Fast Recovery Diodes (T-Modules), 40 A, 70 A, 85 A

D-55 (T-module)

FEATURES

- Fast recovery time characteristics
- Electrically isolated base plate
- 3500 V_{RMS} isolating voltage
- Standard JEDEC® package
- Simplified mechanical designs, rapid assembly
- Large creepage distances
- UL E78996 approved
- Designed and qualified for industrial level
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

RoHS COMPLIANT

DESCRIPTION

The series of T-modules uses fast recovery power diodes in a single diode configuration. The semiconductors are electrically isolated from the metal base, allowing common heatsink and compact assemblies to be built.
These single diode modules can be used in conjunction with the thyristor modules as a freewheel diode. Application includes self-commutated inverters, DC choppers, motor control, inductive heating and electronic welders. These modules are intended for those applications where very fast recovery characteristics are required and for general power switching applications.

PRODUCT SUMMARY	
$I_{F(AV)}$	40 A, 70 A, 85 A
Type	Modules - Diode, Fast

MAJOR RATINGS AND CHARACTERISTICS					
SYMBOL	CHARACTERISTICS	T40HFL	T70HFL	T85HFL	UNITS
$I_{F(AV)}$		40	70	85	A
	T_C	70	70	70	°C
$I_{F(RMS)}$		63	110	133	A
I_{FSM}	50 Hz	475	830	1300	A
	60 Hz	500	870	1370	
I^2t	50 Hz	1130	3460	8550	A^2s
	60 Hz	1030	3160	7810	
V_{RRM}	Range	100 to 1000			V
t_{rr}	Range	200 to 1000			ns
T_J	Range	-40 to +125			°C

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ELECTRICAL SPECIFICATIONS

VOLTAGE RATINGS

TYPE NUMBER	VOLTAGE CODE	t_{rr} CODE	V_{RRM}, MAXIMUM REPETITIVE PEAK REVERSE VOLTAGE V	V_{RSM}, MAXIMUM NON-REPETITIVE PEAK REVERSE VOLTAGE V	I_{RRM} MAXIMUM AT T_J = 25 °C µA
VS_T40HFL.. VS_T70HFL.. VS_T85HFL..	10	S02, S05, S10	100	150	100
	20	S02, S05, S10	200	300	
	40	S02, S05, S10	400	500	
	60	S02, S05, S10	600	700	
	80	S05, S10	800	900	
	100	S05, S10	1000	1100	

FORWARD CONDUCTION

PARAMETER	SYMBOL	TEST CONDITIONS			VALUES T40HFL	VALUES T70HFL	VALUES T85HFL	UNITS
Maximum average forward current at case temperature	$I_{F(AV)}$	180° conduction, half sine wave			40	70	85	A
					70			°C
Maximum RMS forward current	$I_{F(RMS)}$				63	110	133	A
Maximum peak, one-cycle forward, non-repetitive surge current	I_{FSM}	t = 10 ms	No voltage reapplied	Sinusoidal half wave, initial $T_J = T_J$ maximum	475	830	1300	A
		t = 8.3 ms			500	870	1370	
		t = 10 ms	100 % V_{RRM} reapplied		400	700	1100	
		t = 8.3 ms			420	730	1150	
Maximum I^2t for fusing	I^2t	t = 10 ms	No voltage reapplied		1130	3460	8550	A^2s
		t = 8.3 ms			1030	3160	7810	
		t = 10 ms	100 % V_{RRM} reapplied		800	2450	6050	
		t = 8.3 ms			730	2230	5520	
Maximum $I^2\sqrt{t}$ for fusing	$I^2\sqrt{t}$	t = 0.1 ms to 10 ms, no voltage reapplied			11 300	34 600	85 500	$A^2\sqrt{s}$
Low level value of threshold voltage	$V_{F(TO)1}$	T_J = 25 °C, (16.7 % x π x $I_{F(AV)}$ < I < π x $I_{F(AV)}$)			0.82	0.87	0.84	V
High level value of threshold voltage	$V_{F(TO)2}$	T_J = 25 °C, (I > π x $I_{F(AV)}$)			0.84	0.90	0.86	
Low level value of forward slope resistance	r_{f1}	T_J = 25 °C, (16.7 % x π x $I_{F(AV)}$ < I < π x $I_{F(AV)}$)			7.0	2.77	2.15	mΩ
High level value of forward slope resistance	r_{f2}	T_J = 25 °C, (I > π x $I_{F(AV)}$)			6.8	2.67	2.07	
Maximum forward voltage drop	V_{FM}	I_{FM} = π x $I_{F(AV)}$, T_J = 25 °C, t_p = 400 µs square wave Average power = $V_{F(TO)}$ x $I_{F(AV)}$ + r_f x $(I_{F(RMS)})^2$			1.60	1.73	1.55	V

REVERSE RECOVERY CHARACTERISTICS

PARAMETER	SYMBOL	TEST CONDITIONS (1)	T40HFL S02	T40HFL S05	T40HFL S10	T70HFL S02	T70HFL S05	T70HFL S10	T85HFL S02	T85HFL S05	T85HFL S10	UNITS
Maximum reverse recovery time	t_{rr}	T_J = 25 °C, -dI_F/dt = 100 A/µs I_F = 1 A to V_R = 30 V	70	110	270	70	110	270	80	120	290	ns
		T_J = 25 °C, -dI_F/dt = 25 A/µs I_{FM} = π x rated $I_{F(AV)}$, V_R = - 30 V	200	500	1000	200	500	1000	200	500	1000	
Maximum reverse recovery charge	Q_{rr}	T_J = 25 °C, -dI_F/dt = 100 A/µs I_F = 1 A to V_R = 30 V	0.25	0.4	1.35	0.25	0.4	1.35	0.3	0.6	1.6	µC
		T_J = 25 °C, -dI_F/dt = 25 A/µs I_{FM} = π x rated $I_{F(AV)}$, V_R = - 30 V	0.55	2.0	8.0	0.6	2.1	8.5	0.8	3.5	1.5	

Note

(1) Tested on LEM 300 A diodemeter tester

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BLOCKING						
PARAMETER	SYMBOL	TEST CONDITIONS	T40HFL	T70HFL	T85HFL	UNITS
Maximum peak reverse leakage current	I_{RRM}	T_J = 125 °C	20			mA
RMS isolation voltage	V_{ISOL}	50 Hz, circuit to base, all terminals shorted, T_J = 25 °C, t = 1 s	3500			V

