FORWARD CONDUCTION

PARAMETER	SYMBOL	TEST CONDITIONS			VALUES 5.MT...K	VALUES 9.MT...K	VALUES 11.MT...K	UNITS
Maximum DC output current at case temperature	I_O	120° rect. conduction angle			55	90	110	A
					85	85	85	°C
Maximum peak, one-cycle forward, non-repetitive on state surge current	I_{TSM}	t = 10 ms	No voltage reapplied	Initial $T_J = T_J$ max.	390	950	1130	A
		t = 8.3 ms			410	1000	1180	
		t = 10 ms	100 % V_{RRM} reapplied		330	800	950	
		t = 8.3 ms			345	840	1000	
Maximum I^2t for fusing	I^2t	t = 10 ms	No voltage reapplied		770	4525	6380	A^2s
		t = 8.3 ms			700	4130	5830	
		t = 10 ms	100 % V_{RRM} reapplied		540	3200	4510	
		t = 8.3 ms			500	2920	4120	
Maximum $I^2\sqrt{t}$ for fusing	$I^2\sqrt{t}$	t = 0.1 ms to 10 ms, no voltage reapplied			7700	45 250	63 800	$A^2\sqrt{s}$
Low level value of threshold voltage	$V_{T(TO)1}$	(16.7 % x π x $I_{T(AV)}$ < I < π x $I_{T(AV)}$), T_J maximum			1.17	1.09	1.04	V
High level value of threshold voltage	$V_{T(TO)2}$	(I > π x $I_{T(AV)}$), T_J maximum			1.45	1.27	1.27	
Low level value on-state slope resistance	r_{t1}	(16.7 % x π x $I_{T(AV)}$ < I < π x $I_{T(AV)}$), T_J maximum			12.40	4.10	3.93	mΩ
High level value on-state slope resistance	r_{t2}	(I > π x $I_{T(AV)}$), T_J maximum			11.04	3.59	3.37	
Maximum on-state voltage drop	V_{TM}	I_{pk} = 150 A, T_J = 25 °C, t_p = 400 µs single junction			2.68	1.65	1.57	V
Maximum non-repetitve rate of rise of turned on current	dI/dt	T_J = 25 °C, from 0.67 V_{DRM}, I_{TM} = π x $I_{T(AV)}$, I_g = 500 mA, t_r < 0.5 µs, t_p > 6 µs			150			A/µs
Maximum holding current	I_H	T_J = 25 °C, anode supply = 6 V, resistive load, gate open circuit			200			mA
Maximum latching current	I_L	T_J = 25 °C, anode supply = 6 V, resistive load			400			

BLOCKING

PARAMETER	SYMBOL	TEST CONDITIONS	5.MT...K	9.MT...K	11.MT...K	UNITS
RMS isolation voltage	V_{ISOL}	T_J = 25 °C all terminal shorted, f = 50 Hz, t = 1 s	4000			V
Maximum critical rate of rise of off-state voltage	dV/dt (1)	$T_J = T_J$ maximum, linear to 0.67 V_{DRM}, gate open circuit	500			V/µs

Note

(1) Available with dV/dt = 1000 V/µs, to complete code add S90 i. e. 113MT160KBS90

TRIGGERING

PARAMETER	SYMBOL	TEST CONDITIONS		5.MT...K	9.MT...K	11.MT...K	UNITS
Maximum peak gate power	P_{GM}	$T_J = T_J$ maximum		10			W
Maximum average gate power	$P_{G(AV)}$			2.5			
Maximum peak gate current	I_{GM}			2.5			A
Maximum peak negative gate voltage	- V_{GT}			10			V
Maximum required DC gate voltage to trigger	V_{GT}	T_J = - 40 °C	Anode supply = 6 V, resistive load	4.0			
		T_J = 25 °C		2.5			
		T_J = 125 °C		1.7			
Maximum required DC gate current to trigger	I_{GT}	T_J = - 40 °C		270			mA
		T_J = 25 °C		150			
		T_J = 125 °C		80			
Maximum gate voltage that will not trigger	V_{GD}	$T_J = T_J$ maximum, rated V_{DRM} applied		0.25			V
Maximum gate current that will not trigger	I_{GD}			6			mA

