

# VCR2N, VCR4N, VCR7N, VCR3P



## JFET Voltage Controlled Resistors

The VCR2N, VCR4N, VCR7N, and VCR3P line of JFET voltage controlled resistors utilize the JFET's linear output characteristics in the resistive region. This area of operation is around  $V_{DS} = 0$  V and extends for a range up to several hundred millivolts – up to the point  $I_D$  begins to saturate. Key to device performance is the predictable  $r_{DS}$  change versus  $V_{GS}$  bias where:

$$r_{DS \text{ bias}} \approx \frac{r_{DS} (@ V_{GS} = 0)}{1 - \left| \frac{V_{GS}}{V_{GS(OFF)}} \right|}$$

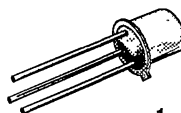
This series features three n-channel devices with  $r_{DS(ON)}$  ranging from 20 – 8000  $\Omega$ . Also featured is a p-channel device with  $r_{DS(ON)}$  specified between 70 and 200  $\Omega$ . All packages are hermetically sealed and may be processed per MIL-S-19500. (See Section 1.)

For additional design information please consult typical performance curves (Section 7) as follows:

VCR2N ..... NCB  
VCR4N ..... NPA  
VCR7N ..... NT  
VCR3P ..... PSCIA

PART NUMBER	$V_{GS(OFF)}$ MAX (V)	$V_{(BR)GSS}$ MIN ( $\Omega$ )	$r_{DS(ON)}$	
			MIN ( $\Omega$ )	MAX ( $\Omega$ )
VCR2N	-3.5	-15	20	60
VCR4N	-7	-15	200	600
VCR7N	-5	-15	4000	8000
VCR3P	5	15	70	200

TO-18

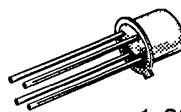


1 SOURCE  
2 DRAIN  
3 GATE

BOTTOM VIEW



TO-72



1 SOURCE  
2 DRAIN  
3 GATE  
4 SUBSTRATE

BOTTOM VIEW



## ABSOLUTE MAXIMUM RATINGS ( $T_A = 25^\circ\text{C}$ unless otherwise noted)

PARAMETERS/TEST CONDITIONS	SYMBOL	LIMIT		UNITS
		VCR2N-7N	VCR3P	
Gate-Drain Voltage	V <sub>GD</sub>	-15	15	V
Gate-Source Voltage	V <sub>GS</sub>	-15	15	
Gate Current	I <sub>G</sub>	10	-10	mA
Power Dissipation (Case 25°C)	P <sub>D</sub>	300		mW
Power Derating		2		mW/°C
Operating Junction Temperature	T <sub>J</sub>	-55 to 175		°C
Storage Temperature	T <sub>stg</sub>	-55 to 175		
Lead Temperature (1/16" from case for 10 seconds)	T <sub>L</sub>	300		

## N-CHANNEL

ELECTRICAL CHARACTERISTICS <sup>1</sup>				LIMITS						
PARAMETER	SYMBOL	TEST CONDITIONS	TYP <sup>2</sup>	VCR2N		VCR4N		VCR7N		UNIT
				MIN	MAX	MIN	MAX	MIN	MAX	
STATIC										
Gate-Source Breakdown Voltage	V <sub>(BR)GSS</sub>	I <sub>G</sub> = -1 μA, V <sub>DS</sub> = 0 V	-55	-15		-15		-15		V
Gate-Source Cutoff Voltage	V <sub>GS(OFF)</sub>	V <sub>DS</sub> = 10 V, I <sub>D</sub> = 1 μA		-1	-3.5	-3.5	-7	-2.5	-5	
Gate Reverse Current	I <sub>GSS</sub>	V <sub>GS</sub> = -15 V, V <sub>DS</sub> = 0 V			-5		-0.2		-0.1	nA
Drain-Source On-Resistance	r <sub>DS(ON)</sub>	V <sub>GS</sub> = 0 V, I <sub>D</sub> = 1 mA		20	60	200	600	4000	8000	Ω
Gate-Source Forward Voltage	V <sub>GS(F)</sub>	I <sub>G</sub> = 1 mA, V <sub>DS</sub> = 0 V	0.7							V
DYNAMIC										
Drain-Source On-Resistance	r <sub>ds(ON)</sub>	V <sub>GS</sub> = 0 V, I <sub>D</sub> = 0 A f = 1 kHz		20	80	200	600	4000	8000	Ω
Drain-Gate Capacitance	C <sub>dg</sub>	V <sub>GD</sub> = -10 V, I <sub>S</sub> = 0 A f = 1 MHz			7.5		3		1.5	pF
Source-Gate Capacitance	C <sub>sg</sub>	V <sub>GS</sub> = -10 V, I <sub>D</sub> = 0 A f = 1 MHz			7.5		3		1.5	

## P-CHANNEL

ELECTRICAL CHARACTERISTICS <sup>1</sup>			LIMITS			
PARAMETER	SYMBOL	TEST CONDITIONS	TYP <sup>2</sup>	VCR3P		UNIT
				MIN	MAX	
STATIC						
Gate-Source Breakdown Voltage	V <sub>(BR)GSS</sub>	I <sub>G</sub> = 1 μA, V <sub>DS</sub> = 0 V	50	15		V
Gate-Source Cutoff Voltage	V <sub>GS(OFF)</sub>	V <sub>DS</sub> = -10 V, I <sub>D</sub> = -1 μA	2.5	1	5	
Gate Reverse Current	I <sub>GSS</sub>	V <sub>GS</sub> = 15 V, V <sub>DS</sub> = 0 V	0.005		20	nA
Drain-Source On-Resistance	r <sub>DS(ON)</sub>	V <sub>GS</sub> = 0 V, I <sub>D</sub> = -1 mA	100	70	200	Ω
Gate-Source Forward Voltage	V <sub>GS(F)</sub>	I <sub>G</sub> = -1 mA, V <sub>DS</sub> = 0 V	-0.7			V
DYNAMIC						
Drain-Source On-Resistance	r <sub>ds(ON)</sub>	V <sub>GS</sub> = 0 V, I <sub>D</sub> = 0 A f = 1 kHz	100	70	200	Ω
Drain-Gate Capacitance	C <sub>dg</sub>	V <sub>GD</sub> = 10 V, I <sub>S</sub> = 0 A f = 1 MHz	6		25	pF
Source-Gate Capacitance	C <sub>sg</sub>	V <sub>GS</sub> = 10 V, I <sub>D</sub> = 0 A f = 1 MHz	6		15	

NOTES: 1.  $T_A = 25^\circ C$  unless otherwise noted.  
2. For design aid only, not subject to production testing.