

SK 151 GALE 07F3 TUF



IGBT module

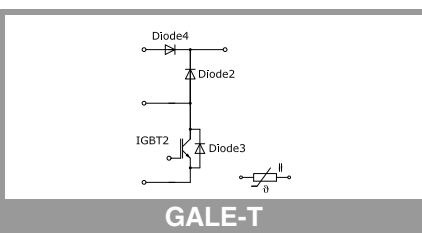
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Features*

- 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



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	129	A
		T _s = 70 °C	96	A
I _C	T _j = 175 °C	T _s = 25 °C	145	A
		T _s = 70 °C	115	A
I _{Cnom}			150	A
I _{CRM}			450	A
V _{GES}			-20 ... 20	V
t _{psc}	V _{CC} = 400 V V _{GE} ≤ 15 V V _{CES} ≤ 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 _{FRM}			450	A
I _{FSM}	8.3 ms	T _j = 25 °C	1134	A
	sin 180°	T _j = 150 °C	988	A
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 _{FRM}			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 _{FSM}	10 ms, sin 180°, T _j = 150 °C		490	A
i ² t	10 ms, sin 180°, T _j = 150 °C		1200	A ² s
T _j			-40 ... 150	°C

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SEMITOP® 3

IGBT module

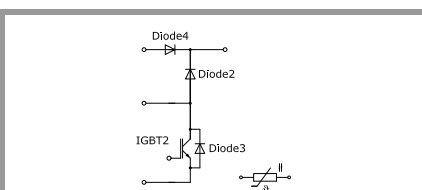
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GALE-T

Absolute Maximum Ratings			
Symbol	Conditions	Values	Unit
Module			
$I_{t(RMS)}$	$\Delta T_{terminal}$ at PCB joint = 30 K, per pin	60	A
T_{stg}	module without TIM	-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 $V_{CE} = 600$ 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	9.30		nF
C_{oes}		$f = 1$ MHz	0.35		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	$T_j = 150$ °C	153		ns
t_r	$V_{GE neg} = -15$ V $V_{GE pos} = 15$ V	$T_j = 150$ °C	130		ns
E_{on}		$T_j = 150$ °C	8.8		mJ
$t_{d(off)}$	$R_{G on} = 15$ Ω	$T_j = 150$ °C	719		ns
t_f	$R_{G off} = 15$ Ω	$T_j = 150$ °C	43		ns
E_{off}	$di/dt_{on} = 974$ A/μs $di/dt_{off} = 3024$ A/μs	$T_j = 150$ °C	4		mJ
$R_{th(j-s)}$	per IGBT, $\lambda_{paste}=0.8$ W/(mK)		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	$T_j = 150$ °C	150		A
Q_{rr}	$di/dt_{off} = 891$ A/μs $V_{GE} = -15$ V	$T_j = 150$ °C	3.1		μC
E_{rr}	$V_{CC} = 300$ V	$T_j = 150$ °C	0.26		mJ
$R_{th(j-s)}$	per Diode, $\lambda_{paste}=0.8$ W/(mK)		0.62		K/W

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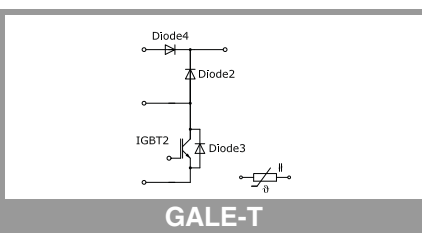
- Switching (not for linear use)
- Inverter
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Characteristics						
Symbol	Conditions		min.	typ.	max.	Unit
Diode 3						
V _F	I _F = 20 A	T _j = 25 °C		1.59	2.06	V
	chiplevel	T _j = 150 °C		1.68	2.01	V
V _{F0}	chiplevel	T _j = 25 °C		0.99	1.10	V
		T _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}	V _{CC} = 300 V			-		mJ
R _{th(j-s)}	per Diode, λ _{paste} =0.8 W/(mK)			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}	chiplevel	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}	I _F = 25 A	T _j = 125 °C		-		A
Q _{rr}		T _j = 125 °C		-		μC
E _{rr}		T _j = 125 °C		-		mJ
R _{th(j-s)}	per Diode, λ _{paste} =0.8 W/(mK)			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



