OKI Semiconductor

This version: Jan. 1998
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MSM7557

Single Chip MSK Modem with Compandor for Cordless Telephone

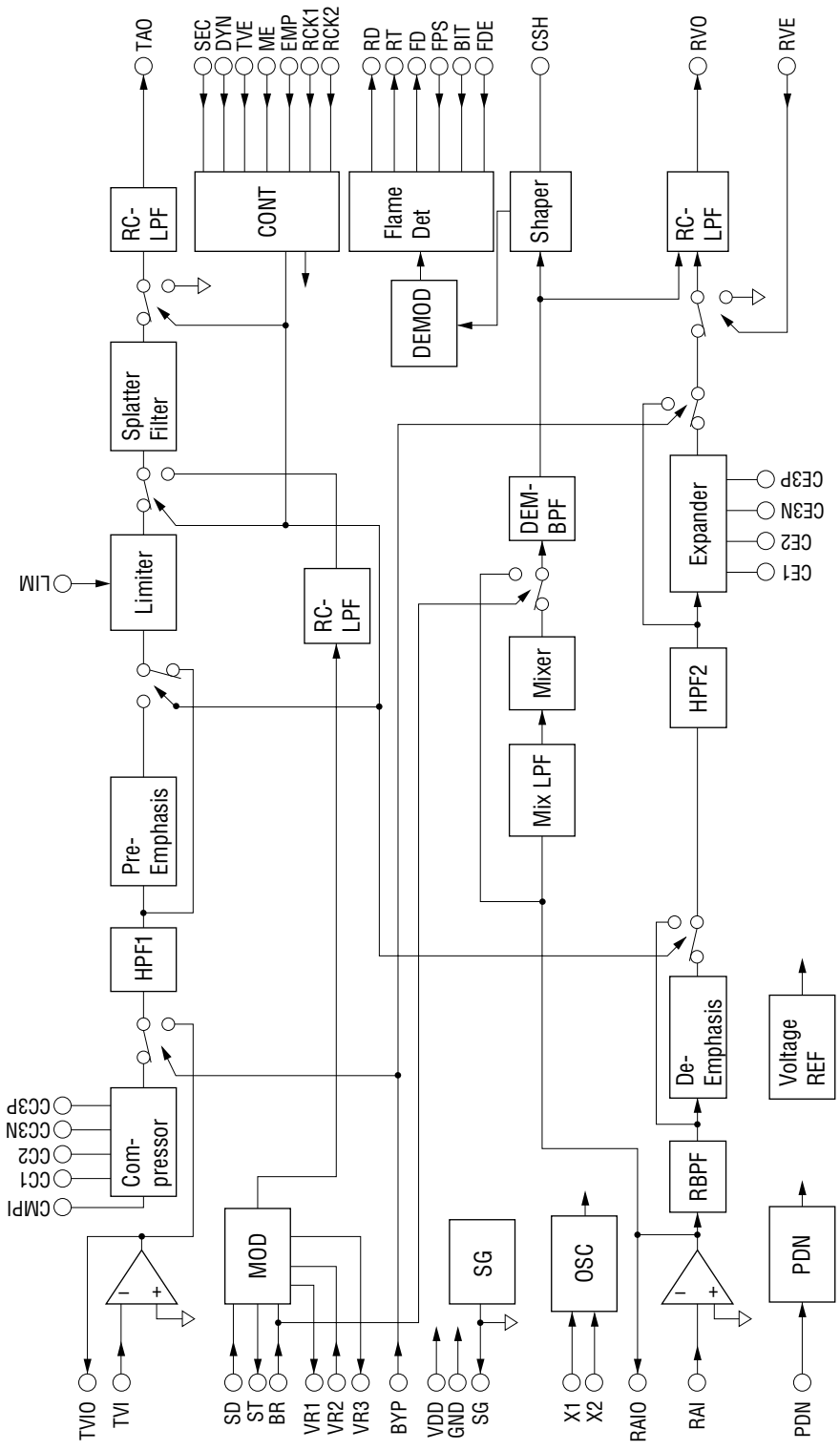
GENERAL DESCRIPTION

The MSM7557 is a single chip MSK modem with base band voice processor for cordless telephone. The MSM7557 voice transmit block consists of high pass filter, compressor, pre-emphasis, limiter and splatter filter.
Voice receive block consists of Band pass filter, De-emphasis and Expander.

