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# **PRODUCT INFORMATION**

*Vol. 54*

## **Voltage Controlled Local Oscillator (VCO) Modules Developed Devices that Are Optimal for Microwave Data Communications**

**SMO1137V, SMO0705V**

### **Overview**

Rapid growth is expected in the field of data communications using microwave signals. In particular, electronics manufacturers see the market for high-speed large-capacity bidirectional data communications using satellites as a major growth area. Although microwave local oscillators are implemented by directly driving a GaAs MESFET or by providing a frequency amplifier for an oscillator that uses silicon transistors, both of these techniques suffer from excessive noise levels and are difficult to apply in digital communications applications. Thus there are now strong market demands for local oscillators that provide a stable oscillator signal with good phase noise characteristics in high-frequency transceivers.

Sanyo has developed two VCO (voltage controlled oscillator) modules, the SMO1137V, which is optimal for fire prevention and other civil defense data communications applications, and the SMO0705V, which is optimal for general data communications and internet related applications. These VCO modules are local oscillators that use a VSAT (very small aperture terminal) systems and can support digital data communications systems.

These modules combine the technology cultivated in Sanyo's low phase noise GaAs MESFET (the 2SK1645), which is provided for use in broadcast and communications satellite down converters, the SMO series of ultrahigh-frequency local oscillator modules, and Sanyo's GaAs varactor diodes to easily achieve low phase noise characteristics. The SMO1137V features a center frequency of 11.30 GHz with excellent frequency stability characteristics and a frequency range of  $\pm 5$  MHz and achieves modulation characteristics with superlative linearity. This product, due to its direct oscillation at ultrahigh frequencies, allows the number of external components to be reduced and thus can contribute to lower end product costs. It is provided in the industry's thinnest and lightest package and can thus contribute to end product miniaturization. The SMO0705V features a center frequency of 7.0 to 7.25 GHz, and a frequency range of 250 MHz. It can achieve the industry's highest transmission rate of 12 Mbps in an internet modem high-frequency down-converter. Also, since this module can use a silicon prescaler in place of the high-cost GaAs prescaler previously used for the ultrahigh-frequency signals, it can contribute to lower end product costs.

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## Features and Functions

SMO1137V (For civil defense radio and data communications applications)

- Provides modulation characteristics with superlative linearity.
- The industry's thinnest, lightest module of its type.
- Achieves low phase noise characteristics when combined with a PLL circuit.
- Hermetically sealed package structure for high reliability.
- Can also be provided in packages that require no mounting screws (solder-plated packages).

SMO0705V (For data communications and internet applications)

- Provides a frequency range of 250 MHz or greater.
- Allows the use of a silicon prescaler to contribute to lower end product costs.
- Achieves low phase noise characteristics when combined with a PLL circuit.
- Provided in a surface mounting package with package end through holes.
- Achieves a data transfer rate of 12 Mbps.

## Applications

VSAT system data communications converters

## Specifications

### SMO1137V

#### Electrical Characteristics at $T_a = 25^\circ\text{C}$

Parameter	Symbol	Test conditions	Typical value	Unit
Oscillation frequency	$f_0$	$V_{CC} = 5\text{ V}, V_C = 4\text{ V}$	11.300	GHz
Operating current drain	ID	$V_{CC} = 5\text{ V}, V_C = 4\text{ V}$	40	mA
Output power	$P_O$	$V_{CC} = 5\text{ V}, V_C = 4\text{ V}$	9	dBm
Modulation sensitivity	$f_m$	$V_{CC} = 5\text{ V}, V_C = 4 \pm 1\text{ V}$	1.6	MHz/V
Frequency variation range	$\Delta f_{ra}$	$V_{CC} = 5\text{ V}, V_C = 0\text{ to }8\text{ V}$	12	MHz
Frequency voltage stability	$\Delta f_V$	$V_{CC} = 5 \pm 0.1\text{ V}, V_C = 4\text{ V}$	1.7	MHz
Frequency load stability	$\Delta f_L$	$V_{CC} = 5\text{ V}, V_C = 4\text{ V}, V_{SWR}: 1.5$	$\pm 0.6$	MHz
Frequency temperature stability	$\Delta f_T$	$V_{CC} = 5\text{ V}, V_C = 4\text{ V}, -30\text{ to }75^\circ\text{C}$	$\pm 2.0$	MHz
Phase noise	NP	$V_{CC} = 5\text{ V}, V_C = 4\text{ V}, \text{off-carrier: } 100\text{ kHz}$	-104	dBc/Hz
		$V_{CC} = 5\text{ V}, V_C = 4\text{ V}, \text{off-carrier: } 10\text{ kHz}$	-83	
Package dimensions		$20.22 \times 12.6 \times 7.5$		mm

# PRODUCT INFORMATION

## SMO0705V

### Electrical Characteristics at Ta = 25°C

Parameter	Symbol	Test conditions	Typical value	Unit
Oscillation frequency	f <sub>o</sub>	V <sub>CC</sub> = 5 V, V <sub>C</sub> = 1 V	≤ 7.00	GHz
		V <sub>CC</sub> = 5 V, V <sub>C</sub> = 6 V	≥ 7.25	
Operating current drain	I <sub>D</sub>	V <sub>CC</sub> = 5 V, V <sub>C</sub> = 1 to 6 V	30	mA
Output power	P <sub>O</sub>	V <sub>CC</sub> = 5 V, V <sub>C</sub> = 1 to 6 V	5	dBm
Modulation sensitivity	f <sub>m</sub>	V <sub>CC</sub> = 5 V, V <sub>C</sub> = 1 to 6 V	70	MHz/V
Frequency variation range	Δf <sub>ra</sub>	V <sub>CC</sub> = 5 V, V <sub>C</sub> = 1 to 6 V	≥ 250	MHz
Frequency voltage stability	Δf <sub>V</sub>	V <sub>CC</sub> = 5 ±0.25 V, V <sub>C</sub> = 1 to 6 V	±10	MHz
Frequency load stability	Δf <sub>L</sub>	V <sub>CC</sub> = 5 V, V <sub>C</sub> = 1 to 6 V, VSWR: 1.5	≤ 60	MHz
Frequency temperature stability	Δf <sub>T</sub>	V <sub>CC</sub> = 5 V, V <sub>C</sub> = 1 to 6 V, -30 to 75°C	±40	MHz
Phase noise	NP	V <sub>CC</sub> = 5 V, V <sub>C</sub> = 1 to 6 V, off-carrier: 10 MHz	-120	dBc/Hz
		V <sub>CC</sub> = 5 V, V <sub>C</sub> = 1 to 6 V, off-carrier: 1 MHz	-110	
		V <sub>CC</sub> = 5 V, V <sub>C</sub> = 1 to 6 V, off-carrier: 10 KHz	-63	
Package dimensions		33.02 (1.3 inches) × 25.4 (1 inch) × 8		mm

### Sample Availability

Samples of the SMO1137V and SMO0705V will be available in March 1998; production quantities will be anticipated in April of 1998.

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