POLOVODIČE
akciová společnost

TI 929L-1400-45

Integrated Gate-Commutaded Thyristor

Properties

- Full reverse voltage
- Low on-state losses
- Snubberless
- Suitable for inverters, drives and traction applications
- High reliability

Key Parameters

V_{DRM}, V_{RRM}	=	4 500	V
I_{TGQM}	=	1 400	A
I_{TAVm}	=	572	A
I_{TSM}	=	12 000	A
V_{TO}	=	2.728	V
r_T	=	0.923	mΩ

Types

	V_{DRM}, V_{RRM}
TI 929L-1400-45	**4 500 V**
TI 929L-1400-40	**4 000 V**
TI 929L-1400-36	**3 600 V**

Mechanical Data (see Fig. 6)

F_m	**Mounting force**	17 ± 3	kN
m	**Weight**	1.70	kg
D_S	**Surface creepage distance**	33	mm
D_a	**Air strike distance**	11	mm
D_p	**Pole-piece diameter**	63	mm
l	**Lenght**	286	mm
h	**Height**	59	mm
w	**Width**	150	mm

Fig. 1 Case

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Maximum Ratings			*Maximum Limits*	*Unit*
V_{DRM} V_{RRM}	**Repetitive peak off-state and peak reverse voltage** *T_j = -40 ÷ 115 ℃, Gate unit energized*	**TI 929L-1400-45** **TI 929L-1400-40** **TI 929L-1400-36**	**4 500** **4 000** **3 600**	**V**
V_{Dclink}	***Permanent DC voltage for λ = 100 FIT failure rate*** *Gate unit energized*	**TI 929L-1400-45** **TI 929L-1400-40** **TI 929L-1400-36**	**2 700** **2 400** **2 160**	**V**
I_{TRMS}	**RMS on-state current** *T_c = 70 ℃, half sine waveform, f = 50 Hz*		**899**	**A**
I_{TAVm}	**Average on-state current** *T_c = 70 ℃, half sine waveform, f = 50 Hz*		**572**	**A**
I_{TSM}	**Peak non-repetitive surge** *half sine pulse, t_p = 10 ms, V_R = 0 V*		**12 000**	**A**
I^2t	**Limiting load integral** *half sine pulse, t_p = 10 ms, V_R = 0 V*		**720 000**	**A^2s**
T_{jmin} - T_{jmax}	**Junction operating temperature range**		**-40 ÷ 115**	**℃**
T_{stgmin} - T_{stgmax}	**Storage temperature range**		**-40 ÷ 80**	**℃**

Unless otherwise specified T_j = 115 ℃

Characteristics		Value			Unit
		min.	typ.	max.	
V_{TM}	**Maximum peak on-state voltage** I_{TM} = 1 400 A, CS - ON			4.110	V
V_{T0} r_T	**Threshold voltage** **Slope resistance** I_{T1} = 898 A, I_{T2} = 2 695 A			2.728 0.923	V mΩ
I_{DM}	**Peak off-state current** $V_D = V_{DRM}$, Gate unit energized			150	mA
I_{RM}	**Peak reverse current** $V_R = V_{RRM}$, Gate unit energized			150	mA

Unless otherwise specified T_j = 115 ℃

Turn-on switching

Maximum rated values		Value	Unit
$(di_T/dt)_{cr}$	**Critical rate of rise of on-state current**	1 000	A/µs
Conditions: T_j = 90 ℃, I_T = 1400 A, f =0÷1000 Hz			
Characteristic values		**Value**	**Unit**
I_{Tm}	**Peak on-state current**	1 400	A
t_{don}	**Turn-on delay time**	≤ 3.5	µs
t_r	**Rise on-time**	≤ 1.2	µs
E_{on}	**Turn-on energy per pulse**	≤ 0.85	J
Conditions: T_j = 90 ℃, L_{CL} = 0.2µH, L_i = 2 µH, R_s = 12 Ω, V_{LC} = 0,6 V_{DRM} (Fig. 8)			

