

DEDICATED INFRARED RECEIVER

FEATURES

- **Highly Integrated Device with No External Components except PIN Diode**
- **High Sensitivity due to Adaptive Gain Control**
- **High Immunity against Interference from Ambient Light**
- **Improved Immunity against 2.4GHz and 5GHz Wi-Fi Noise**
- **Available for Carrier Frequencies of 33kHz, 36kHz, 38kHz, 40kHz, 56kHz**
- **Wide Supply Voltage Range: 2.7V to 5.5V**
- **Compatible with Popular IR Coding Protocol such as: NEC, RC5 and Sony etc.**
- **TTL Compatible**

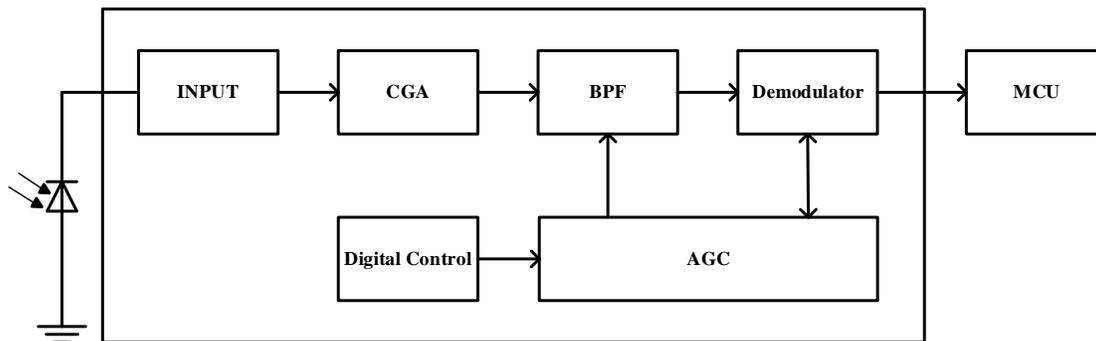
APPLICATIONS

- **Home Entertainment Applications**
- **Remote Control Equipment**
- **Home Appliances**

PRODUCT DESCRIPTION

TS3114 is a complete IR receiver for using in carrier-frequency-modulated transmission applications. The IC combines small size with high sensitivity as well as high suppression of interference from daylight and lamps. TS3114 operates in a supply voltage range of 2.7V to 5.5V, and is available with standard frequencies (33, 36, 38, 40, 56kHz). The function of TS3114 is described using the block diagram of Figure 1. The IC contains input stage IV conversion circuit, variable gain VGA, bandpass filter BPF, integral demodulation circuit and output stage circuit. The input stage has two main functions: first, it provides a suitable bias voltage for the PIN diode; second, the pulsed photo current signals are transformed into a voltage.

The signals have to pass a Controlled Gain Amplifier (CGA), and then pass a bandpass filter (BPF) with a center frequency, which is equal to the carrier frequency. The demodulator converts the input burst signal to a digital envelope output pulse. The output stage provides a certain drive capability. The analog control loop circuit and the Controlled Gain Amplifier can realize that the chip can always keep the most sensitive state in any case, which means the chip always stays above the noise state. Once the signal is sent, it will be immediately received and demodulated.



ORDERING INFORMATION

Product Model	Period	Carrier Frequency	Ecology Plan	Package Type
TS3114-33	Production	33kHz	RoHS	Dice
TS3114-36	Production	36kHz	RoHS	Dice
TS3114-38	Production	38kHz	RoHS	Dice
TS3114-40	Production	40kHz	RoHS	Dice
TS3114-56	Production	56kHz	RoHS	Dice

ABSOLUTE MAXIMUM RATINGS

Over operating free-air temperature range (unless otherwise noted) ⁽¹⁾

Parameter	Minimum	Maximum	Unit
Supply Voltage	-0.3	6	V
Output Voltage	-0.3	V _{DD}	V
Output Current	8		mA
Operating Temperature	-25	85	°C
Storage Temperature	-40	125	°C
ESD HBM		±8000	V

(1) Stresses beyond those listed under “Absolute Maximum Ratings” may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

ESD CAUTION



ESD (electrostatic discharge) sensitive device.
Charged devices and circuit boards can discharge without detection.
Although this product features patented or proprietary protection circuitry, damage may occur on devices subjects to high energy ESD.
Therefore, proper ESD precautions should be taken to avoid performance degradation or loss of functionality.