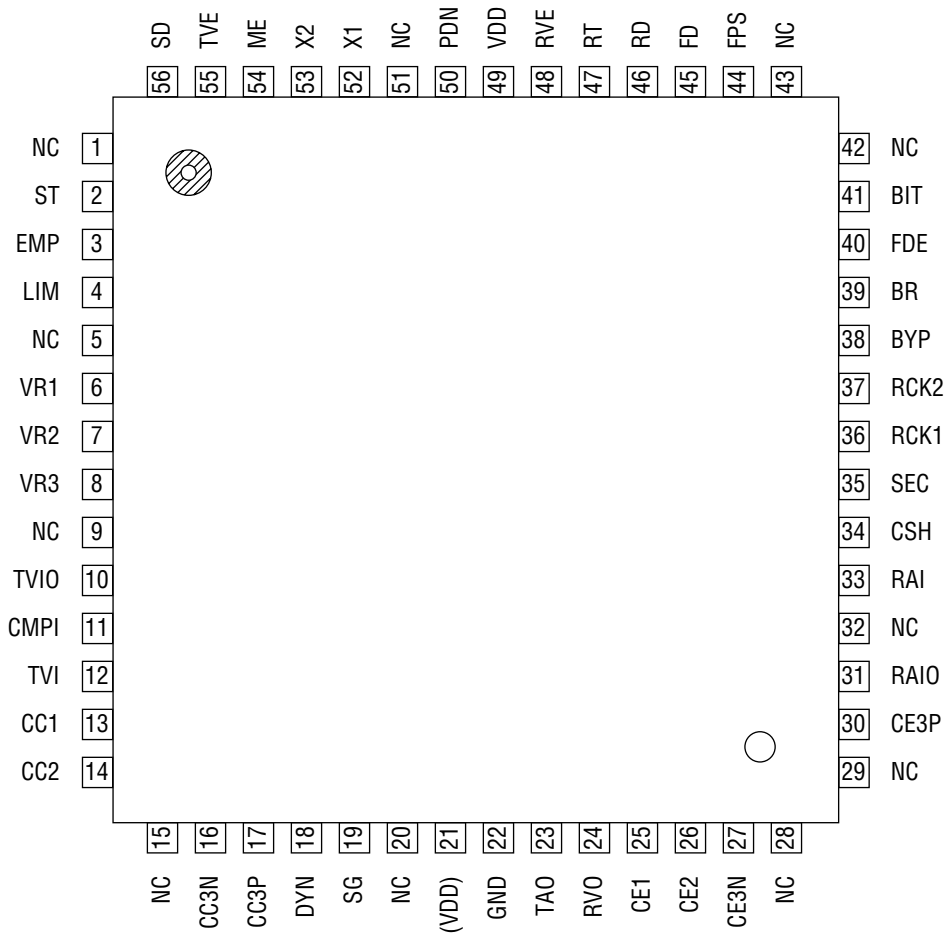
FEATURES

- Available to transmit modem signal and also transmit base band voice signal through wireless transmission path (0.3 kHz to 3.4 kHz)
- Built-in compandor circuit
- Upper limit of voice band (3306 Hz/3400 Hz/3500 Hz) is selectable
- Modem bit rate (2400/1200 bps) is selectable
- Transmit function and receive function operate separately
- Emphasis mode selectable
- Built-in bit synchronous detector and frame synchronous detector
- Built-in limiter level generator and external limit voltage input
- Dynamic range selectable
- Built-in crystal oscillator circuit
- Wide range power supply voltage (2.7V ~ 5.5V)
- Package :
  56-pin plastic QFP (QFP56-P-910-0.65-2K) (Product name : MSM7557GS-2K)

BLOCK DIAGRAM

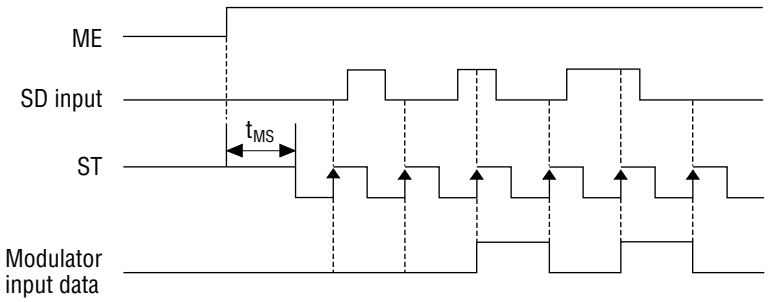


PIN CONFIGURATION (TOP VIEW)



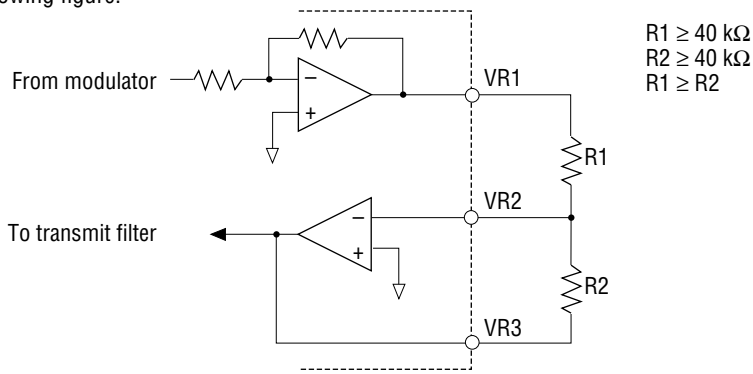
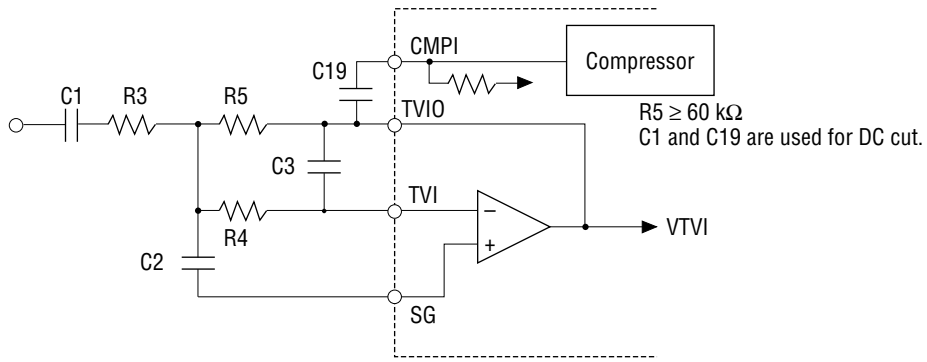
Notes: The pin 49 should be used for V_{DD}.
The pin 21 should be connected to V_{DD} or opened.
NC : No connect pin

PIN DESCRIPTION

<table>
<tr><th>Name</th><th>Description</th></tr>
<tr><td>SD</td><td>Transmit data input.
The data on SD pin are took into MSK modulator and the data are available on the positive edge of ST.
 

In order to synchronize a receive modem, more than 18bits bit-synchronous signal should be transmitted before data transmission. If S/N ratio of the receive signal is always good, more than 11bits bit-synchronous signal synchronizes the receiver.</td></tr>
<tr><td>ST</td><td>Transmit data timing clock output.
When digital "0" is put on ME pin, ST is fixed to digital "1" level.</td></tr>
<tr><td>EMP</td><td>Emphasis path selection.
<table>
<tr><th>EMP</th><th>Transmit side</th><th>Receive side</th></tr>
<tr><td>0</td><td>Pre-emphasis circuit is bypassed to the path</td><td>De-emphasis circuit is bypassed to the path</td></tr>
<tr><td>1</td><td>Pre-emphasis circuit is connected to the path</td><td>De-emphasis circuit is connected to the path</td></tr>
</table></td></tr>
<tr><td>LIM</td><td>Deviation limiter control.
Voice signal maximum Rf modulation level is controlled by connecting external reference voltage to this pin.
Input impedance of this pin is about 200 kΩ.
When this pin is left open, internal reference voltage is used as the clamp level.
Internal clamp level is as follows.
<table>
<tr><th>DYN</th><th>Internal clamp level</th><th>Limiter level</th></tr>
<tr><td>0</td><td>0.50 V</td><td>–9 dBV</td></tr>
<tr><td>1</td><td>1.26 V</td><td>–1 dBV</td></tr>
</table>
This internal clamp level is made by internal reference voltage which is unrelated with V_{DD}.
Negative clamp level is made by internal operational amplifier and the voltage is reversed at VSG.</td></tr>
</table>

