SK 151 GALE 07F3 TUF

SEMITOP® 3

IGBT module

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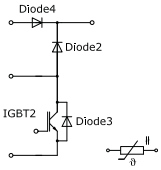
Features

- Compact design
- One screw mounting module
- Optimum heat transfer and isolation through direct copper bonding aluminium oxide ceramic (DBC)
- 650V Fast IGBT technology
- Ultrafast switching free-wheeling diode
- Integrated NTC temperature sensor
- UL recognized, file no. E 63 532

Typical Applications*

- Switching (not for linear use)
- Inverter
- Switch mode power supply
- UPS



GALE-T

Absolute Maximum Ratings				
Symbol	**Conditions**		**Values**	**Unit**
IGBT 2				
V_{CES}	T_j = 25 °C		650	V
I_C	T_j = 150 °C	T_s = 25 °C	128	A
		T_s = 70 °C	95	A
I_C	T_j = 175 °C	T_s = 25 °C	144	A
		T_s = 70 °C	114	A
I_{Cnom}			150	A
I_{CRM}	I_{CRM} = 3 x I_{Cnom}		450	A
V_{GES}			-20 ... 20	V
t_{psc}	V_{CC} = 400 V $V_{GE} \leq$ 15 V $V_{CES} \leq$ 650 V	T_j = 150 °C	5	µs
T_j			-40 ... 175	°C

Absolute Maximum Ratings				
Symbol	**Conditions**		**Values**	**Unit**
Diode 2				
V_{RRM}	T_j = 25 °C		600	V
I_F	T_j = 150 °C	T_s = 25 °C	116	A
		T_s = 70 °C	85	A
I_{Fnom}			150	A
I_{FSM}	10 ms, sin 180°, T_j = 150 °C		988	A
i^2t	10 ms, sin 180°, T_j = 150 °C		4880	A^2s
T_j			-40 ... 150	°C

Absolute Maximum Ratings				
Symbol	**Conditions**		**Values**	**Unit**
Diode 3				
V_{RRM}	T_j = 25 °C		600	V
I_F	T_j = 150 °C	T_s = 25 °C	25	A
		T_s = 70 °C	19	A
I_F	T_j = 175 °C	T_s = 25 °C	28	A
		T_s = 70 °C	22	A
I_{Fnom}			20	A
I_{FRM}	I_{FRM} = 2 x I_{Fnom}		40	A
I_{FSM}	10 ms, sin 180°, T_j = 150 °C		95	A
T_j			-40 ... 175	°C

Absolute Maximum Ratings				
Symbol	**Conditions**		**Values**	**Unit**
Diode 4				
V_{RRM}			1600	V
I_F	T_j = 150 °C	T_s = 25 °C	67	A
		T_s = 70 °C	49	A
I_{Fnom}			25	A
I_{FSM}	10 ms, sin 180°, T_j = 150 °C		490	A
I^2t	10 ms, sin 180°, T_j = 150 °C		1200	A^2s
T_j			-40 ... 150	°C

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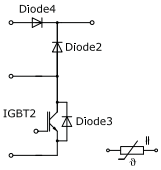

GALE-T

Absolute Maximum Ratings

Symbol	Conditions	Values	Unit
Module			
$I_{t(RMS)}$		-	A
T_{stg}		-40 ... 125	°C
V_{isol}	AC, sinusoidal, 50Hz, t = 1 min	2500	V