ELECTRICAL CHARACTERISTICS

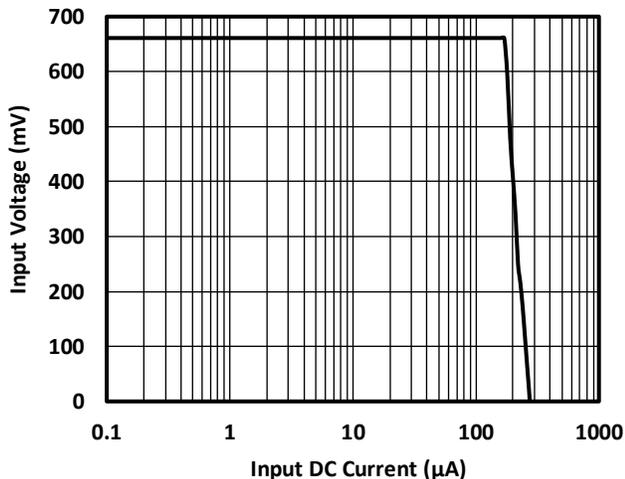
$T_A = -25^{\circ}\text{C}$ to $+85^{\circ}\text{C}$, $V_S = 2.7\text{V}$ to 5.5V (unless otherwise specified)

Parameters		Test Conditions	Min	Typ	Max	Unit
Supply						
V_S	Supply-Voltage Range		2.7	3	5.5	V
I_S	Supply Current	$I_{IN} = 0$		0.41		mA
Output						
R_{PU}	Internal Pull-Up Resistor	$T_A = 25^{\circ}\text{C}$		39		k Ω
V_{OL}	Output Voltage Low	external pull-up resistor is 1.4k Ω			125	mV
V_{OH}	Output Voltage High		$V_S - 0.125$		V_S	V
I_{oCL}	Output Current Clamping			6		mA
Input						
I_{IN_DCMAX}	Input DC Current	$V_{IN} = 0, T_A = 25^{\circ}\text{C}$		270		μA
I_{Eemin}	Minimum Detection Threshold Current	$I_{IN_DC} = 0.1\mu\text{A}, T_A = 25^{\circ}\text{C}, \text{burst } N = 16, f = f_0$		0.42		nA
	Minimum Detection Threshold Current with AC Current Disturbance $I_{IN_AC100} = 1\mu\text{A}$ at 50Hz			0.7		nA
I_{Eemax}	Maximum Detection Threshold Current	$V_{IN} > 0\text{V}, I_{IN_DC} = 1\mu\text{A}, T_A = 25^{\circ}\text{C}, \text{burst } N = 16, f = f_0$		TBD		μA
Controlled Amplifier and Filter						
G_{VARMAX}	Maximum Value of Variable Gain (CGA)	$T_A = 25^{\circ}\text{C}$		70		dB
G_{VARMIN}	Minimum Value of Variable Gain (CGA)	$T_A = 25^{\circ}\text{C}$		-10		dB
G_{MAX}	Total Internal Amplification (VGA + BPF)	$T_A = 25^{\circ}\text{C}$		85		dB
f_{03V_FUSE}	Center Frequency Fusing Accuracy of Bandpass	$T_A = 25^{\circ}\text{C}, 0.5\%$ accuracy	-2.5	f_0	2.5	%
f_{03V}	Overall Accuracy Center Frequency of Bandpass		-4.3	f_0	3.2	%
BW	BPF Bandwidth	-3dB, $f_0 = 38\text{kHz}$		4		kHz

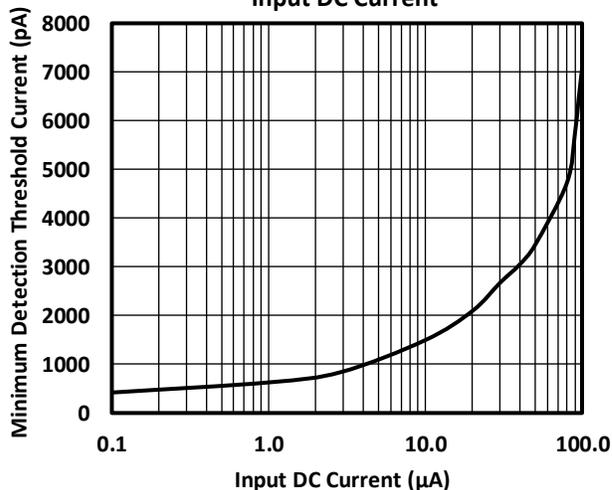
TYPICAL ELECTRICAL CURVES

At $T_A = +25^\circ\text{C}$, $V_{DD} = 3\text{V}$ (unless otherwise noted)

