• GE of USA
11/82

Germanium Diodes

1N3712-21

Tunnel Diode Measurements – WW May 1965 p 108.
also in article re 50mA3 range WW 1976

The General Electric 1N3712 through 1N3720 and 1N3713 through 1N3721 are Germanium Tunnel Diodes offering peak currents of 1.0, 2.2, 4.7, 10, and 22 ma. These devices, which make use of the quantum mechanical tunneling phenomenon to obtain a negative conductance characteristic, are designed for low level switching and small signal applications at very high frequencies. All 1N3713-1N3721 version parameters are closely controlled for use in critical applications such as level detection, frequency converters, etc. These devices are housed in General Electric's new hermetically sealed subminiature axial package.

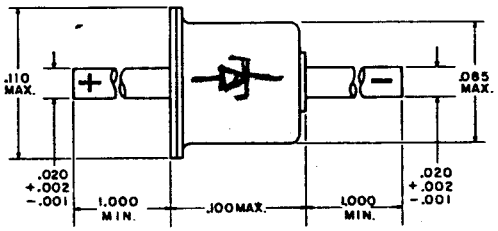
FEATURES:

- V_{FS} Specified for more accurate designing of load lines
- Low capacitance
- Fast speed

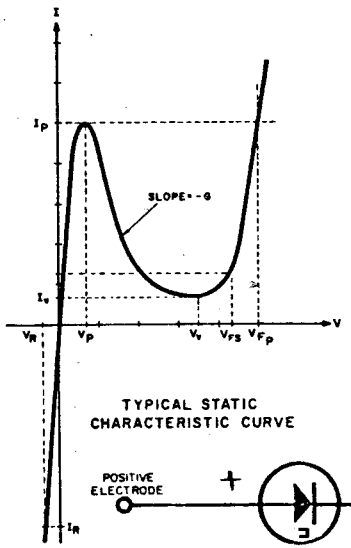
	1N3712 1N3713	1N3714 1N3715	1N3716 1N3717	1N3718 1N3719	1N3720 1N3721	
Forward Current*	5	10	25	50	100	ma
Reverse Current*	10	20	50	50	100	ma
Storage Temperature	←	−55 to +100			→	°C
Lead Temperature 1/16" ± 1/32" from case for 10 seconds	←	260			→	°C

*Derate maximum currents 1% per °C ambient temperature above 25°C.

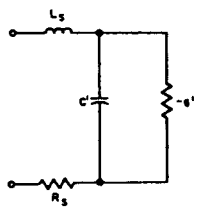
AXIAL DIODE OUTLINE



ALL DIMENSIONS IN INCHES.
DIMENSIONS ARE REFERENCE UNLESS TOLERANCED.



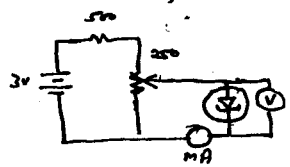
TYPICAL STATIC CHARACTERISTIC CURVE

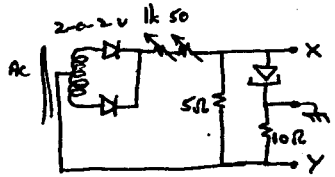


EQUIVALENT CIRCUIT (BIASED IN NEGATIVE CONDUCTANCE REGION)

TUNNEL DIODE SYMBOL

T.D. Tester, or WW March'65



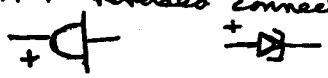


Y at 10 mV/cm { 2mA = 2cm, 5mA = 5cm, 10mA = 10cm

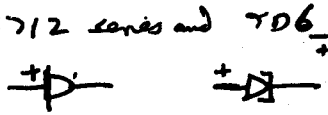
X at 0.1V/cm 50mV = 5cm

21

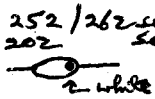
TD714 reversed connections



1N3712 series and TD6



TD 252/262 series
TD 202 series.