Turn-off switching

Maximum rated values		Value	Unit
I_{TGQM}	**Max. controllable turn-off current**	1 400	A
t_{doff}	**Turn-off delay time**	≤ 3.5	µs
t_f	**Fall time**	≤ 0.5	µs
E_{off}	**Turn-off energy per pulse**	≤ 4.0	J
Conditions: T_j = 90 ℃, C_{CL} = 10 µF, L_{CL} = 0.2 µH, L_i = 2 µH, R_s = 12 Ω, V_{LC} = 0,6 V_{DRM} (Fig. 8)			

Thermal Parameters		Value	Unit
R_{thjc}	**Thermal resistance junction to case** *double side cooling*	18.4	K/kW
R_{thch}	**Thermal resistance case to heatsink,** *double side cooling*	6.0	K/kW

Transient Thermal Impedance

Analytical function for transient thermal impedance

$$Z_{thjc} = \sum_{i=1}^{4} R_i (1 - \exp(-t / \tau_i))$$

Conditions:

F_m = 17 ± 3 kN, Double side cooled

i	1	2	3	4
R_i (K/kW)	10.03	7.35	0.80	0.22
τ_i (s)	0.7140	0.1491	0.0109	0.0019

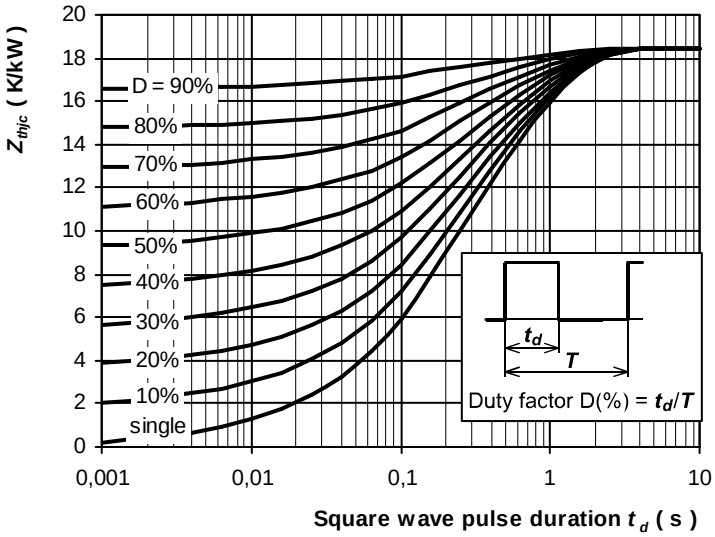

Fig. 2 Transient thermal impedance junction to case (Double side cooled)

