

SKM150GAL12V



SEMITRANS® 2

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Features

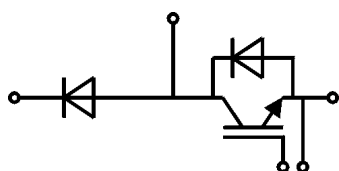
- V-IGBT = 6. Generation Trench V-IGBT (Fuji)
- CAL4 = Soft switching 4. Generation CAL-diode
- Isolated copper baseplate using DBC technology (Direct Copper Bonding)
- UL recognized, file no. E63532
- Increased power cycling capability
- With integrated gate resistor
- Low switching losses at high di/dt

Typical Applications*

- DC/DC – converter
- Brake chopper
- Switched reluctance motor
- DC – Motor

Remarks

- Case temperature limited to $T_c = 125^\circ\text{C}$ max, recomm. $T_{op} = -40 \dots +150^\circ\text{C}$, product rel. results valid for $T_j = 150^\circ$



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Absolute Maximum Ratings				
Symbol	Conditions		Values	Unit
IGBT				
V_{CES}	$T_j = 25^\circ\text{C}$		1200	V
I_C	$T_j = 175^\circ\text{C}$	$T_c = 25^\circ\text{C}$	231	A
		$T_c = 80^\circ\text{C}$	176	A
I_{Cnom}			150	A
I_{CRM}	$I_{CRM} = 3 \times I_{Cnom}$		450	A
V_{GES}			-20 ... 20	V
t_{psc}	$V_{CC} = 720\text{ V}$	$T_j = 125^\circ\text{C}$	10	μs
	$V_{GE} \leq 20\text{ V}$			
	$V_{CES} \leq 1200\text{ V}$			
T_j			-40 ... 175	$^\circ\text{C}$
Inverse diode				
I_F	$T_j = 175^\circ\text{C}$	$T_c = 25^\circ\text{C}$	189	A
		$T_c = 80^\circ\text{C}$	141	A
I_{Fnom}			150	A
I_{FRM}	$I_{FRM} = 3 \times I_{Fnom}$		450	A
I_{FSM}	$t_p = 10\text{ ms, sin } 180^\circ, T_j = 25^\circ\text{C}$		900	A
T_j			-40 ... 175	$^\circ\text{C}$
Freewheeling diode				
I_F	$T_j = 175^\circ\text{C}$	$T_c = 25^\circ\text{C}$	189	A
		$T_c = 80^\circ\text{C}$	141	A
I_{Fnom}			150	A
I_{FRM}	$I_{FRM} = 3 \times I_{Fnom}$		450	A
I_{FSM}	$t_p = 10\text{ ms, sin } 180^\circ, T_j = 25^\circ\text{C}$		900	A
T_j			-40 ... 175	$^\circ\text{C}$
Module				
$I_{t(RMS)}$	$T_{terminal} = 80^\circ\text{C}$		200	A
T_{stg}			-40 ... 125	$^\circ\text{C}$
V_{isol}	AC sinus 50Hz, $t = 1\text{ min}$		4000	V

Characteristics						
Symbol	Conditions		min.	typ.	max.	Unit
IGBT						
$V_{CE(sat)}$	$I_C = 150\text{ A}$ $V_{GE} = 15\text{ V}$ chipelevel	$T_j = 25^\circ\text{C}$	1.75	2.20		V
		$T_j = 150^\circ\text{C}$	2.20	2.50		V
V_{CE0}		$T_j = 25^\circ\text{C}$	0.94	1.04		V
		$T_j = 150^\circ\text{C}$	0.88	0.98		V
r_{CE}	$V_{GE} = 15\text{ V}$	$T_j = 25^\circ\text{C}$	5.40	7.7		$\text{m}\Omega$
		$T_j = 150^\circ\text{C}$	8.80	10.13		$\text{m}\Omega$
$V_{GE(th)}$	$V_{GE} = V_{CE}, I_C = 6\text{ mA}$		5.5	6	6.5	V
I_{CES}	$V_{GE} = 0\text{ V}$ $V_{CE} = 1200\text{ V}$	$T_j = 25^\circ\text{C}$	0.1	0.3		mA
		$T_j = 150^\circ\text{C}$				mA
C_{ies}	$V_{CE} = 25\text{ V}$ $V_{GE} = 0\text{ V}$	$f = 1\text{ MHz}$	9			nF
C_{oes}		$f = 1\text{ MHz}$	0.89			nF
C_{res}		$f = 1\text{ MHz}$	0.884			nF
Q_G	$V_{GE} = -8\text{ V} \dots +15\text{ V}$		1650			nC
R_{Gint}			5.0			Ω