THERMAL AND MECHANICAL SPECIFICATIONS						
PARAMETER		SYMBOL	TEST CONDITIONS		VALUES	UNITS
Junction operating temperature range		T_J			-40 to +125	°C
Storage temperature range		T_{Stg}			-40 to +150	
Maximum internal thermal resistance, junction to case per module	T40HFL	R_{thJC}		DC operation	0.85	K/W
	T70HFL				0.53	
	T85HFL				0.46	
Thermal resistance, case to heatsink per module		R_{thCS}		Mounting surface, flat, smooth and greased	0.2	
Mounting torque ± 10 %	base to heatsink		Non-lubricated threads	M3.5 mounting screws (1)	1.3 ± 10 %	Nm
	busbar to terminal			M5 screws terminals	3 ± 10 %	
Approximate weight				See dimensions - link at the end of datasheet	54	g
					19	oz.
Case style					D-55 (T-module)	

Note

(1) A mounting compound is recommended and the torque should be rechecked after a period of about 3 hours to allow for the spread of the compound

ΔR CONDUCTION											
DEVICES	SINUSOIDAL CONDUCTION AT T_J MAXIMUM					RECTANGULAR CONDUCTION AT T_J MAXIMUM					UNITS
	180°	120°	90°	60°	30°	180°	120°	90°	60°	30°	
T40HFL	0.06	0.08	0.10	0.14	0.24	0.05	0.08	0.10	0.15	0.24	K/W
T70HFL	0.05	0.06	0.08	0.11	0.19	0.04	0.06	0.08	0.12	0.19	
T85HFL	0.04	0.05	0.06	0.09	0.15	0.03	0.05	0.07	0.09	0.015	

Note

- The table above shows the increment of thermal resistance R_{thJC} when devices operate at different conduction angles than DC

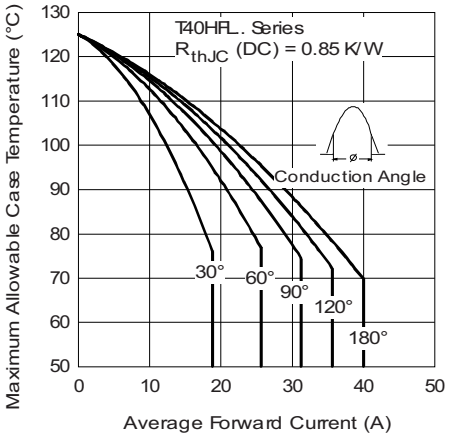

Fig. 1 - Current Ratings Characteristics

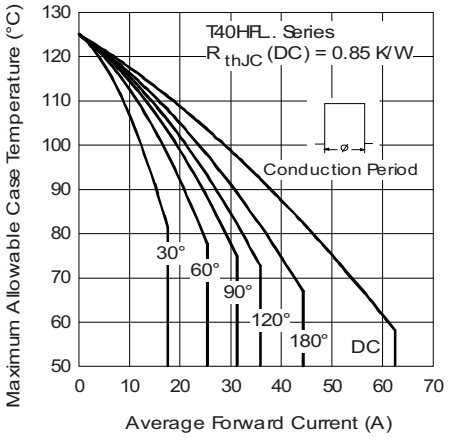

Fig. 2 - Current Ratings Characteristics

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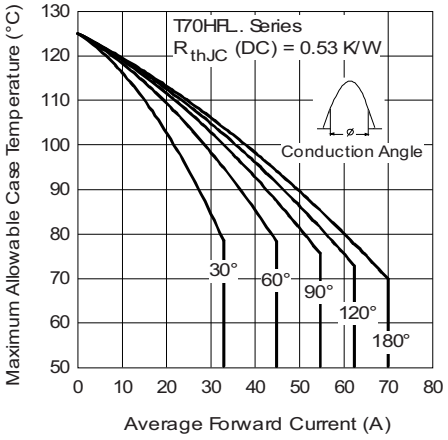

