

Three Phase Controlled Bridge (Power Modules), 55 A to 110 A



MTK

FEATURES

- Package fully compatible with the industry standard INT-A-PAK power modules series
- High thermal conductivity package, electrically insulated case
- Excellent power volume ratio
- 4000 V_{RMS} isolating voltage
- UL E78996 approved
- Compliant to RoHS directive 2002/95/EC
- Designed and qualified for industrial level



PRODUCT SUMMARY

I_o	55 A to 110 A
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DESCRIPTION

A range of extremely compact, encapsulated three phase controlled bridge rectifiers offering efficient and reliable operation. They are intended for use in general purpose and heavy duty applications.

MAJOR RATINGS AND CHARACTERISTICS

SYMBOL	CHARACTERISTICS	5.MT...K	9.MT...K	11.MT...K	UNITS
I_o		55	90	110	A
	T_c	85	85	85	°C
I_{FSM}	50 Hz	390	950	1130	A
	60 Hz	410	1000	1180	
I^2t	50 Hz	770	4525	6380	A^2s
	60 Hz	700	4130	5830	
$I^2\sqrt{t}$		7700	45 250	63 800	$A^2\sqrt{s}$
V_{RRM}	Range	800 to 1600			V
T_{Stg}, T_J	Range	- 40 to 125			°C

5.MT...KPbF, 9.MT...KPbF, 11.MT...KPbF Series

Vishay High Power Products Three Phase Controlled Bridge
(Power Modules), 55 A to 110 A



ELECTRICAL SPECIFICATIONS

VOLTAGE RATINGS					
TYPE NUMBER	VOLTAGE CODE	V _{RRM} , MAXIMUM REPETITIVE PEAK REVERSE VOLTAGE V	V _{RSM} , MAXIMUM NON-REPETITIVE PEAK REVERSE VOLTAGE V	V _{DRM} , MAXIMUM REPETITIVE PEAK OFF-STATE VOLTAGE, GATE OPEN CIRCUIT V	I _{RRM} /I _{DRM} , MAXIMUM AT T _J = 125 °C mA
5.MT...K	80	800	900	800	10
	100	1000	1100	1000	
	120	1200	1300	1200	
	140	1400	1500	1400	
	160	1600	1700	1600	
9.MT...K 11.MT...K	80	800	900	800	20
	100	1000	1100	1000	
	120	1200	1300	1200	
	140	1400	1500	1400	
	160	1600	1700	1600	

FORWARD CONDUCTION											
PARAMETER	SYMBOL	TEST CONDITIONS			5.MT...K	9.MT...K	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 maximum	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 ² t for fusing	I ² t	t = 10 ms	No voltage reapplied		770	4525	6380	A ² s			
		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 √t for fusing	I ² √t	t = 0.1 ms to 10 ms, no voltage reapplied			7700	45 250	63 800	A ² √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-repetitive rate of rise of turned on current	dl/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						



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BLOCKING						
PARAMETER	SYMBOL	TEST CONDITIONS	5.MT...K	9.MT...K	11.MT...K	UNITS
RMS isolation voltage	V_{ISOL}	$T_J = 25^\circ\text{C}$ all terminal shorted, $f = 50\text{ Hz}$, $t = 1\text{ s}$	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 $dV/dt = 1000\text{ V}/\mu\text{s}$, 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}	$T_J = -40^\circ\text{C}$	4.0				
		$T_J = 25^\circ\text{C}$	2.5				
		$T_J = 125^\circ\text{C}$	1.7				
Maximum required DC gate current to trigger	I_{GT}	$T_J = -40^\circ\text{C}$	270			mA	
		$T_J = 25^\circ\text{C}$	150				
		$T_J = 125^\circ\text{C}$	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			K/W	
		DC operation per junction	1.07				
		120 °C rect. conduction angle per module	0.19				
		120 °C rect. conduction angle per junction	1.17				
Maximum thermal resistance, case to heatsink per module	R_{thCS}	Mounting surface smooth, flat and grased	0.03			Nm	
Mounting torque $\pm 10\%$ to heatsink to terminal		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				
			3 to 4				
Approximate weight			225			g	