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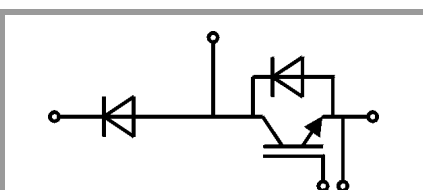
Typical Applications*

- DC/DC – converter
- Brake chopper
- Switched reluctance motor
- DC – Motor

Remarks

- Case temperature limited to $T_c = 125^\circ\text{C}$ max, recomm.
 $T_{op} = -40 \dots +150^\circ\text{C}$, product rel. results valid for $T_j = 150^\circ$

Characteristics						
Symbol	Conditions		min.	typ.	max.	Unit
$t_{d(on)}$	$V_{CC} = 600\text{ V}$	$T_j = 150^\circ\text{C}$		258		ns
t_r	$I_C = 150\text{ A}$	$T_j = 150^\circ\text{C}$		32		ns
E_{on}	$V_{GE} = \pm 15\text{ V}$	$T_j = 150^\circ\text{C}$		13.5		mJ
$t_{d(off)}$	$R_{G\ on} = 1.5\ \Omega$	$T_j = 150^\circ\text{C}$		388		ns
t_f	$R_{G\ off} = 1.5\ \Omega$	$T_j = 150^\circ\text{C}$		62		ns
E_{off}	$di/dt_{on} = 4400\text{ A}/\mu\text{s}$ $di/dt_{off} = 1800\text{ A}/\mu\text{s}$ $du/dt_{off} = 8100\text{ V}/\mu\text{s}$	$T_j = 150^\circ\text{C}$		14.2		mJ
$R_{th(j-c)}$	per IGBT				0.19	K/W
Inverse diode						
$V_F = V_{EC}$	$I_F = 150\text{ A}$	$T_j = 25^\circ\text{C}$		2.14	2.46	V
	$V_{GE} = 0\text{ V}$ chip	$T_j = 150^\circ\text{C}$		2.07	2.38	V
V_{F0}		$T_j = 25^\circ\text{C}$		1.3	1.5	V
		$T_j = 150^\circ\text{C}$		0.9	1.1	V
r_F		$T_j = 25^\circ\text{C}$		5.6	6.4	m Ω
		$T_j = 150^\circ\text{C}$		7.8	8.5	m Ω
I_{RRM}	$I_F = 150\text{ A}$	$T_j = 150^\circ\text{C}$		160		A
Q_{rr}	$di/dt_{off} = 5500\text{ A}/\mu\text{s}$	$T_j = 150^\circ\text{C}$		21.5		μC
E_{rr}	$V_{GE} = \pm 15\text{ V}$ $V_{CC} = 600\text{ V}$	$T_j = 150^\circ\text{C}$		8.9		mJ
$R_{th(j-c)}$	per diode				0.31	K/W
Freewheeling diode						
$V_F = V_{EC}$	$I_F = 150\text{ A}$	$T_j = 25^\circ\text{C}$		2.14	2.46	V
	$V_{GE} = 0\text{ V}$ chip	$T_j = 150^\circ\text{C}$		2.07	2.38	V
V_{F0}		$T_j = 25^\circ\text{C}$		1.3	1.5	V
		$T_j = 150^\circ\text{C}$		0.9	1.1	V
r_F		$T_j = 25^\circ\text{C}$		5.6	6.4	m Ω
		$T_j = 150^\circ\text{C}$		7.8	8.5	m Ω
I_{RRM}	$I_F = 150\text{ A}$	$T_j = 150^\circ\text{C}$		116		A
Q_{rr}	$di/dt_{off} = 5900\text{ A}/\mu\text{s}$	$T_j = 150^\circ\text{C}$		22		μC
E_{rr}	$V_{GE} = \pm 15\text{ V}$ $V_{CC} = 600\text{ V}$	$T_j = 150^\circ\text{C}$		8.2		mJ
$R_{th(j-c)}$	per Diode				0.31	K/W
Module						
L_{CE}					30	nH
$R_{CC+EE'}$	terminal-chip	$T_c = 25^\circ\text{C}$		0.65		m Ω
		$T_c = 125^\circ\text{C}$		1		m Ω
$R_{th(c-s)}$	per module			0.04	0.05	K/W
M_s	to heat sink M6			3	5	Nm
M_t		to terminals M5		2.5	5	Nm
						Nm
w					160	g



