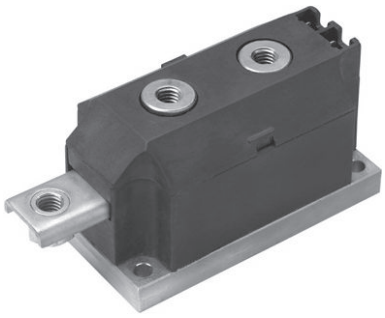
Fast Recovery Diodes, 250 A (MAGN-A-PAK Power Modules)



MAGN-A-PAK

FEATURES

- Fast recovery time characteristics
- Electrically isolated base plate
- Industrial standard package
- Simplified mechanical designs, rapid assembly
- High surge capability
- Large creepage distances
- 3000 V_{RMS} isolating voltage
- UL approved file E78996
- Compliant to RoHS Directive 2002/95/EC
- Designed and qualified for industrial level

Pb-free
RoHS COMPLIANT

DESCRIPTION

The VSK.L240 Series of MAGN-A-PAKs uses fast recovery power diodes in four basic configurations. The semiconductors are electrically isolated from the metal base, allowing common heatsinks and compact assemblies to be built. Application includes power supplies, battery chargers, welders, motor controls and general industrial current rectification. These modules are intended for those applications where fast recovery characteristics are required.

PRODUCT SUMMARY	
$I_{F(AV)}$	250 A
Type	Modules - Diode, Fast

MAJOR RATINGS AND CHARACTERISTICS				
SYMBOL	CHARACTERISTICS	VSK.L240		UNITS
		S10/S20	S30	
$I_{F(AV)}$		250	240	A
	T_C	100	100	°C
$I_{F(RMS)}$		392	377	A
I_{FSM}	50 Hz	8000	7500	
	60 Hz	8400	7850	
I^2t	50 Hz	322	280	kA^2s
	60 Hz	294	256	
$I^2\sqrt{t}$		3220	2800	$kA^2\sqrt{s}$
V_{RRM}	Range	600 to 2500		V
T_J	Range	- 40 to 150		°C

ELECTRICAL SPECIFICATIONS

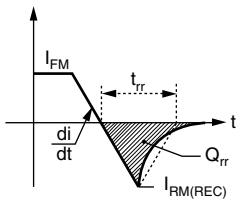
VOLTAGE RATINGS

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 150 °C mA
VSK.L240	06	S10	600	700	50
	10	S10	1000	1100	
	12	S20	1200	1300	
	14	S20	1400	1500	
	20	S30	2000	2100	
	25	S30	2500	2600	

FORWARD CONDUCTION

PARAMETER	SYMBOL	TEST CONDITIONS			VSK.L240 S10/S20	VSK.L240 S30	UNITS
Maximum average forward current at case temperature	$I_{F(AV)}$	180° conduction, half sine wave			250	240	A
					100	100	°C
Maximum RMS forward current	$I_{F(RMS)}$	As AC switch			392	377	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	8000	7500	
		t = 8.3 ms			8400	7850	
		t = 10 ms	100 % V_{RRM} reapplied		6750	6300	
		t = 8.3 ms			7100	6600	
Maximum I^2t for fusing	I^2t	t = 10 ms	No voltage reapplied		322	280	kA^2s
		t = 8.3 ms			294	256	
		t = 10 ms	100 % V_{RRM} reapplied		228	198	
		t = 8.3 ms			208	181	
Maximum $I^2\sqrt{t}$ for fusing	$I^2\sqrt{t}$	t = 0.1 ms to 10 ms, no voltage reapplied			3220	2800	$kA^2\sqrt{s}$
Low level value of threshold voltage	$V_{F(TO)1}$	(16.7 % x π x $I_{F(AV)}$ < I < π x $I_{F(AV)}$), $T_J = T_J$ maximum			0.98	0.98	V
High level value of threshold voltage	$V_{F(TO)2}$	(I > π x $I_{F(AV)}$), $T_J = T_J$ maximum			1.31	1.31	
Low level value of forward slope resistance	r_{f1}	(16.7 % x π x $I_{F(AV)}$ < I < π x $I_{F(AV)}$), $T_J = T_J$ maximum			0.75	0.97	mΩ
High level value of forward slope resistance	r_{f2}	(I > π x $I_{F(AV)}$), $T_J = T_J$ maximum			0.41	0.60	
Maximum forward voltage drop	V_{FM}	I_{FM} = 800 A, T_J = 150 °C, t_p = 10 ms Average power = $V_{F(TO)}$ x $I_{F(AV)}$ + r_f x $(I_{F(RMS)})^2$			1.57	1.75	V

