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## VS-FCSP05H40ETR

Vishay Semiconductors

### FlipKY®, 0.5 A



FlipKY®

#### FEATURES

- Ultralow  $V_F$  to footprint area
- Very low profile ( $< 0.6$  mm)
- Low thermal resistance
- Supplied tested and on tape and reel
- Designed for consumer level

#### APPLICATIONS

- Reverse polarity protection
- Current steering
- Freewheeling
- Flyback
- Oring

#### DESCRIPTION

FlipKY® product family utilizes wafer level chip scale packaging to deliver Schottky diodes with the lowest  $V_F$  to PCB footprint area in industry. The three pad  $0.9$  mm x  $1.2$  mm devices can deliver up to  $0.5$  A and occupy only  $1.08$  mm<sup>2</sup> of board space. The anode and cathode connections are made through solder bump pads on one side of the silicon rather than through protruding leads enabling designers to strategically place the diodes on the PCB. This design not only minimizes board space but also reduces thermal resistance and inductance, which can improve overall circuit efficiency.

Typical applications include hand-held, portable equipment such as cell phones, MP3 players, PDAs, and portable hard disk drives where space savings and performance are crucial.

PRODUCT SUMMARY	
$I_{F(AV)}$	0.5 A
$V_R$	40 V
$V_F$ at $I_F$	0.42 V
$I_{RM}$ max. 25 °C	10 $\mu$ A
$I_{RM}$ max. 125 °C	2 mA
$T_J$ max.	150 °C
$E_{AS}$	5 mJ

MAJOR RATINGS AND CHARACTERISTICS			
SYMBOL	CHARACTERISTICS	VALUES	UNITS
$I_{F(AV)}$	Rectangular waveform	0.5	A
$V_{RRM}$		40	V
$I_{FSM}$	$t_p = 5$ $\mu$ s sine	190	A
$V_F$	0.5 A <sub>pk</sub> , $T_J = 125$ °C	0.42	V
$T_J$	Range	- 55 to 150	°C

VOLTAGE RATINGS			
PARAMETER	SYMBOL	VS-FCSP05H40ETR	UNITS
Maximum DC reverse voltage	$V_R$	40	V
Maximum working peak reverse voltage	$V_{RWM}$		



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ABSOLUTE MAXIMUM RATINGS					
PARAMETER	SYMBOL	TEST CONDITIONS		VALUES	UNITS
Maximum average forward current	I <sub>F(AV)</sub>	50 % duty cycle at T <sub>PCB</sub> = 114 °C, rectangular waveform		0.5	A
Maximum peak one cycle non-repetitive surge current at 25 °C	I <sub>FSM</sub>	5 μs sine or 3 μs rect. pulse	Following any rated load condition and with rated V <sub>RRM</sub> applied	190	
		10 ms sine or 6 ms rect. pulse		10	
Non-repetitive avalanche energy	E <sub>AS</sub>	T <sub>J</sub> = 25 °C, I <sub>AS</sub> = 2.0 A, L = 5.0 mH		5	mJ
Repetitive avalanche current	I <sub>AR</sub>	Current decaying linearly to zero in 1 μs Frequency limited by T <sub>J</sub> maximum V <sub>A</sub> = 1.5 x V <sub>R</sub> typical		0.5	A