THERMAL AND MECHANICAL SPECIFICATIONS

PARAMETER	SYMBOL	TEST CONDITIONS	5.MT...K	9.MT...K	11.MT...K	UNITS
Maximum junction operating and storage temperature range	T_J, T_{Stg}		- 40 to 125			°C
Maximum thermal resistance, junction to case	R_{thJC}	DC operation per module	0.18	0.14	0.12	K/W
		DC operation per junction	1.07	0.86	0.70	
		120 °C rect. conduction angle per module	0.19	0.15	0.12	
		120 °C rect. conduction angle per junction	1.17	0.91	0.74	
Maximum thermal resistance, case to heatsink per module	R_{thCS}	Mounting surface smooth, flat and grased	0.03			
Mounting torque ± 10 % to heatsink		A mounting compound is recommended and the torque should be rechecked after a period of 3 hours to allow for the spread of the compound. Lubricated threads.	4 to 6			Nm
Mounting torque ± 10 % to terminal			3 to 4			
Approximate weight			225			g

ΔR CONDUCTION PER JUNCTION

DEVICES	SINUSOIDAL CONDUCTION AT T_J MAXIMUM					RECTANGULAR CONDUCTION AT T_J MAXIMUM					UNITS
	180°	120°	90°	60°	30°	180°	120°	90°	60°	30°	
5.MT...K	0.072	0.085	0.108	0.152	0.233	0.055	0.091	0.117	0.157	0.236	K/W
9.MT...K	0.033	0.039	0.051	0.069	0.099	0.027	0.044	0.055	0.071	0.100	
11.MT...K	0.027	0.033	0.042	0.057	0.081	0.023	0.037	0.046	0.059	0.082	

Note

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

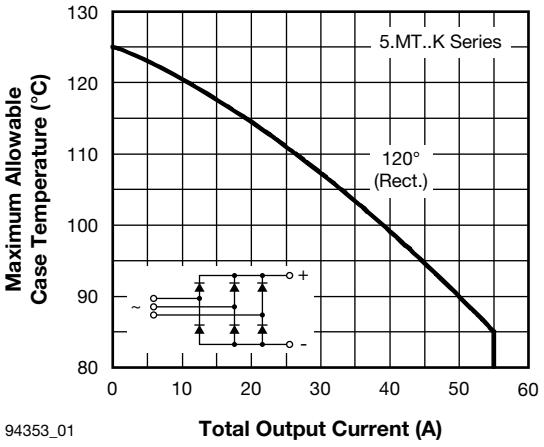


Fig. 1 - Current Ratings Characteristic

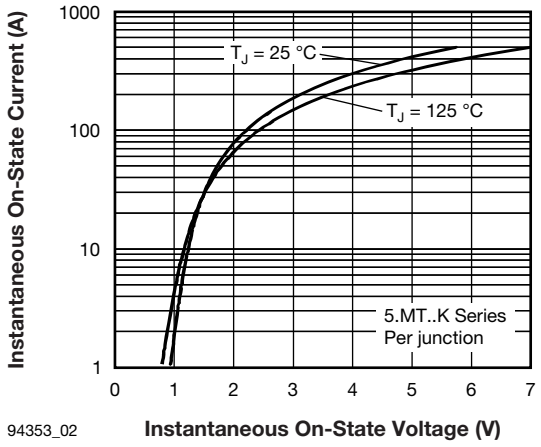
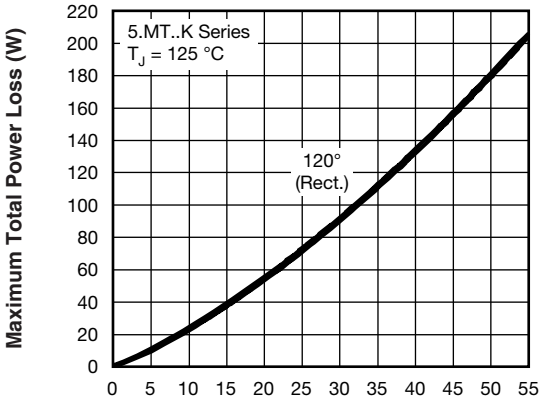


