

DATA SHEET

DMK2790 Series and DMK2308 Series GaAs Flip-Chip Schottky Diodes: Singles and Antiparallel Pairs

Applications

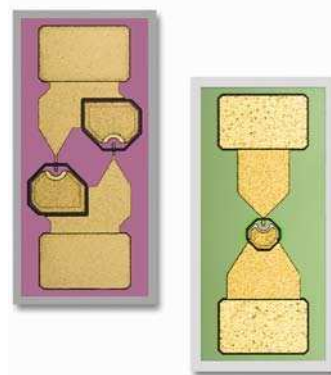
- Personal Communication Network mixers and circuits
- Low power, fast switching circuits
- Detectors

Features

- Designed for high-volume designs
- High frequency: 20 GHz to 100 GHz
- Exceeds environmental requirements for microwave integrated circuits and hybrid applications
- Designed for low junction capacitance and low series resistance
- Low parasitic flip-chip configurations



Skyworks Green™ products are compliant with all applicable legislation and are halogen-free. For additional information, refer to *Skyworks Definition of Green™*, document number SQ04-0074.


Description

This series of Skyworks GaAs Schottky barrier flip-chip diodes produces excellent high frequency performance up to millimeter wave ranges in a mechanically robust, small form factor.

These diodes are comprised of single junction devices (DMK2790 series) and antiparallel pairs (DMK2308 series). These products offer very low series resistance and capacitance typically available only in beam-lead devices but without the fragility of beam leads. The DMK2308 antiparallel pairs are suitable for use in subharmonically pumped mixers or in limiting circuits.

These diodes are designed to be mounted on hard or soft substrate PCBs with conductive epoxy or solder.

Typical applications include mixers or detectors in point-to-point millimeter-wave radios, collision avoidance automotive radars, and adaptive cruise control radar systems.

Table 1. Flip-Chip Schottky Diodes Absolute Maximum Ratings

Parameter	Symbol	Minimum	Maximum	Units
Forward current	I_F		50	mA
Operating temperature	T_{OP}	-65	+125	°C
Junction temperature	T_J	-65	+175	°C
Storage temperature	T_{STG}	-65	+150	°C

Note: Exposure to maximum rating conditions for extended periods may reduce device reliability. There is no damage to device with only one parameter set at the limit and all other parameters set at or below their nominal value. Exceeding any of the limits listed here may result in permanent damage to the device.

CAUTION: Although this device is designed to be as robust as possible, Electrostatic Discharge (ESD) can damage this device. This device must be protected at all times from ESD. Static charges may easily produce potentials of several kilovolts on the human body or equipment, which can discharge without detection. Industry-standard ESD precautions should be used at all times. The DMK2790 series and DMK2308 series are Class 0 ESD devices.

Table 2. Flip-Chip Schottky Diodes Electrical Specifications (Note 1)
($T_{OP} = +25\text{ °C}$ Per Junction, Unless Otherwise Noted)

Recommended Frequency (GHz)	$V_B @ 10\text{ }\mu\text{A}$ (Note 2) (V)	$C_T @ 0\text{ V \& 1 MHz}$ (Note 3) (pF)		$R_S @ 10\text{ mA}$ (Ω)	$V_F @ 1\text{ mA}$ (mV)	
		Min.	Max.		Min.	Max.
20 to 100	3	0.04	0.07	7	650	750

Note 1: Performance is guaranteed only under the conditions listed in this Table.

Note 2: Breakdown voltage cannot be measured nondestructively in antiparallel configuration.

Note 3: Junction capacitance plus 0.02 pF (overlay).

Electrical and Mechanical Specifications

The absolute maximum ratings of the flip-chip Schottky diodes series are provided in Table 1. Electrical specifications are specified in Table 2. Typical performance characteristics are provided in Figures 1 through 4.

The SPICE models for the DMK2790 series and DMK2308 series diodes are shown in Figures 5 and 6, respectively. Associated SPICE model parameters are provided in Table 3.

Package dimensions are shown in Figures 7 and 8. All flip-chip Schottky diodes are provided in standard waffle packs or gel packs (refer to the Ordering Information Table on page 6).

Otherwise, problems related to moisture absorption may occur when the part is subjected to high temperature during solder assembly.

The DMK2790 series and DMK2308 series diodes are rated to Moisture Sensitivity Level 1 (MSL1) at 260 °C. They can be used for lead or lead-free soldering. For additional information, refer to the Skyworks Application Note, *Solder Reflow Information*, document number 200164.

Care must be taken when attaching this product, whether it is done manually or in a production solder reflow environment.

Package and Handling Information

Instructions on the shipping container label regarding exposure to moisture after the container seal is broken must be followed.