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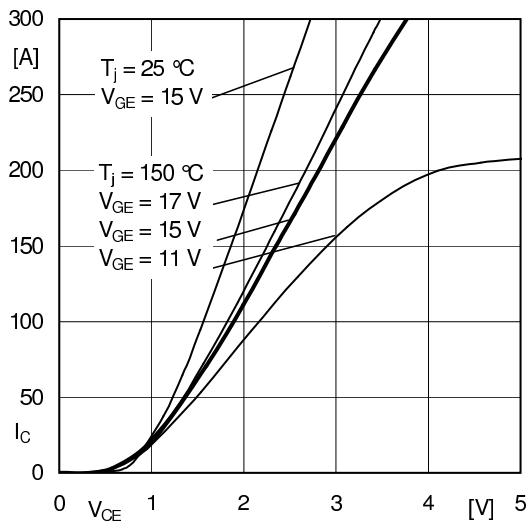


Fig. 1: Typ. output characteristic, inclusive R_{CC+EE}

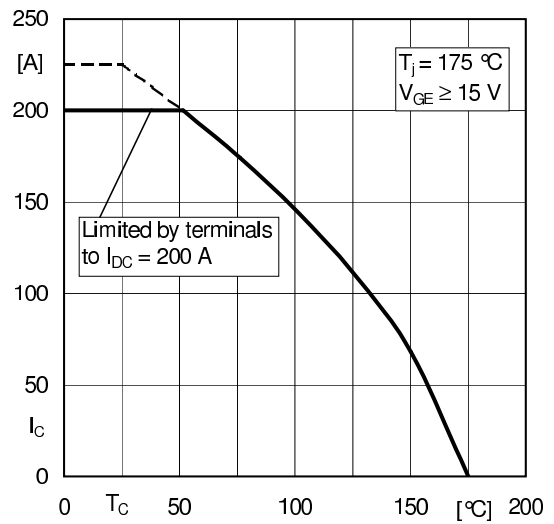


Fig. 2: Rated current vs. temperature $I_c = f(T_c)$

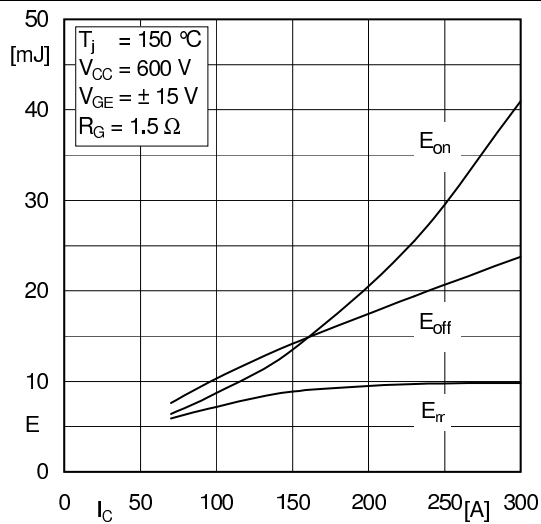


Fig. 3: Typ. turn-on /-off energy = $f(I_c)$

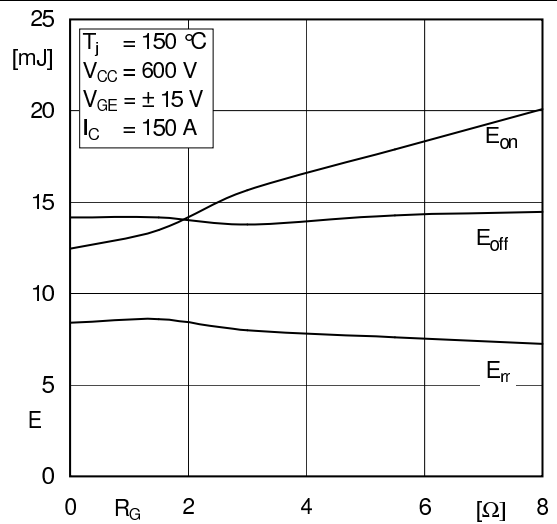