5.MT...KPbF, 9.MT...KPbF, 11.MT...KPbF Series

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DEVICES	ΔR CONDUCTION PER JUNCTION									UNITS	
	SINUSOIDAL CONDUCTION AT T_J MAXIMUM					RECTANGULAR CONDUCTION AT T_J MAXIMUM					
	180°	120°	90°	60°	30°	180°	120°	90°	60°		
5.MT...K	0.072	0.085	0.108	0.152	0.233	0.055	0.091	0.117	0.157	0.236	
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

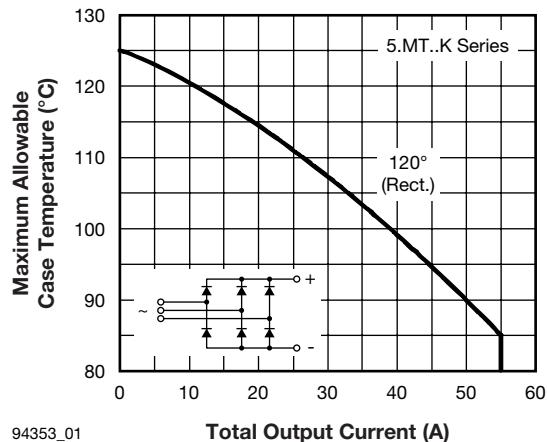


Fig. 1 - Current Ratings Characteristic

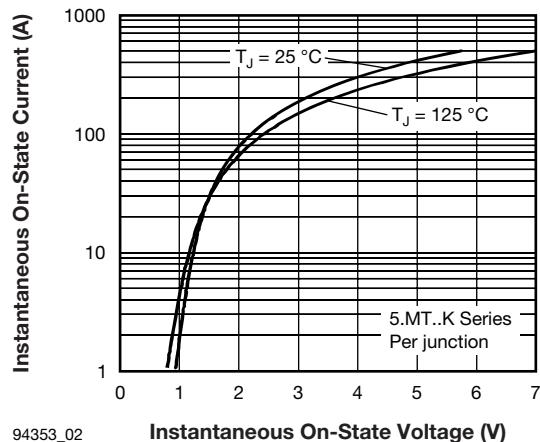


Fig. 2 - Forward Voltage Drop Characteristics

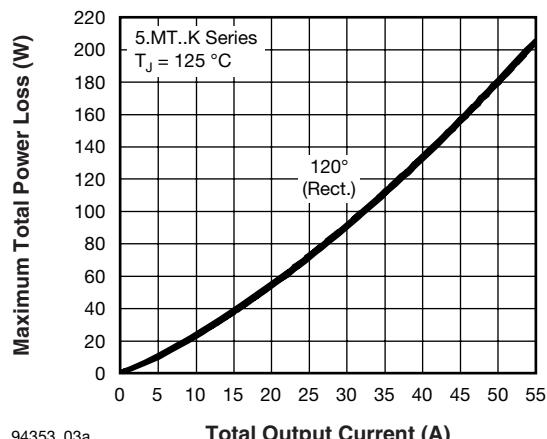
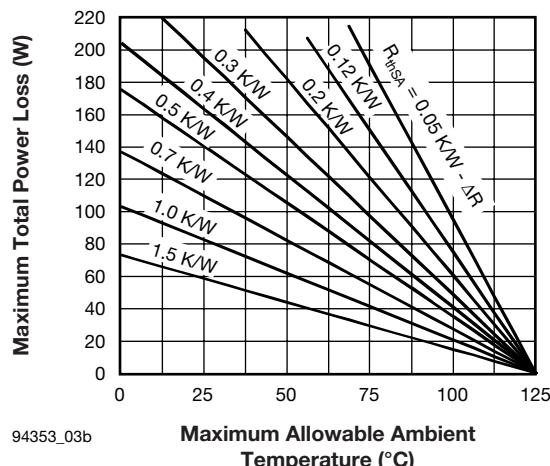