Typical Parameter Distribution on Wafer

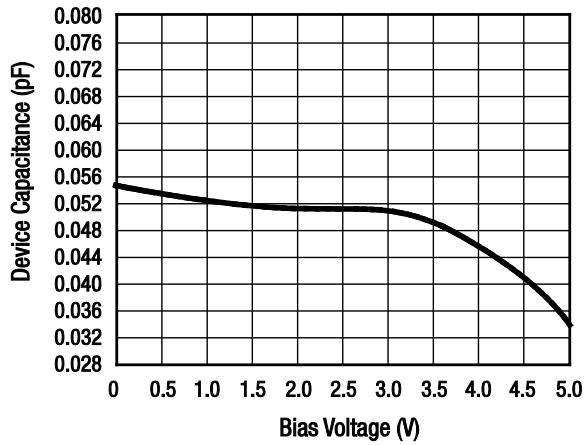


Figure 1. Capacitance/Voltage Variation

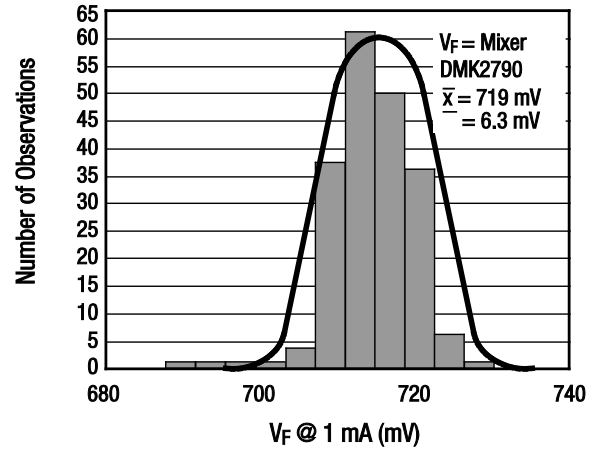


Figure 2. Histogram: Distribution of Forward Voltage @ 1 mA

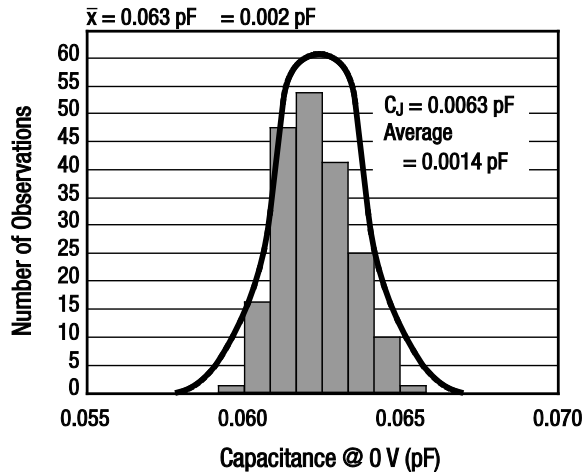


Figure 3. Histogram: Distribution of Total Capacitance @ 0 V

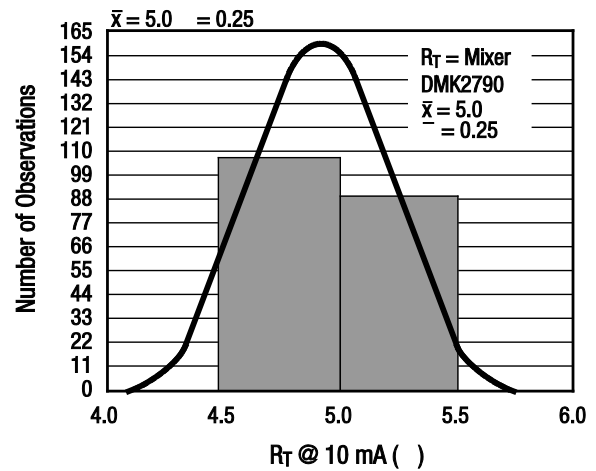


Figure 4. Histogram: Distribution of Resistance @ 10 mA

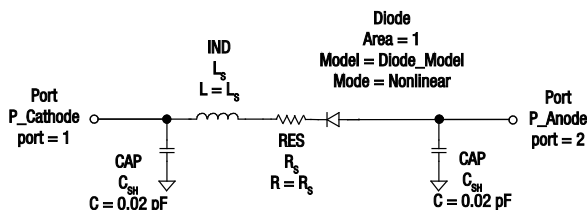


Figure 5. DMK2790 Series SPICE Model

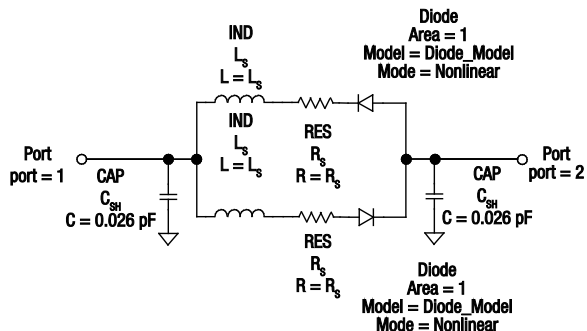


Figure 6. DMK2308 Series SPICE Model

Table 3. SPICE Model Parameters

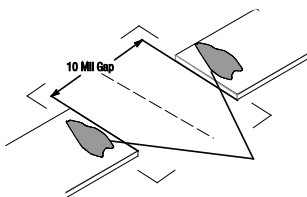
Is (A)	Rs (Ω)	n	Td (sec)	Cj0 (pF)	M	Eg (eV)	Vj (V)	Xti	Fc	Bv (V)	Ibv (A)
0.5E-12	4	1.05	1E-11	0.05	0.26	1.43	0.82	2	0.5	4.0	1E-05

The Epoxy Die Attach Process for GaAs Flip-Chips

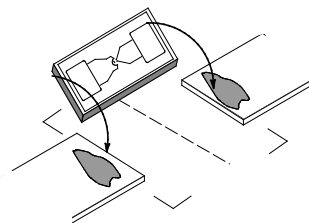
Epoxy Material. Microelectronic grade conductive epoxy. For attachment to soft boards, a stress absorbent conductive epoxy must be used to produce a consistent process and reliable bond.