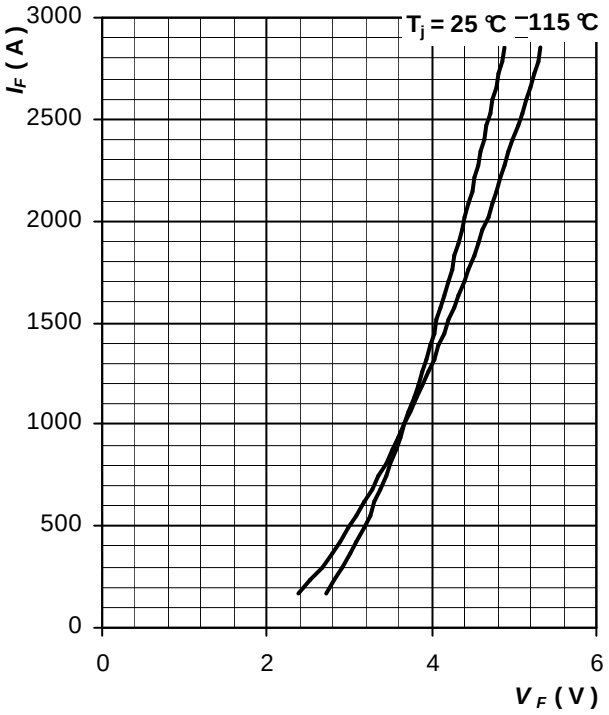

Fig. 3 Maximum instaneous on-state characteristics

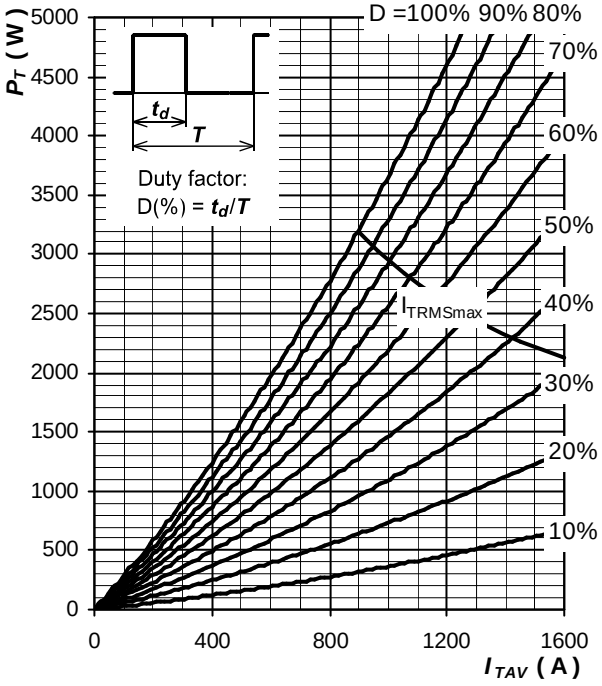

Fig. 4 Power losses vs. rectangular pulse current

Gate unit		*Value*	*Unit*
V_{GIN}	**Gate unit voltage**	**- 20**	**V**
P_{max}	**Gate unit power consuption** [1)]	**80**	**W**
I_{Gmax}	**Max. power current**	**4**	**A**
$P_{on\ CS}$	**Control Signal optical input power** (B1)	**> -20**	**dBm**
$P_{off\ CS}$	**Control Signal optical noise power** (B1)	**< -45**	**dBm**
$P_{on\ SF}$	**Status Feedback optical output power**(B2)	**> -20**	**dBm**
$P_{off\ SF}$	**Status Feedback optical noise power** (B2)	**< -50**	**dBm**
t_{onmin}	**Minimal on time**	**5 ± 20%**	**µs**
t_{offmin}	**Minimal off time**	**6 ± 20%**	**µs**
t_{GLITCH}	**Pulse width threshold**	**< 0.75**	**µs**
f_{max}	**Frequency**	**1 000**	**Hz**
t_{fd}	**Delay time of on gate current**	**2.0**	**µs**
t_{rd}	**Delay time of off gate current**	**2.0**	**µs**
D_{max}	**Maximum duty**	**100**	**%**
T_{wmin} - T_{wmax}	**Operating temperature range** [2)] *(Fig. 5)*	**-20 ÷ 70**	**°C**
T_{stgmin} - T_{stgmax}	**Storage temperature range**	**-40 ÷ 80**	**°C**
X1	**Gate part power connector** *(see Fig.6)*	**BU95-02 Hartman**	**-**
CS - B1	**LWL receiver for command signal**	**HFBR-2524 Agilent**	**-**
SF - B2	**LWL transmitter for status feedback**	**HFBR-1528 Agilent**	**-**

Note 1: Powered with recomended supply unit SU 929A

Note 2: Recomended temperature: ≤ 60°C

Visual feedback *(see Fig.6)*		***Color***
Power	**„Light“ when power supply is OK**	**green**
Fault	**„Light“ when GCT not redy / Failure**	**red**
Gate ON	**„Light“ when gate current is flowing**	**yelow**