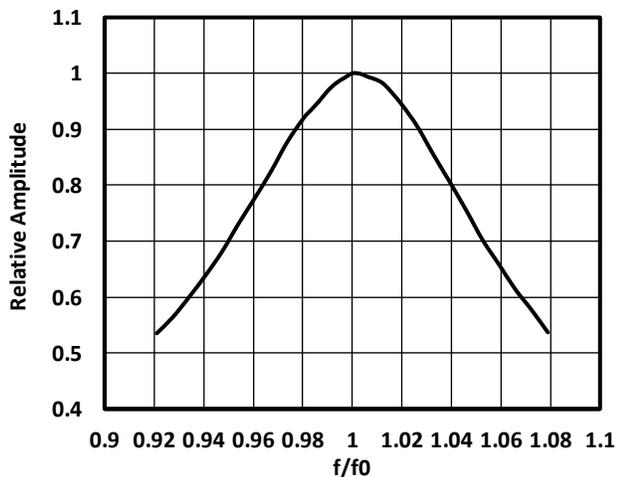
Input Voltage vs Input DC Current



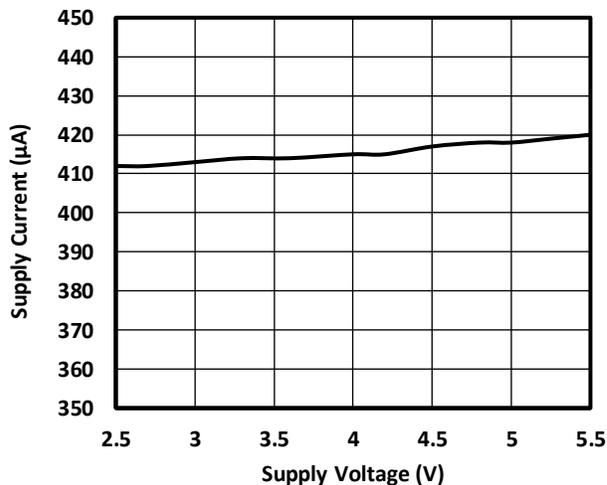
Minimum Detection Threshold Current vs Input DC Current