Cleanness. Flexible or hard substrates must be clean and free of contaminants before epoxy die attachment takes place.

Epoxy Dispensing. Dispense epoxy dot size, approximately 0.008 inch, and a bondlike thickness of approximately 0.001 inch, between die and substrate. See illustration below:



Die Attachment. Flip the device, aligning bond pads to dispensed dots, using an even force of approximately 15 to 30 grams. See illustration below:



Epoxy Curing. Cure per manufacturer's recommendations.

Attachment Quality. The strength of the die attachment can be verified by stressing the attachment joint to failure, using a die shear test on a sample base. Increase the force of the shear test equipment on the die until the component pops from the surface of the circuit, recording a gram force value at the time of the fracture from the substrate.

The value for pass or fail criteria is based on the contact bond pad size of the die and compared against military standard requirements.

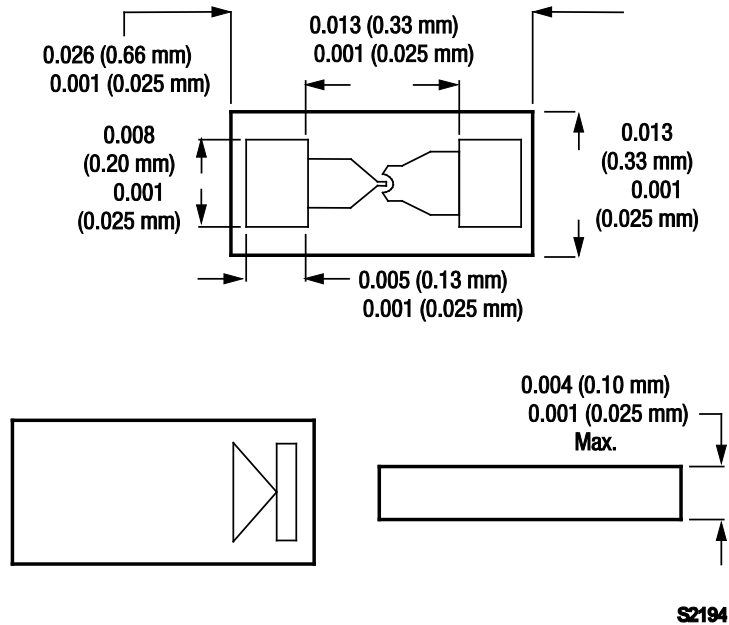


Figure 7. DMK2790 Series Package Dimensions

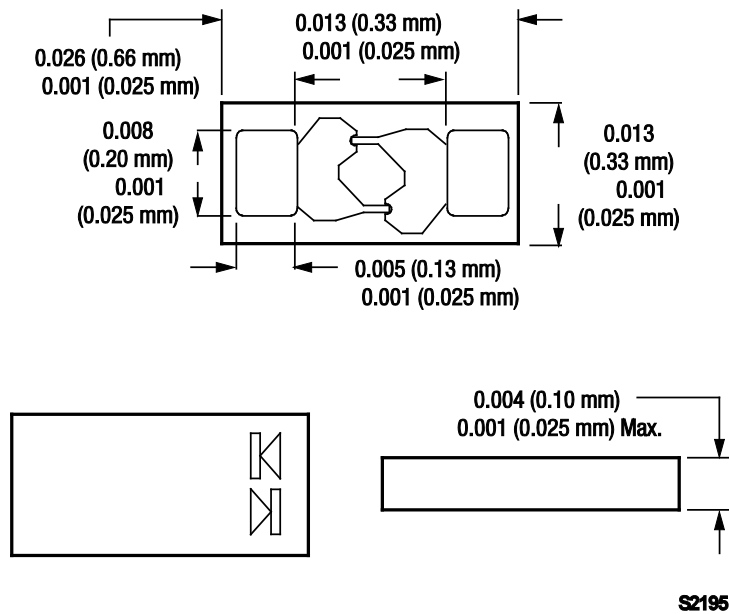


Figure 8. DMK2308 Series Package Dimensions

Ordering Information

Part Number	Packing Method
DMK2790-000	Standard waffle pack, 100 pcs per, active side down
DMK2790-G1U	Standard gel pack, 100 pcs per, active side up
DMK2790-G4D	Standard gel pack, 400 pcs per, active side down

DMK2308-000	Standard waffle pack, 100 pcs per, active side down
DMK2308-G1U	Standard gel pack, 100 pcs per, active side up
DMK2308-G4D	Standard gel pack, 400 pcs per, active side down

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