(Continued)

Name	Description
VR1 VR2 VR3	Modulator output level control. Refer to the following figure.  V_{TAO} = 20 × log (R2/R1) – 9 dBV (DYN = "0") V_{TAO} = 20 × log (R2/R1) – 1 dBV (DYN = "1") This level is made from internal voltage reference, so this level doesn't depend on power supply voltage.
TVIO TVI	Transmit side RC active filter input (TVI) and output (TVIO). If over 50 kHz frequency element is in the input signal, folding noise is generated from internal SCF circuit, so second order RC-active filter is needed. (fc = 10 kHz)  Example of fc = 10 kHz and 0 dB gain R3 = R4 = R5 = 68 kΩ C1 = 0.22 µF, C2 = 510 pF, C3 = 110 pF When digital "1" is applied to TVE pin, transmit voice signal comes out to TAO.
CC1 CC2	Capacitor connection pins to remove for DC offset of the compressor. A 1 µF capacitor between SG pin and each pin should be connected.
CC3N CC3P	Capacitor connection pins for the compressor attack and recovery time. When DYN is digital "0" level, a 0.22 µF capacitor should be connected between CC3N and CC3P. And when DYN is digital "1" level, a 0.47 µF capacitor should be connected between them.

(Continued)

<table>
<tr><th>Name</th><th>Description</th></tr>
<tr><td>CMPI</td><td>Compressor circuit input.
A 0.47 μF capacitor should be connected between CMPI and TVIO.</td></tr>
<tr><td>DYN</td><td>Dynamic range control input.
For an application of which V_{DD} is always higher than 4.5 V (Base station), by setting DYN = "1", modem transmit carrier level, typical input signal level, limiter clamp level and compandor standard input level are up about 8dB to improve S/N ratio.
For an application of which V_{DD} is lower than 4.5 V (Hand-set) DYN shall be digital "0".
To make easier interface with the RF part, one solution is to put digital "0" on DYN pin for both Base station and Handset.</td></tr>
<tr><td>SG</td><td>Built-in analog signal ground. The DC voltage is half of V_{DD}.
To make this voltage source impedance lower and to ensure the device performance, it is necessary to put a bypass capacitor of more than 1μF between SG and V_{DD} in close physical proximity to the device.</td></tr>
<tr><td>GND</td><td>Ground pin, (0V).</td></tr>
<tr><td>TAO</td><td>Transmit analog signal output.
According to control data on ME and TVE, TAO is set as follows.
<table>
<tr><th>ME</th><th>TVE</th><th>TAO</th></tr>
<tr><td>0</td><td>0</td><td>No signal output (potential = SG)</td></tr>
<tr><td>0</td><td>1</td><td>Voice signal output</td></tr>
<tr><td>1</td><td>X</td><td>MSK modulator output</td></tr>
</table>
X : Don't care</td></tr>
<tr><td>RVO</td><td>Receive voice signal output.
RVO pin state is defined by RVE control.
<table>
<tr><th>RVE</th><th>RVO</th></tr>
<tr><td>0</td><td>Output disable (potential = SG)</td></tr>
<tr><td>1</td><td>Output enable</td></tr>
</table></td></tr>
<tr><td>CE1
CE2</td><td>Capacitor connection pins to remove DC offset of the expander.
A 1 μF capacitor between SG pin and each pin should be connected.</td></tr>
<tr><td>CE3N
CE3P</td><td>Capacitor connection pins for the expander attack time and recovery time.
When DYN is digital "0" level, a 0.22 μF capacitor should be connected between CE3N and CE3P.
And when DYN is digital "1" level, a 0.47 μF capacitor should be connected between them.</td></tr>
<tr><td>RAIO
RAI</td><td>Receive side amplifier input (RAI) and output (RAIO).
Second order RC-active filter is needed like TVIO and TVI.
Refer to TVIO and TVI pin description.</td></tr>
<tr><td>CSH</td><td>Capacitor connection pin to remove DC offset of the modem shaper circuit.
A 1 μF capacitor should be connected between GND pin and CSH.</td></tr>
</table>

(Continued)

<table>
<tr><th>Name</th><th>Function</th></tr>
<tr><td>SEC</td><td>Device test input.
SEC shall be connected to GND.</td></tr>
<tr><td>RCK1
RCK2</td><td>Voice band select.
<table>
<tr><th>RCK1</th><th>RCK2</th><th>Upper Limit of Voice Band</th></tr>
<tr><td>0</td><td>1</td><td>3306 Hz</td></tr>
<tr><td>X</td><td>0</td><td>3400 Hz</td></tr>
<tr><td>1</td><td>1</td><td>3500 Hz</td></tr>
</table></td></tr>
<tr><td>BYP</td><td>Compandor path selection.
<table>
<tr><th>BYP</th><th>Transmit side</th><th>Receive side</th></tr>
<tr><td>0</td><td>Compressor is connected to the path.</td><td>Expander is connected to the path.</td></tr>
<tr><td>1</td><td>Compressor is bypassed to the path.</td><td>Expander is bypassed to the path.</td></tr>
</table></td></tr>
<tr><td>BR</td><td>Modem data signaling rate select pin.
<table>
<tr><th>BR</th><th>Date signaling rate</th></tr>
<tr><td>0</td><td>1200 bps</td></tr>
<tr><td>1</td><td>2400 bps</td></tr>
</table></td></tr>
</table>

(Continued)