Fig. 3 - Total Power Loss Characteristics



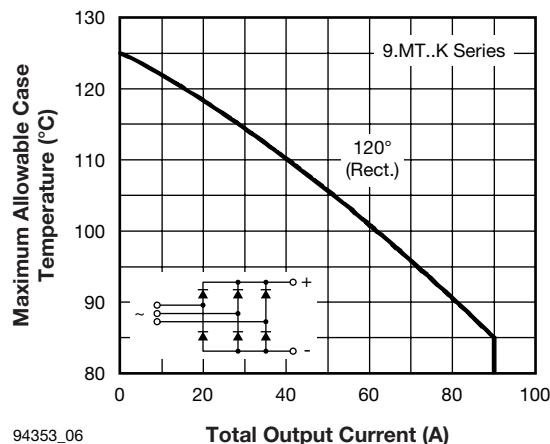
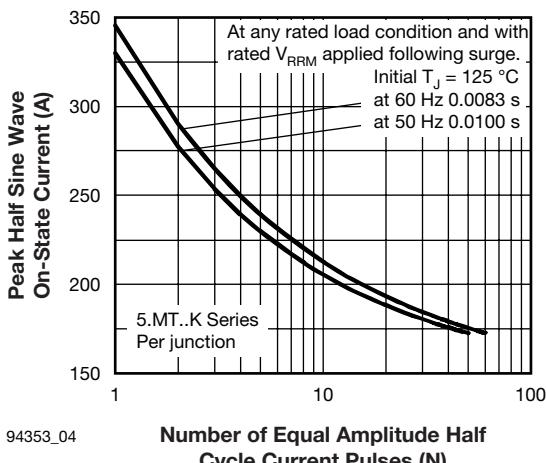


Fig. 4 - Maximum Non-Repetitive Surge Current

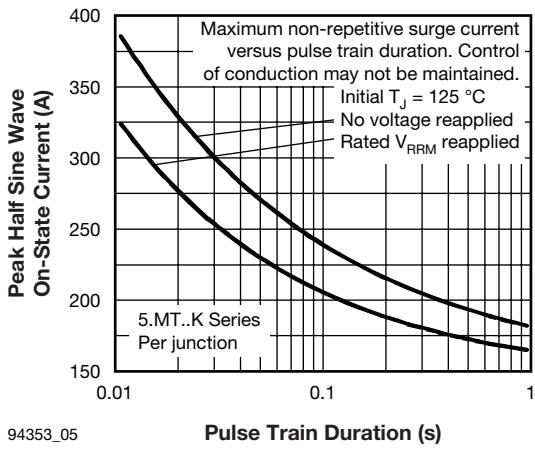


Fig. 5 - Maximum Non-Repetitive Surge Current

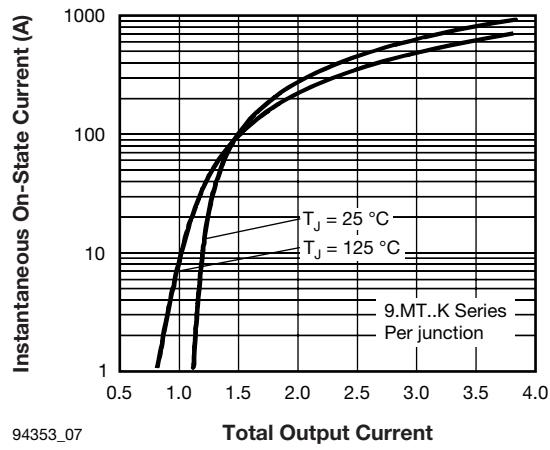


Fig. 7 - Forward Voltage Drop Characteristics

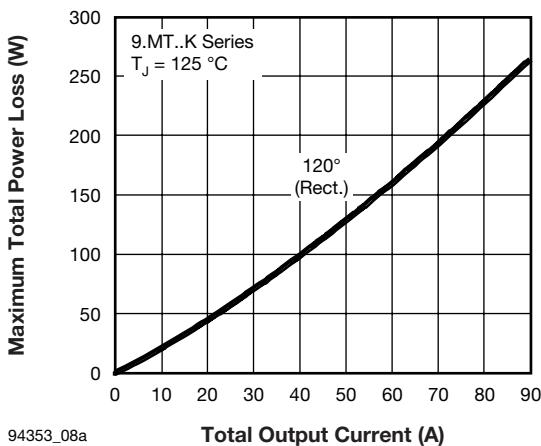
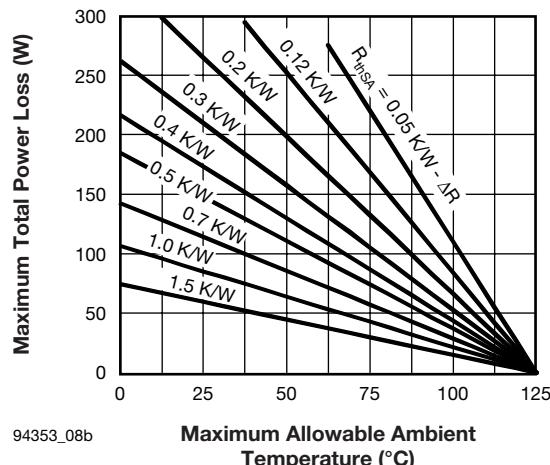