RECOVERY CHARACTERISTICS

CODE	MAXIMUM VALUE AT T_J = 25 °C	TEST CONDITIONS			TYPICAL VALUES AT T_J = 150 °C			
	t_{rr} AT 25 % I_{RRM} (µs)	I_{pk} SQUARE PULSE (A)	dI/dt (A/µs)	V_r (V)	t_{rr} AT 25 % I_{RRM} (µs)	Q_{rr} (µC)	I_r (A)	
S10	1.0	500	100	- 50	2.7	135	100	
S20	2.0				3.5	250	145	
S30	3.0				3.6	360	200	

BLOCKING

PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS
Maximum peak reverse leakage current	I_{RRM}	T_J = 150 °C, leakage current	50	mA
RMS insulation voltage	V_{INS}	50 Hz, circuit to base, all terminals shorted, 25 °C, t = 1 s	3000	V

THERMAL AND MECHANICAL SPECIFICATIONS

PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS
Maximum junction operating and storage temperature range	T_J, T_{Stg}		- 40 to 150	°C
Maximum internal thermal resistance, junction to case per junction	R_{thJC}	DC operation	0.125	K/W
Thermal resistance, case to heatsink per module	R_{thCS}	Mounting surface flat, smooth and greased	0.02	
Mounting torque ± 10 % — MAP to heatsink		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.	4 to 6	Nm
Mounting torque ± 10 % — busbar to MAP			8 to 10	
Approximate weight			850	g
			30	oz.
Case style			MAGN-A-PAK	

ΔR CONDUCTION PER JUNCTION

CONDUCTION ANGLE	SINUSOIDAL CONDUCTION	RECTANGULAR CONDUCTION	TEST CONDITIONS	UNITS
180°	0.008	0.007	T_J = T_J maximum	K/W
120°	0.010	0.011		
90°	0.013	0.015		
60°	0.019	0.020		
30°	0.032	0.033		