<table>
<tr><th>Name</th><th>Function</th></tr>
<tr><td>FDE</td><td>Frame synchronous signal detector control.
When digital "0" is applied to this pin, FD pin is fixed to "0" level. RT and RD always work.
When digital "1" is applied to this pin, frame synchronous detector works, and RT and RD pins are fixed to "1" level untill synchronous signal detector detects frame synchronous signal and FD becomes "1" level.
Refer to Fig.3 (receive signal timing).</td></tr>
<tr><td>BIT</td><td>Bit synchronous signal detector control.
When BIT and FDE pins are digital "1" level and when bit synchronous signal and frame synchronous signal are detected continously, FD becomes digital "1".
When BIT pin is digital "0" level and FDE pin is digital "1" level and when 16-bit frame synchronous signal is detected, FD pin becomes digital "1" level.
Refer to FPS pin detection.</td></tr>
<tr><td>FPS</td><td>Frame synchronous pattern control.
<table>
<tr><th>BIT</th><th>FPS</th><th>Detect pattern</th><th>Receiver</th></tr>
<tr><td>0</td><td>0</td><td>1001 0011 0011 0110 (=9336H)</td><td>Handset side</td></tr>
<tr><td>0</td><td>1</td><td>1100 0100 1101 0110 (=C4D6H)</td><td>Base station</td></tr>
<tr><td>1</td><td>0</td><td>1010 1001 0011 0011 0110 (=A9336H)</td><td>Handset side</td></tr>
<tr><td>1</td><td>1</td><td>1010 1100 0100 1101 0110 (=AC4D6H)</td><td>Base station</td></tr>
</table>
(Note : This pattern is for Japanese Cordless Telephone.)</td></tr>
<tr><td>FD</td><td>Frame synchronous detector output.
When receive data correspond to detection pattern, FD pin is held to digital "1" level.
When FDE is applied to digital "0" level, FD pin is reset to digital "0" level.
And at the full power down state (PDN = "1", RVE = "0"), FD pin is reset to digital "0" level.</td></tr>
<tr><td>RD</td><td>Demodulator serial data output.
The data are synchronized with the re-generated timing clock of RT.
When FDE is digital "1" level and also FD is digital "0" level, RD is fixed to digital "1" level.</td></tr>
<tr><td>RT</td><td>Receive data timing clock output.
This signal is re-generated by internal digital PLL. The falling edge of this clock output is coincident with the transitions of RD.
The rising edge of RT can be used to latch the valid receive data.
When FDE pin is applied to digital "1" level and also FD pin output digital "0" level, RT pin is fixed to digital "1" level. Refer to Fig.3.</td></tr>
<tr><td>RVE</td><td>Receive voice signal control.
Refer to RVO pin description.</td></tr>
<tr><td>V_{DD}</td><td>Power supply.
This device is sensitive to power supply noises as switched capacitor tequniques are utilized.
A bypass capacitor of more than 10 μF between V_{DD} and GND pin should be connected to ensure the performance.</td></tr>
</table>

(Continued)

<table>
<tr><th>Name</th><th>Function</th></tr>
<tr><td>PDN</td><td>Power down control.
Power down state is controlled by PDN, ME, RVE, and TVE.
<table>
<tr><th></th><th>PDN</th><th>ME</th><th>RVE</th><th>TVE</th><th>Voice control path</th><th>Transmit side modem</th><th>Receive side modem</th></tr>
<tr><td>Mode1</td><td>1</td><td>X</td><td>0</td><td>X</td><td>OFF</td><td>OFF</td><td>OFF</td></tr>
<tr><td>Mode2</td><td>1</td><td>X</td><td>1</td><td>X</td><td>OFF</td><td>OFF</td><td>ON</td></tr>
<tr><td>Mode3</td><td>0</td><td>1</td><td>0</td><td>0</td><td>OFF</td><td>ON</td><td>ON</td></tr>
<tr><td>Mode4</td><td colspan="4">others</td><td>ON</td><td>ON</td><td>ON</td></tr>
</table>
X : Don't care
At the mode 4, all functions are powered on.
At the full power down mode(PDN = "1" and RVE = "0"), the demodulator circuit and FD pin are reset.
When V_{DD} is turned ON, the demodulator circuit and FD pin should be reset by setting Mode1.</td></tr>
<tr><td>X1
X2</td><td>Crystal connection.
3.6864 MHz crystal shall be connected.
When an external master clock is applied, the clock should be supplied to X2 pin via a 200 pF capacitor for AC coupling and X1 should be opened.</td></tr>
<tr><td>ME</td><td>MSK moudulator output.
When digital "1" is applied to this pin, MSK modulator is connected to the splatter filter.
Refer to TAO pin description.</td></tr>
<tr><td>TVE</td><td>Transmit side voice signal contorol.
Refer to TAO pin description.</td></tr>
</table>

ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Condition	Rating	Unit
Power Supply Voltage	V_{DD}	Ta = 25°C Refer to GND	–0.3 to +7.0	V
Analog Input Voltage *1	V_{IA}		–0.3 to V_{DD} + 0.3	
Digital Input Voltage *2	V_{ID}			
Storage Temperature	T_{STG}	—	–55 to +150	°C

*1 : LIM, VR2, TVI, RAI, CMPI
*2 : SD, EMP, DYN, SEC, RCK1, RCK2, BYP, BR, FDE, BIT, FPS, RVE, PDN, X2, ME, TVE

RECOMMENDED OPERATING CONDITIONS

Parameter	Symbol	Condition		Min.	Typ.	Max.	Unit
Power Supply Voltage	V_{DD}	from GND level	DYN = "0"	2.7	3.6	5.5	V
			DYN= "1"	4.5	5.0	5.5	
Operating Temperature	T_{op}	V_{DD} = 2.7 V to 5.5 V		–30	+25	+70	°C
Crystal Oscillating Freq.	$f_{X'TAL}$	—		3.6860	3.6864	3.6868	MHz
Data Signaling Rate	T_S	BR = 0"		—	1200	—	bit/sec
		BR = "1"		—	2400	—	
C4, C5, C11, C12, C15	—	—		—	1.0	—	μF
C6, C13	—	DYN = "0"		—	0.22	—	
	—	DYN = "1"		—	0.47	—	
C7, C8	—	—		—	1.0	—	
C9, C10	—	RL ≥ 40kΩ		—	0.22	—	
C14	—	—		—	10	—	
C19	—	—		—	0.47	—	
C20, C21	—	—		—	20	—	pF

