

SKM50GB12V

1200 V / 50 A IGBT Half-Bridge Power Module — SEMITRANS 2



The SKM50GB12V is a 1200 V, 50 A nominal IGBT half-bridge power module in the SEMITRANS 2 package. It combines sixth-generation trench V-IGBT chips with soft-switching CAL4 free-wheeling diodes on an insulated copper base plate produced by direct copper bonding, giving low switching losses at high di/dt together with high power-cycling capability. An integrated gate resistor is fitted. The module is used as the switching stage in AC inverter drives, uninterruptible power supplies and electronic welding equipment.

General / Identification

Part number	SKM50GB12V
Legacy part number	22892003
Product line / housing	SEMITRANS — SEMITRANS 2
Topology	IGBT half bridge (GB), two switches
Chip technology	6th generation trench V-IGBT; CAL4 soft-switching free-wheeling diode
Construction	Insulated copper base plate, direct copper bonded (DBC); integrated gate resistor
Number of terminals	7

Absolute Maximum Ratings — IGBT

Collector-emitter voltage V_{CES} ($T_j = 25\text{ °C}$)	1200 V
Nominal collector current I_{Cnom}	50 A
Collector current I_C ($T_j = 175\text{ °C}$, $T_c = 25\text{ °C}$)	77 A
Collector current I_C ($T_j = 175\text{ °C}$, $T_c = 80\text{ °C}$)	59 A
Repetitive peak collector current I_{CRM}	150 A ($3 \times I_{Cnom}$)
Gate-emitter voltage V_{GES}	-20 V to +20 V
Short-circuit withstand time t_{psc}	10 μ s ($V_{CC} = 720\text{ V}$, $V_{GE} \leq 15\text{ V}$, $T_j = 125\text{ °C}$)
Junction temperature T_j	-40 °C to +175 °C

Absolute Maximum Ratings — Inverse Diode

Nominal forward current I_{Fnom}	50 A
Forward current I_F ($T_j = 175\text{ °C}$, $T_c = 25\text{ °C}$)	65 A
Forward current I_F ($T_j = 175\text{ °C}$, $T_c = 80\text{ °C}$)	49 A
Repetitive peak forward current I_{FRM}	150 A ($3 \times I_{Fnom}$)
Surge forward current I_{FSM}	270 A (10 ms, sin 180°, $T_j = 25\text{ °C}$)
Junction temperature T_j	-40 °C to +175 °C

Electrical Characteristics

Collector-emitter saturation voltage $V_{CE(sat)}$ ($I_C = 50$ A, $V_{GE} = 15$ V, chip level)	typ. 1.84 V / max. 2.29 V at $T_j = 25$ °C typ. 2.18 V / max. 2.63 V at $T_j = 150$ °C
Collector-emitter threshold voltage V_{CE0}	typ. 0.94 V at 25 °C; typ. 0.88 V at 150 °C
Slope resistance r_{CE} ($V_{GE} = 15$ V)	typ. 18 mΩ at 25 °C; typ. 26 mΩ at 150 °C
Gate threshold voltage $V_{GE(th)}$	5.5 V – 6.5 V (typ. 6 V)
Collector-emitter cut-off current I_{CES}	max. 0.3 mA ($V_{CE} = 1200$ V, $T_j = 25$ °C)
Input capacitance C_{ies}	typ. 3.0 nF ($V_{CE} = 25$ V, $f = 1$ MHz)
Output / reverse transfer capacitance	C_{oes} typ. 0.30 nF; C_{res} typ. 0.30 nF
Gate charge Q_G	typ. 550 nC ($V_{GE} = -8$ V to +15 V)
Internal gate resistance R_{Gint}	typ. 4.0 Ω at $T_j = 25$ °C
Module stray inductance L_{CE}	typ. 30 nH
Terminal resistance R_{CC+EE} , per switch	typ. 0.65 mΩ at 25 °C; typ. 1.09 mΩ at 125 °C

Switching Characteristics ($V_{CC} = 600$ V, $I_C = 50$ A, $V_{GE} = \pm 15$ V, $R_G = 13$ Ω, $T_j = 150$ °C)