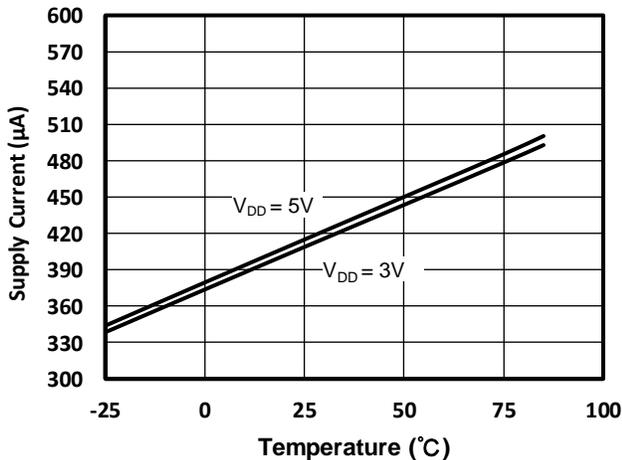
Bandpass



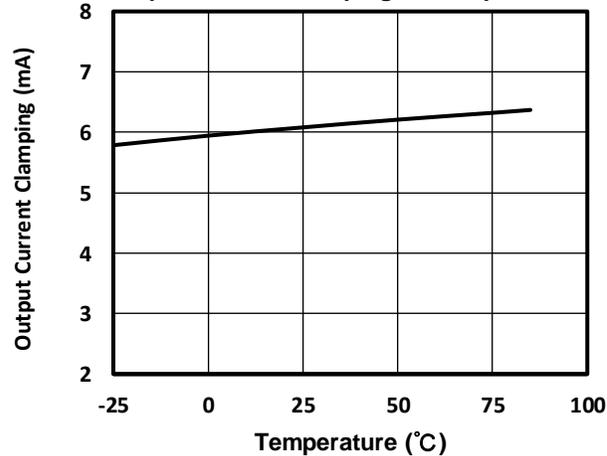
Supply Current vs Supply Voltage



Supply Current vs Temperature

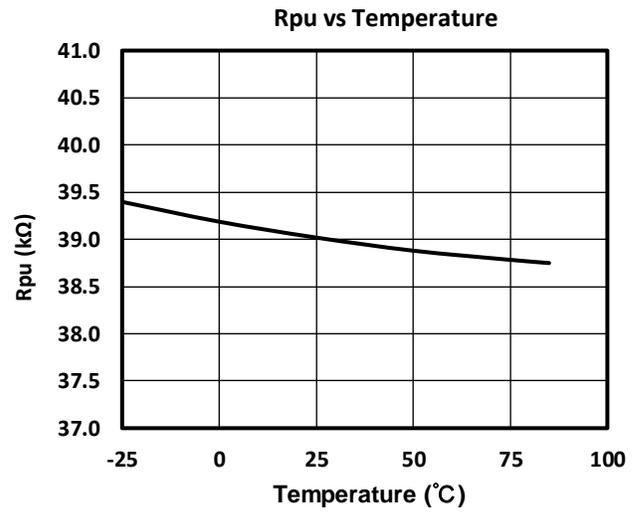
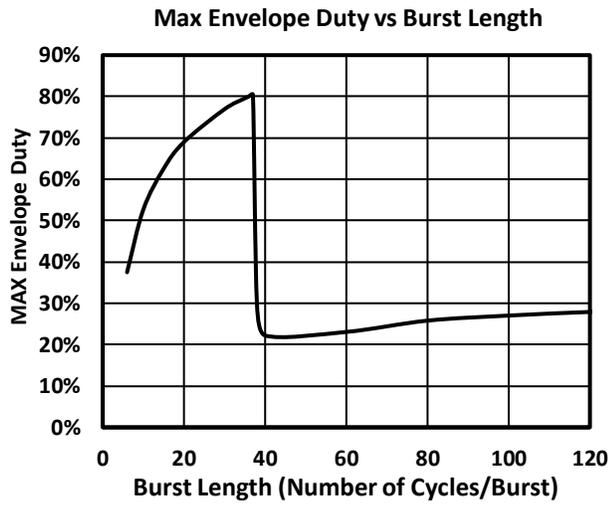


Output Current Clamping vs Temperature

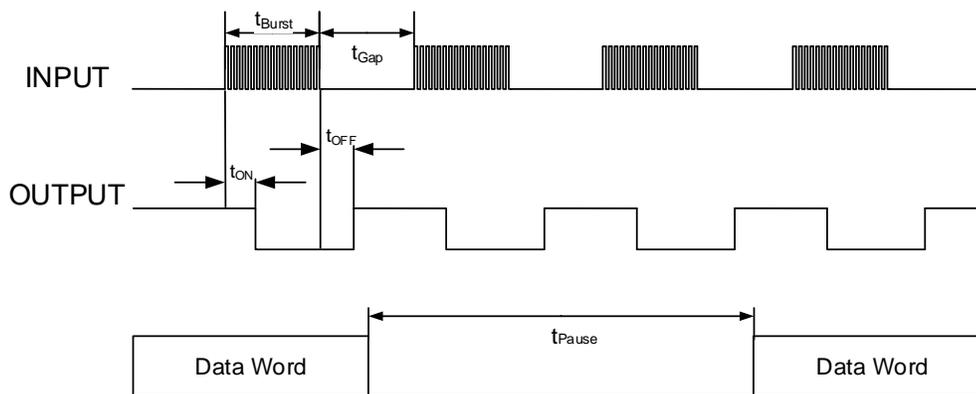


TYPICAL ELECTRICAL CURVES (CONTINUE)

At $T_A = +25^\circ\text{C}$, $V_S = 3\text{V}$ (unless otherwise noted)