Fig. 2 - Forward Voltage Drop Characteristics



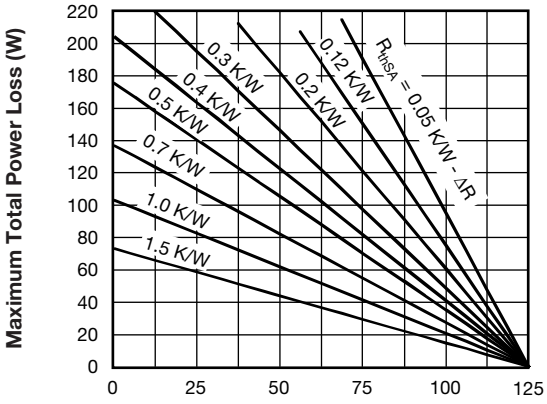


Fig. 3 - Total Power Loss Characteristics

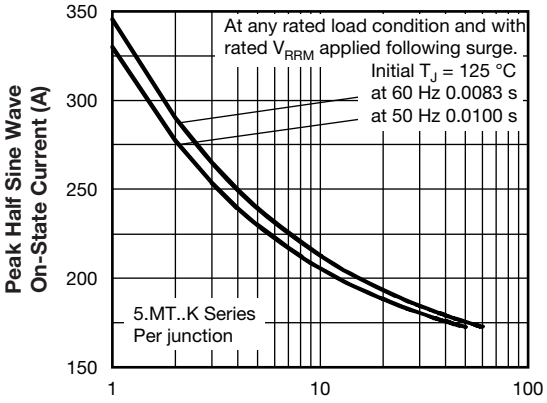


Fig. 4 - Maximum Non-Repetitive Surge Current

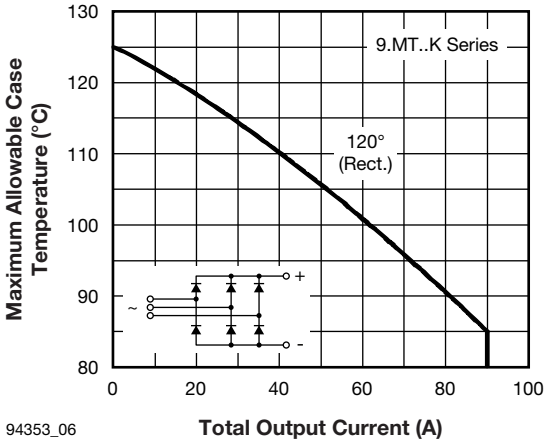


Fig. 6 - Current Ratings Characteristic

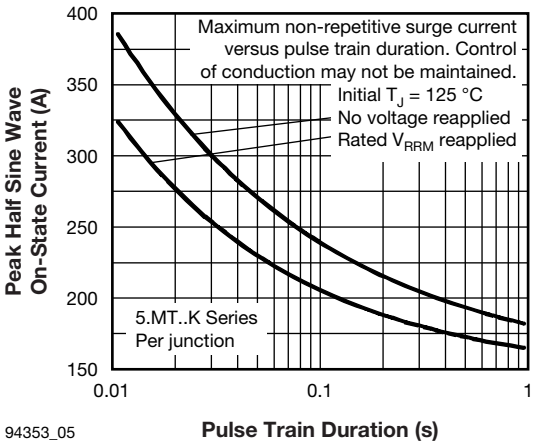


Fig. 5 - Maximum Non-Repetitive Surge Current

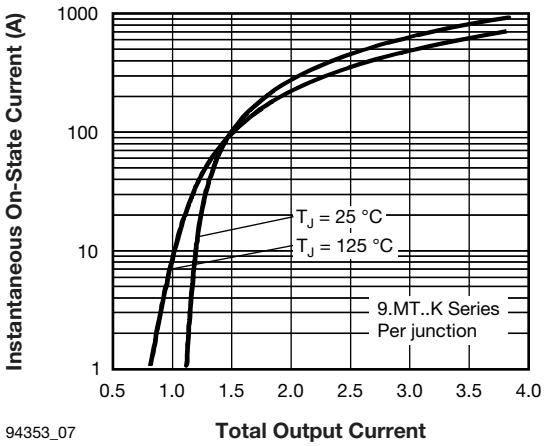
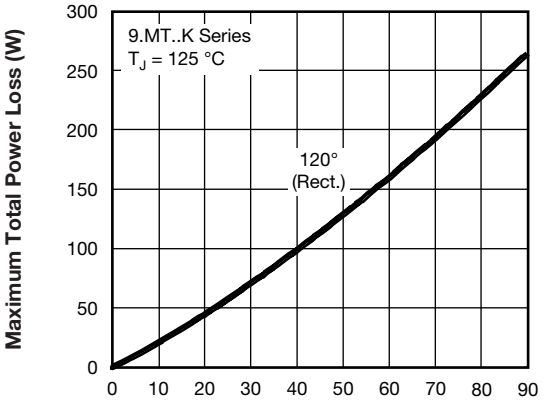