Note

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

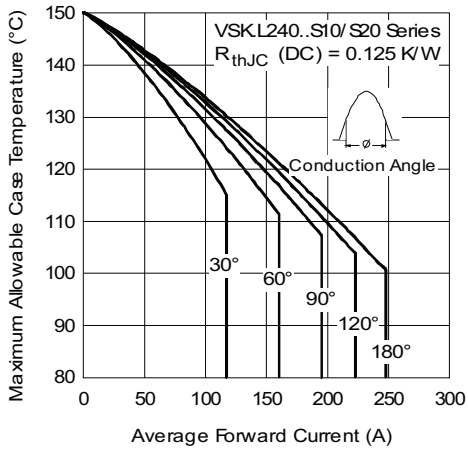


Fig. 1 - Current Ratings Characteristics

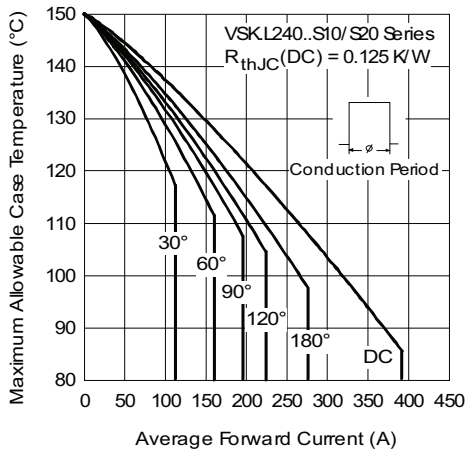


Fig. 2 - Current Ratings Characteristics

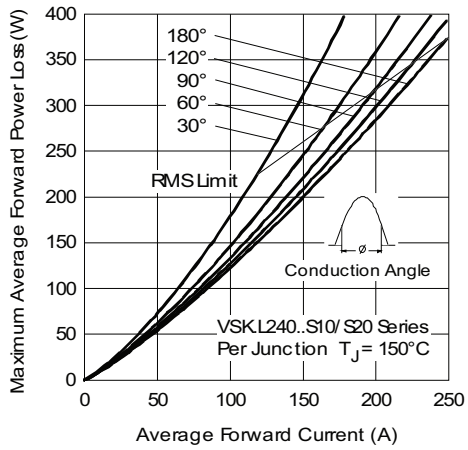


Fig. 3 - Forward Power Loss Characteristics

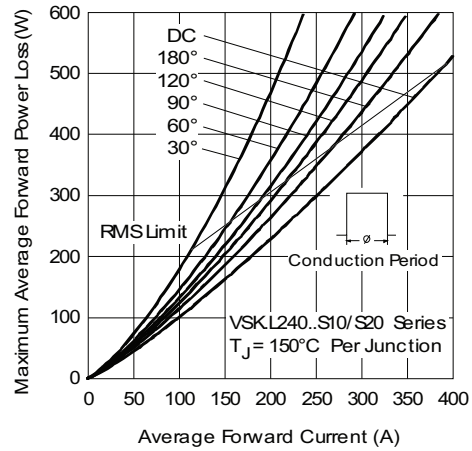


Fig. 4 - Forward Power Loss Characteristics

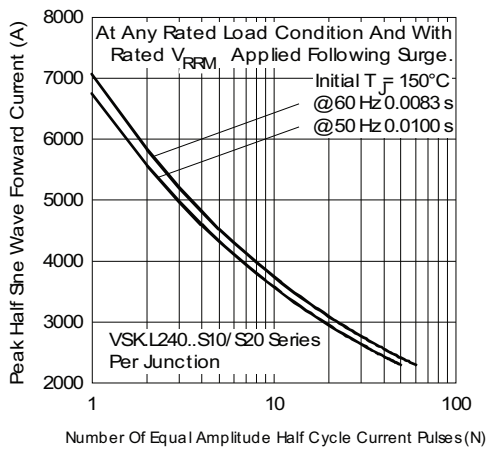


Fig. 5 - Maximum Non-Repetitive Surge Current

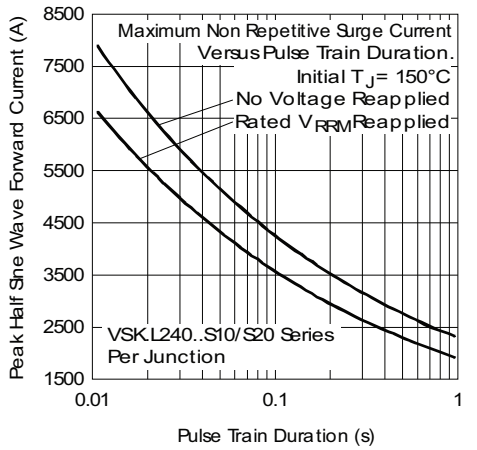


Fig. 6 - Maximum Non-Repetitive Surge Current

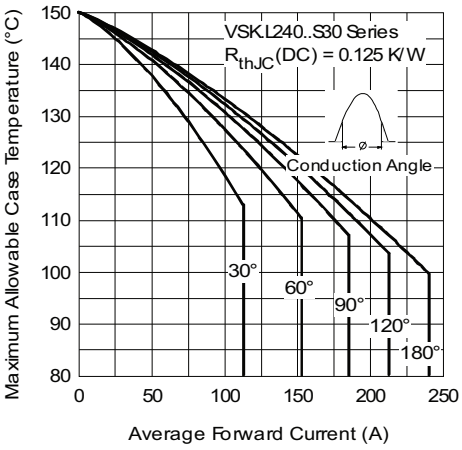