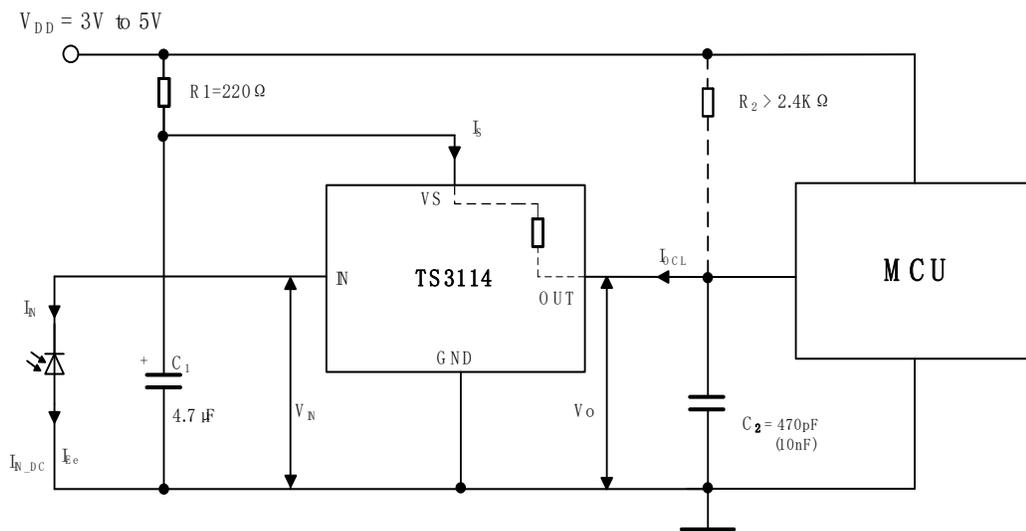
DATA SIGNAL DIAGRAM



DATA SIGNAL LIMITATION

Symbol	Parameter	TS3114
T_{Burst_Min}	Minimum Burst Length	6 cycles/burst
T_{Gap_Min}	For bursts greater than a minimum gap time is required of	6 to 35 cycles ≥ 10 cycles
T_{Burst_Max}	For bursts greater than a minimum gap time is required of	35 cycles $\geq 4 \times$ burst length
T_{Pause_Min}	Suitable minimum data pause time	350 cycles
N_{BPS_Max}	Maximum number of continuous short bursts/second	2000
t_{ON}	Turn-on Propagation Delay	7 to 11 cycles
t_{OFF}	Turn-off Propagation Delay	8 to 13cycles

APPLICATION CIRCUIT



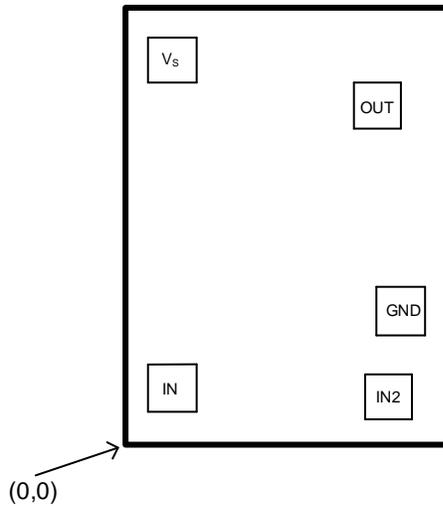
COMPATIBILITY FOR DATA FORMAT

Item	TS3114	TS3115	TS3116	BEST CHOICE
NEC code	Yes	Yes	Yes	TS3114
RC5 code	Yes	Yes	Yes	TS3114
RC6 code	Yes	Yes	Yes	TS3114
RCMM code	Yes	NO	Yes	TS3116
RECS-80 code	Yes	Yes	Yes	TS3116
SONY SIRC12 code	Yes	Yes	Yes	TS3114
Panasonic code	Yes	Yes	Yes	TS3114
Sharp code	Yes	Yes	Yes	TS3114
Nokia NRC17 code	Yes	Yes	Yes	TS3114
JVC code	Yes	Yes	Yes	TS3114
RCA code	Yes	Yes	Yes	TS3114
X-Sat code	Yes	Yes	Yes	TS3114
MIT-C8D8/40K	Yes	Yes	Yes	TS3116
MIT-C8D8/33K	Yes	Yes	Yes	TS3116
KONKA code	Yes	Yes	Yes	TS3114
M3004 Carrier code	Yes	Yes	Yes	TS3116
XMP-1	Yes	Yes	Yes	TS3116
XMP-2	Yes	Yes	Yes	TS3116
UART-1200bps	No	No	Yes	TS3115
Continues Data(less than t_{Burst_max})	No	No	No	

DIE INFORMATION

- 1) Logo: IC2031
- 2) Die Size: 550um x 768um (not including trimming pad)
- 3) hip Size: 630um x 848um (including scribe line)
- 4) Scribe Line: 80um
- 5) Pad Opening Size: 80um x 80um (bond pad), 50um x 50um (test pad)
- 6) Pad Location:

PAD NAME	x	y
IN	90.580	104.285
GND	483.145	241.615
IN2	463.280	90.580
OUT	442.390	598.710
V _{DD}	90.580	675.550



Note: The pad coordinates are given for the center of the pad, values in μm from the origin (0,0)

REVISION HISTORY

NOTE: Page numbers for previous revisions may be different from that of the current version.

2020/7/10 — REV KY1.0.1A to REV KY1.0.2A

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2020/7/29 — REV KY1.0.2A to REV KY1.1.2A

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2020/10/23 — REV KY1.1.2A to REV KY1.1.3A

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2020/11/2 — REV KY1.1.3A to REV KY1.1.4A

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2021/5/26 — REV KY1.1.4A to REV KY1.2.4A

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2021/6/8 — REV KY1.2.4A to REV KY1.3.4A

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CONTACT INFORMATION

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