Fig. 3 - Current Ratings Characteristics

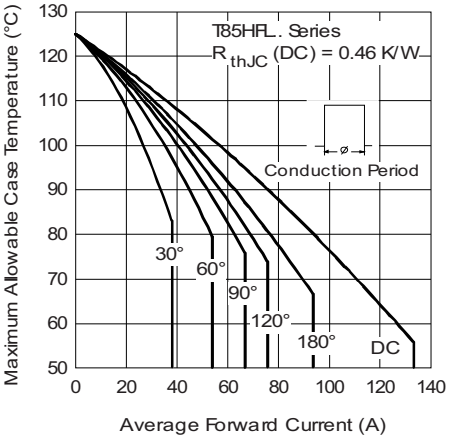

Fig. 6 - Current Ratings Characteristics

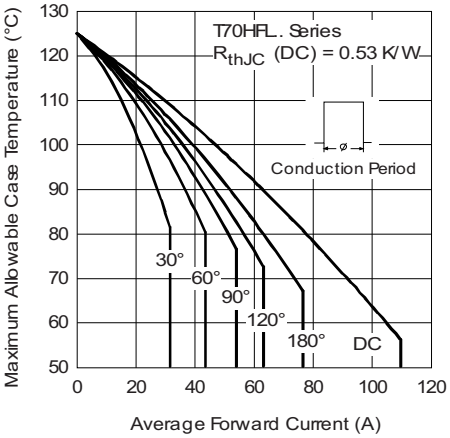

Fig. 4 - Current Ratings Characteristics

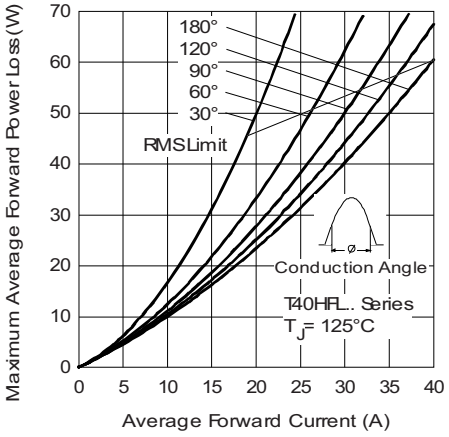

Fig. 7 - Forward Power Loss Characteristics

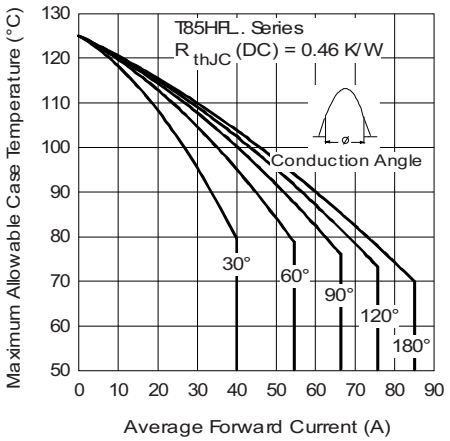

Fig. 5 - Current Ratings Characteristics

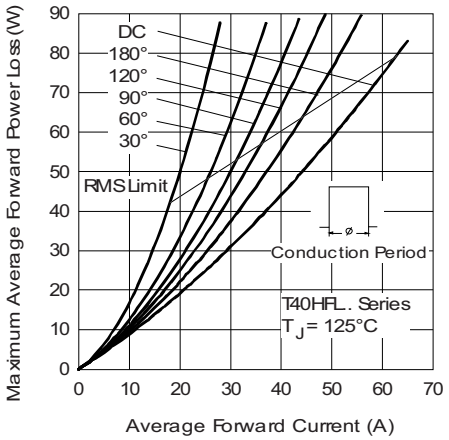

Fig. 8 - Forward Power Loss Characteristics

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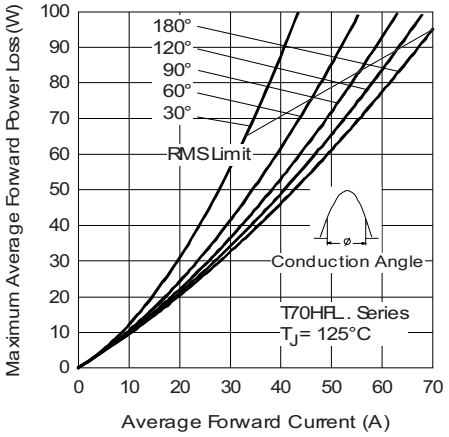

Fig. 9 - Forward Power Loss Characteristics

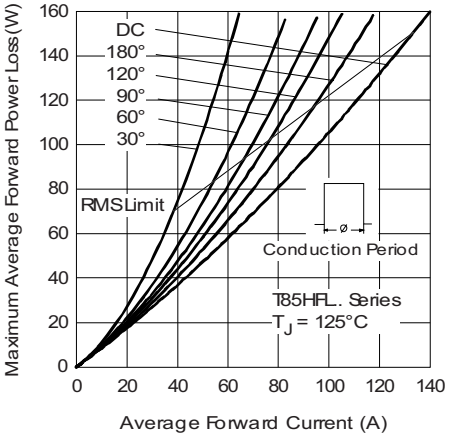

Fig. 12 - Forward Power Loss Characteristics

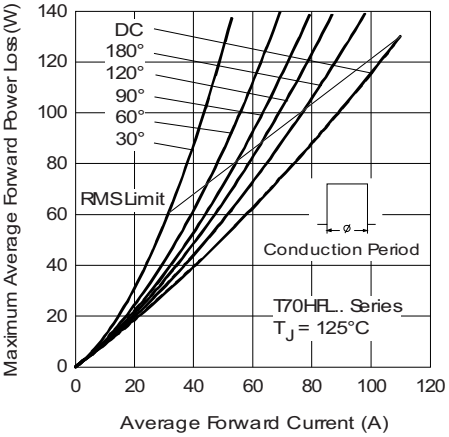

Fig. 10 - Forward Power Loss Characteristics

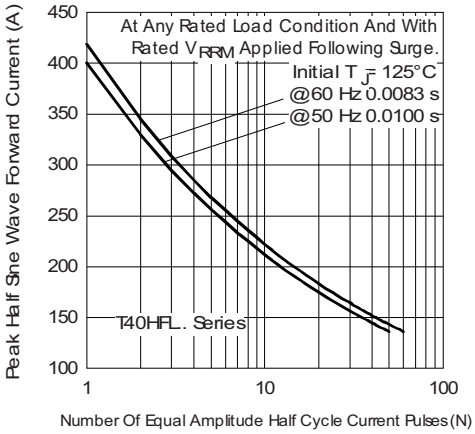

Fig. 13 - Maximum Non-Repetitive Surge Current

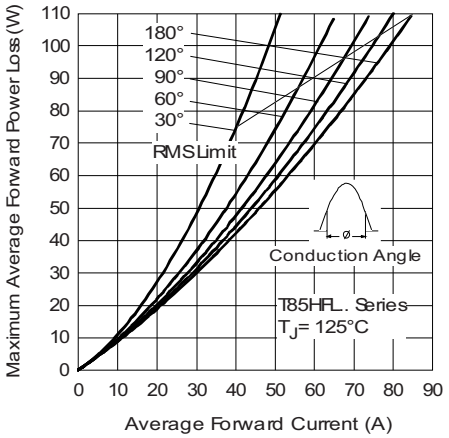

Fig. 11 - Forward Power Loss Characteristics

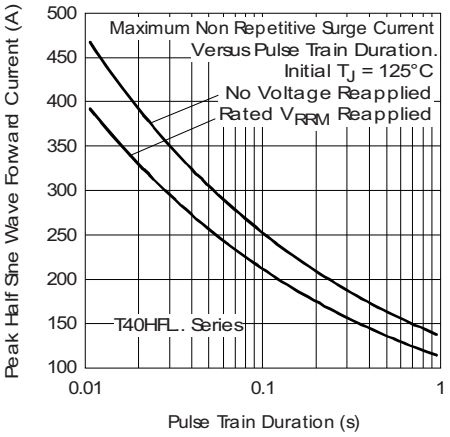

Fig. 14 - Maximum Non-Repetitive Surge Current

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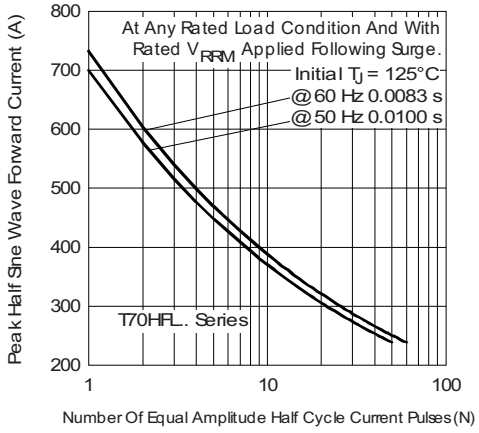