Fig. 8 - Total Power Loss Characteristics



5.MT...KPbF, 9.MT...KPbF, 11.MT...KPbF Series



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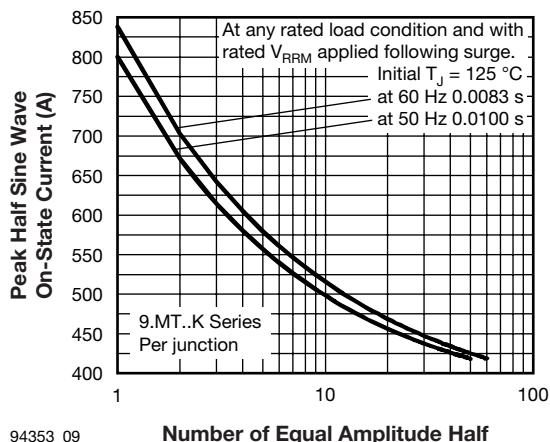


Fig. 9 - Maximum Non-Repetitive Surge Current

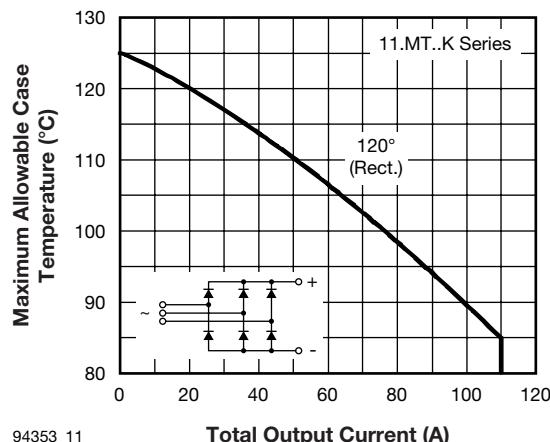


Fig. 11 - Current Ratings Characteristic

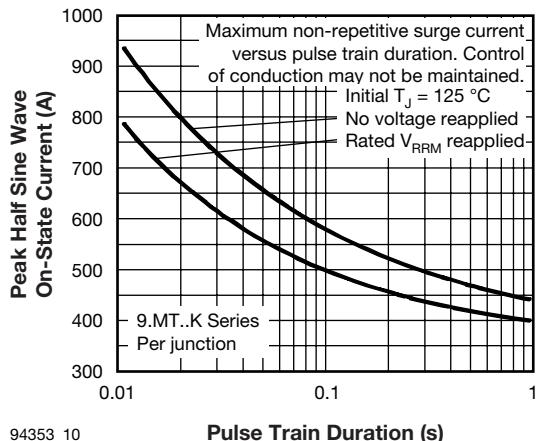