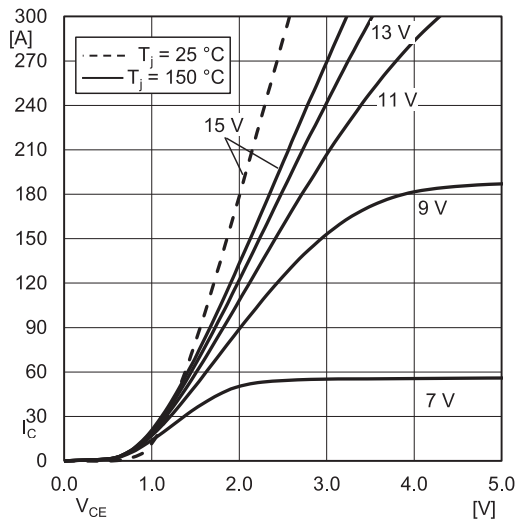


Fig. 1: Typ. output characteristic, inclusive $R_{CC} + EE'$

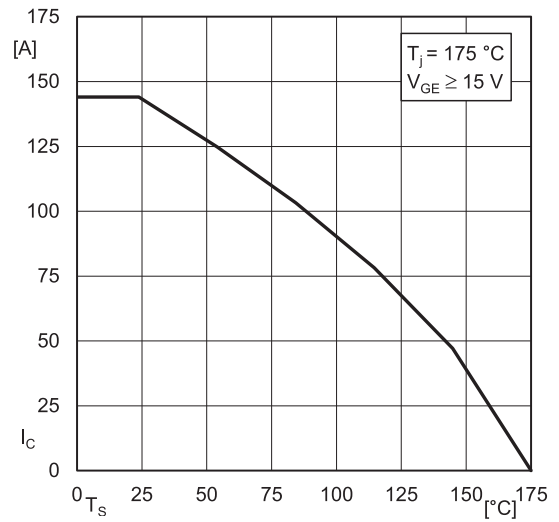


Fig. 2: Typ. rated current vs. temperature $I_C = f(T_S)$

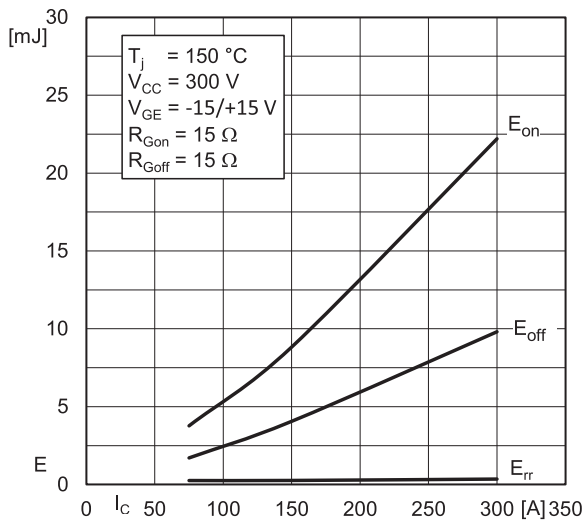


Fig. 3: Typ. turn-on /-off energy = $f(I_C)$

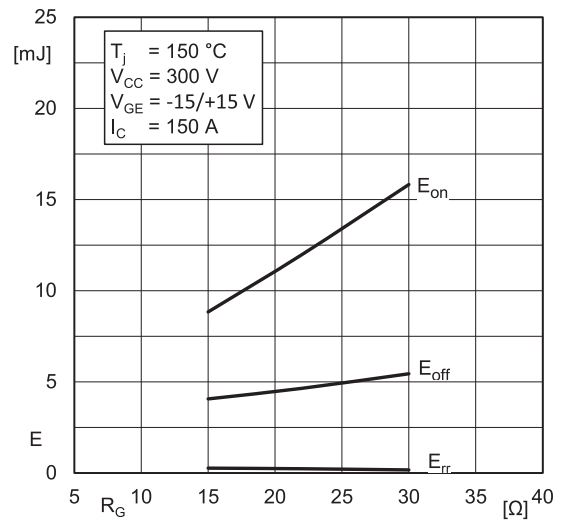


Fig. 4: Typ. turn-on /-off energy = $f(R_G)$

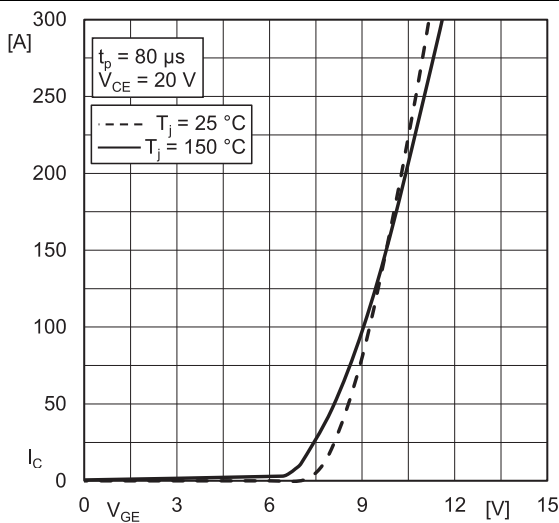