Fig. 15 - Maximum Non-Repetitive Surge Current

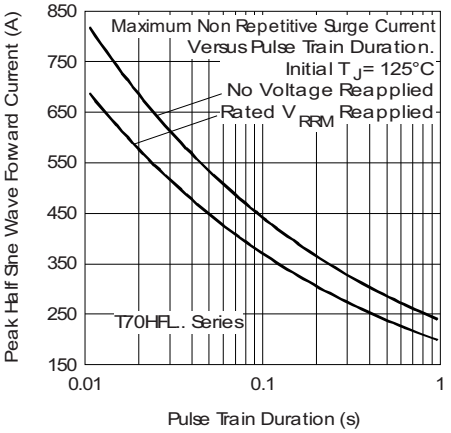

Fig. 16 - Maximum Non-Repetitive Surge Current

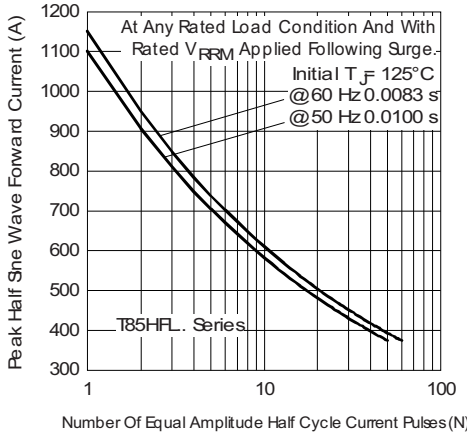

Fig. 17 - Maximum Non-Repetitive Surge Current

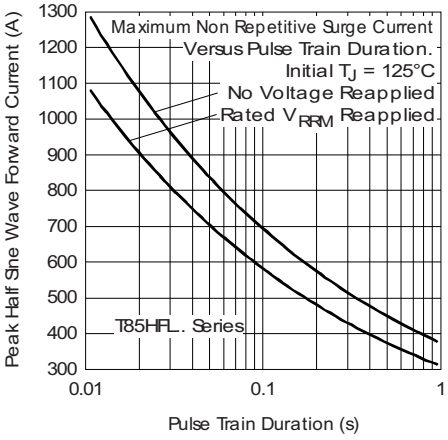

Fig. 18 - Maximum Non-Repetitive Surge Current

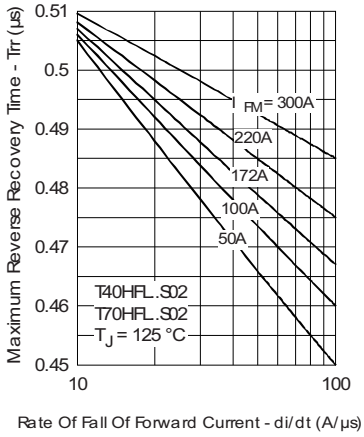

Fig. 19 - Recovery Time Characteristics

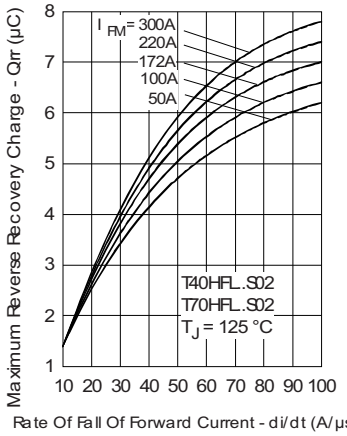

Fig. 20 - Recovery Charge Characteristics

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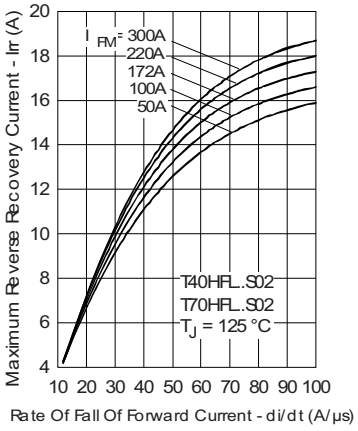

Fig. 21 - Recovery Current Characteristics

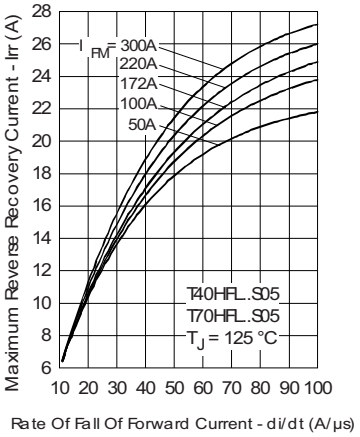

Fig. 24 - Recovery Current Characteristics

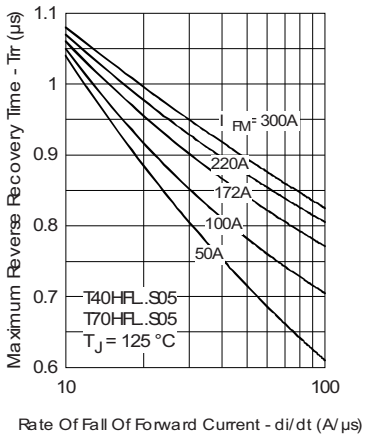

Fig. 22 - Recovery Time Characteristics

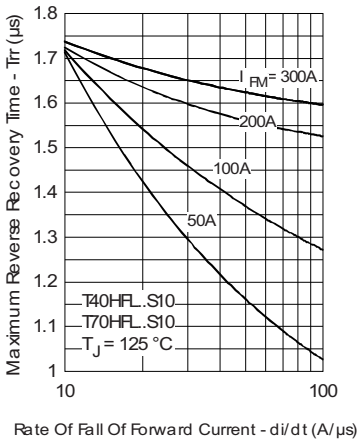

Fig. 25 - Recovery Time Characteristics

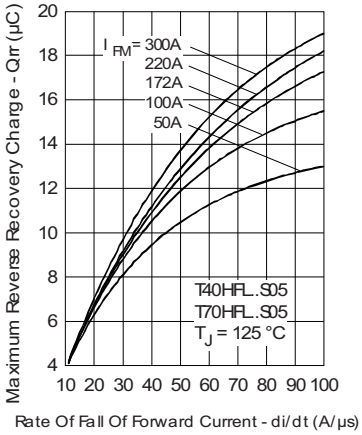

Fig. 23 - Recovery Charge Characteristics

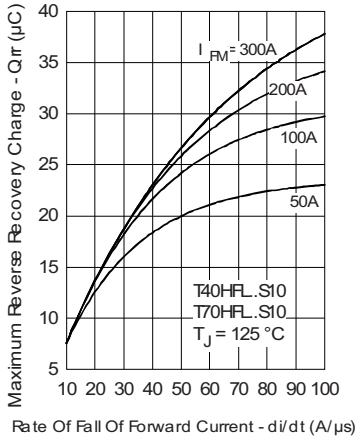

Fig. 26 - Recovery Charge Characteristics

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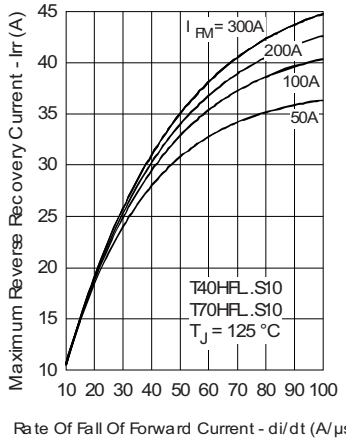

