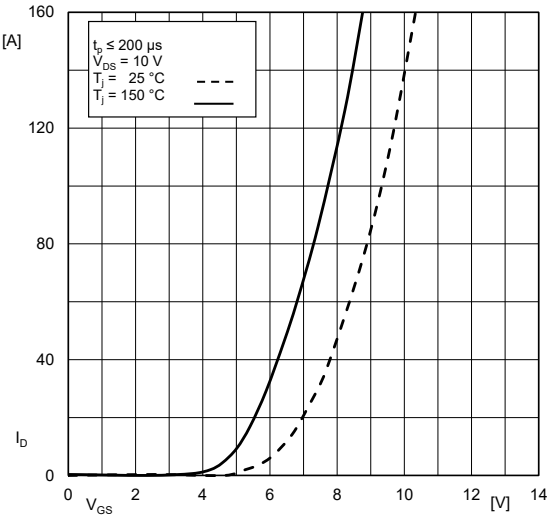


Fig. 5: Typ. MOSFET transfer characteristic

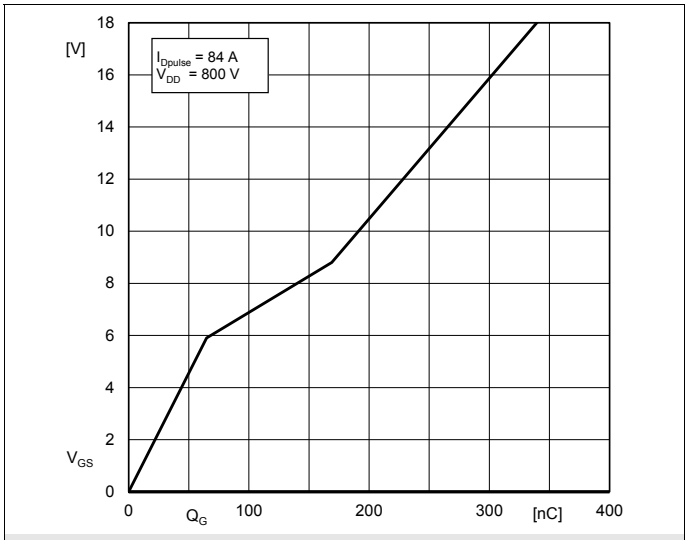


Fig. 6: Typ. MOSFET gate charge characteristic

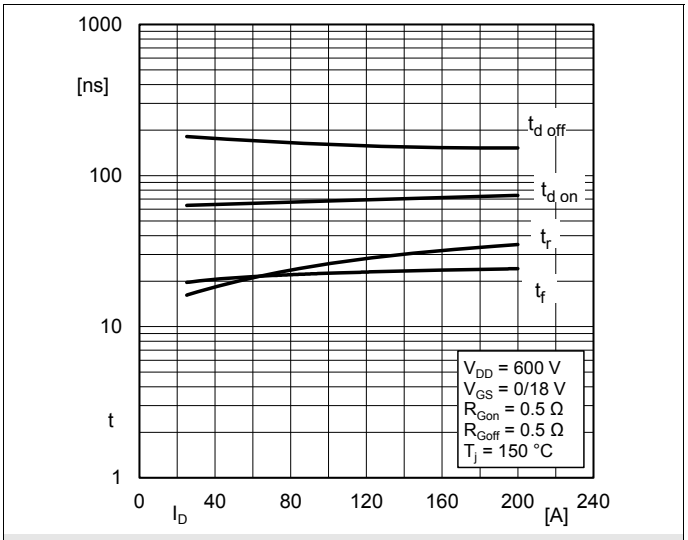


Fig. 7: Typ. MOSFET switching times t = f ($I_D$)

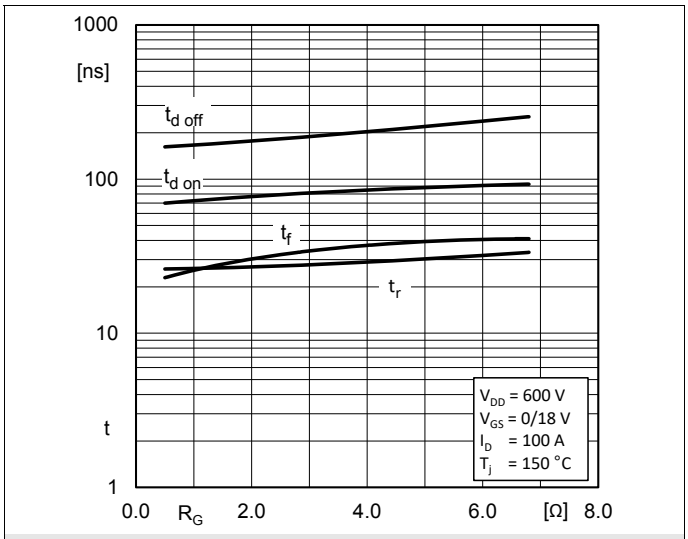


Fig. 8: Typ. MOSFET switching times t = f ($R_G$)

