# SCRAMBLER IC WITH COMPANDOR



## FEATURES

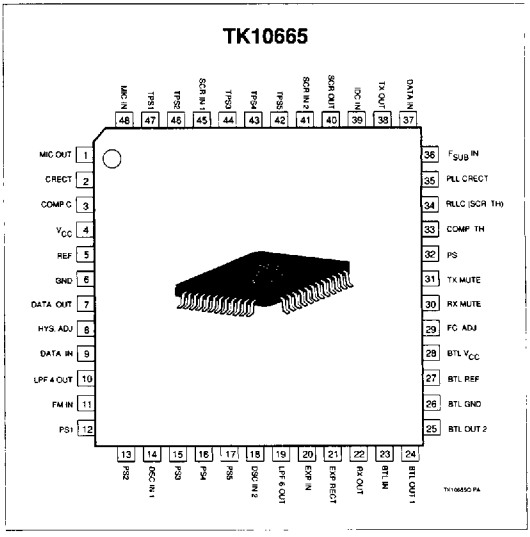
- **Low Supply Current**
- **Low Operating Voltage (1.9 V)**
- **Complete Noise Reduction System**
- **Complete Scrambler/Descrambler**
- **IDC Circuit for Modulation Control**

## APPLICATIONS

- **Amateur Radio**
- **Transceiver**
- **Cordless Telephone**

## DESCRIPTION

The TK10665 is a compandor and voice scrambler system for cordless telephones and other communications equipment. It is designed for battery operated systems and can operate from 1.8 to 5.5 V. In addition, it contains an Instantaneous Deviation Control (IDC) circuit for modulation control, separate data inputs and outputs. A microphone preamplifier is also provided. The TK10665Q is available in QFP48 surface mount package.



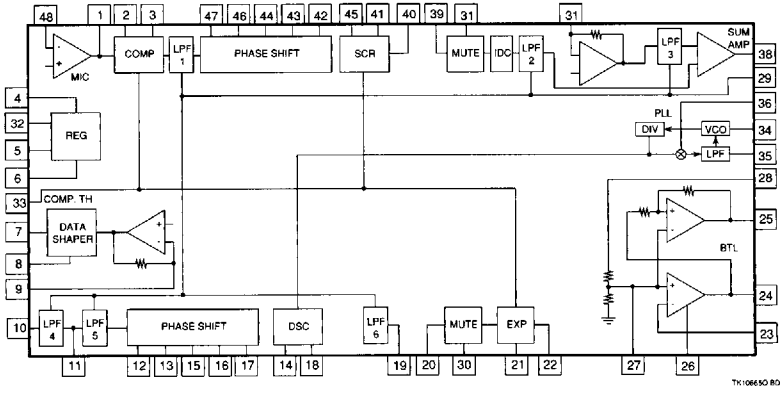

## ORDERING INFORMATION

**TK10665** □ □ □□

- Tape/Reel Code
- Temp. Range
- Package Code

| PACKAGE CODE | TEMP. RANGE | TAPE/REEL CODE |
|---|---|---|
| Q: Surface Mount | C : -10 to +75 °C | BX: Bulk/Bag<br>TX: Paper Tape<br>TR: Tape Right<br>TL: Tape Left<br>MG: Magazine |

## BLOCK DIAGRAM



## ABSOLUTE MAXIMUM RATINGS

Input Voltage $V_{CCMAX}$ ..... 6.0 V
Operating Voltage Range ..... 1.9 to 5.5 V
Maximum Input Frequency ..... 80 kHz
Power Dissipation (Note 1) ..... 300 mW

Junction Temperature ..... 150 °C
Storage Temperature Range ..... -55 to +150 °C
Operating Temperature Range ..... -10 to +75 °C
Lead Soldering Temp. (10 sec.) ..... 300 °C

## ELECTRICAL CHARACTERISTICS

Test conditions: $V_{CC}$ = 2.3 V, $P_{VCC}$ = 2.6 V, $T_A$ = 25 °C, f = 1 kHz, Sub = 3.25 kHz, 0.4 Vp-p

| SYMBOL | PARAMETER | TEST CONDITIONS | MIN | TYP | MAX | UNITS |
|---|---|---|---|---|---|---|
| $I_{CC}$ | Supply Current 1 | | | 11.0 | | mA |
| $I_{CCP}$ | Supply Current 2 | | | 0.7 | | mA |
| $I_{CCS}$ | Standby Supply Current 1 | Data System Operation | | 2.0 | | mA |
| $I_{CCPS}$ | Standby Supply Current 2 | | | 48 | | µA |
| **Compressor** | | 48→43 Pin, MICAMP = 0 dB | | | | |
| $V_{ORC}$ | Output Reference Voltage | $V_{IN}$ = 100 mV (0 dB) | | 63 | | mV |
| $THD_C$ | Total Harmonic Distortion | $V_{IN}$ = 100 mV | | 0.45 | | % |
| $\Delta G_{C1}$ | Gain Error 1 | $V_{IN}$ = -20 dB | | 0 | | dB |
| $\Delta G_{C2}$ | Gain Error 2 | $V_{IN}$ = -40 dB | | 0 | | dB |
| $\Delta G_{TC}$ | Through On/Off Difference | $V_{IN}$ = 100 mV | | -1 | | dB |
| **IDC** | | 39→38 Pin | | | | |
| $V_{OIDC}$ | Output Voltage | $V_{IN}$ = 50 mV | | 195 | | mV |
| $THD_{IDC}$ | Total Harmonic Distortion | $V_{IN}$ = 50 mV | | 0.6 | | % |
| $V_{LIM}$ | Limiting Voltage | | | 1.4 | | Vp-p |
| **DATA AMP** | | 37→38 Pin | | | | |
| $V_{ODATA}$ | Output Voltage | $V_{IN}$ = 50 mV | | 350 | | mV |
| $THD_{DATA}$ | Total Harmonic Distortion | $V_{IN}$ = 50 mV | | 0.5 | | % |
| **Transmitting System Characteristics** | | 48→38 Pin | | | | |
| $V_{OTX}$ | Output Voltage | $V_{IN}$ = 50 mV | | 200 | | mV |
| THDTX | Total Harmonic Distortion | $V_{IN}$ = 50 mV, ($F_{IN}$ = 2.25 kHz) | | 1.0 | | % |

Note 1: Power dissipation must be derated at the rate of 2.4 mW/°C for operation at $T_A$ = 25 °C and above.