Ultra fast (75°C TD251, 100°C TD261 series) {TD251A, TD251}

TD252A t_r 74ps, TD252 t_r 320ps; TD253B t_r 68ps, TD253A t_r 110ps, TD253 t_r 350ps; TD254A, TD254

electrical characteristics:

G.E. & USA

STATIC CHARACTERISTICS		1N3712 (TD201) Min.	Typ.	Max.	1N3713 (TD201A) Min.	Typ.	Max.	1N3714 (TD202, TD2) Min.	Typ.	Max.	1N3715 (TD202A) Min.	Typ.	Max.	1N3716 (TD203, TD3) Min.	Typ.	Max.
Peak Point Current	I_P	0.9	1.0	1.1	0.975	1.000	1.025	2.0	2.2	2.4	2.15	2.20	2.25	4.2	4.7	5.2
Valley Point Current	I_V		0.12	0.18	.075	.095	.140		0.29	0.48	.165	.210	.310		0.60	1.04
Peak Point Voltage	V_P		65		58	65	72		65		58	65	72		65	
Valley Point Voltage	V_V		350		315	355	395		350		315	355	395		350	
Reverse Voltage ($I_R = I_P$ typ.)	V_R			40		20	40			40		20	40			40
Forward Voltage ($I_F = I_P$ typ.)	V_{FP}		500		475	510	535		500		475	510	535		500	
► ($I_F = .25\ I_P$ typ.)	V_{FS}*				410	450					410	450				
DYNAMIC CHARACTERISTICS																
Total Series Inductance	L_S		0.5			0.5			0.5			0.5			0.5	
Total Series Resistance	R_S		1.5	4.0		1.7	4.0		1.0	3.0		1.1	3.0		.50	2.0
► Valley Point Terminal Capacitance	C		5	10		3.5	5.0		10	25		7.0	10.0		25	50
Max. Negative Terminal Conductance	-G		8		7.5	8.5	9.5		18		16	19	22		40	
Resistive Cutoff Frequency	f_{ro}		2.3			3.2			2.2			3.0			1.8	
Self-Resonant Frequency	f_{xo}		3.2			3.8			2.2			2.7			1.4	
Frequency of Oscillation	F_{osc}**		3.2			3.8			2.2			2.7			1.4	
► Rise Time	t_r***					1.7						1.6				

STATIC CHARACTERISTICS		1N3717 (TD203A) Min.	Typ.	Max.	1N3718 (TD204, TD4) Min.	Typ.	Max.	1N3719 (TD204-A) Min.	Typ.	Max.	1N3720 (TD205) Min.	Typ.	Max.	1N3721 (TD205A) Min.	Typ.	Max.	
Peak Point Current	I_P	4.58	4.70	4.82	9.0	10.0	11.0	9.75	10.00	10.25	20	22	24	21.5	22	22.5	ma
Valley Point Current	I_V	.350	.45	.60		1.3	2.2	.75	.95	1.40		2.9	4.8	1.65	2.10	3.10	ma
Peak Point Voltage	V_P	58	65	72		65		58	65	72		65		58	65	72	mv
Valley Point Voltage	V_V	315	355	395		350		315	355	395		350		315	355	395	mv
Reverse Voltage ($I_R = I_P$ typ.)	V_R		20	40			40		20	40			40		20	40	mv
Forward Voltage ($I_F = I_P$ typ.)	V_{FP}	475	510	535		500		475	510	535		500		475	510	575	mv
► ($I_F = .25\ I_P$ typ.)	V_{FS}*	410	450					410	450					410	450		
DYNAMIC CHARACTERISTICS																	
Total Series Inductance	L_S		0.5			0.5			0.5			0.5			0.5		nh
Total Series Resistance	R_S		.52	2.0		.30	1.5		.36	1.5		.20	1.0		.22	1.0	ohms
► Valley Point Terminal Capacitance	C		13	25		50	90		27	50		90	150		55	100	pf
Max. Negative Terminal Conductance	-G	36	41	46		80		75	85	95		180		160	190	220	10^{-3} mho
Resistive Cutoff Frequency	f_{ro}		3.4			1.6			2.8			1.6			2.6		KMC
Self-Resonant Frequency	f_{xo}		1.9			.97			1.3			.67			.78		KMC
Frequency of Oscillation	F_{osc}**		2.0			1.0			1.4			.74			.95		KMC
► Rise Time	t_r***		1.4						1.3						1.2		nsec

*V_{FS} is defined as the value of forward voltage at a forward current of one quarter the typical peak current.

**The frequency of oscillation (under short circuit conditions) for steady state large signal sinusoidal oscillation is given by equation (3) which is the maximum frequency attainable without capacitance compensation.