Fig. 7 - Forward Voltage Drop Characteristics



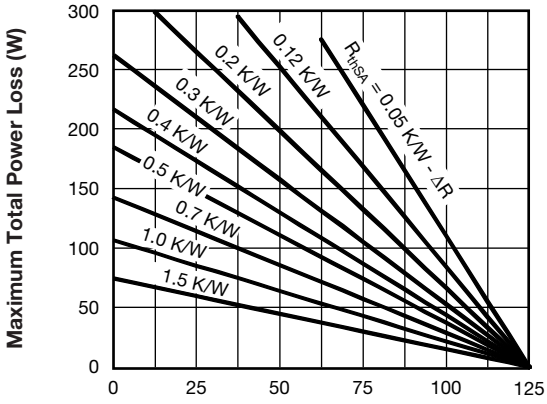


Fig. 8 - Total Power Loss Characteristics

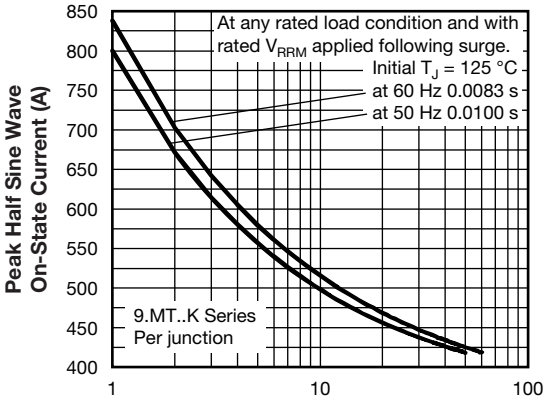


Fig. 9 - Maximum Non-Repetitive Surge Current

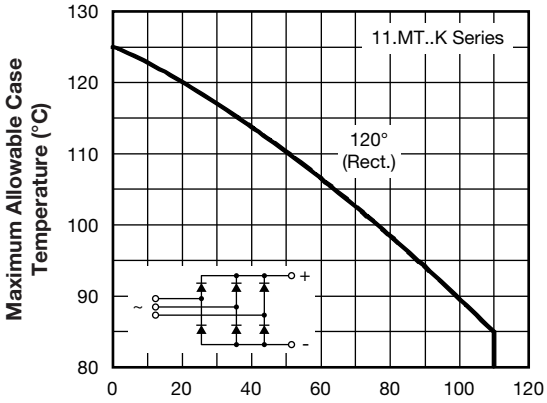


Fig. 11 - Current Ratings Characteristic

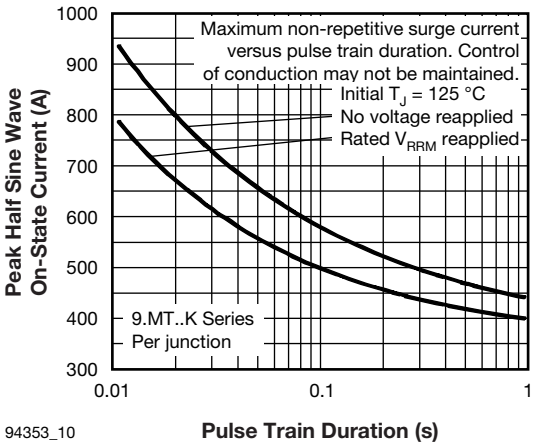


Fig. 10 - Maximum Non-Repetitive Surge Current

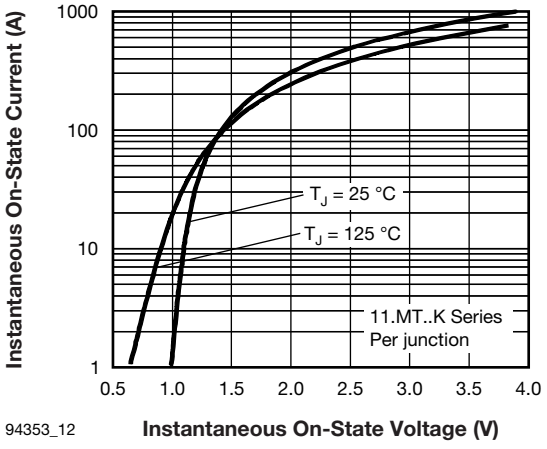
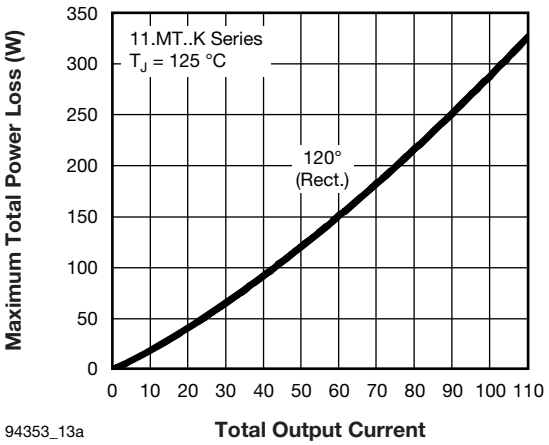