Fig. 7 - Current Ratings Characteristics

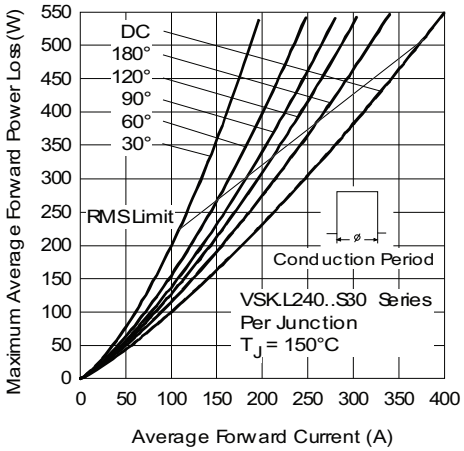


Fig. 10 - Forward Power Loss Characteristics

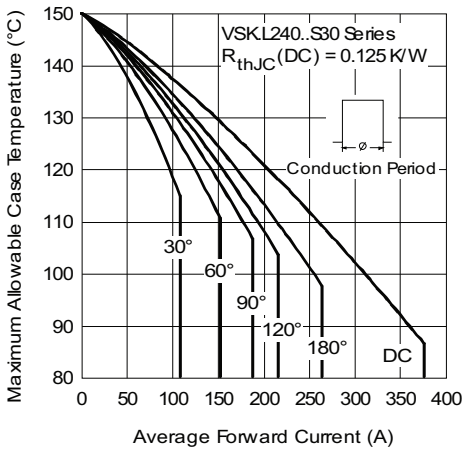


Fig. 8 - Current Ratings Characteristics

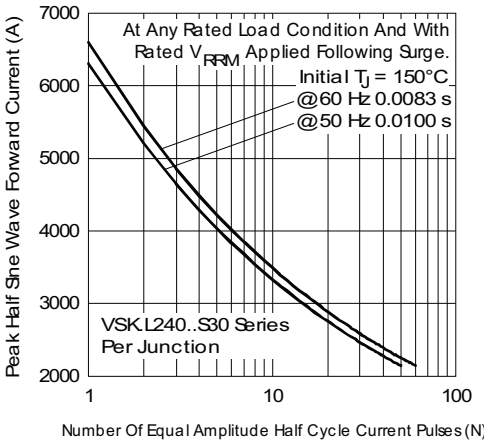


Fig. 11 - Maximum Non-Repetitive Surge Current

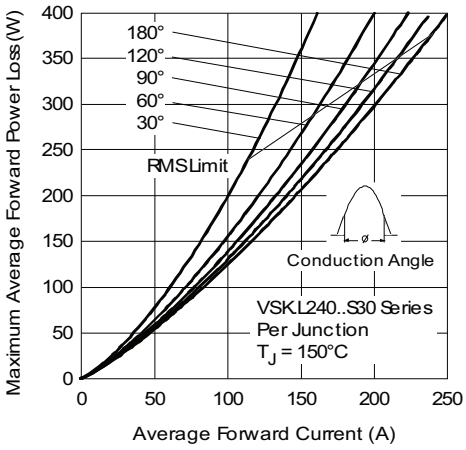


Fig. 9 - Forward Power Loss Characteristics

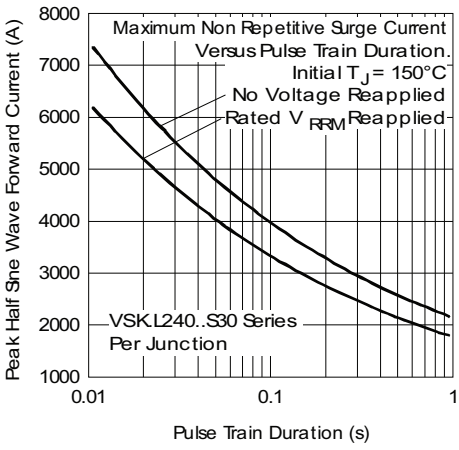


Fig. 12 - Maximum Non-Repetitive Surge Current

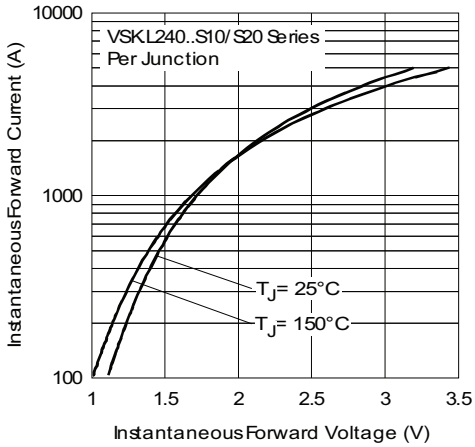


Fig. 13 - Forward Voltage Drop Characteristics