Fig. 27 - Recovery Current Characteristics

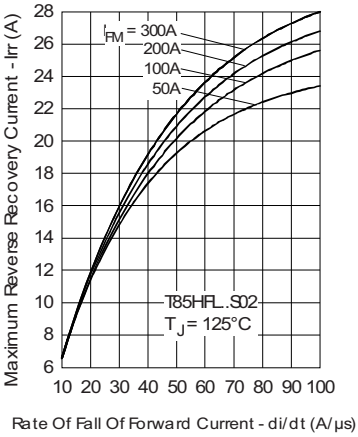

Fig. 30 - Recovery Current Characteristics

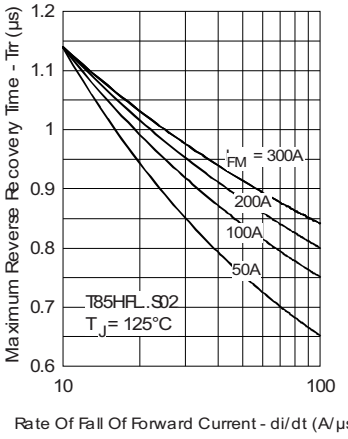

Fig. 28 - Recovery Time Characteristics

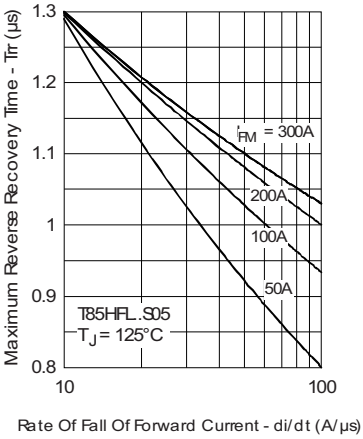

Fig. 31 - Recovery Time Characteristics

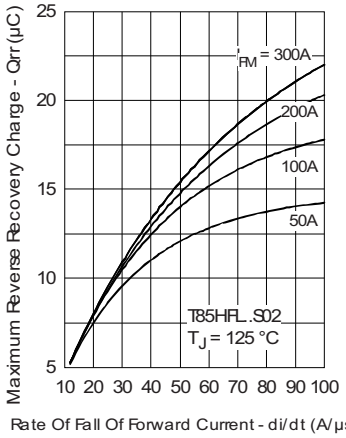

Fig. 29 - Recovery Charge Characteristics

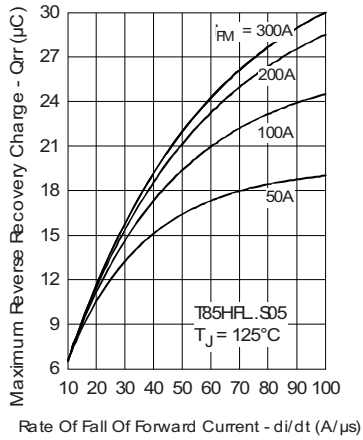

Fig. 32 - Recovery Charge Characteristics

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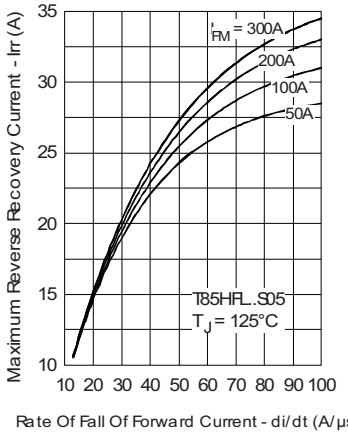