Fig. 12 - Forward Voltage Drop Characteristics



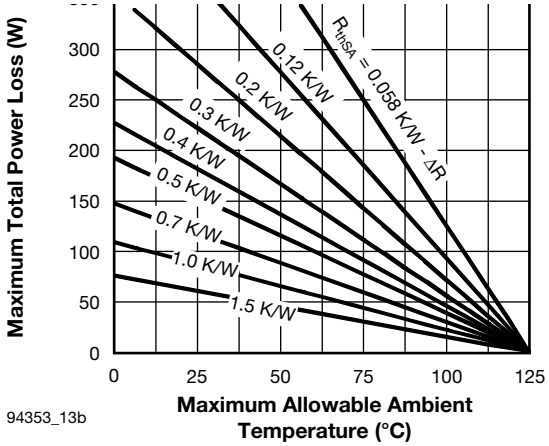


Fig. 13 - Total Power Loss Characteristics

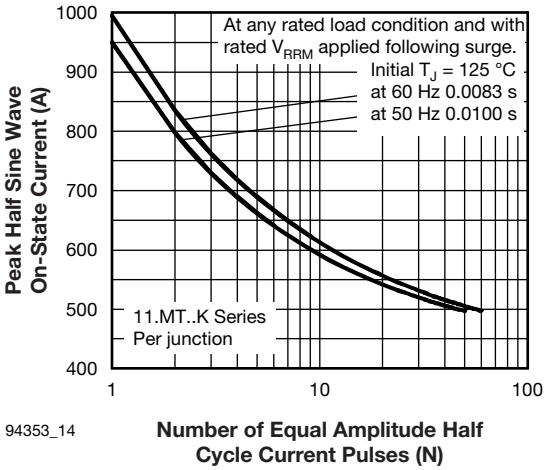


Fig. 14 - Maximum Non-Repetitive Surge Current

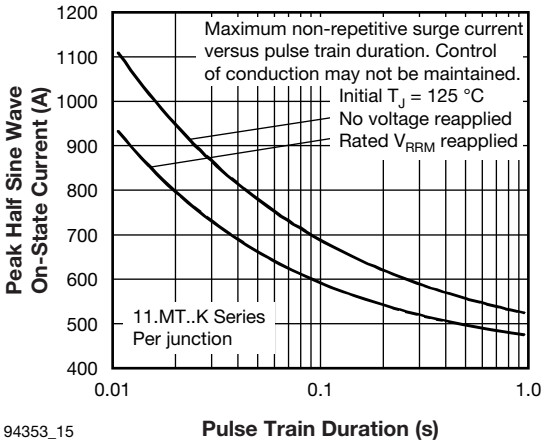


Fig. 15 - Maximum Non-Repetitive Surge Current

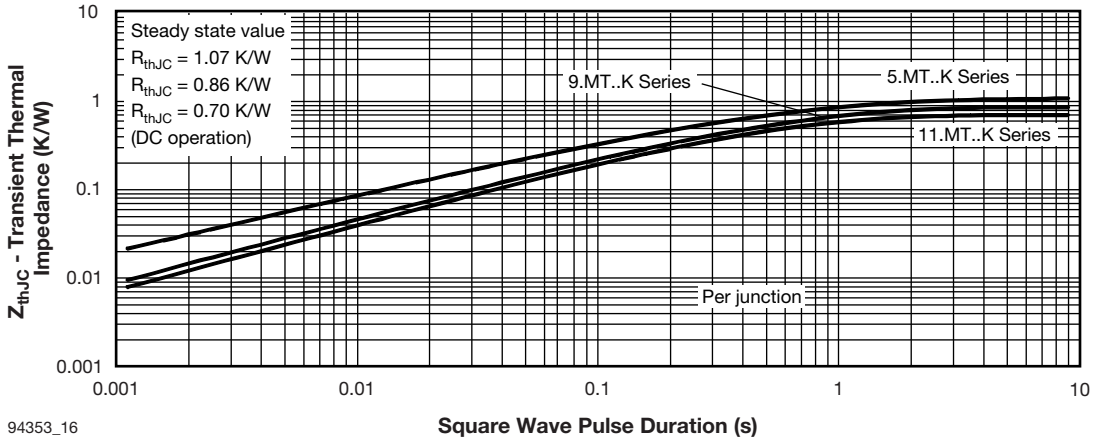


Fig. 16 - Thermal Impedance Z_{thJC} Characteristics

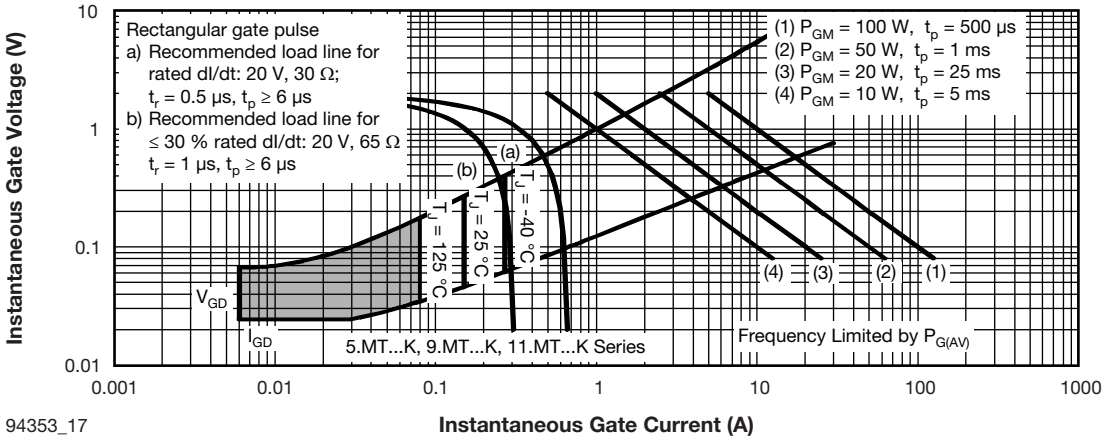


Fig. 17 - Gate Characteristics

ORDERING INFORMATION TABLE

Device code

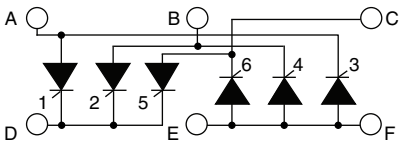
VS-	11	3	MT	160	K	S90	PbF
1	2	3	4	5		6	7

- **1** - Vishay Semiconductors product
- **2** - Current rating code:
  - 5 = 55 A (average)
  - 9 = 90 A (average)
  - 11 = 110 A (average)
- **3** - Circuit configuration code:
  - 1 = Negative half-controlled bridge
  - 2 = Positive half-controlled bridge
  - 3 = Full-controlled bridge
- **4** - Essential part number
- **5** - Voltage code x 10 = V_{RRM} (see Voltage Ratings table)
- **6** - Critical dV/dt:
  - None = 500 V/µs (standard value)
  - S90 = 1000 V/µs (special selection)
- **7** - PbF = Lead (Pb)-free

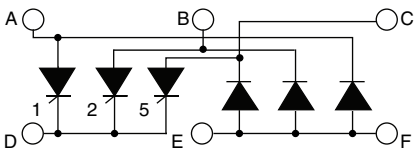
Note

- To order the optional hardware go to www.vishay.com/doc?95172

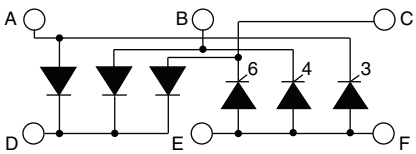
CIRCUIT CONFIGURATION



Full-controlled bridge
(5.MT...K, 9.MT...K, 11.MT..K)