Fig. 10 - Maximum Non-Repetitive Surge Current

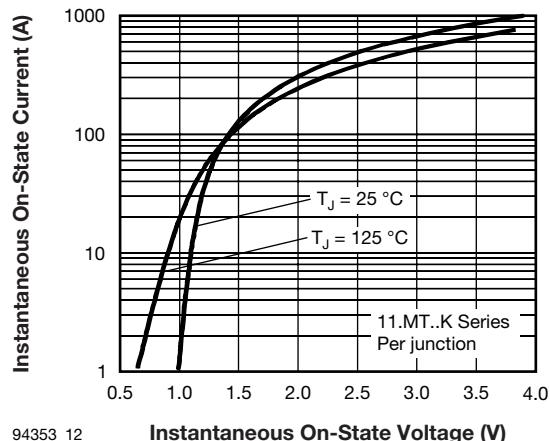


Fig. 12 - Forward Voltage Drop Characteristics

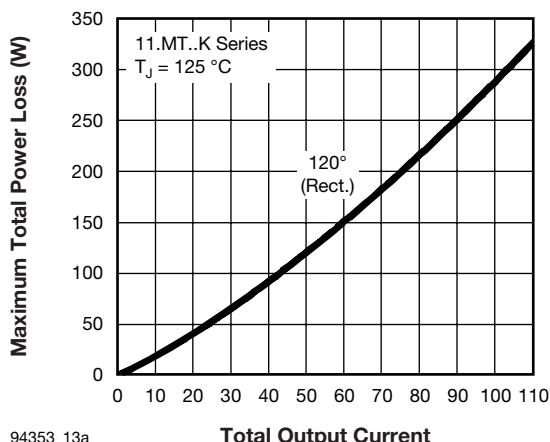
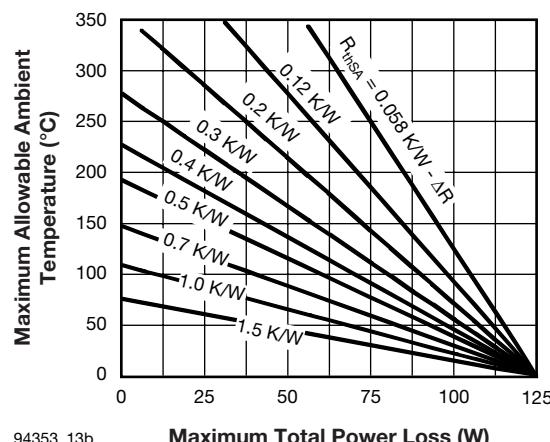
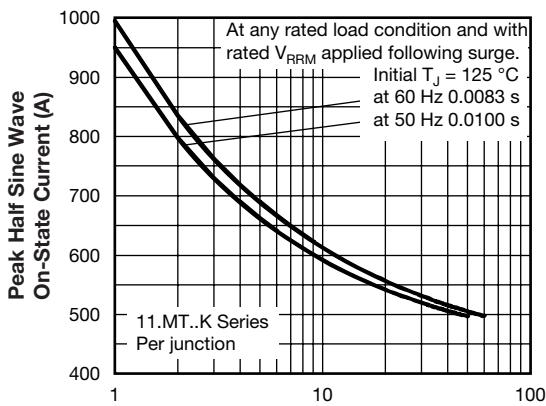


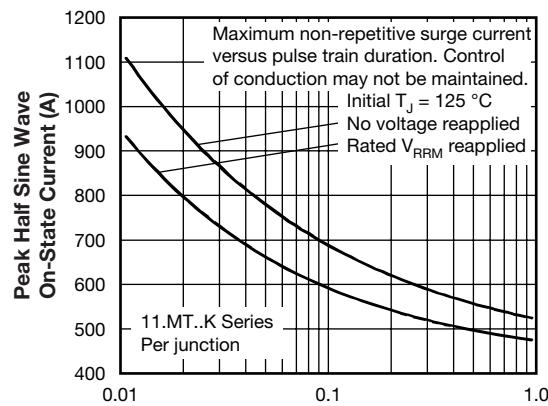
Fig. 13 - Total Power Loss Characteristics