Fig. 33 - Recovery Current Characteristics

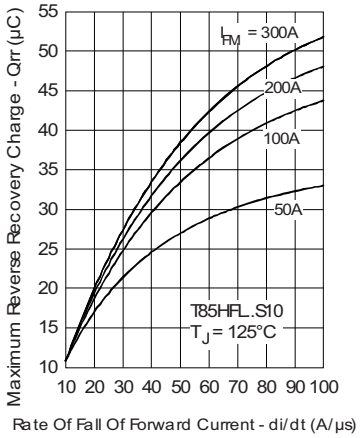

Fig. 35 - Recovery Charge Characteristics

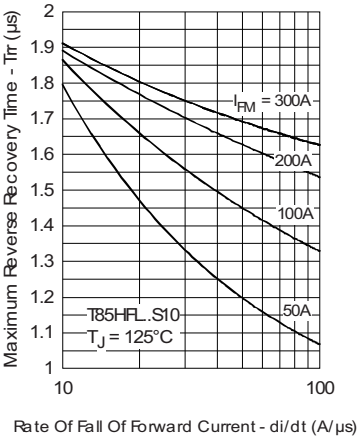

Fig. 34 - Recovery Time Characteristics

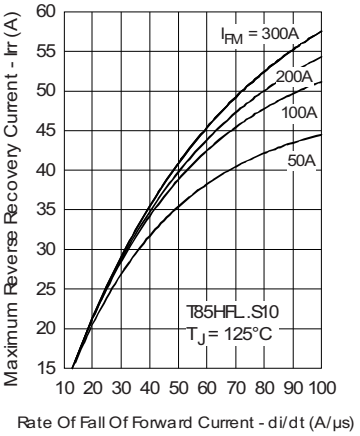

Fig. 36 - Recovery Current Characteristics

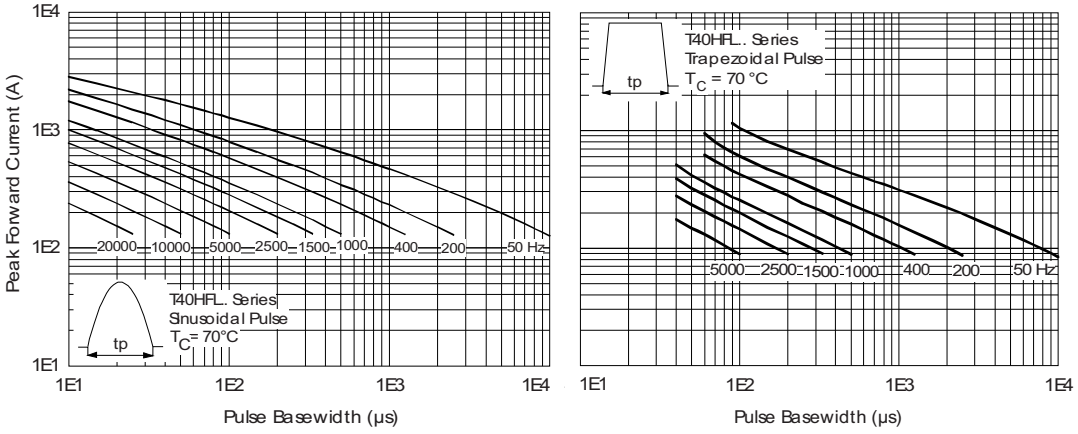

Fig. 37 - Frequency Characteristics

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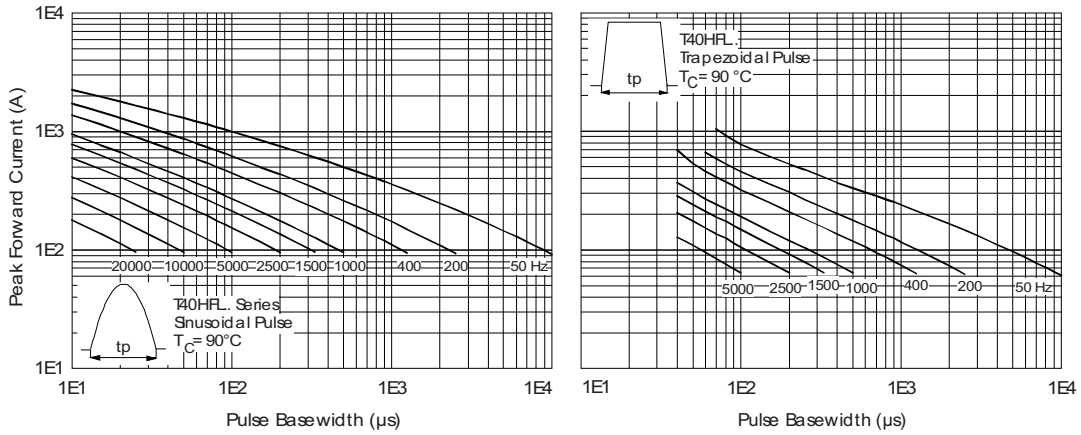

Fig. 38 - Frequency Characteristics

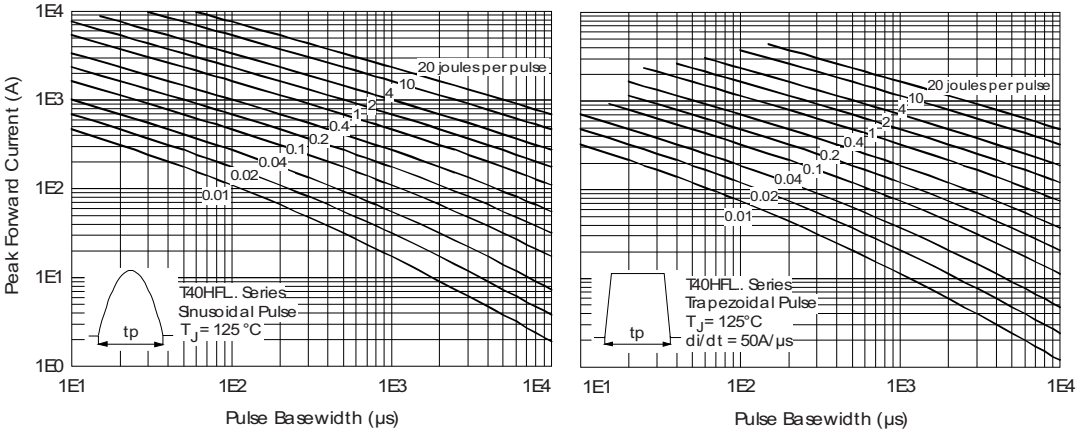

Fig. 39 - Maximum Forward Energy Power Loss Characteristics

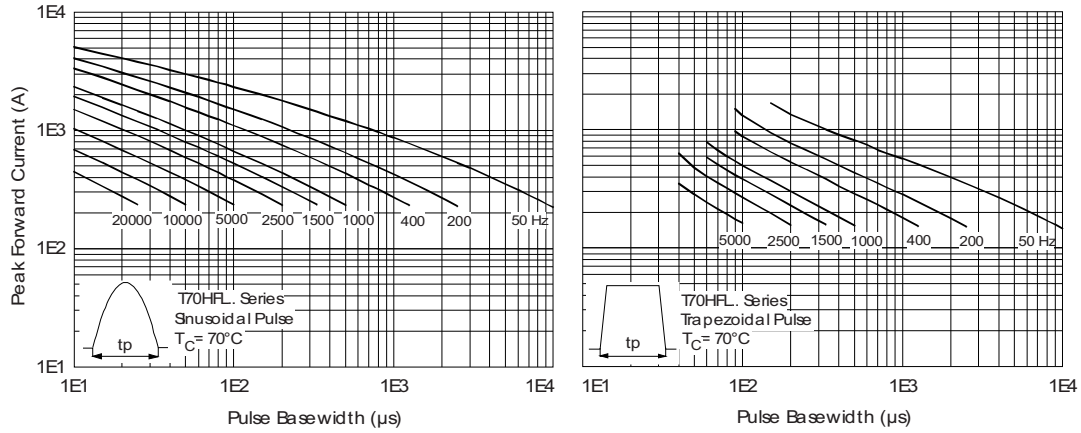

Fig. 40 - Frequency Characteristics

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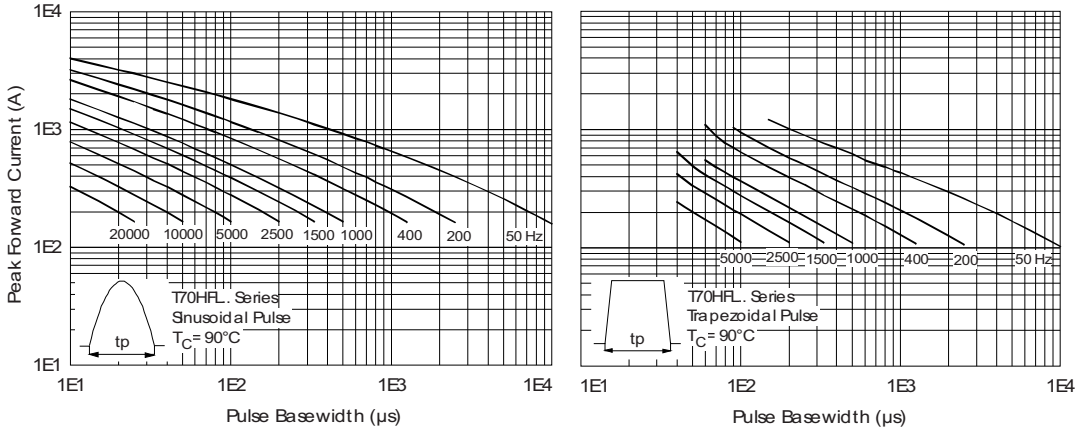

