

IS Process Device Feature Cross Section

Description

The high performance IS Switch Process is based on a Pseudomorphic High Electron Mobility Transistor (pHEMT) epitaxial structure. This highly refined material configuration results in superior device consistency and ease of manufacture. The unique electron transport characteristics of our 0.5 μm gate length pHEMT switch process enables realization of control products with high linearity, low insertion loss and high isolation. This device is ideal for demanding low control voltage, low insertion loss, low distortion control applications.

Features

- $R_{ON} = 1.5 \Omega/\text{mm}$; $C_{OFF} = 0.24 \text{ pF}/\text{mm}$
- $F_t = 20 \text{ GHz}$, $V_{DS} = 3 \text{ V}$, $I_D = 1/2 I_{dss}$
- MTTF is $>10^7$ hours @ $T_{ch} = 125^\circ\text{C}$, $T_{ch} = 250^\circ\text{C}$ during life test
- BCB Protection Layer
- Single Pole Double Throw Switch :
 IL = 0.4 dB; Isolation = 20 dB (1 GHz)
 IL = 0.55 dB; Isolation = 15 dB (2 GHz)
 $P_{1dB} = 36 \text{ dBm}$ ($V_{CTRL} = 5 \text{ V}$)
 Harmonics $< -70 \text{ dBc}$ (@ 33 dBm, $V_{CTRL} = 5 \text{ V}$)

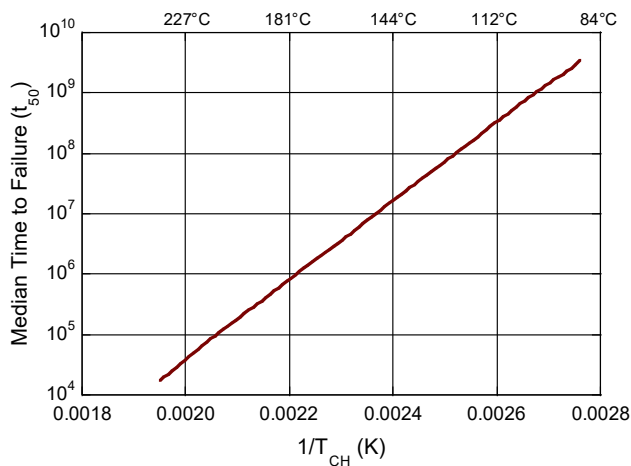
Applications

- Low cost, high power, low control voltage, low insertion loss, high isolation switches for GSM and other handset systems and base-station applications
- Broadband Switches
- Attenuators
- Phase Shifters

Key Process Parameters

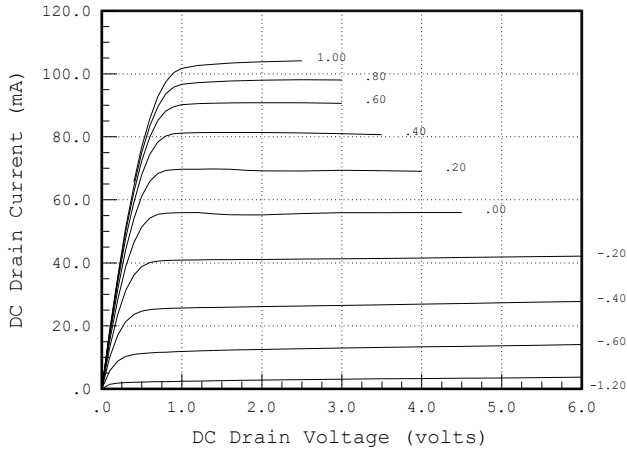
Element	Parameter	Nominal Value	Units
FET	I_{DSS}	250	mA/mm
	I_{MAX}	525	mA/mm
	$G_{\text{M}} (@3\text{V}, 1/2 I_{\text{DSS}})$	280	mS/mm
	BV_{GD}	11	V
	V_{P}	-1	V
MIM Capacitor	Density	400	pF/mm^2
Air-Bridge Crossover	—	Yes	—
NiCr Resistor	Sheet Resistance	50	Ω/sq
Substrate Via	—	30	μm
BCB Protection Layer	—	Yes	—
Substrate	Thickness	4	mil
Pad Size	—	75	μm
Total Mask Number	—	7	—
Metal Number	—	2	—

Arrhenius Plot for IS Process: MTTF vs. Temperature, $T_{\text{ch}} = 250^\circ\text{C}$ @ Life Test

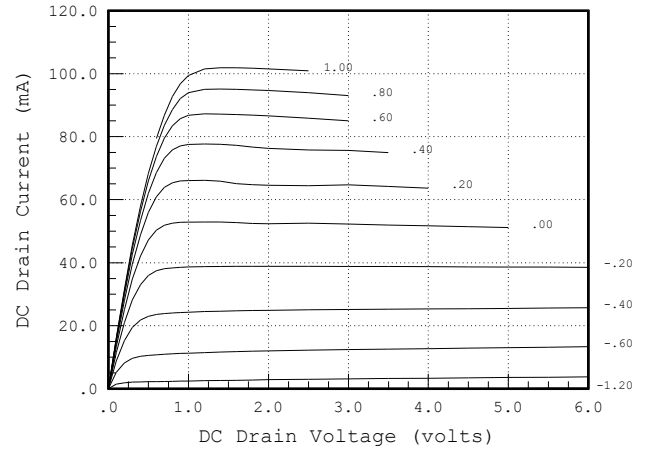


Typical Performance Curves: DC IV 2 x 100 μm FET Characteristics

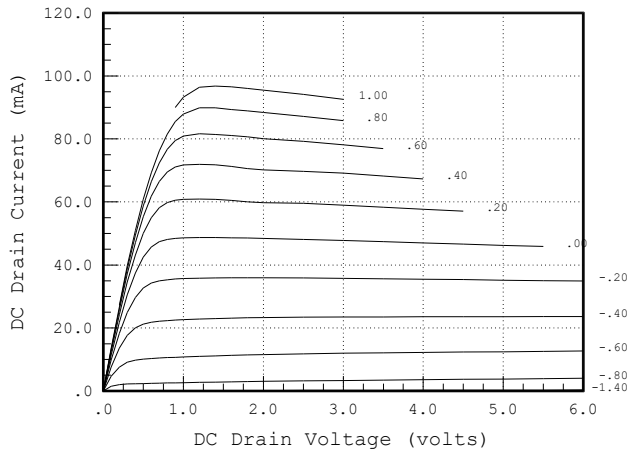
Drain Current vs. Drain Voltage @ -30°C



Drain Current vs. Drain Voltage @ +27°C



Drain Current vs. Drain Voltage @ +85°C



Benefits of Using MACOM as a Foundry Service:

- Over 30 years of GaAs MMIC production experience
- A complete offering of stable and mature GaAs production processes for commercial handset, infrastructure, and military applications
- Superior device performance to meet the most stringent specifications
- World-class testing and modeling capabilities
- Shortest production cycle time in the industry
- Proven manufacturer of microwave components and systems for more than 50 years

MACOM Foundry Services Include:

- Support in:
 - Layout
 - Circuit Design
 - DRC and LVS checking
 - Technical consultation
- Provide design kit including transistor models and passive models to assist design

Upon Request, Services Available to Foundry Customer:

- Extract small signal, noise, and large signal models
- Provide transistor characterization data in:
 - Small signal measurements
 - Load pull measurements
- Perform circuit test at:
 - Wafer level
 - Package level
- Production qualification testing