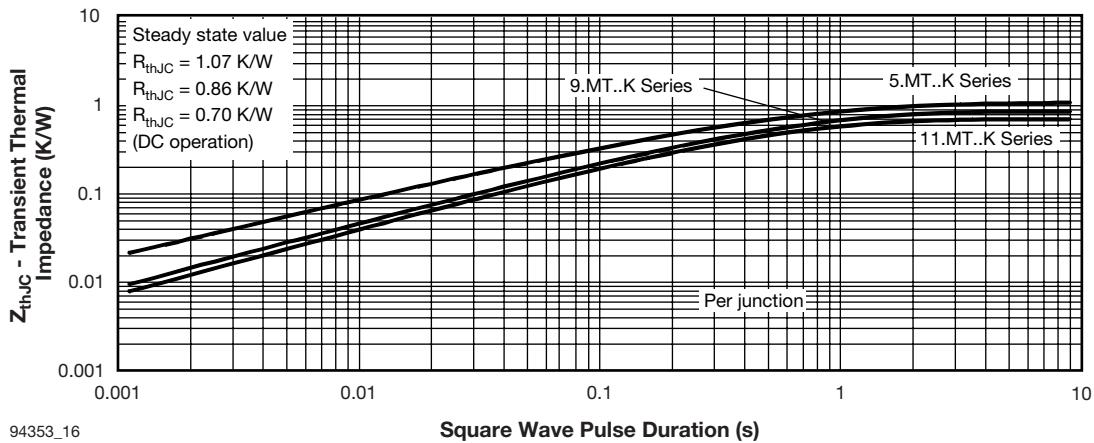
94353_14 Number of Equal Amplitude Half Cycle Current Pulses (N)

Fig. 14 - Maximum Non-Repetitive Surge Current



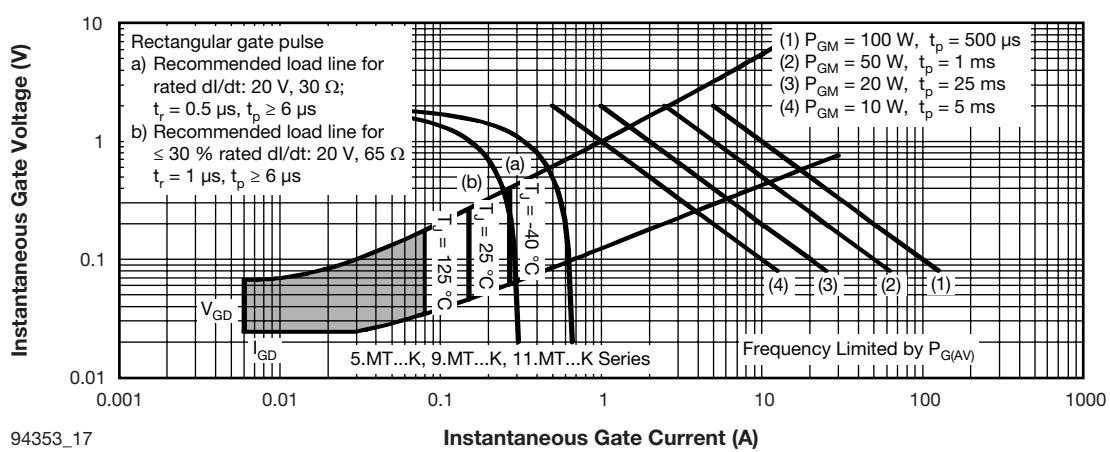
94353_15 Pulse Train Duration (s)

Fig. 15 - Maximum Non-Repetitive Surge Current



94353_16

Fig. 16 - Thermal Impedance Z_{thJC} Characteristics



94353_17

Fig. 17 - Gate Characteristics

5.MT...KPbF, 9.MT...KPbF, 11.MT...KPbF Series

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ORDERING INFORMATION TABLE

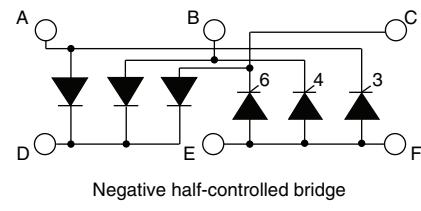
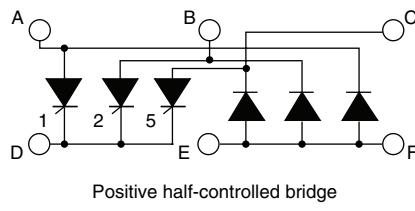
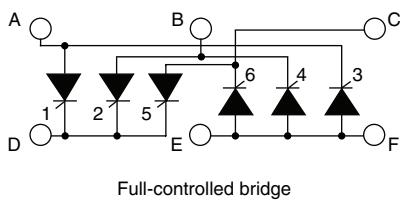
Device code	11	3	MT	160	K	S90	PbF
	(1)	(2)	(3)	(4)	(5)	(6)	