Characteristics

Symbol	Conditions		min.	typ.	max.	Unit
IGBT 2						
$V_{CE(sat)}$	I_C = 150 A, V_{GE} = 15 V, chiplevel	T_j = 25 °C		1.85	2.22	V
		T_j = 150 °C		2.18	2.55	V
V_{CE0}	chiplevel	T_j = 25 °C		1.10	1.20	V
		T_j = 150 °C		1.00	1.10	V
r_{CE}	V_{GE} = 15 V, chiplevel	T_j = 25 °C		5.0	6.8	mΩ
		T_j = 150 °C		7.9	9.7	mΩ
$V_{GE(th)}$	V_{GE} = V_{CE}, I_C = 2.4 mA		4.2	5.1	5.6	V
I_{CES}	V_{GE} = 0 V, V_{CE} = 650 V	T_j = 25 °C			0.2	mA
		T_j = 150 °C		-		mA
C_{ies}	V_{CE} = 25 V, V_{GE} = 0 V	f = 1 MHz		9.3		nF
C_{oes}		f = 1 MHz		0.348		nF
C_{res}		f = 1 MHz		0.27		nF
Q_G	V_{GE} = - 15 V...+ 15 V			1380		nC
R_{Gint}	T_j = 25 °C			1.6		Ω
$t_{d(on)}$	V_{CC} = 300 V, I_C = 150 A, $V_{GE\ neg}$ = -15 V, $V_{GE\ pos}$ = 15 V, $R_{G\ on}$ = 15 Ω, $R_{G\ off}$ = 15 Ω, di/dt_{on} = 974 A/µs, di/dt_{off} = 3024 A/µs	T_j = 150 °C		153		ns
t_r		T_j = 150 °C		130		ns
E_{on}		T_j = 150 °C		8.8		mJ
$t_{d(off)}$		T_j = 150 °C		719		ns
t_f		T_j = 150 °C		43		ns
E_{off}		T_j = 150 °C		4		mJ
$R_{th(j-s)}$	per IGBT			0.41		K/W

Characteristics

Symbol	Conditions		min.	typ.	max.	Unit
Diode 2						
V_F	I_F = 150 A, V_{GE} = 0 V, chiplevel	T_j = 25 °C		1.80	2.20	V
		T_j = 125 °C		1.60	2.00	V
V_{F0}	chiplevel	T_j = 25 °C		1.15	1.35	V
		T_j = 125 °C		0.85	1.05	V
r_F	chiplevel	T_j = 25 °C		4.3	5.7	mΩ
		T_j = 125 °C		5.0	6.3	mΩ
I_{RRM}	I_F = 150 A, di/dt_{off} = 891 A/µs, V_{GE} = -15 V, V_{CC} = 300 V	T_j = 150 °C		150		A
Q_{rr}		T_j = 150 °C		3.1		µC
E_{rr}		T_j = 150 °C		0.26		mJ
$R_{th(j-s)}$	per Diode			0.62		K/W

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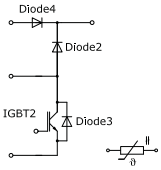

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Characteristics						
Symbol	**Conditions**		**min.**	**typ.**	**max.**	**Unit**
Diode 3						
V_F	I_F = 20 A	T_j = 25 °C		1.59	2.06	V
	chiplevel	T_j = 150 °C		1.68	2.01	V
V_{F0}	chiplevel	T_j = 25 °C		0.99	1.10	V
		T_j = 150 °C		0.80	0.89	V
r_F	chiplevel	T_j = 25 °C		30	48	mΩ
		T_j = 150 °C		44	56	mΩ
I_{RRM}				-		A
Q_{rr}				-		µC
E_{rr}				-		mJ
$R_{th(j-s)}$	per Diode			2.34		K/W

Characteristics						
Symbol	**Conditions**		**min.**	**typ.**	**max.**	**Unit**
Diode 4						
V_F	I_F = 25 A	T_j = 25 °C		1.00	1.21	V
	chiplevel	T_j = 125 °C		0.90	1.10	V
V_{F0}	chip	T_j = 25 °C		0.88	0.98	V
		T_j = 125 °C		0.73	0.83	V
r_F	chiplevel	T_j = 25 °C		6.8	9.2	mΩ
		T_j = 125 °C		6.8	11	mΩ
I_{RRM}				-		A
Q_{rr}				-		µC
E_{rr}				-		mJ
$R_{th(j-s)}$	per Diode			1.2		K/W

Characteristics					
Symbol	**Conditions**	**min.**	**typ.**	**max.**	**Unit**
Module					
M_s	to heatsink	2.25		2.5	Nm
w	weight		29		g