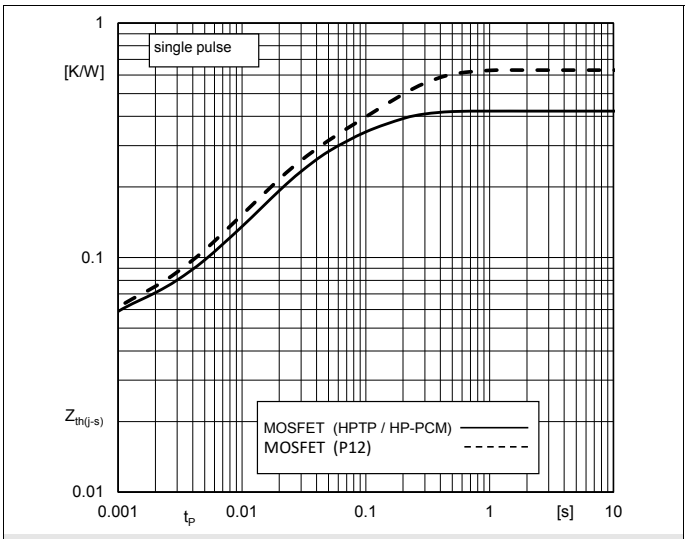


Fig. 9: Typ. transient thermal impedance

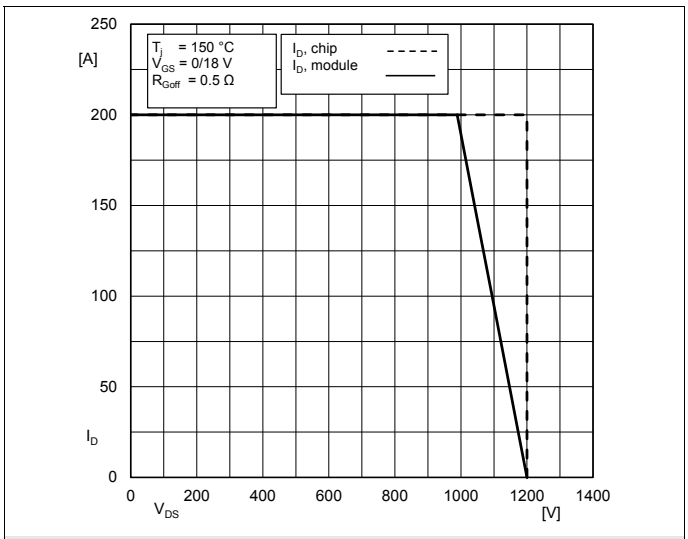


Fig. 13: MOSFET Reverse Bias Safe Operating Area (RBSOA)

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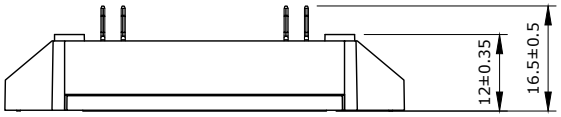
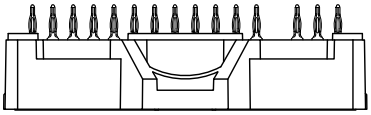
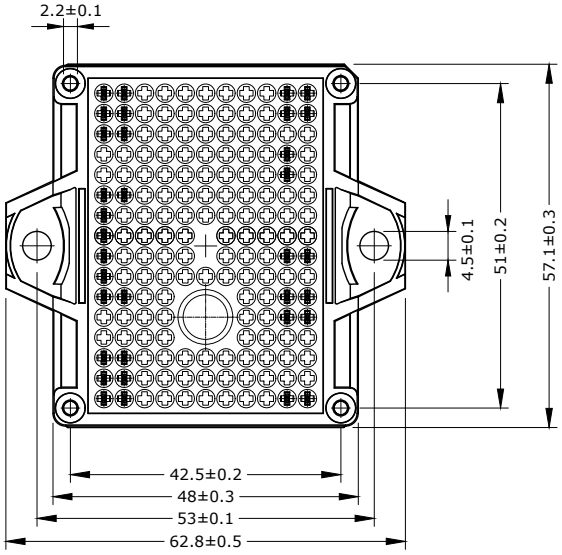
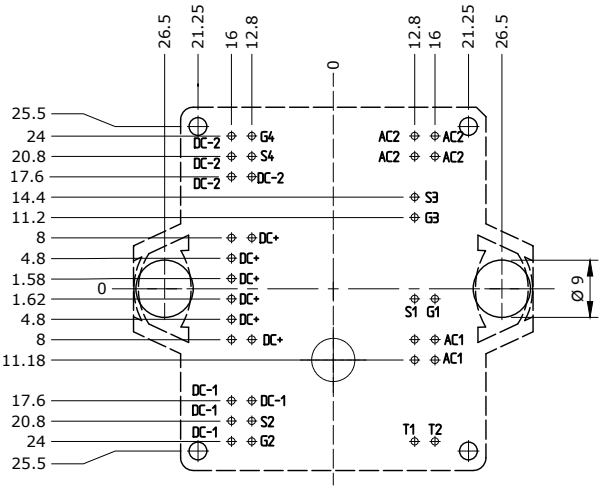


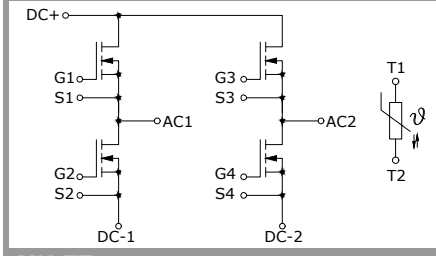






- Pin-Grid 3.2 mm
- Tolerance of PCB hole pattern ⌖ Ø0.1
- Diameters of drill ∅ 1.15mm
- Copper thickness in hole 25 - 50 µm
- Hole specification for contacts:
  refer to SEMITOP E1/E2 Mounting Instruction

**SEMITOP®E2**




**MH-ET**

**IMPORTANT INFORMATION AND WARNINGS**

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

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