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

Note

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

CIRCUIT CONFIGURATION



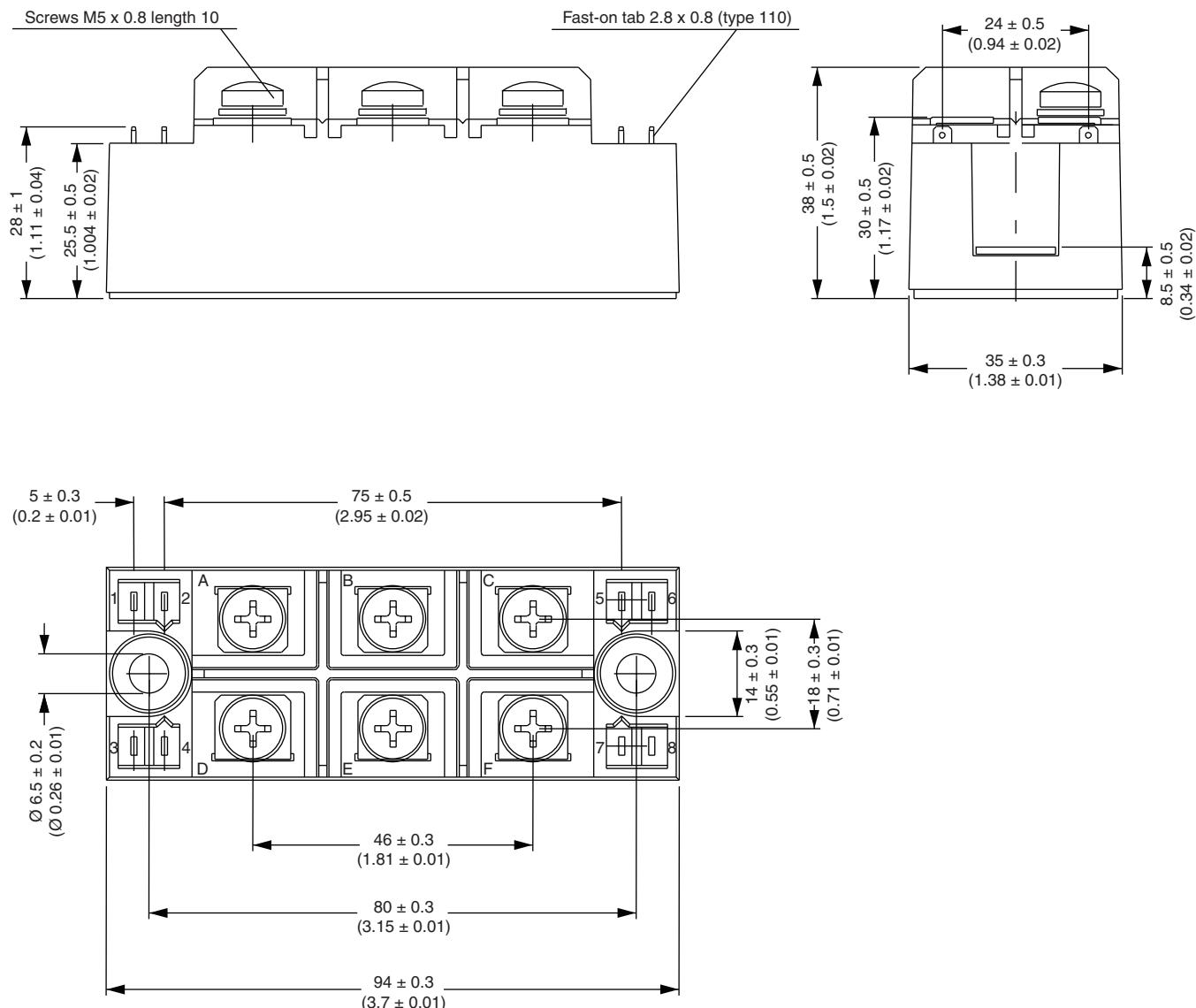
LINKS TO RELATED DOCUMENTS

Dimensions

www.vishay.com/doc?95004

MTK (with and without optional barrier)

DIMENSIONS WITH OPTIONAL BARRIERS in millimeters (inches)