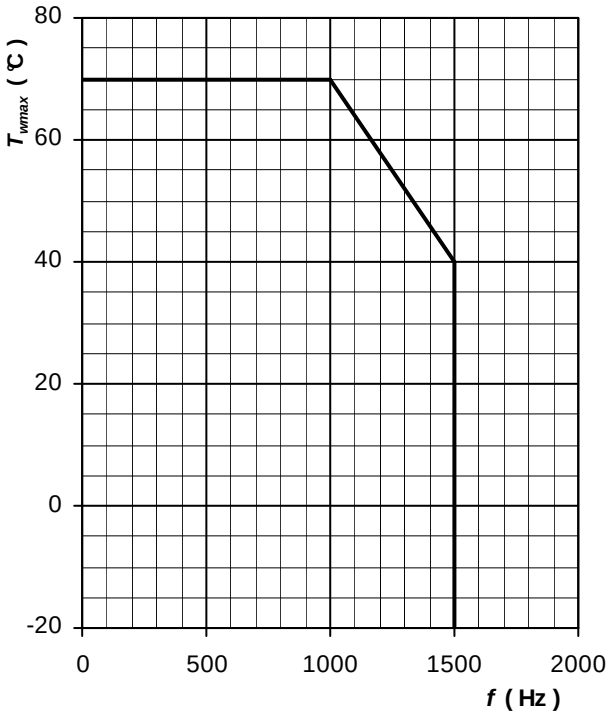

Fig. 5 Gate drive part operating temperature area

Supply unit (recomended type)		***Value***	***Unit***
Vc	**DC power supply – SU 929A-24 or SU 929B - SU 929A-48**	**18 ÷ 36 36 ÷ 60**	**V**
P	**Power consumption (cut-off limit)**	**90**	**W**
V_{out1}	**Output supply voltage**	**-20**	**V**
T_{wmin} **-** T_{wmax}	**Operating temperature range[2)]**	**-20 to +70**	**℃**
V_{is}***/1min***	**Insulation strength (SU 929A / SU 929B)**	**5.0 / 10.5**	**[kV]**
m	**Weight (SU 929A / SU 929B)**	**1 135 / 1 650**	**g**