## ELECTRICAL CHARACTERISTICS (CONT.)

Test conditions: $V_{CC}$ = 2.3 V, $P_{VCC}$ = 2.6 V, $T_A$ = 25 °C, f = 1 kHz, Sub = 3.25 kHz, 0.4 Vp-p

| SYMBOL | PARAMETER | TEST CONDITIONS | MIN | TYP | MAX | UNITS |
|---|---|---|---|---|---|---|
| $ATT_{TX}$ | Mute S/N Ratio | | | -45 | | dB |
| $Crss_{TX}$ | Crosstalk | $R_X \rightarrow T_X$ | | -37 | | dB |
| $V_{NTX}$ | Output Noise Voltage | | | 2.5 | | mV |
| **Desk Ramble** | | 11→19 Pin | | | | |
| $V_{ODSC}$ | Output Voltage | $V_{IN}$ = 100 mV | | 41 | | mV |
| $THD_{DSC}$ | Total Harmonic Distortion | $V_{IN}$ = 100 mV, ($F_{IN}$ = 2.25 kHz) | | 0.65 | | % |
| **LPF4** | | 11→10 Pin | | | | |
| $V_{OLP4}$ | Output Voltage | $V_{IN}$ = 100 mV | | 70 | | mV |
| $THD_{LP4}$ | Total Harmonic Distortion | $V_{IN}$ = 100 mV | | 0.6 | | % |
| **Schmitt** | | 9→7 Pin | | | | |
| $V_{INST}$ | Input Sensitivity | Duty = 50 ± 5%, $R_{HYS}$ = 51 kΩ | 2.5 | | | mV |
| **Expander** | | 20→22 Pin | | | | |
| $V_{ORE}$ | Output Reference Voltage | $V_{IN}$ = 50 mV, (0 dB) | | 290 | | mV |
| $THD_E$ | Total Harmonic Distortion | $V_{IN}$ = 50 mV | | 0.22 | | % |
| $\Delta G_{E1}$ | Gain Error 1 | $V_{IN}$ = -10 mV | | 0 | | dB |
| $\Delta G_{E2}$ | Gain Error 2 | $V_{IN}$ = -20 mV | | 0 | | dB |
| $\Delta G_{TE}$ | Through On/Off Difference | $V_{IN}$ = 50 mV | | -8 | | dB |
| $ATT_E$ | Mute S/N Ratio | $V_{IN}$ = 50 mV | | -84 | | dB |
| **Receiving System Characteristics** | | 11→22 Pin | | | | |
| $V_{ORX}$ | Output Voltage | $V_{IN}$ = 100 mV | | 240 | | mV |
| $THD_{RX}$ | Total Harmonic Distortion | $V_{IN}$ = 100 mV, ($F_{IN}$ = 2.25 kHz) | | 0.66 | | % |
| $Crss_{RX}$ | Crosstalk | $T_X \rightarrow R_X$ | | -83 | | dB |
| $V_{NRX}$ | Output Noise Voltage | | | 16 | | µV |

## ELECTRICAL CHARACTERISTICS (CONT.)

Test conditions: $V_{CC}$ = 2.3 V, $P_{VCC}$ = 2.6 V, $T_A$ = 25 °C, f = 1 kHz, Sub = 3.25 kHz, 0.4 Vp-p

| SYMBOL | PARAMETER | TEST CONDITIONS | MIN | TYP | MAX | UNITS |
|---|---|---|---|---|---|---|
| **BTL AMP** | | 23→24/25 Pin | | | | |
| $V_{CBTL}$ | Voltage Gain | $R_L$ = 2 k | | 5.0 | | dB |
| $THD_B$ | Total Harmonic Distortion | $V_{IN}$ = 200 mV | | 0.15 | | % |
| $V_{OMB}$ | Maximum Output Voltage | THD = 5% | 1.4 | | | V |
| **Filter Characteristics** | | | | | | |
| $F_{CHE4}$ | LPF1 | Chebyshev Type 4<br>fc = 3 kHz | | -3 | | dB |
| $F_{CHE6}$ | LPF2 | Chebyshev Type 6<br>fc = 3 kHz | | -3 | | dB |
| $F_{BES3A}$ | LPF3 | Bessel Type 3<br>fc = 5 kHz | | -3 | | dB |
| $F_{BES3B}$ | LPF4 | Bessel Type 3<br>fc = 5 kHz | | -3 | | dB |
| $F_{CHE3}$ | LPF5 | Chebyshev Type 3<br>fc = 3 kHz | | -3 | | dB |
| $F_{CHE5}$ | LPF6 | Chebyshev Type 5<br>fc = 3 kHz | | -3 | | dB |
| **DC Characteristics** | | | | | | |
| SW Low | Individual SW Low Level | | | 0 | 0.4 | V |
| SW High | Individual SW High Level | | | 1.4 | $V_{CC}$ | V |

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## TEST CIRCUIT