Fig. 5: Typ. transfer characteristic

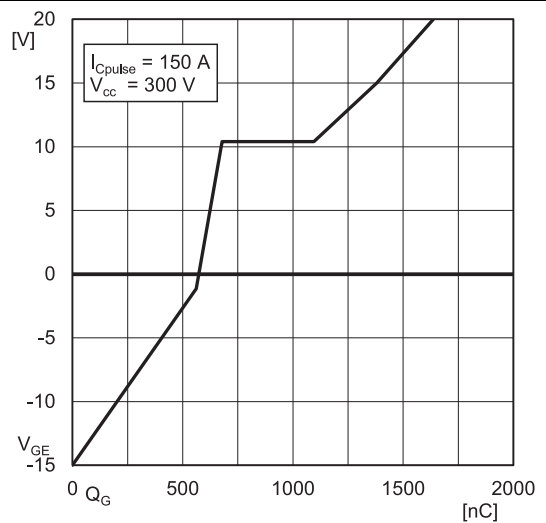


Fig. 6: Typ. gate charge characteristic

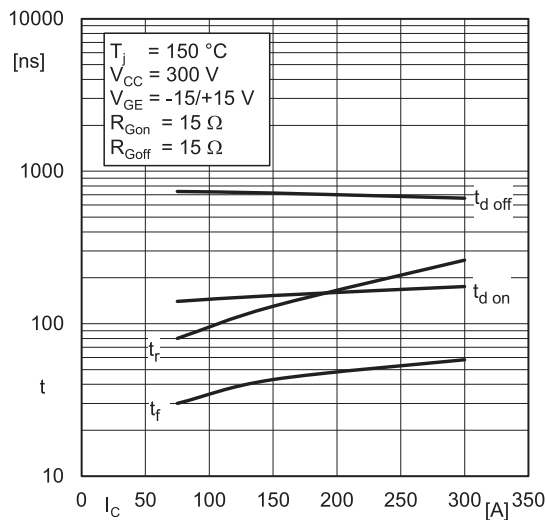


Fig. 7: Typ. switching times vs. I_C

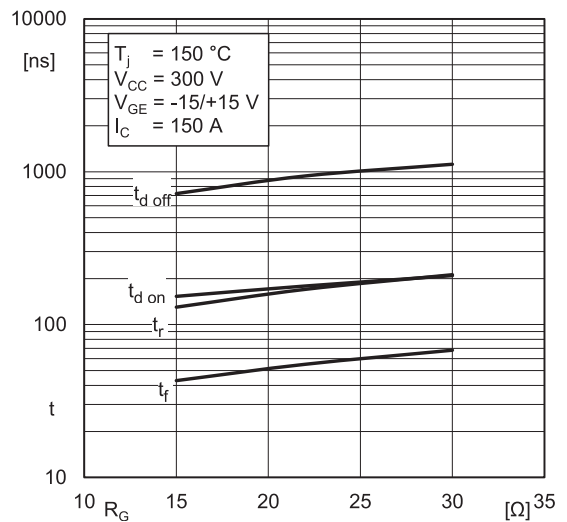


Fig. 8: Typ. switching times vs. gate resistor R_G

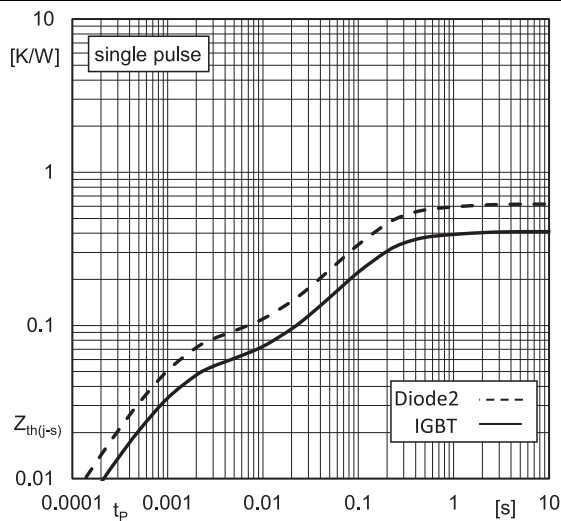


Fig. 9: Typ. transient thermal impedance of IGBT and Diode