Fig. 41 - Frequency Characteristics

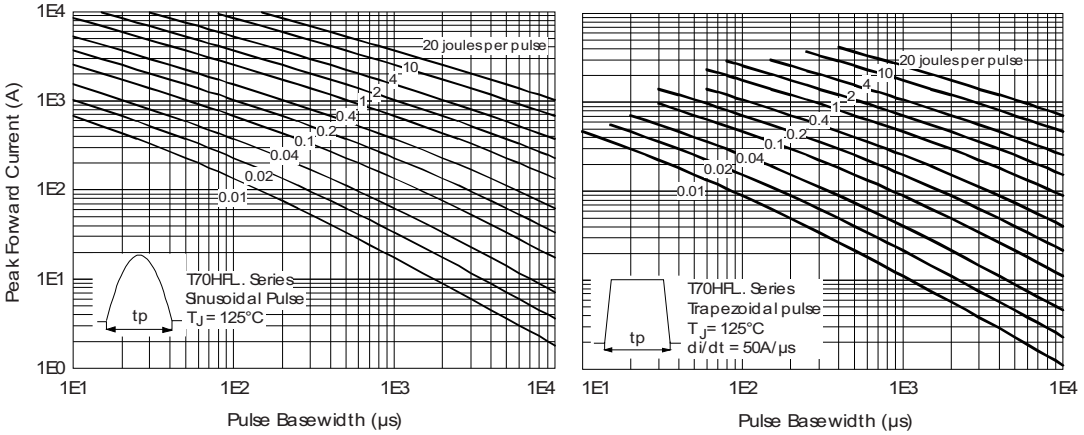

Fig. 42 - Maximum Forward Energy Power Loss Characteristics

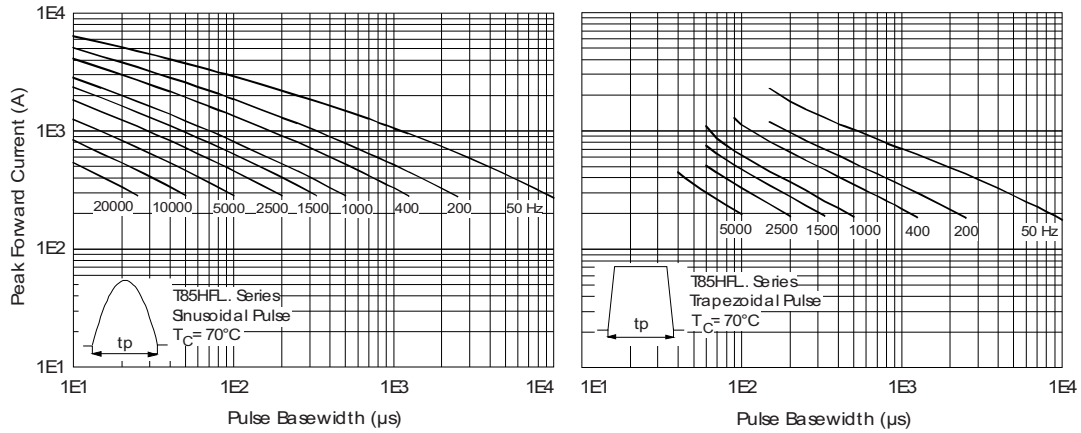

Fig. 43 - Frequency Characteristics

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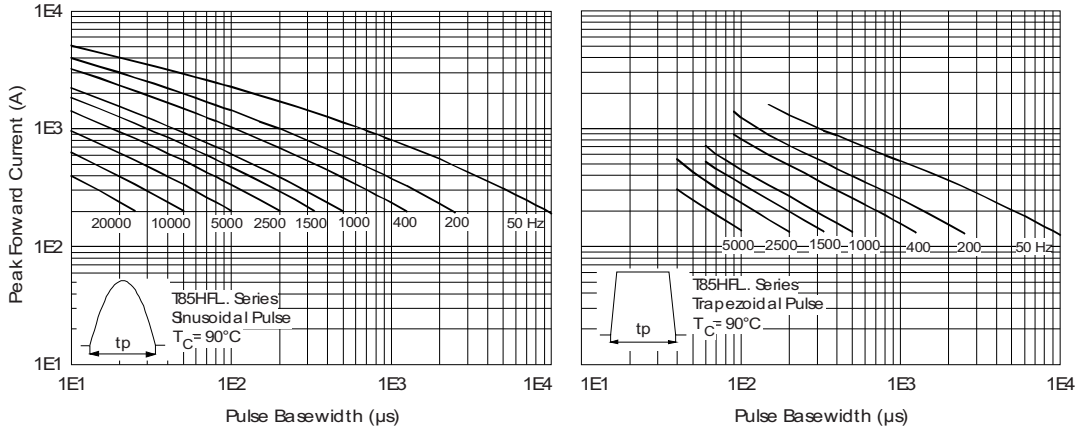