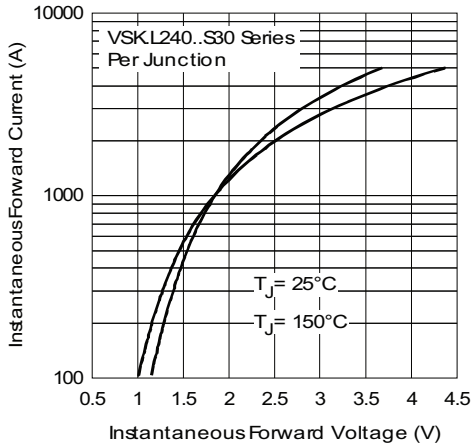


Fig. 14 - Forward Voltage Drop Characteristics

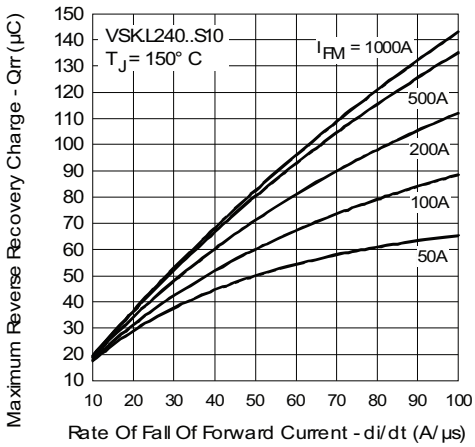


Fig. 15 - Reverse Recovery Charge Characteristics

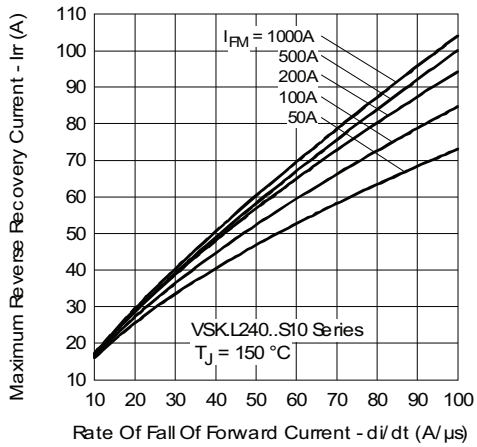


Fig. 16 - Reverse Recovery Current Characteristics

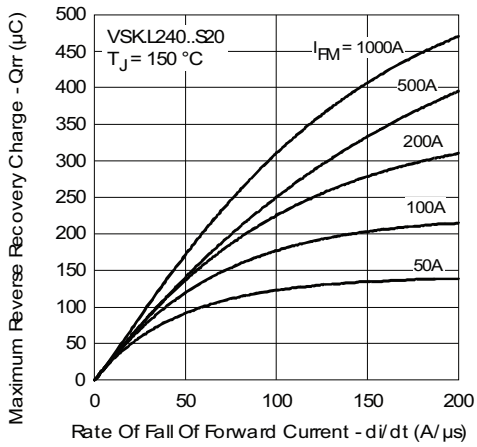


Fig. 17 - Reverse Recovery Charge Characteristics

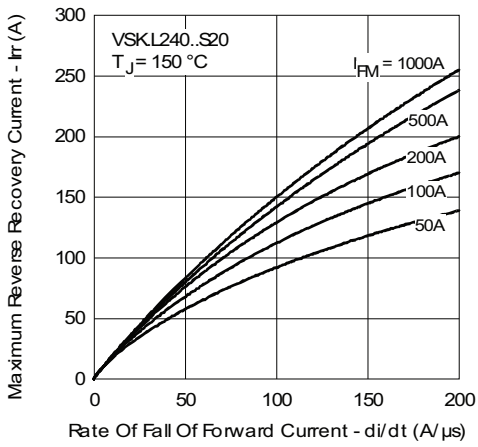


Fig. 18 - Reverse Recovery Current Characteristics

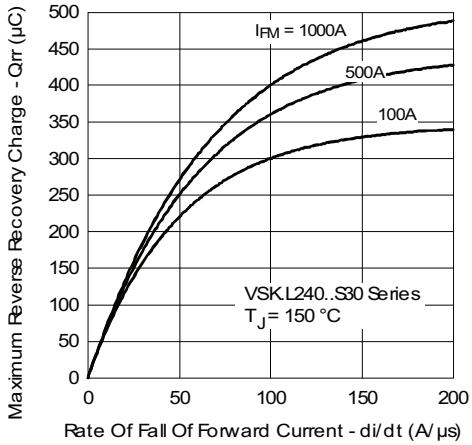


Fig. 19 - Reverse Recovery Charge Characteristics

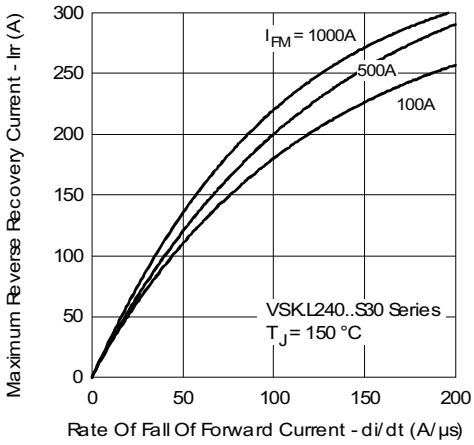