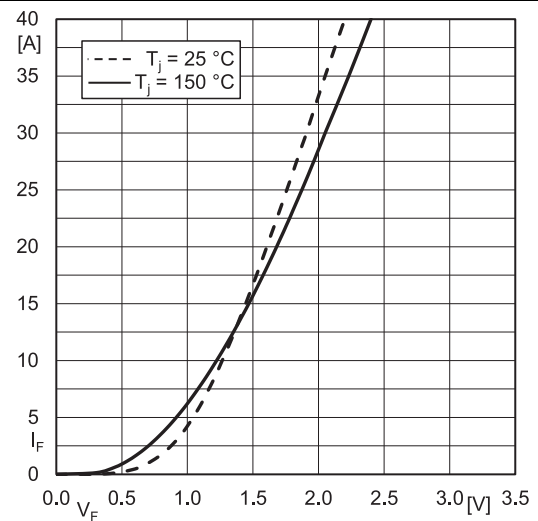


Fig. 10: Typ. Diode3 forward characteristic, incl. $R_{CC'+EE'}$

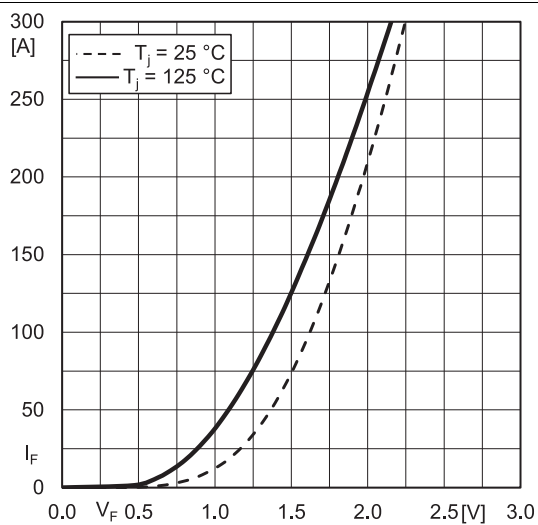


Fig. 13: Typ. Diode2 forward characteristic, incl. $R_{CC'+EE'}$

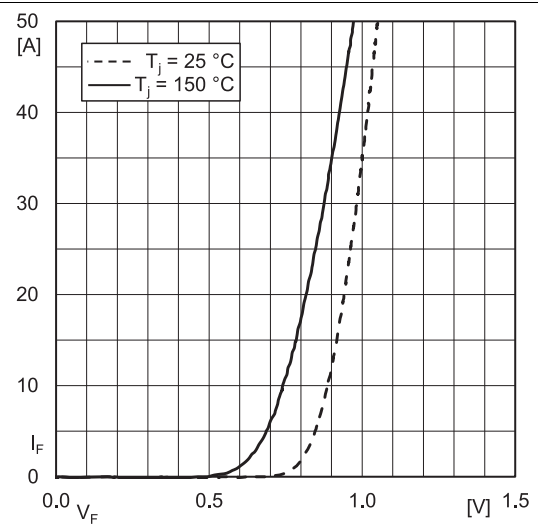
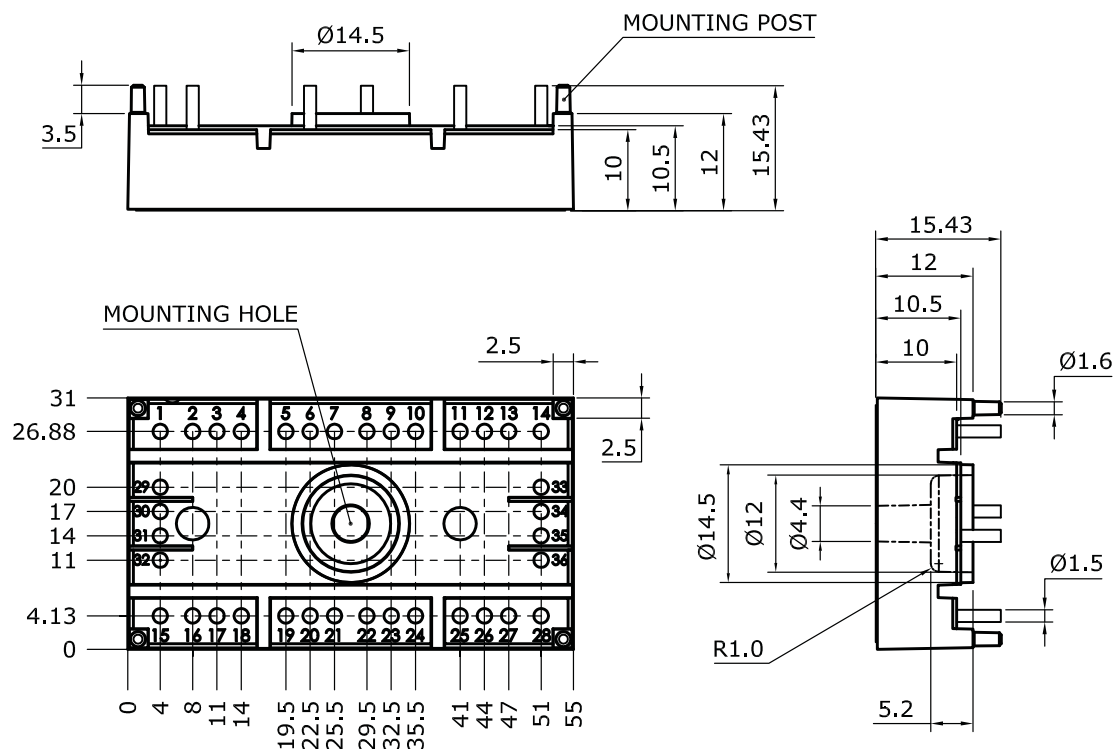


Fig. 14: Typ. Diode4 forward characteristic, incl. $R_{CC'+EE'}$

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Dimensions: mm

Tolerance system: ISO 2768-m



Suggested hole diameter for solder pins in the circuit board:

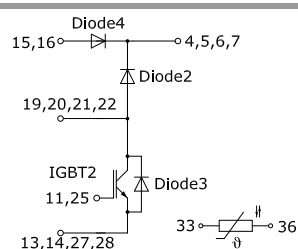
- 2.0 mm

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

- 2.0 mm

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GALE-T

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

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