Fig. 44 - Frequency Characteristics

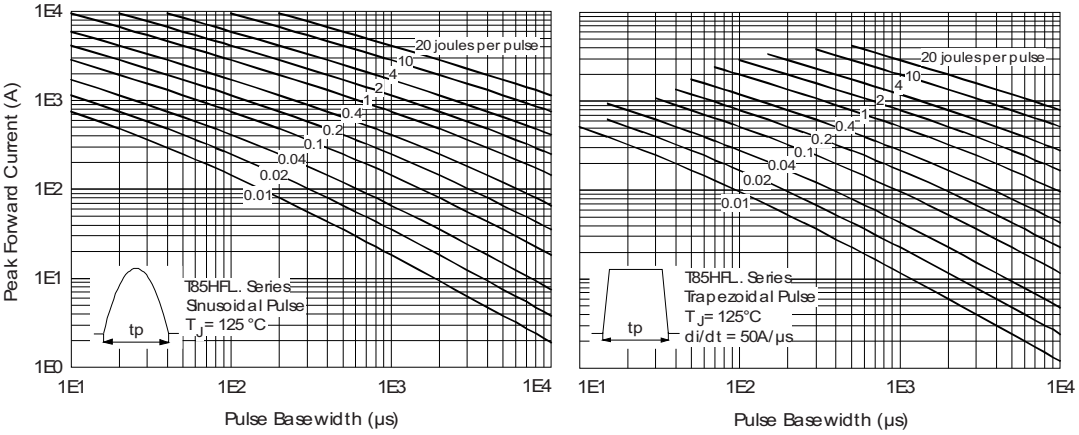

Fig. 45 - Maximum Forward Energy Power Loss Characteristics

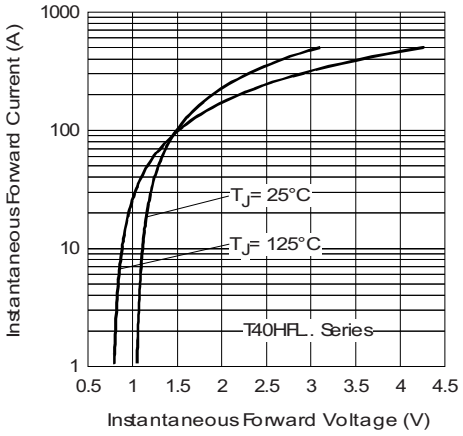

Fig. 46 - Forward Voltage Drop Characteristics

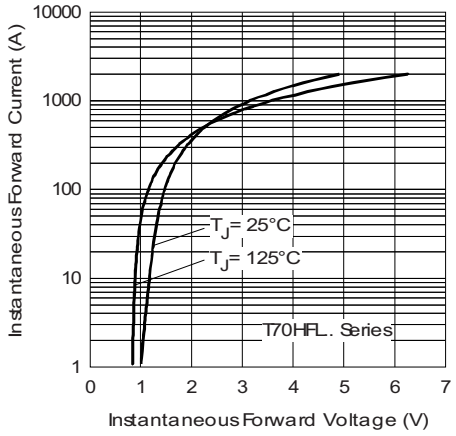

Fig. 47 - Forward Voltage Drop Characteristics

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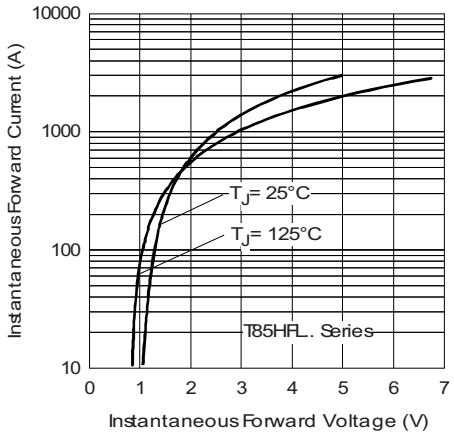

Fig. 48 - Forward Voltage Drop Characteristics

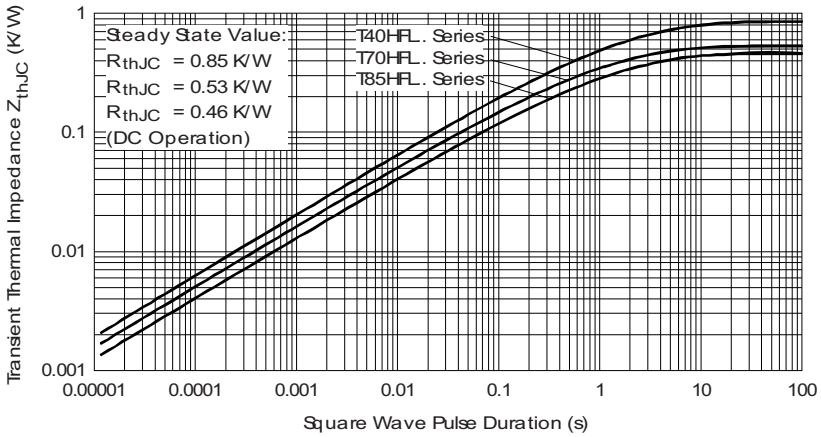

Fig. 49 - Thermal Impedance Z_{thJC} Characteristics

ORDERING INFORMATION TABLE

Device code

VS-	T	40	HFL	100	S10
1	2	3	4	5	6

1 - Vishay Semiconductors product

2 - Module type

3 - Current rating
- 40 = 40 A (average)
- 70 = 70 A (average)
- 85 = 85 A (average)

4 - Fast recovery diode

5 - Voltage code x 10 = V_{RRM}

6 - t_{rr} code
- S02 = 200 ns
- S05 = 500 ns
- S10 = 1000 ns

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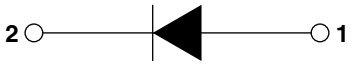
CIRCUIT CONFIGURATION		
CIRCUIT	**CIRCUIT CONFIGURATION CODE**	**CIRCUIT DRAWING**
Single switch diode	N/A	

LINKS TO RELATED DOCUMENTS	
Dimensions	www.vishay.com/doc?95313

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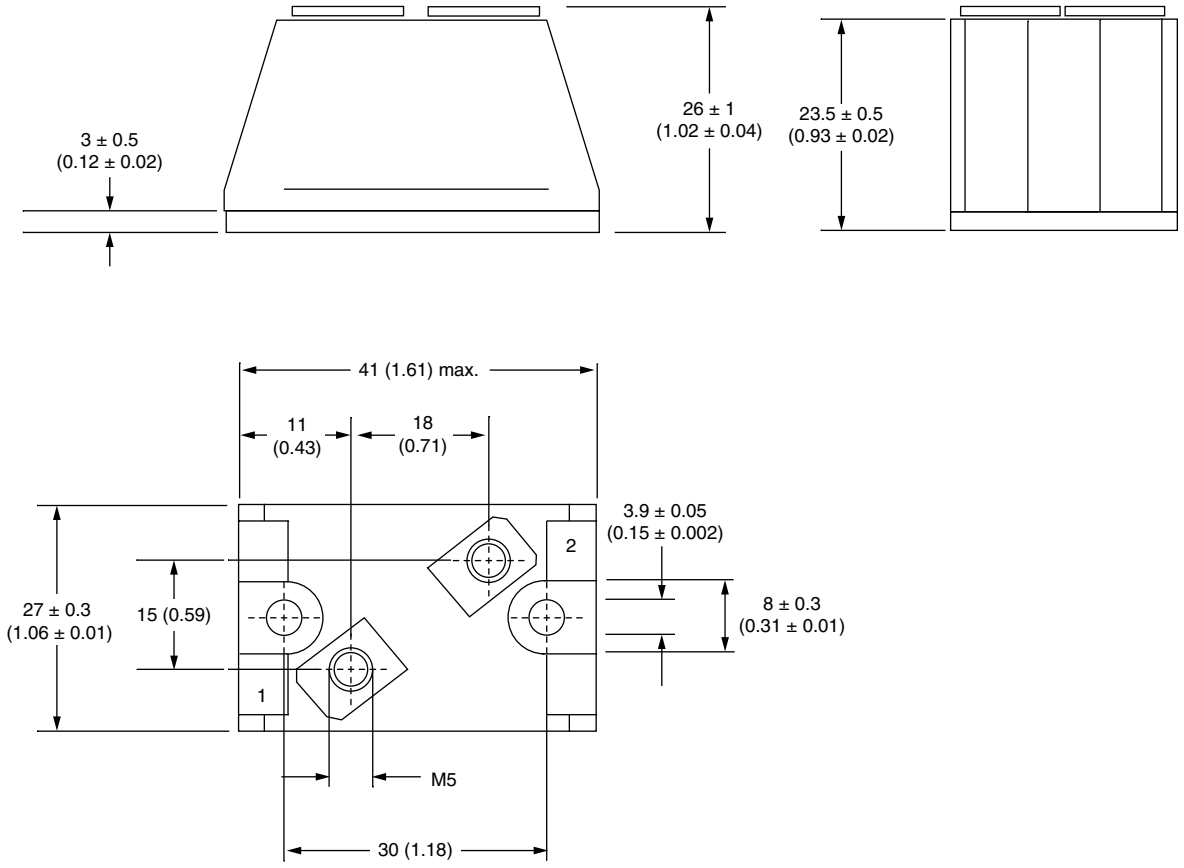
D-55 T-Module Diode Standard and Fast Recovery

DIMENSIONS in millimeters (inches)



Note

- 1 = Anode
  2 = Cathode

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