Fig. 4: Typ. turn-on /-off energy = $f(R_G)$

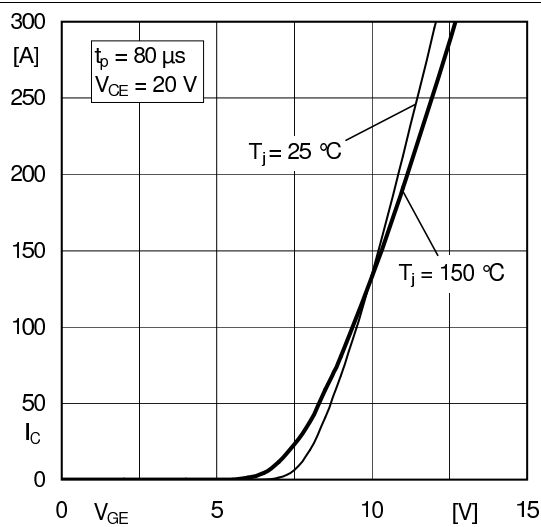


Fig. 5: Typ. transfer characteristic

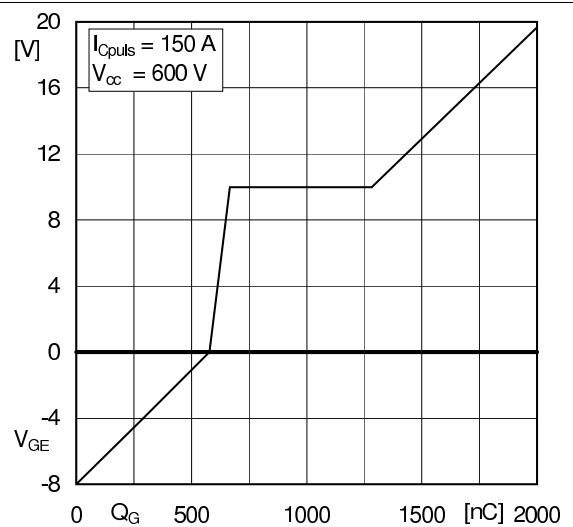


Fig. 6: Typ. gate charge characteristic

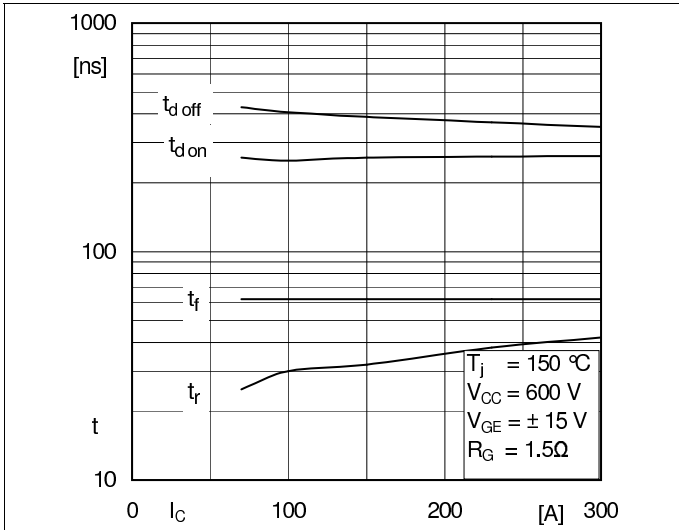


Fig. 7: Typ. switching times vs. I_C

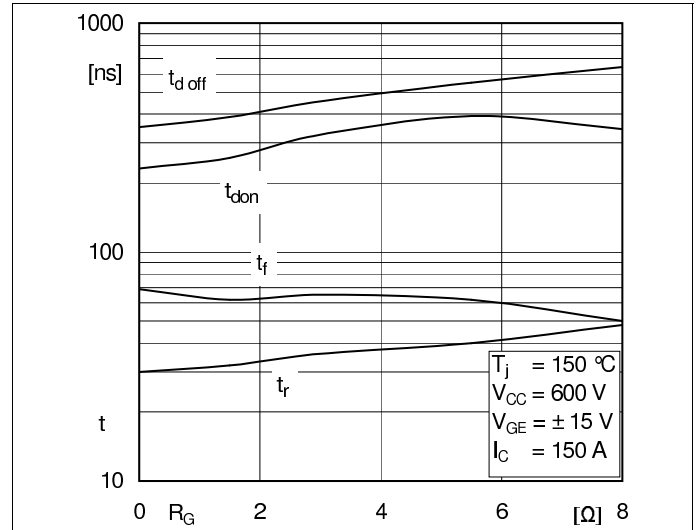


Fig. 8: Typ. switching times vs. gate resistor R_G