ELECTRICAL CHARACTERISTICS

DC Characteristics

(DYN = "0" : V_{DD} = 2.7 V to 5.5 V, Ta = –30°C to 70°C
DYN = "1" : V_{DD} = 4.5 V to 5.5 V, Ta = –30°C to 70°C)

Parameter	Symbol	Condition		Min.	Typ.	Max.	Unit
Power Supply Current *1	I_{DD}	Normal mode (mode 4)	3.6 V	—	9.0	18	mA
			5.5 V	—	14.0	24	
	I_{DDS1}	Power down mode 1	5.5 V	—	1.0	20	µA
	I_{DDS2}	Power down mode 2	3.6 V	—	3.8	7.0	mA
	I_{DDS3}	Power down mode 3		—	4.6	9.0	
Input Leakage Current *2	I_{IL}	V_{IN} = 0 V		–10	—	+10	µA
	I_{IH}	V_{IN} = V_{DD}					
Input Voltege *2	I_{IL}	—		0	—	$0.2V_{DD}$	V
	I_{IH}			$0.7V_{DD}$	—	V_{DD}	
Output Voltege *3	V_{OL}	I_{OL} = –20 µA		0	—	$0.1V_{DD}$	
	V_{OH}	I_{OH}= 20 µA		$0.8V_{DD}$	—	V_{DD}	

*1 Refer to PDN pin description
*2 SD, EMP, DYN, SEC, RCK1, RCK2, BYP, BR, FDE, BIT, FPS, RVE, PDN, ME, TVE
*3 ST, FD, RD, RT

AC Characteristics

(DYN = "0" : V_{DD} = 2.7 V to 5.5 V, Ta = –30°C to 70°C
DYN = "1" : V_{DD} = 4.5 V to 5.5 V, Ta = –30°C to 70°C)

Parameter		Symbol	Condition		Min.	Typ.	Max.	Unit
Transmit Carrier Frequency		f_{M1}	SD = "1"	BR = "0"	1199	1200	1201	Hz
		f_{S1}	SD= "0"	ME= "1"	1799	1800	1801	
		f_{M2}	SD = "1"	BR = "1"	1199	1200	1201	
		f_{S2}	SD= "0"	ME= "1"	2399	2400	2401	
Transmit Carrier Level		V_{OX}	R1 = R2	DYN = "0"	–11	–9	–7	dBV
				DYN = "1"	–3	–1	+1	
Receive Carrier Input Level		V_{IR}			–32	—	–2	
Bit Error Rate	1200 bps	B_{ER}	Defined at RAIO	8 dB	—	1×10^{-3}	—	—
				10 dB	—	5×10^{-5}	—	
	2400 bps			11 dB	—	1×10^{-3}	—	
				13 dB	—	5×10^{-5}	—	
Number of PLL Lock-in Data Bits *1		V_{IR}	Number of data bits required for the PLL to be locked in within the phase difference of 22.5° or less		—	—	18	bit
			Number of data bits required for the PLL to be locked in within the phase difference of 90° or less		—	—	11	

*1 Receive MSK signal is bit synchronous signal (modulated signal of alternating "0", "1" pattern).

Voice Signal Interfaces

(DYN = "0" : V_{DD} = 2.7 V to 5.5 V, Ta = –30°C to 70°C
DYN = "1" : V_{DD} = 4.5 V to 5.5 V, Ta = –30°C to 70°C)

Parameter		Symbol	Condition			Min.	Typ.	Max.	Unit
RVO Maximum Output Signal Level		V_{OUT}	f_{IN} = 1 kHz, BYP = "0" *1	DYN = "0"		—	—	–6	dBV
				DYN = "1"		—	—	+2	
Limiter Clamp Level		V_{LIM}	f_{IN} = 1 kHz, LIM = open	DYN = "0"		–10	–9	–8	
				DYN = "1"		–2	–1	0	
Transmit Output Distortion		H_{DT}	f_{IN} = 1 kHz, –12 dBV			—	–40	—	dB
Receive Output Distortion		H_{DR}	BYP = "0", EMP = "1"			—	–40	—	
Transmit Gain		G_T	f_{IN} = 1 kHz, BYP = EMP = "1"			–1.5	–0.2	+1	
Receive Gain		G_R	f_{IN} = 1 kHz, BYP = EMP = "1"			–1.5	–0.2	+1	
Transmit Idle Noise		H_{IT}	BYP = "0"			—	–51	—	dBV
Receive Idle Noise		H_{IR}	EMP = "1"			—	–85	—	
Cross Talk	$R_{CV.} \rightarrow T_{ran.}$	C_{TT}	RAIO = –2 dBV		*2	—	–75	–60	
	$T_{ran.} \rightarrow R_{CV.}$	C_{TR}	TVIO = –2 dBV			—	–80	–60	
Transmit Filter Response		FT1	EMP = "1", BYP = "1", RCK2 = "0", Ref. = 1 kHz	100 Hz		—	–28	–23	dB
		FT3		300 Hz		–12.5	–10.5	–8.5	
		FT25		2.5 kHz		+6.5	+8.0	+9.5	
		FT34		3.4 kHz		+8.5	+10.5	+12.5	
		FT60		6 kHz		—	–40	–30	
Receive Filter Response		FR1	EMP = "1", BYP = "1", RCK2 = "0", Ref. = 1 kHz	100 Hz		+1.5	+3.0	+4.5	
		FR3		300 Hz		+8.0	+9.5	+11.0	
		FR25		2.5 kHz		–9.5	–8.0	–6.5	
		FR34		3.4 kHz		–12.5	–10.5	–8.5	
		FR60		6 kHz		—	–40	–30	

*1 S/D ≥ 20 dB

*2 f_{IN} = 1 kHz, BYP = EMP = "1"

(Continued)

(DYN = "0" : V_{DD} = 2.7 V to 5.5 V, Ta = –30°C to 70°C
DYN = "1" : V_{DD} = 4.5 V to 5.5 V, Ta = –30°C to 70°C)