ELECTRICAL SPECIFICATIONS						
PARAMETER	SYMBOL	TEST CONDITIONS		TYP.	MAX.	UNITS
Maximum forward voltage drop See fig. 1	$V_{FM}^{(1)}$	0.5 A	$T_J = 25\text{ }^{\circ}\text{C}$	0.48	0.52	V
		1 A		0.54	0.58	
		0.5 A	$T_J = 125\text{ }^{\circ}\text{C}$	0.38	0.42	
		1 A		0.46	0.50	
Maximum reverse leakage current See fig. 2	$I_{RM}^{(1)}$	$V_R = \text{Rated } V_R$	$T_J = 25\text{ }^{\circ}\text{C}$	1	10	$\mu\text{A}$
		$V_R = 20\text{ V}$		0.2	0.5	
		$V_R = 10\text{ V}$		0.08	0.25	
		$V_R = 5\text{ V}$		0.05	0.15	
		$V_R = \text{Rated } V_R$	$T_J = 125\text{ }^{\circ}\text{C}$	0.5	2	mA
		$V_R = 20\text{ V}$		0.2	1	
		$V_R = 10\text{ V}$		0.15	0.8	
		$V_R = 5\text{ V}$		0.125	0.5	
Maximum junction capacitance	$C_T$	$V_R = 5\text{ V}_{DC}$ (test signal range 100 kHz to 1 MHz), $25\text{ }^{\circ}\text{C}$		-	90	pF
Maximum voltage rate of charge	dV/dt	Rated $V_R$		-	10 000	V/ $\mu\text{s}$

### Note

<sup>(1)</sup> Pulse width < 300  $\mu\text{s}$ , duty cycle < 2 %

THERMAL - MECHANICAL SPECIFICATIONS				
PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS
Maximum junction and storage temperature range	$T_J^{(1)}, T_{Stg}$		- 55 to 150	$^{\circ}\text{C}$
Typical thermal resistance, junction to PCB	$R_{thJL}^{(2)}$	DC operation	35	$^{\circ}\text{C/W}$
Maximum thermal resistance, junction to ambient	$R_{thJA}^{(2)}$		150	

### Notes

<sup>(1)</sup>  $\frac{dP_{tot}}{dT_J} < \frac{1}{R_{thJA}}$  thermal runaway condition for a diode on its own heatsink

<sup>(2)</sup> Mounted on dual sided 0.58" square FR4 PCB with 0.2 square inches of 1 oz. top copper area



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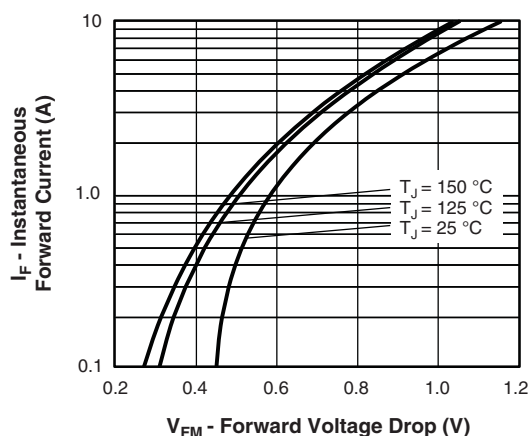


Fig. 1 - Maximum Forward Voltage Drop Characteristics (Per Leg)

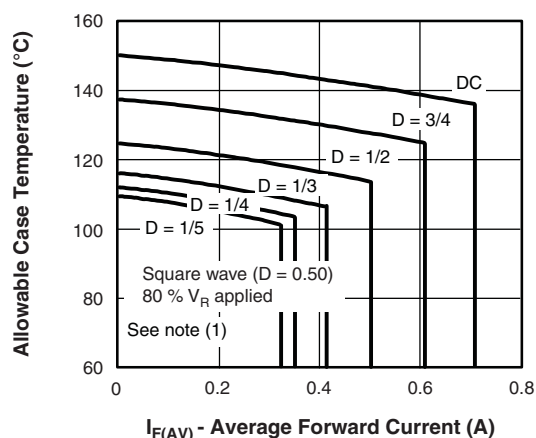


Fig. 4 - Maximum Allowable Case Temperature vs. Average Forward Current (Per Leg)