Fig. 20 - Reverse Recovery Current Characteristics

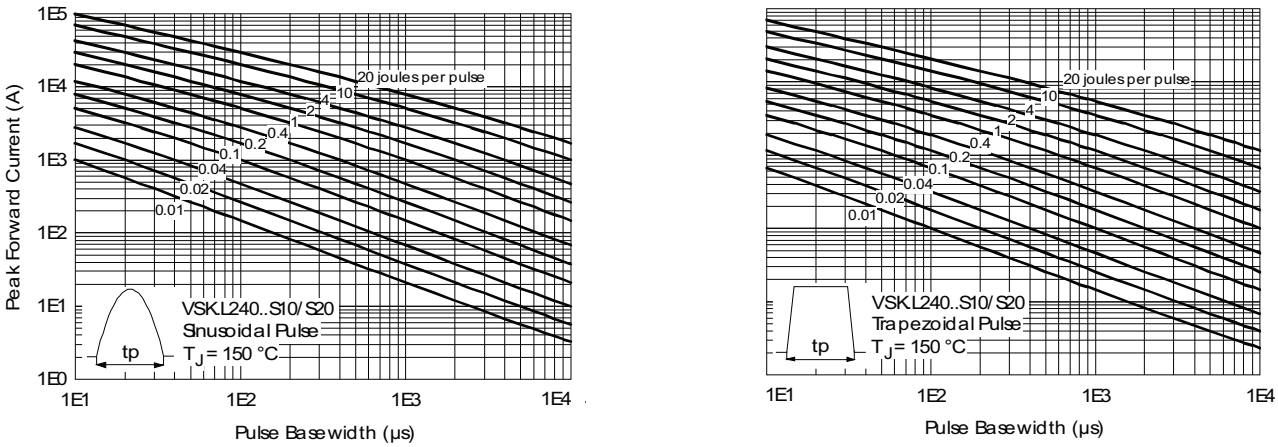


Fig. 21 - Maximum Forward Energy Power Loss Characteristics

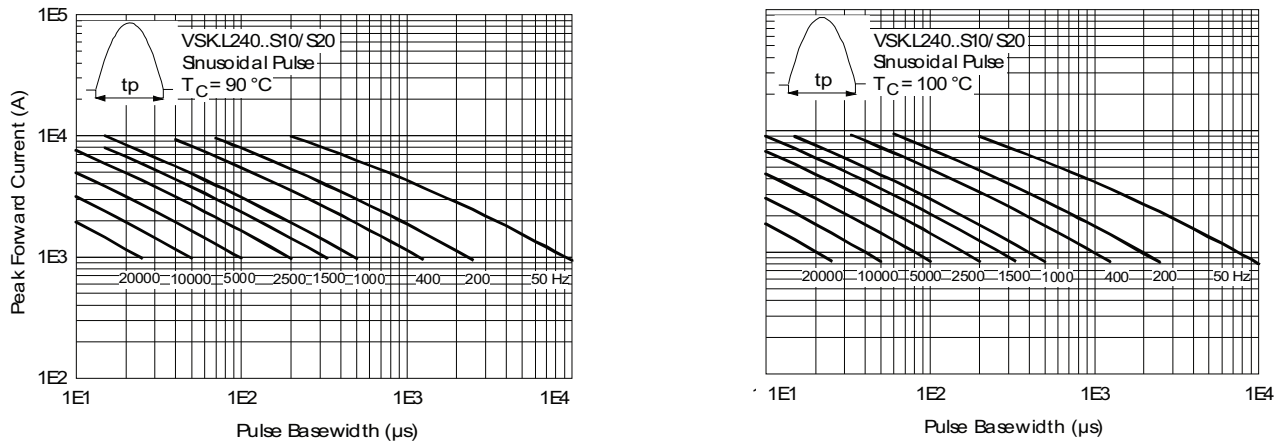


Fig. 22 - Frequency Characteristics

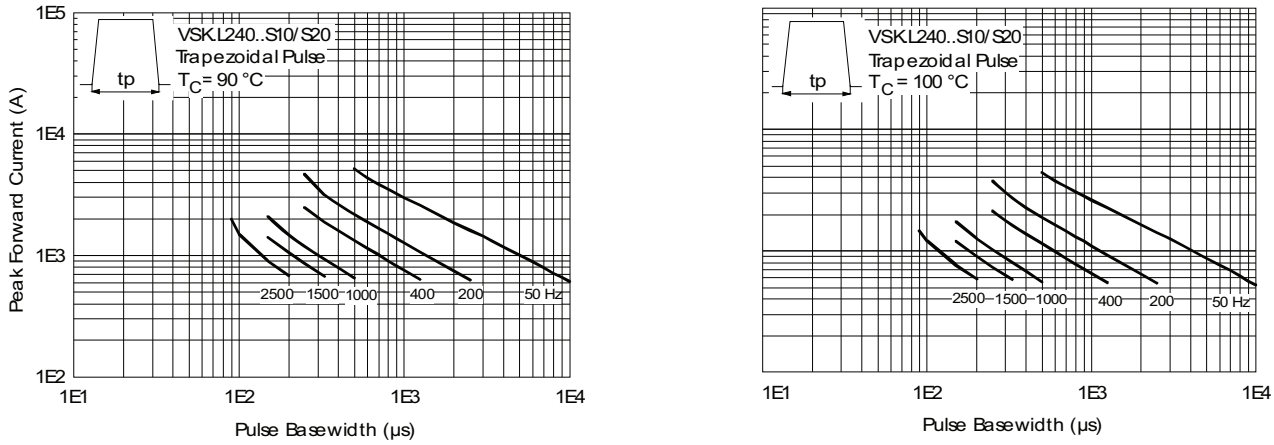


Fig. 23 - Frequency Characteristics

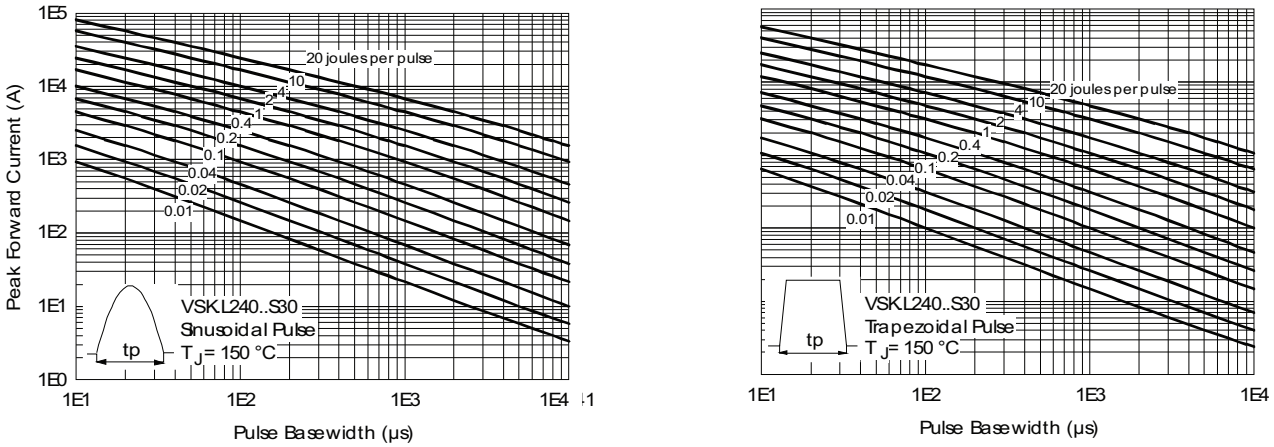


Fig. 24 - Maximum Forward Energy Power Loss Characteristics

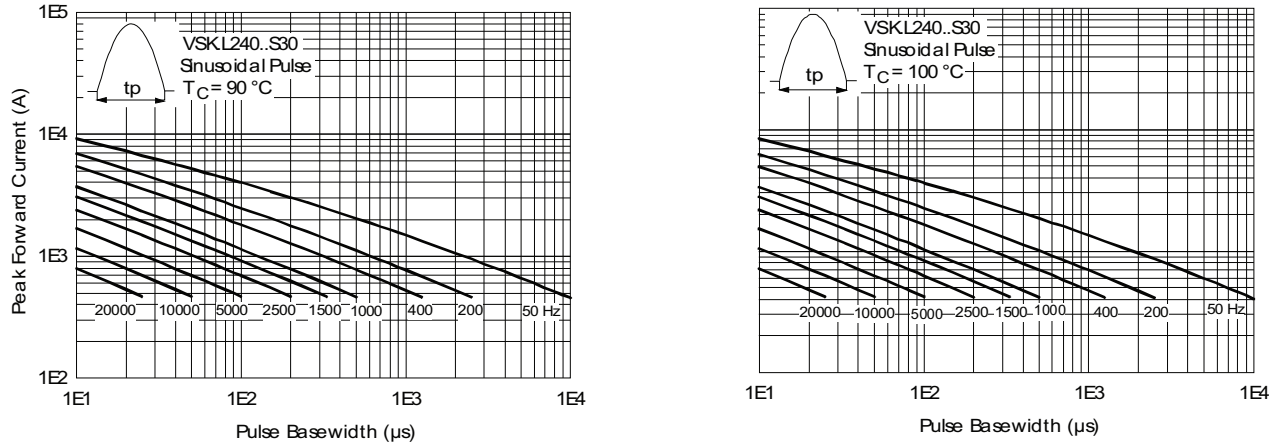


Fig. 25 - Frequency Characteristics

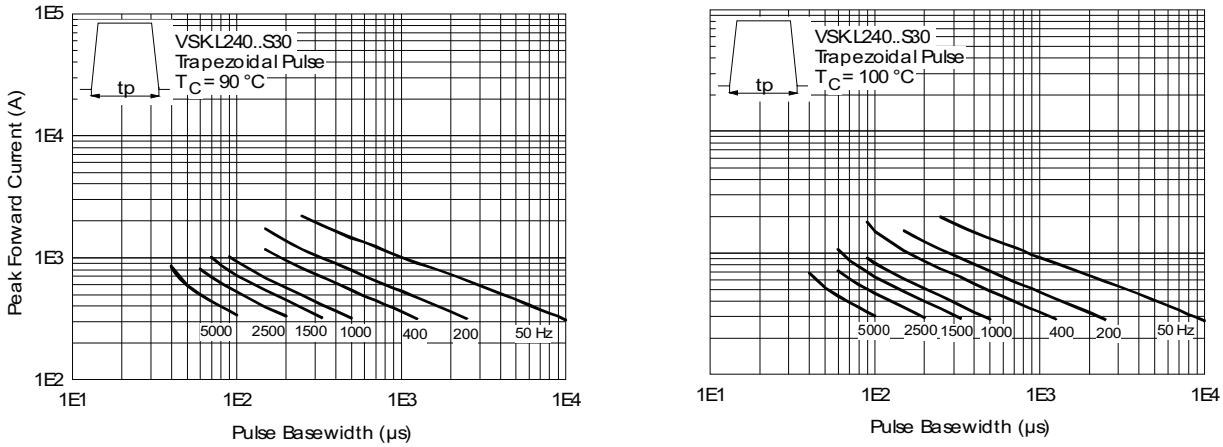


Fig. 26 - Frequency Characteristics

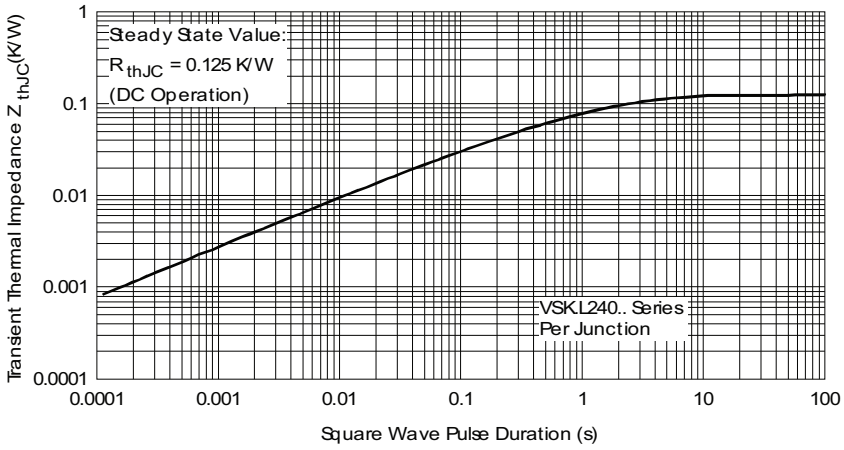