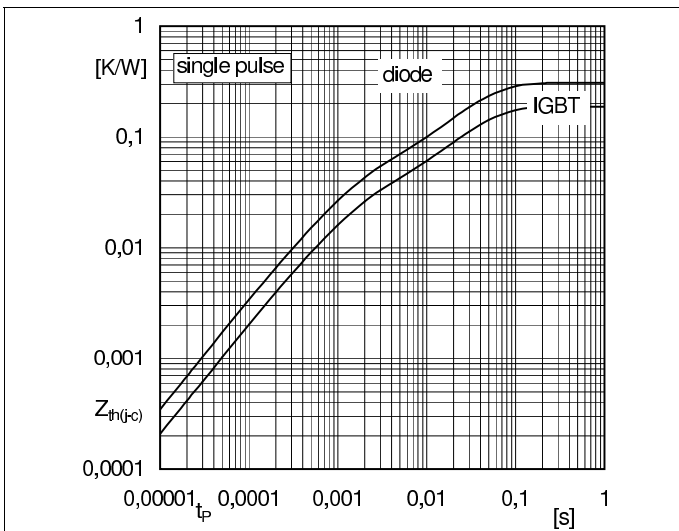


Fig. 9: Transient thermal impedance

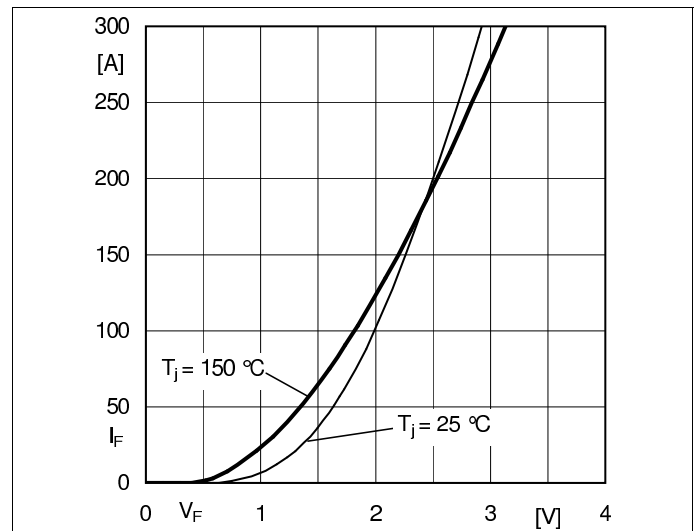


Fig. 10: Typ. CAL diode forward charact., incl. R_{CC+EE}

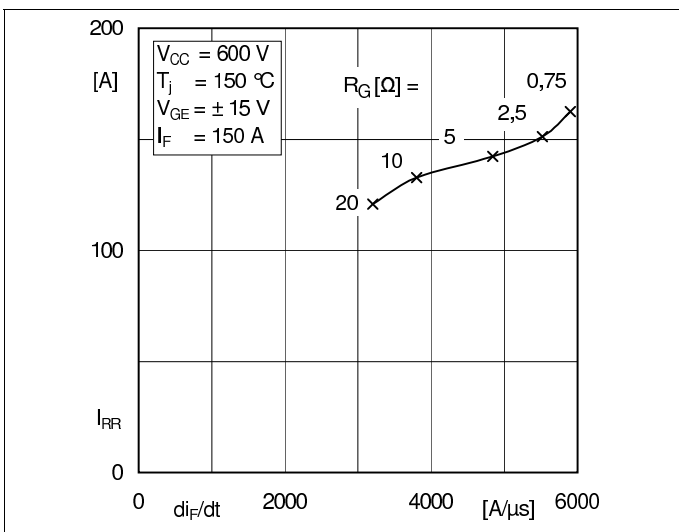


Fig. 11: CAL diode peak reverse recovery current

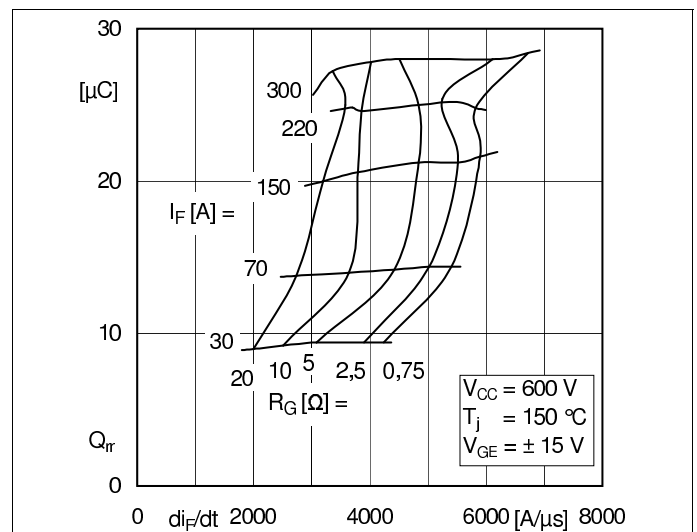


Fig. 12: Typ. CAL diode peak reverse recovery charge