***Switching speed with constant current drive. $t_r \approx \frac{V_{FP} - V_P}{I_P - I_V} C$

$$f_{ro} = \frac{|g'|}{2\pi C'}\sqrt{\frac{1}{R_S|g'|} - 1} \quad (1) \qquad f_{xo} = \frac{1}{2\pi}\sqrt{\frac{1}{L_S C'} - \left(\frac{|g'|}{C'}\right)^2} \quad (2) \qquad f_{osc} = \frac{1}{2\pi}\sqrt{\frac{1}{L_S C} - \left(\frac{R_T}{L}\right)^2} \quad (3)$$

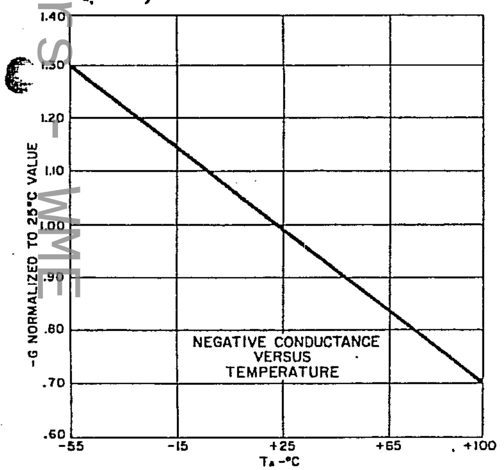
obsolete {RCA (1967), Siemens (1974), STC (1961), TSF/Mullard}

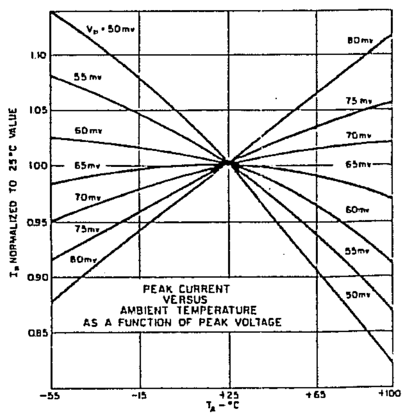
RCA (1967): 40066 | TD714 | TD716, 40571, 40067 | 1N3128, 40566 | 40562, 40568 | 40567 | 40573 | – | RCA

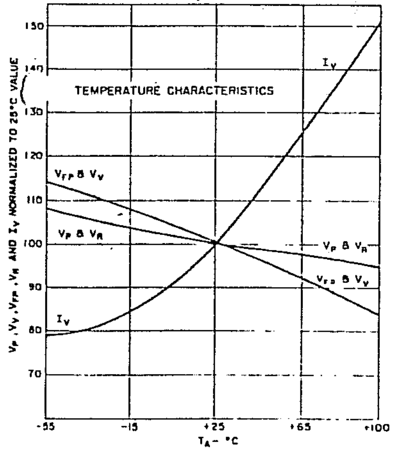
Siemens (1974): AEY30 (1.6mA) | TU205/10 | TU205/5 | TU210/10, 1N3149 | TU210/5 | TU220/10 | TU220/5 | Siemens

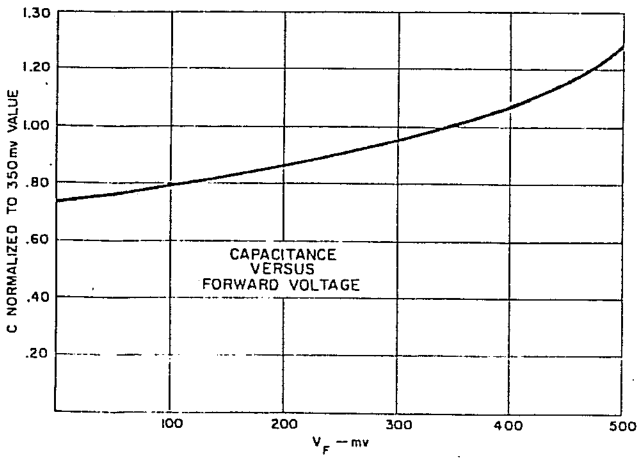
STC (1961): JK19A | JK20A

TSF/Mullard: AEY23 | AEY11, AEY24 | AEY26 | AEY25 | AEY27 | AEY28









1N3712-21