Positive half-controlled bridge
(5.MT...K, 9.MT...K, 11.MT..K)

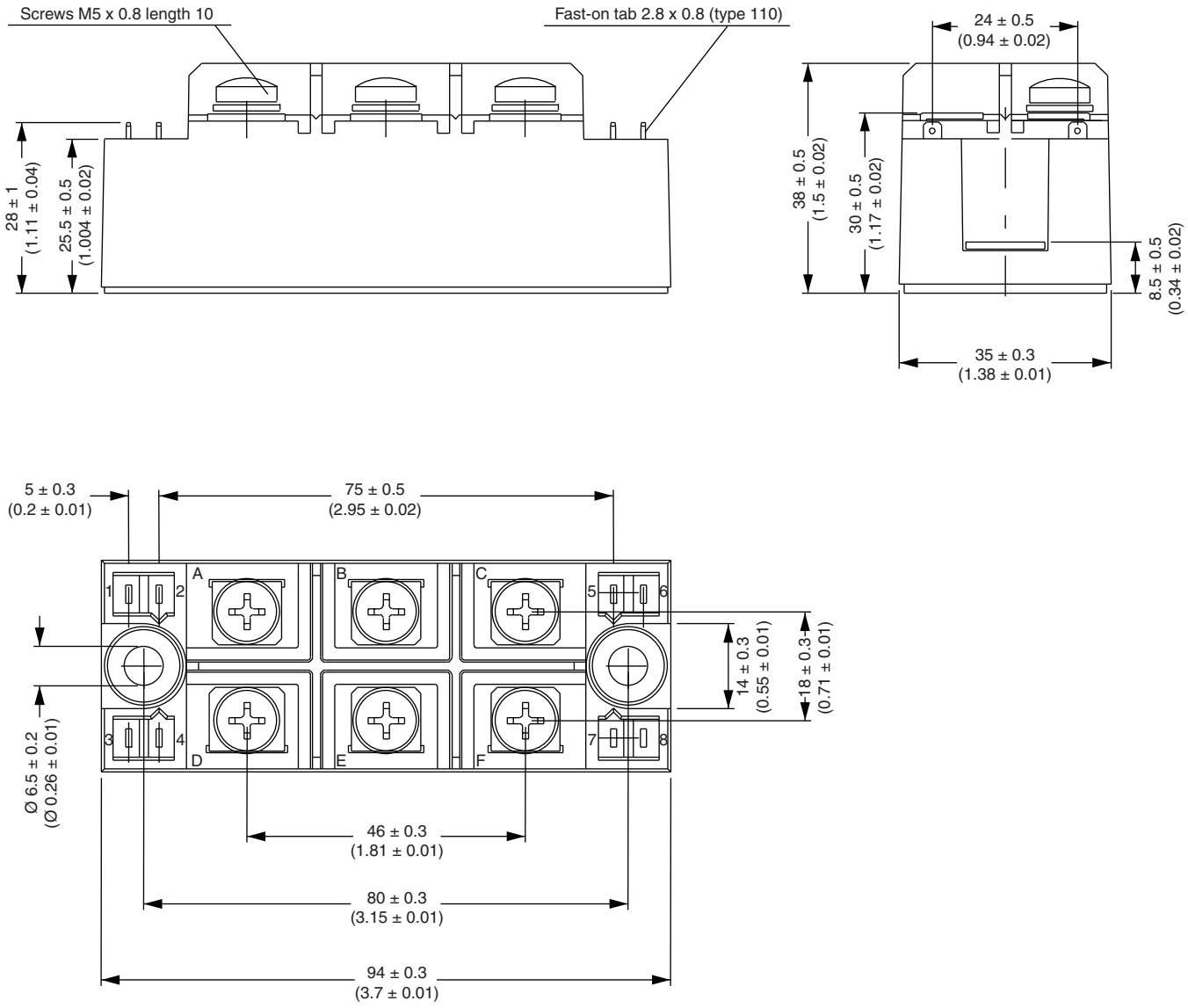


Negative half-controlled bridge
(5.MT...K, 9.MT...K, 11.MT..K)