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

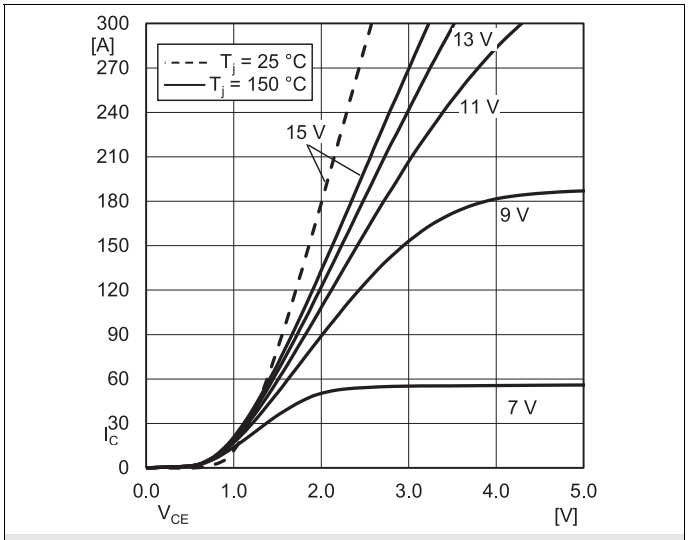


Fig. 1: Typ. output characteristic, inclusive $R_{CC'+EE'}$

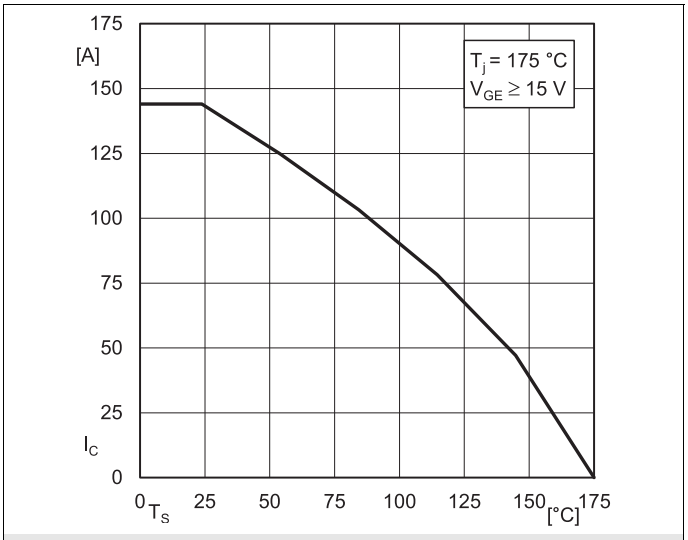


Fig. 2: Typ. rated current vs. temperature $I_C = f(T_S)$

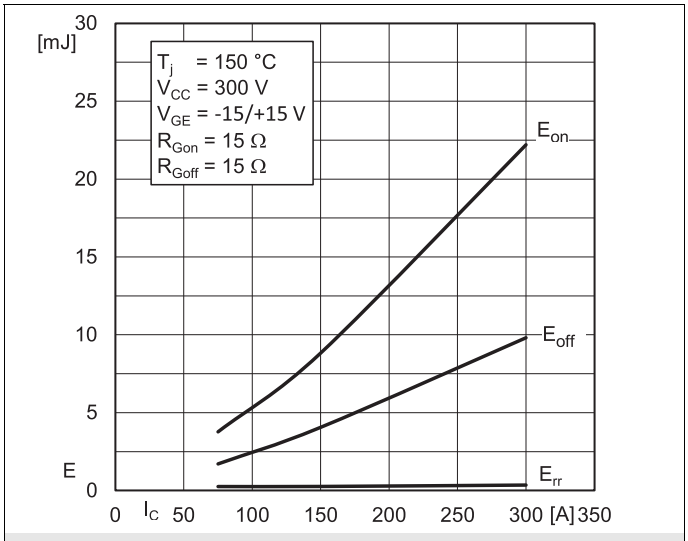


Fig. 3: Typ. turn-on /-off energy = f (I_C)

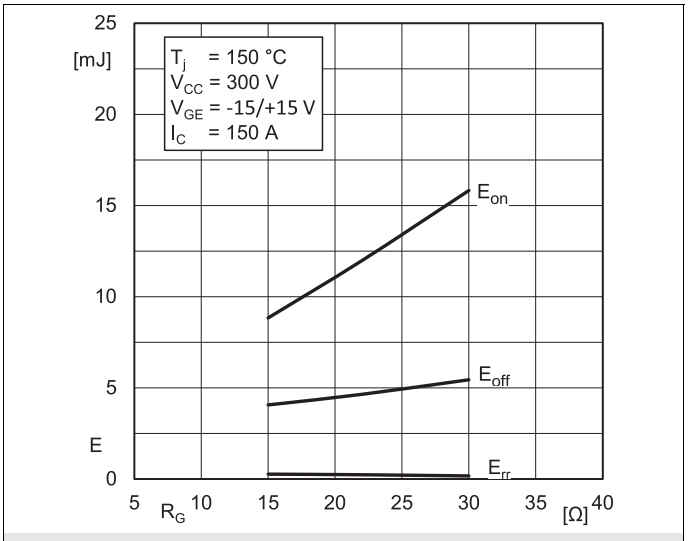


Fig. 4: Typ. turn-on /-off energy = f (R_G)