Fig. 27 - Thermal Impedance Z_{thJC} Characteristics

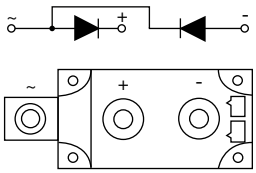
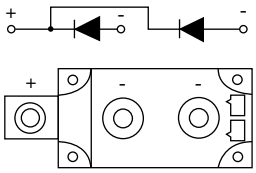
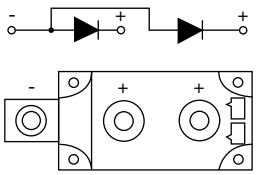
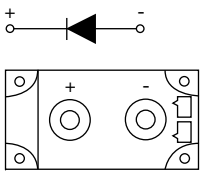
ORDERING INFORMATION TABLE

Device code

VSK	D	L	240	-	25	S30
1	2	3	4		5	6

- 1 - Module type
- 2 - Circuit configuration (see Circuit Configuration table)
- 3 - L = Fast recovery diode
- 4 - Current rating
- 5 - Voltage code x 100 = V_{RRM} (see Voltage Ratings table)
- 6 - t_{rr} code (see Recovery Characteristics table)

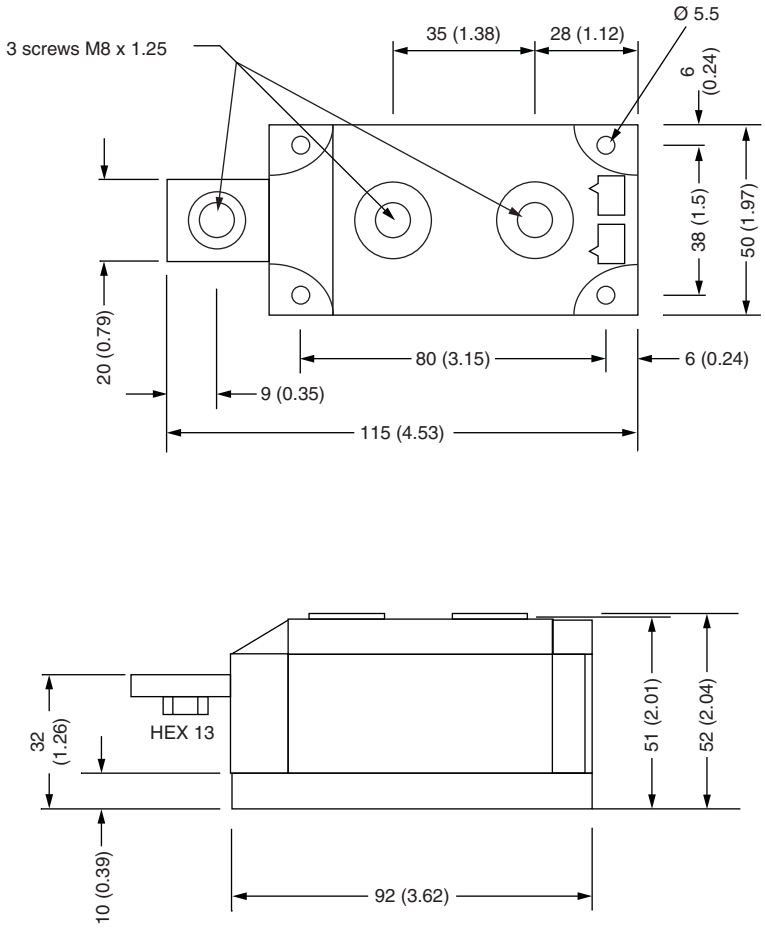
S10 = 1000 ns
S20 = 2000 ns
S30 = 3000 ns

CIRCUIT CONFIGURATION		
CIRCUIT	**CIRCUIT CONFIGURATION CODE**	**CIRCUIT DRAWING**
Two diodes doubler circuit	D	**VSKD...** 
Two diodes common cathodes	C	**VSKC...** 
Two diodes common anodes	J	**VSKJ...** 
Single diode	E	**VSKE...** 

LINKS TO RELATED DOCUMENTS	
Dimensions	www.vishay.com/doc?95086

MAGN-A-PAK

DIMENSIONS in millimeters (inches)



Notes

- Dimensions are nominal
- Full engineering drawings are available on request
- UL identification number for gate and cathode wire: UL 1385
- UL identification number for package: UL 94 V-0

Disclaimer

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