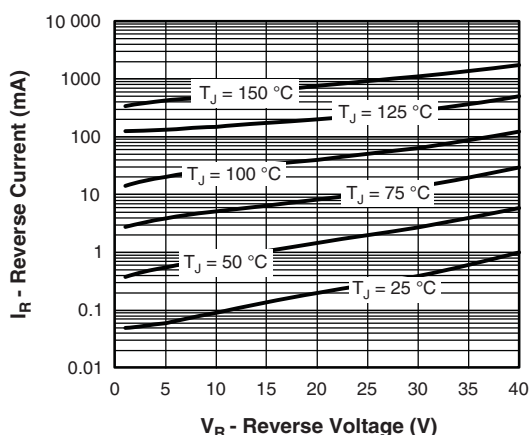


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage (Per Leg)

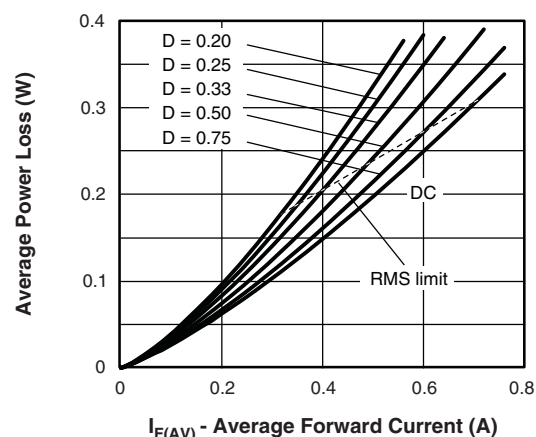


Fig. 5 - Forward Power Loss Characteristics (Per Leg)

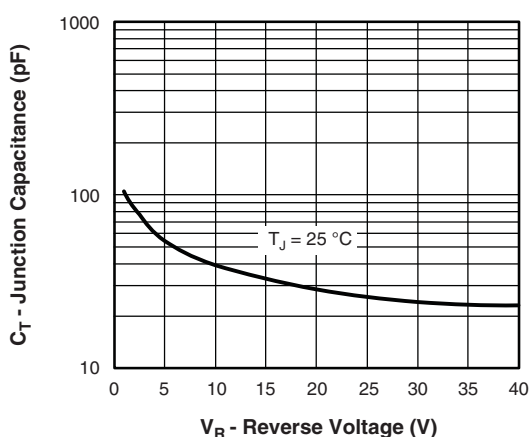


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage (Per Leg)

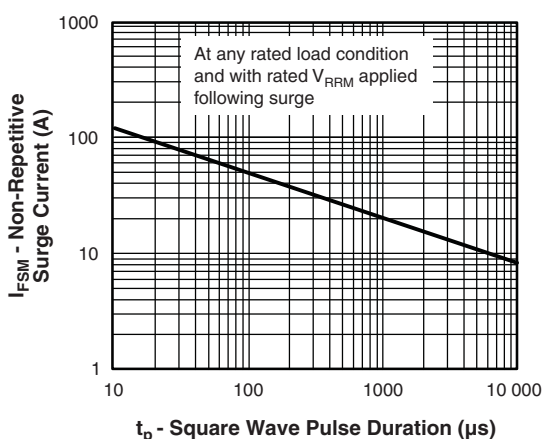


Fig. 6 - Maximum Non-Repetitive Surge Current (Per Leg)

### Note

- (1) Formula used:  $T_C = T_J - (P_d + P_{dREV}) \times R_{thJC}$ ;  $P_d$  = Forward power loss =  $I_{F(AV)} \times V_{FM}$  at  $(I_{F(AV)}/D)$  (see fig. 6);  
 $P_{dREV}$  = Inverse power loss =  $V_{R1} \times I_R (1 - D)$ ;  $I_R$  at 80 %  $V_R$  applied