Turn-on delay time $t_{d(on)}$ / rise time t_r	typ. 276 ns / typ. 35 ns
Turn-off delay time $t_{d(off)}$ / fall time t_f	typ. 403 ns / typ. 62 ns
Turn-on energy E_{on} / turn-off energy E_{off}	typ. 4.9 mJ / typ. 4.5 mJ
Diode peak reverse recovery current I_{RRM}	typ. 35 A ($di/dt_{off} = 1380$ A/μs)
Diode recovered charge Q_{rr} / reverse recovery energy E_{rr}	typ. 8.7 μC / typ. 2.8 mJ

Diode Forward Characteristics

Forward voltage V_F ($I_F = 50$ A, $V_{GE} = 0$ V, chip level)	typ. 2.22 V / max. 2.54 V at 25 °C typ. 2.18 V / max. 2.50 V at 150 °C
Threshold voltage V_{F0}	typ. 1.30 V at 25 °C; typ. 0.90 V at 150 °C
Slope resistance r_F	typ. 18 mΩ at 25 °C; typ. 26 mΩ at 150 °C

Thermal, Mechanical & Environmental

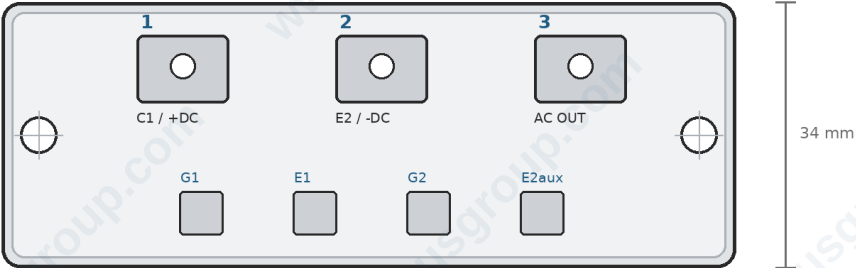
Thermal resistance $R_{th(j-c)}$	0.53 K/W per IGBT; 0.84 K/W per diode
Thermal resistance $R_{th(c-s)}$ per module	0.04 – 0.05 K/W
Isolation voltage V_{isol}	4000 V AC, 50 Hz, 1 min
Module RMS current capability $I_{t(RMS)}$	200 A
Storage temperature T_{stg}	–40 °C to +125 °C
Case temperature limit	$T_c = 125$ °C max.
Recommended operating temperature range	–40 °C to +150 °C
Dimensions (L × W × H)	94 × 34 × 30 mm
Mounting torque to heat sink M_s (M6)	3 – 5 Nm
Terminal torque M_t (M5)	2.5 – 5 Nm
Net weight	160 g (0.16 kg)
Handling	Electrostatic discharge sensitive device (ESDS), IEC 60747-1

Compliance

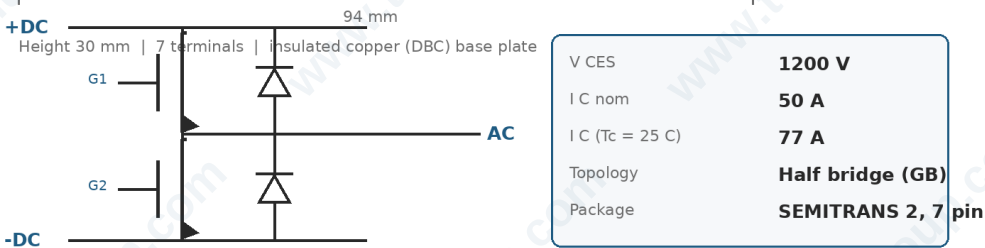
UL	UL recognized, file no. E63532
RoHS	RoHS compliant

Outline & Internal Circuit

SEMITRANS 2 half-bridge module - outline (plan view)



Internal circuit - IGBT half bridge with CA14 free-wheeling diodes



Illustrative outline drawing (original artwork) - dimensions and circuit per manufacturer published data. Not a photograph of the product.

Typical Applications

AC inverter drives · uninterruptible power supplies (UPS) · electronic welders.

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