Note 2: Recomended temperature: ≤ 60°C

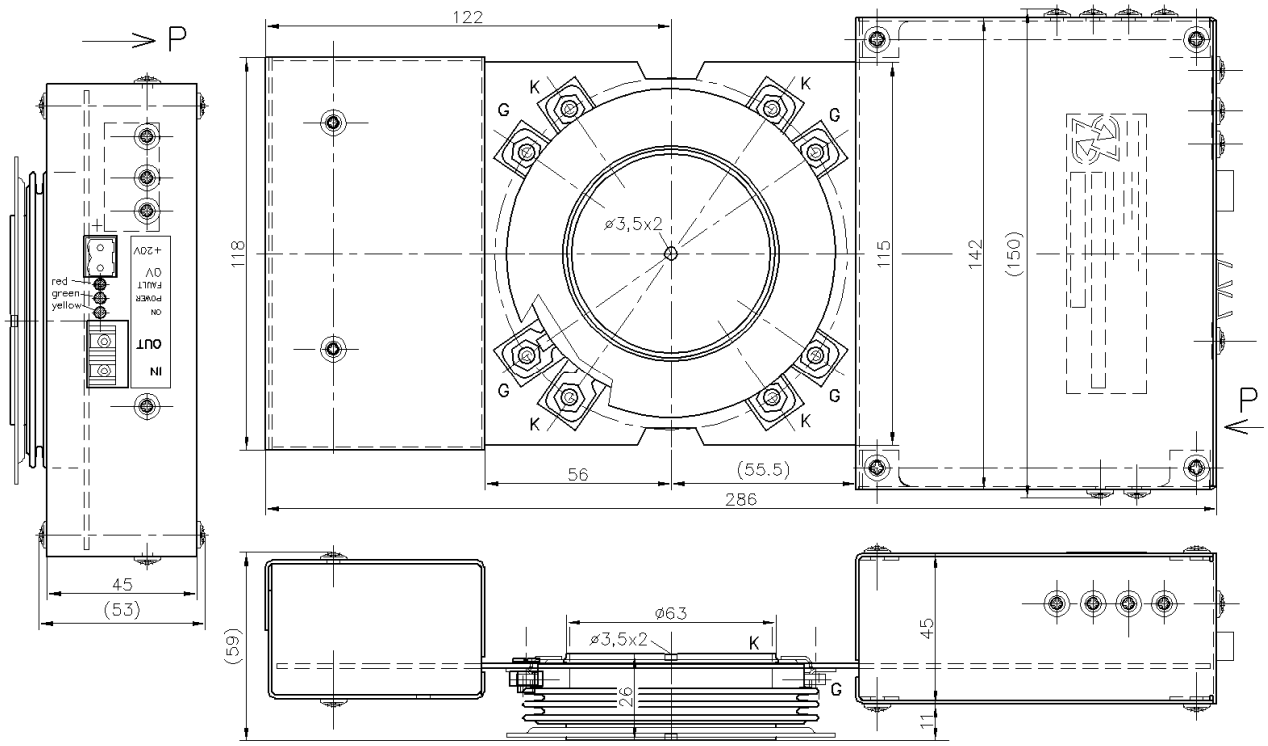

Fig. 6 Device gate part drawing

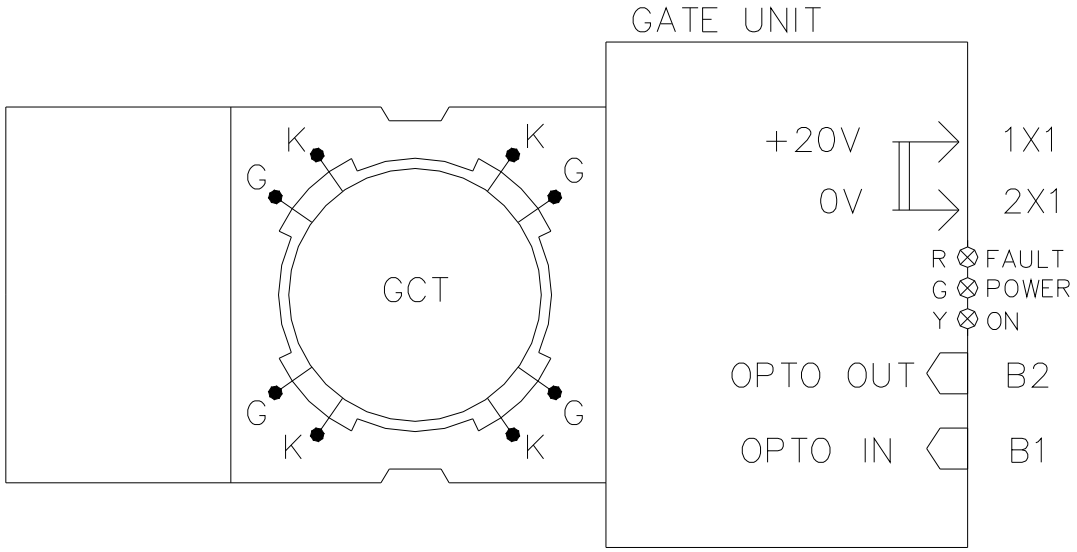