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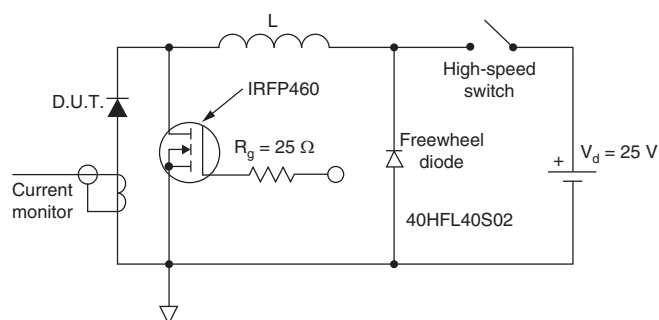


Fig. 7 - Unclamped Inductive Test Circuit

LINKS TO RELATED DOCUMENTS	
Dimensions	<a href="http://www.vishay.com/doc?95049">www.vishay.com/doc?95049</a>
Part marking information	<a href="http://www.vishay.com/doc?95060">www.vishay.com/doc?95060</a>
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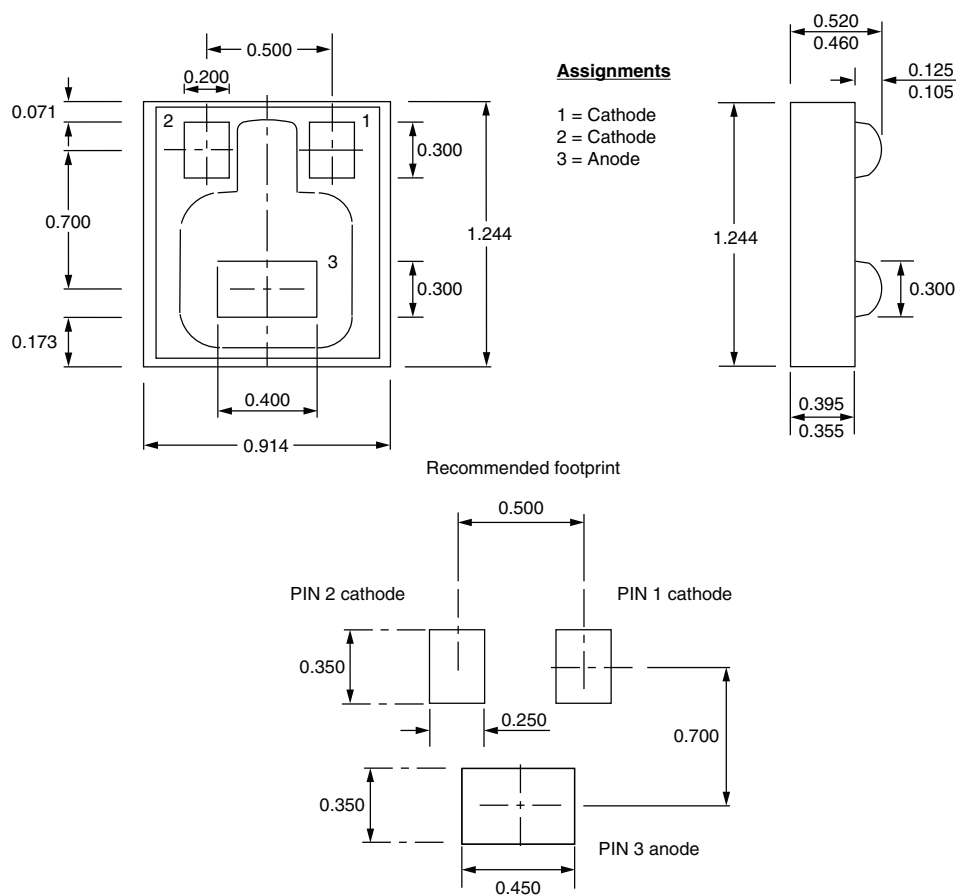


## Outline Dimensions

Vishay High Power Products

### FlipKY® 0.5 A/0.75 A

**DIMENSIONS** in millimeters



#### Notes

- Dimensioning and tolerancing per ASME Y14.5M-1994
- Controlling dimension: millimeter



## Legal Disclaimer Notice

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