	Parameter	Symbol	Condition		Min.	Typ.	Max.	Unit
Compressor	Standard Input Level	V_{ICS}	f_{IN} = 1 kHz	DYN = "0"	–16.1	–13.7	–11.3	dBV
				DYN = "1"	–7.1	–5.5	–3.9	
	Maximum Input Level	V_{ICM}		DYN = "0"	—	—	–7	
				DYN = "1"	—	—	+1.0	
	Output Level *3	GC2	f_{IN} = 1 kHz	–20 dB	–10.6	–9.9	–9.2	dB
		GC4		–40 dB	–21.0	–19.8	–18.6	
		GC5		–60 dB	—	–29.5	—	
	Attack Time	T_{AT1}	DYN = "0", C6 = 0.22 µF		—	3.4	—	ms
		T_{AT2}	DYN = "1", C6 = 0.47 µF		—	3.5	—	
	Recovery Time	T_{RE1}	DYN = "0", C6 = 0.22 µF		—	17	—	
		T_{RE2}	DYN = "1", C6 = 0.47 µF		—	16	—	
Expander	Standard Input Level	V_{IES}	f_{IN} = 1 kHz	*4	–12.9	–10.8	–8.7	dBV
				*5	–13.3	–11.2	–9.1	
				*6	–4.7	–3.1	–1.5	
	Maximum Output Level	V_{IEM}		DYN = "0"	—	—	–6	
				DYN = "1"	—	—	+2	
	Output Level	GE1	f_{IN} = 1 kHz *3	–10 dB	–21.5	–20	–18.3	dB
		GE2		–20 dB	–42.2	–40	–37.5	
		GE3		–30 dB	—	–59	—	
	Attack Time	T_{AT3}	DYN = "0", C13 = 0.22 µF		—	3.4	—	ms
		T_{AT4}	DYN = "1", C13 = 0.47 µF		—	3.5	—	
	Recovery Time	T_{RE3}	DYN = "0", C13 = 0.22 µF		—	17	—	
		T_{RE4}	DYN = "1", C13 = 0.47 µF		—	16	—	

*3 0 dB is defined as the input level and the output level when the standard input level is input.
*4 V_{DD} = 3.6 V, DYN = "0"
*5 V_{DD} = 5.0 V, DYN = "0"
*6 V_{DD} = 5.0 V, DYN = "1"

Common Characteristics

(DYN = "0" : V_{DD} = 2.7 V to 5.5 V, Ta = –30°C to 70°C
DYN = "1" : V_{DD} = 4.5 V to 5.5 V, Ta = –30°C to 70°C)

Parameter	Symbol	Condition		Min.	Typ.	Max.	Unit
Input Resistance	R_{IA}	TVI, RAI, VR2		—	10	—	MΩ
	R_{IC}	LIM		—	200	—	kΩ
Output Resistance	$R_{OX}1$	TAO		—	1750	—	Ω
	$R_{OX}2$	VR1, VR3, RVO		—	600	—	
	$R_{OX}3$	TVIO, RAIO		—	100	—	
Output Load Resistance	RXL1	S/D ≥ 20 dB	*1	40	—	—	kΩ
	RXL2		TVIO	60	—	—	
Output DC Voltage	V_{SG}	SG		$\frac{V_{DD}}{2} - 0.1$	$\frac{V_{DD}}{2}$	$\frac{V_{DD}}{2} + 0.1$	V
	V_{AO}	TAO, RVO		$\frac{V_{DD}}{2} - 0.15$	$\frac{V_{DD}}{2}$	$\frac{V_{DD}}{2} + 0.15$	

*1 VR1, VR3, TAO, RVO, RAIO

Digital Timing Characteristics

(DYN = "0" : V_{DD} = 2.7 V to 5.5 V, Ta = –30°C to 70°C
DYN = "1" : V_{DD} = 4.5 V to 5.5 V, Ta = –30°C to 70°C)

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Transmit Data Set-up Time	t_S	Refer to Fig. 1	1	—	—	µs
Transmit Data Hold Time	t_H		1	—	—	
Receive Data Output Delay	t_D	Refer to Fig. 1	–300	—	300	ns
Sync-signal Output Delay (ME→ST)	t_{MS}	Refer to Fig. 1	0	—	834	µs