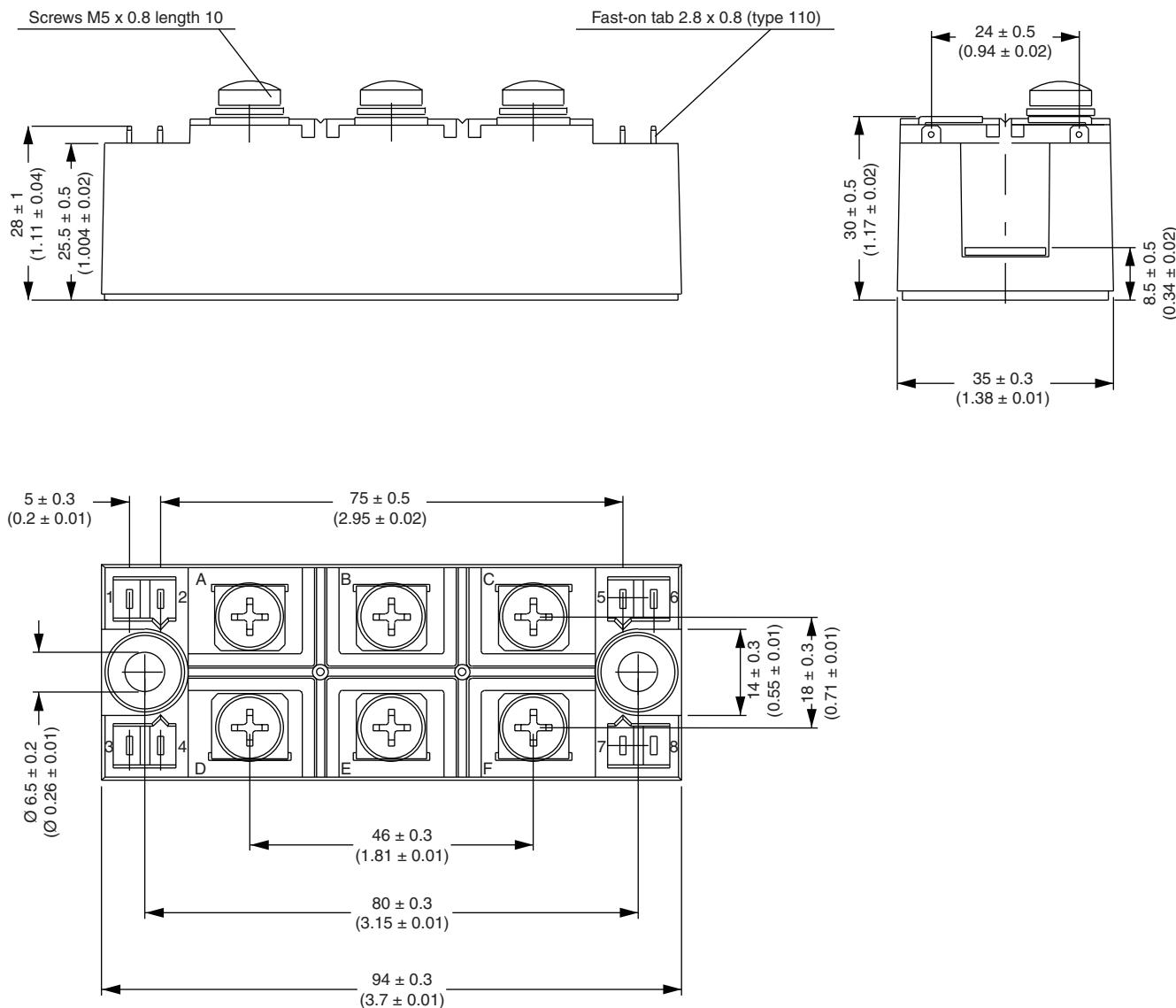


Outline Dimensions

Vishay Semiconductors MTK (with and without optional barrier)



DIMENSIONS WITHOUT OPTIONAL BARRIERS in millimeters (inches)



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Please note that some Vishay documentation may still make reference to RoHS Directive 2002/95/EC. We confirm that all the products identified as being compliant to Directive 2002/95/EC conform to Directive 2011/65/EU.

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