Fig. 7 Schema of input-output conection

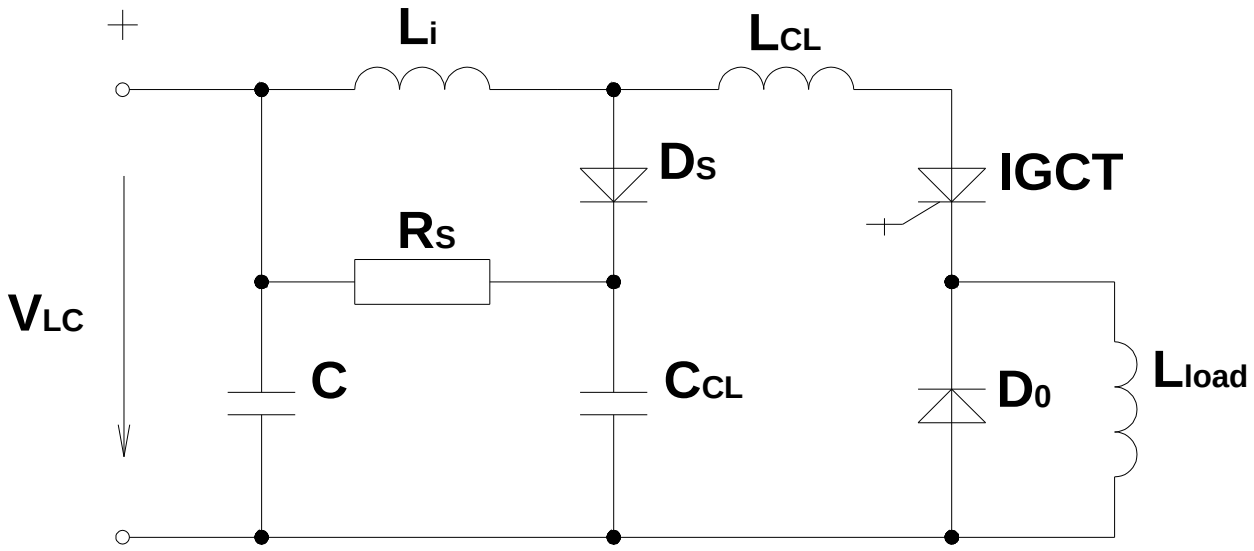

Fig.8 Test circuit.

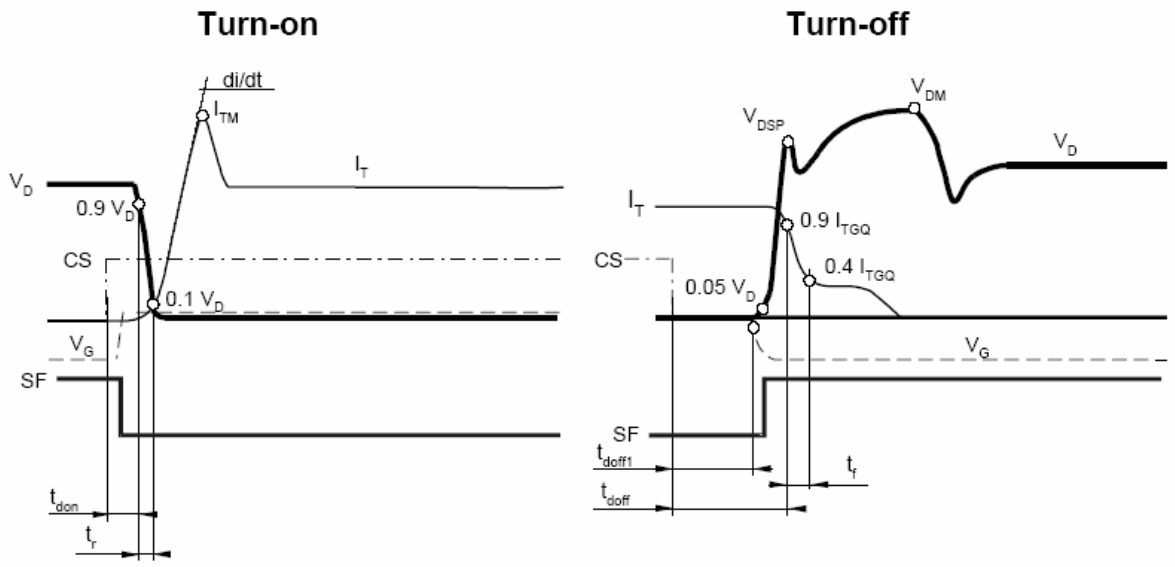

Fig. 9 Turn-on and turn-off waveform diagram