TIMING DIAGRAM

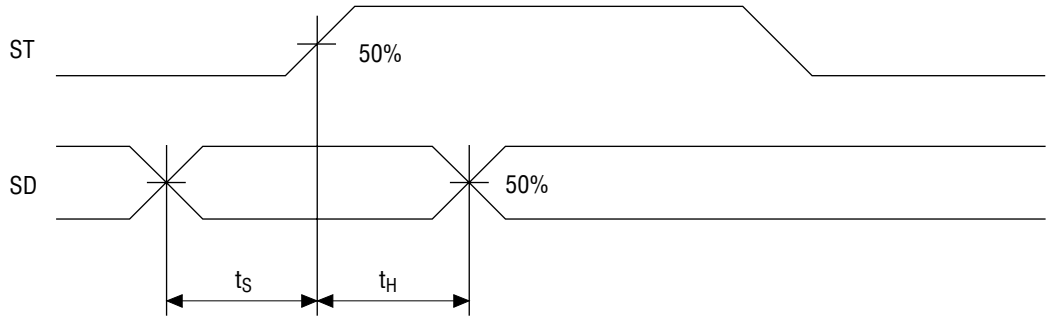


Figure 1 Input Data Timing

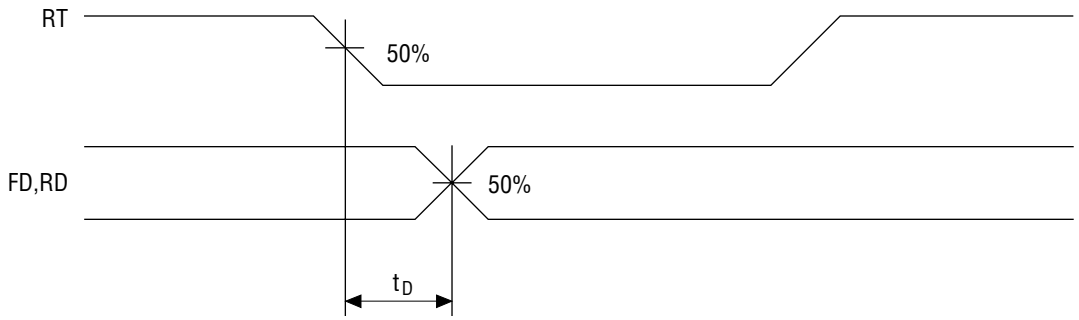
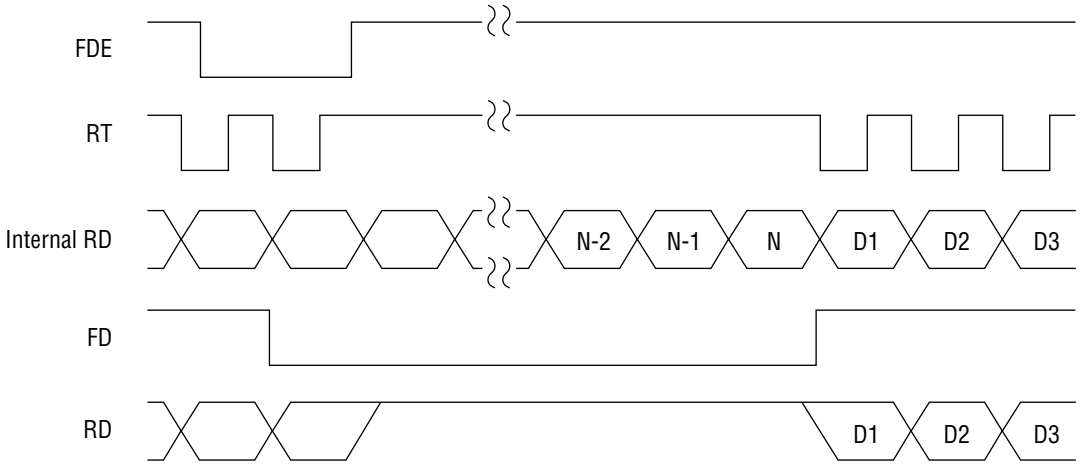


Figure 2 Output Data Timing

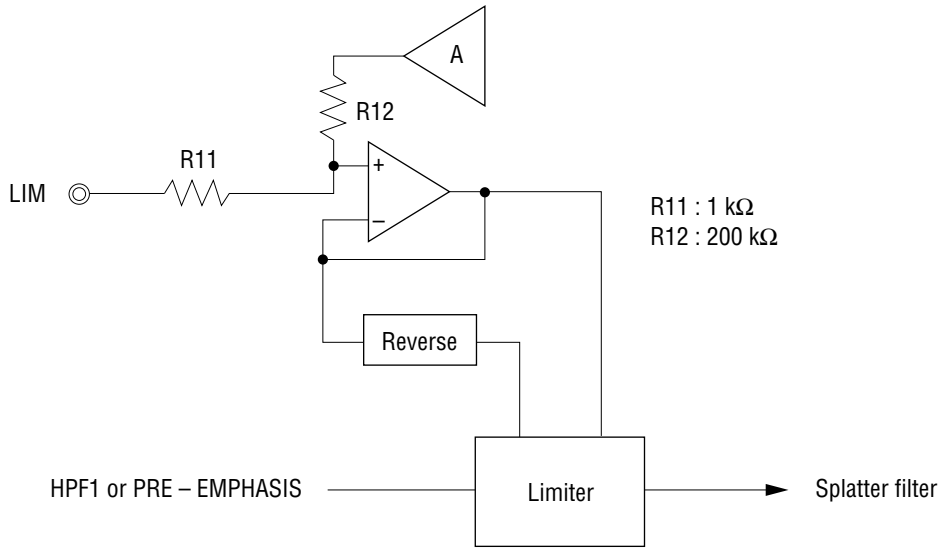


N-2, N-1, N : Frame shnchronous signal

Figure 3 Receive Signal Timing

OPERATION DESCRIPTION

Limiter Circuit



DYN = "0" : Clamp level = VSG ±0.50 V
DYN = "1" : Clamp level = VSG ±1.26 V

2. In case of using external voltage reference

   LIM pin shall be supplied over VSG voltage.

   Notes 1) R11 is protection resister from external extra voltage.
   2) Resistor value of R11 and R12 changes 0.7 to 1.3 times from the typical value by lot variation and temperature variation.

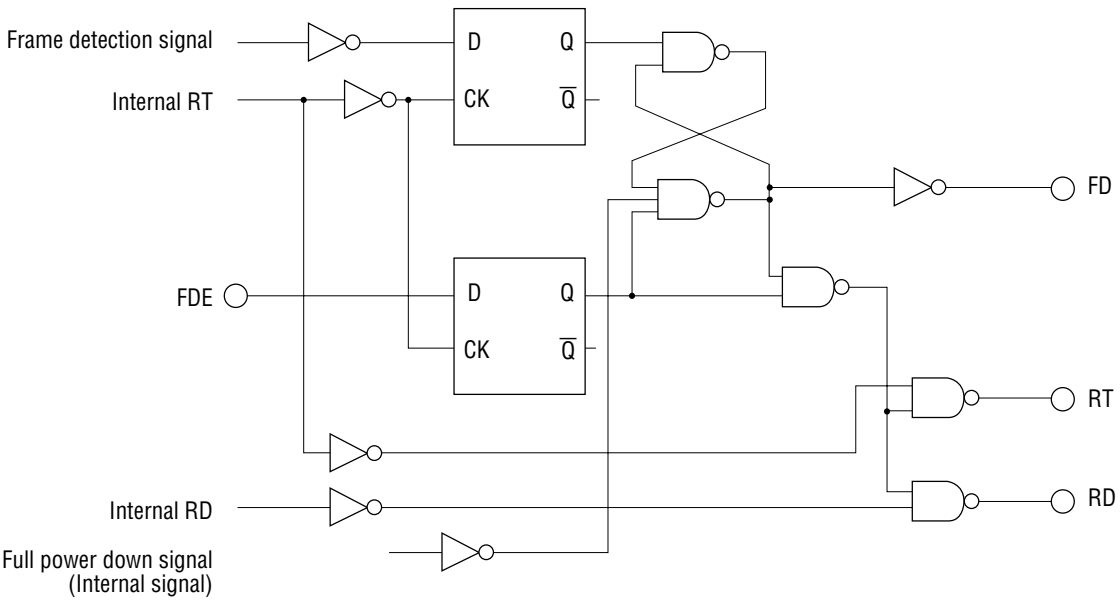
Frame Detector

Frame detection pattern is defined by BIT and FPS.