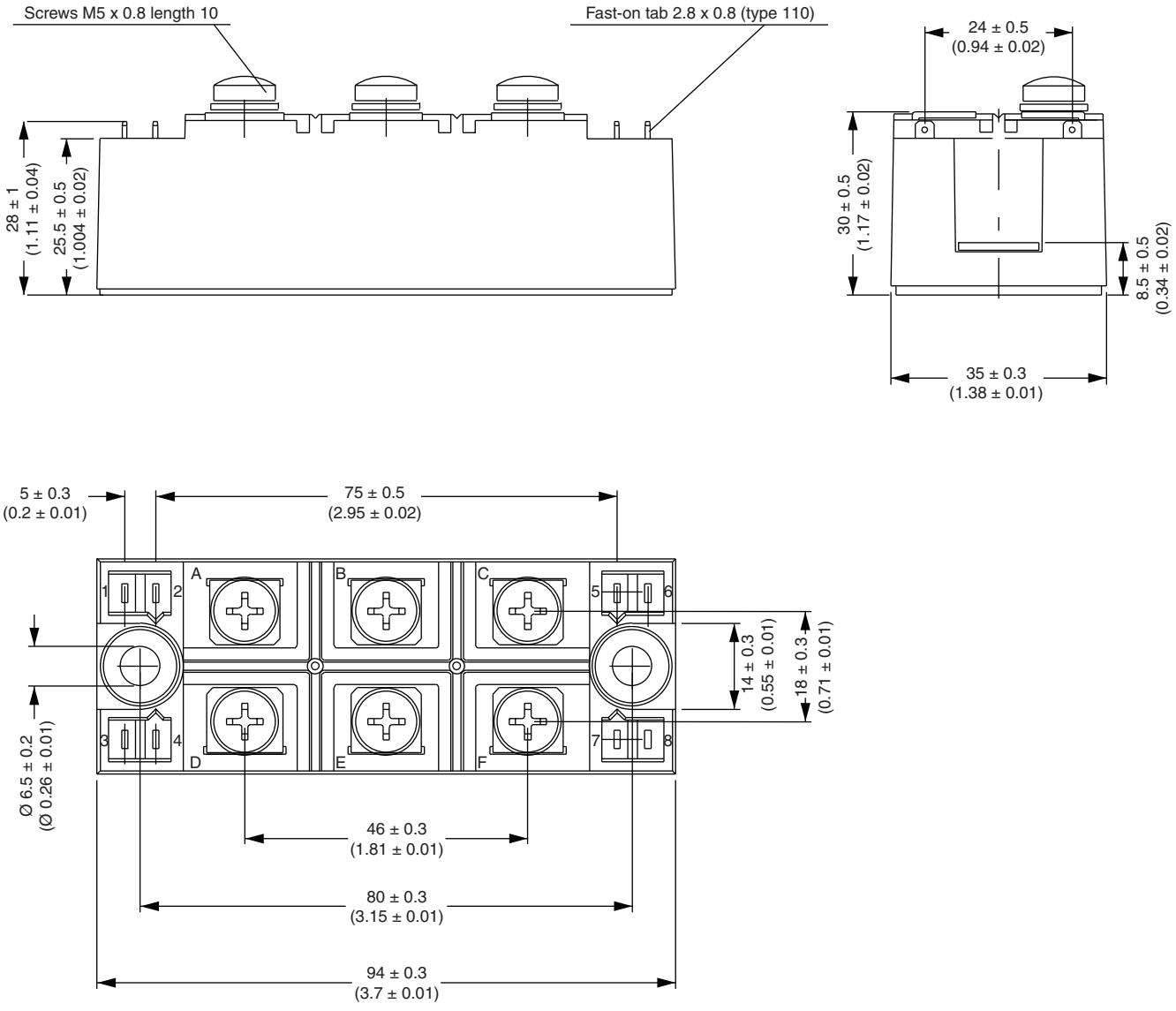
LINKS TO RELATED DOCUMENTS	
Dimensions	www.vishay.com/doc?95004

MTK (with and without optional barrier)

DIMENSIONS WITH OPTIONAL BARRIERS in millimeters (inches)



DIMENSIONS WITHOUT OPTIONAL BARRIERS in millimeters (inches)



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