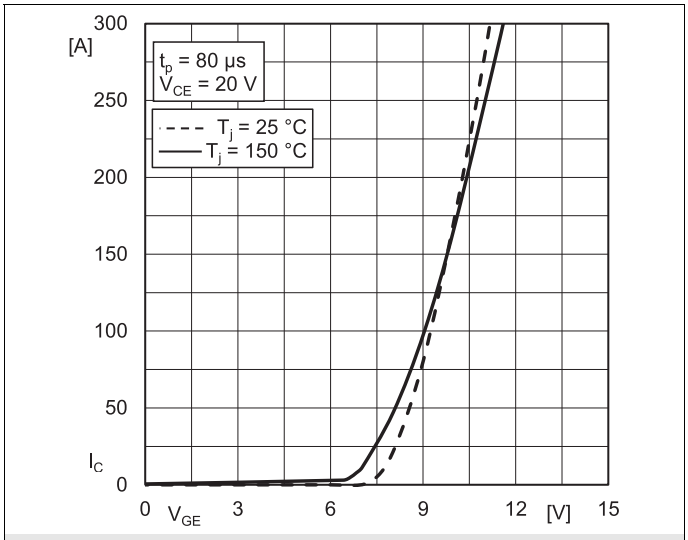


Fig. 5: Typ. transfer characteristic

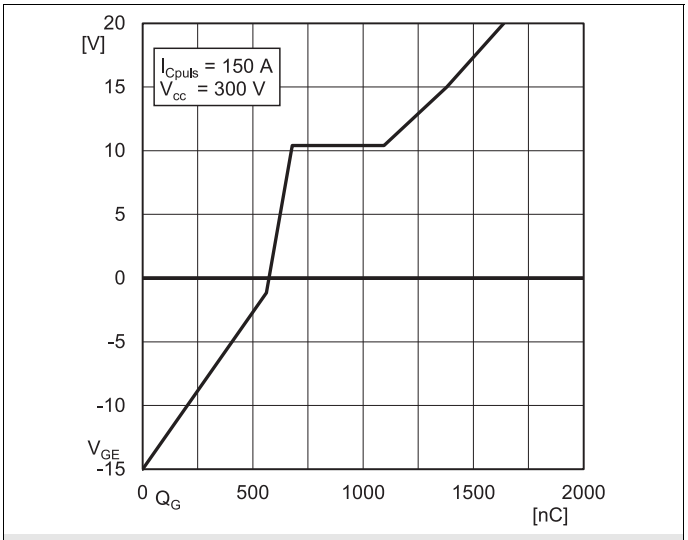


Fig. 6: Typ. gate charge characteristic

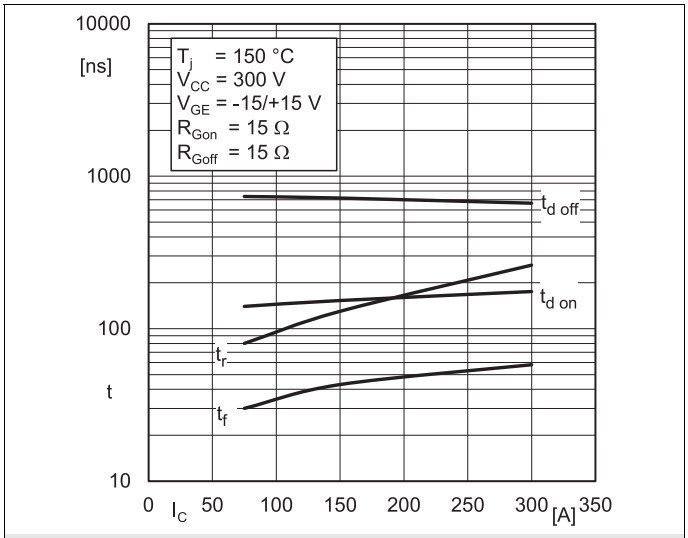


Fig. 7: Typ. switching times vs. I_C

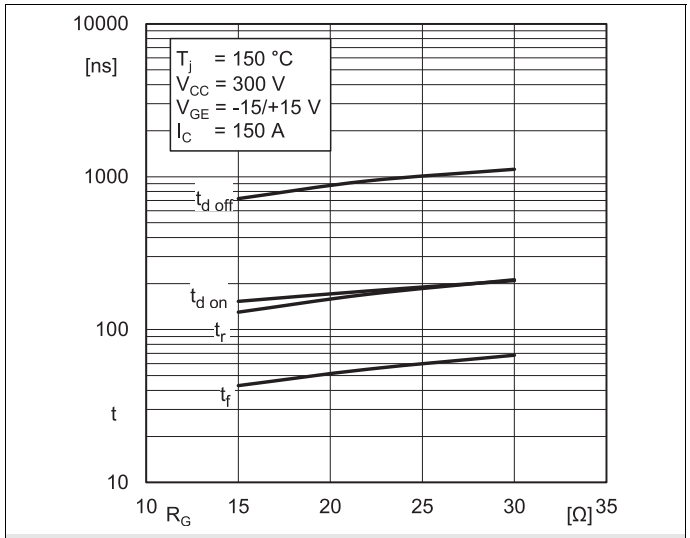


Fig. 8: Typ. switching times vs. gate resistor R_G

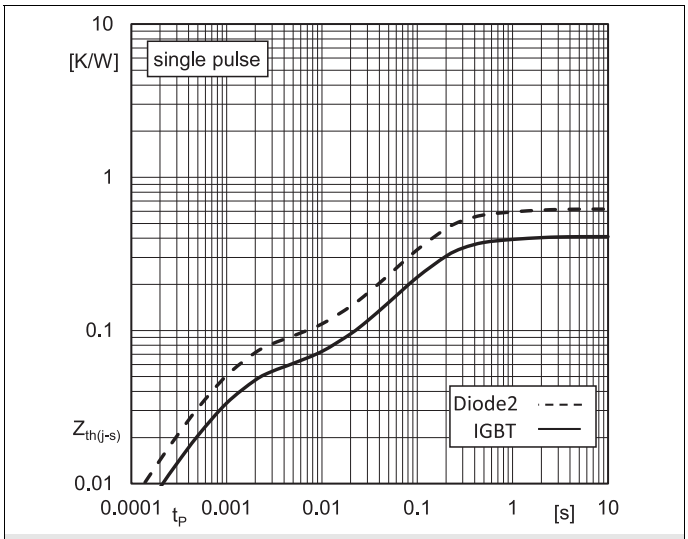


Fig. 9: Transient thermal impedance of IGBT and Diode

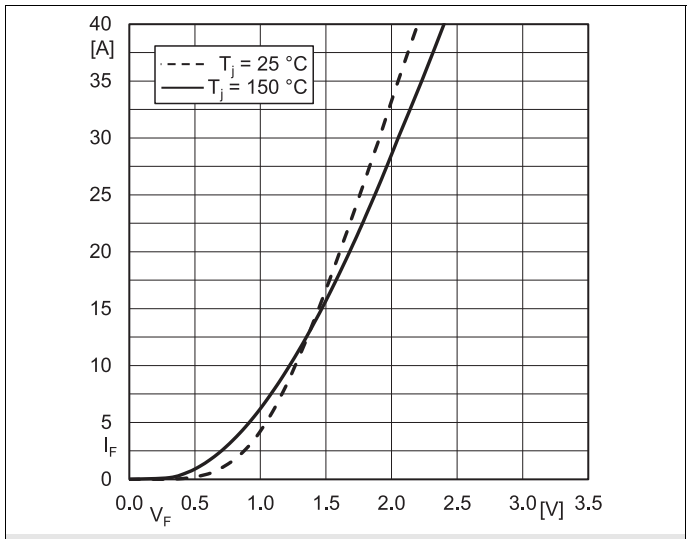


Fig. 10: Typ. CAL Diode3 forward characteristic, incl. $R_{CC'+EE'}$

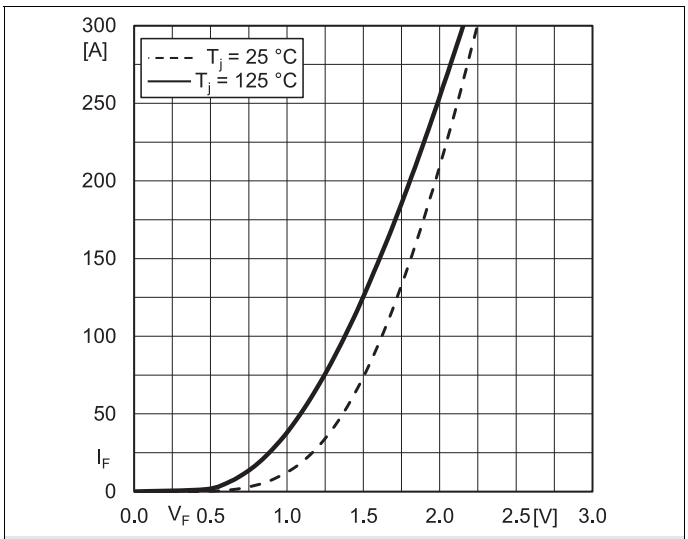
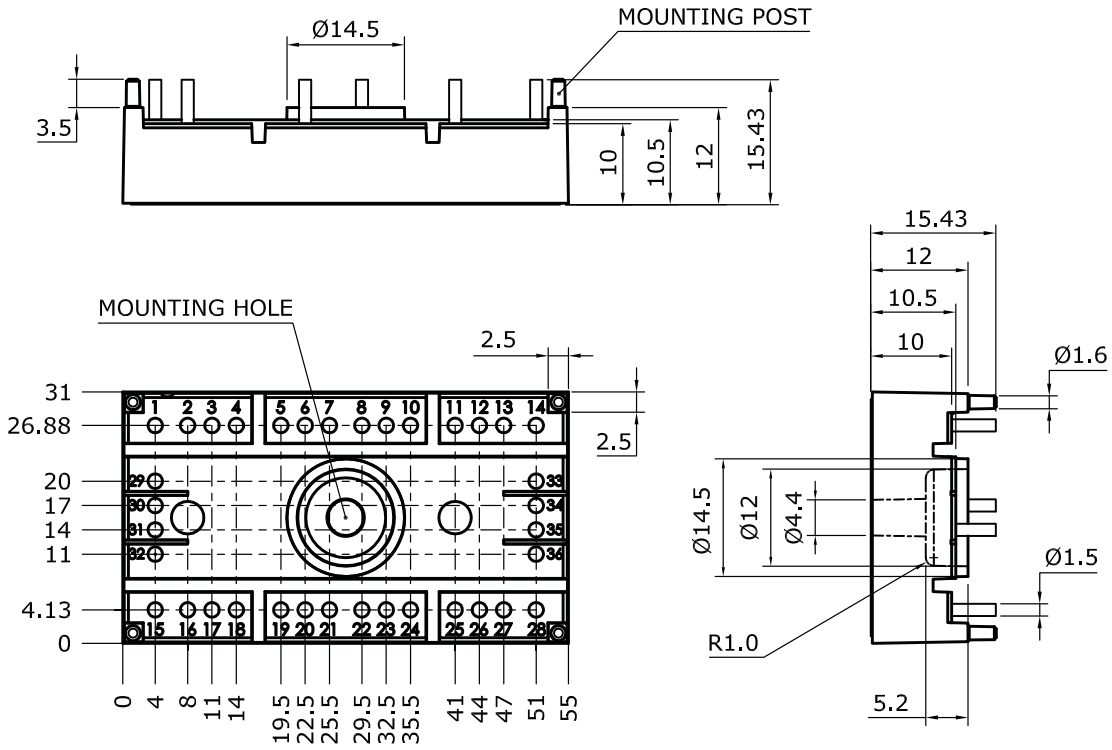


Fig. 13: Typ. Diode2 forward characteristic, incl. $R_{CC'+EE'}$

Dimensions: mm
Tolerance system: ISO 2768-m



Suggested hole diameter for solder pins in the circuit board:

- 2.0 mm

Suggested hole diameter for the mounting post in the circuit board:

- 2.0 mm

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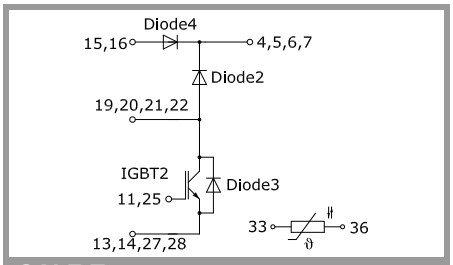

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This is an electrostatic discharge sensitive device (ESDS), international standard IEC 60747-1, chapter IX.

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