BIT	FPS	Sync-pattern	Receiver	Note
0	0	9336H	S.H.	Frame synchronous
0	1	C4D6H	M.T.	Frame synchronous
1	0	A9336H	S.H.	Bit + Frame synchronous
1	1	AC4D6H	M.T.	Bit + Frame synchronous

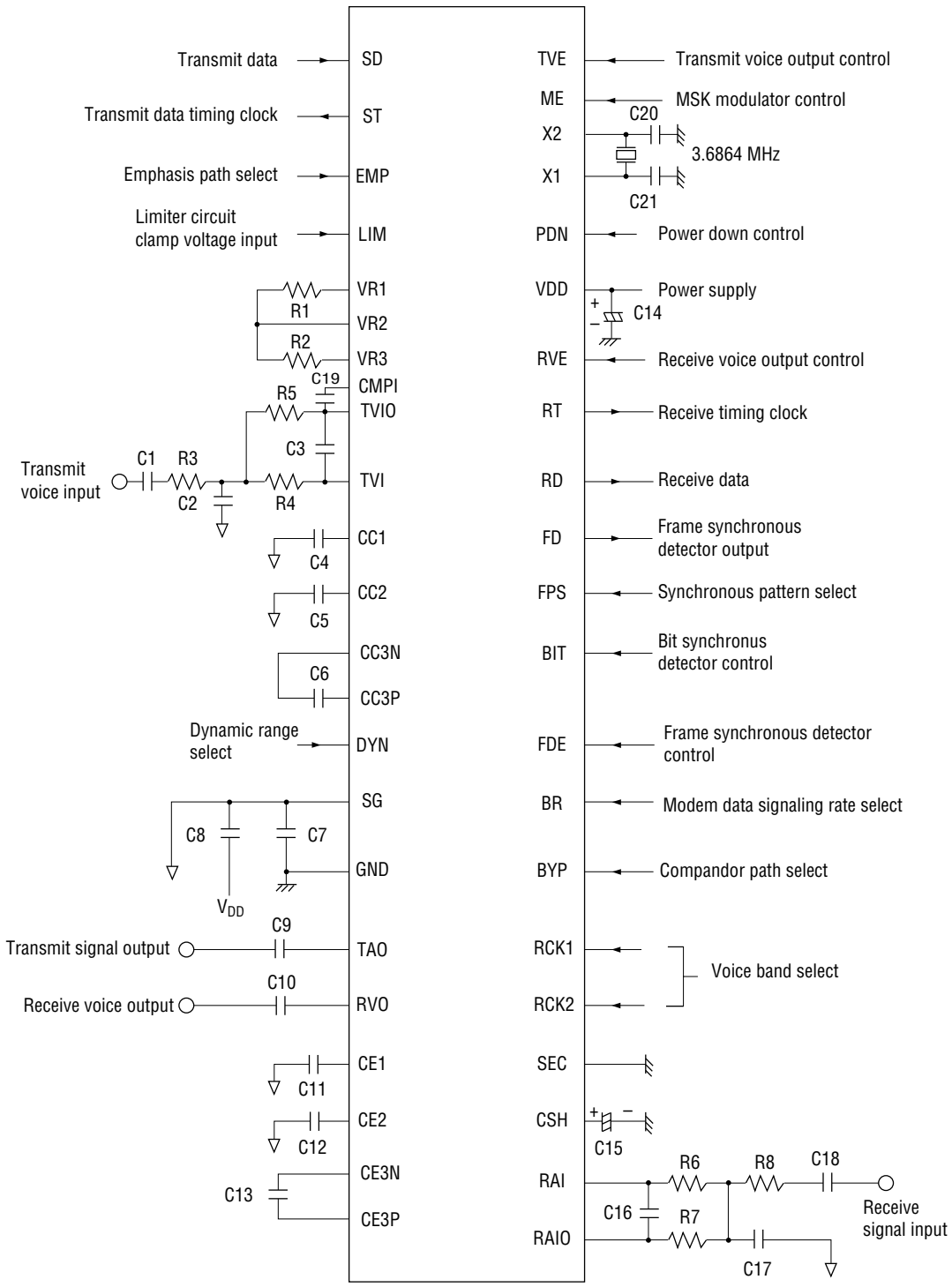
M.T. = Master telephone
S.H. = Slave handset

Fig 3 shows detection timing
First, put digital "0" level to FDE pin more than 1 ms, then FD pin is reset to "0" level.
Next, put digital "1" level to FDE pin, then RT and RD output digital "1" level until frame synchronous signal detected.
When synchronous pattern is detected, FD pin is held to digital "1" level.
At the full power down state (PDN = "1", RVE = "0"), FD pin becomes reset state.
In order to detect frame synchronous signal certainly, receive side PLL should be locked in sufficiently.
When a modem starts data transmittion, the bit-synchronous signal of more than 18 bits should be transmitted before frame pattern of the upper table.



Application Circuit

MSM7557GS-2K



Note : An arrow mark of (⏚) indicates connection to the SG pin.

MSM7557 Filter Characteristics

MSM7557 has wide band filters (0.3 kHz to 3.4 kHz) as follows.

Fig. 4 to Fig. 10 show the filter characteristics when RCK2 is digital "0". When RCK1 is digital "0" and RCK2 is digital "1", the filter characteristics change 0.972 times on the frequency axis. (pass-band becomes narrow) When RCK1 is digital "1" and RCK2 is digital "1", the filter characteristics change 1.029 times on the frequency axis. (pass-band becomes wide)

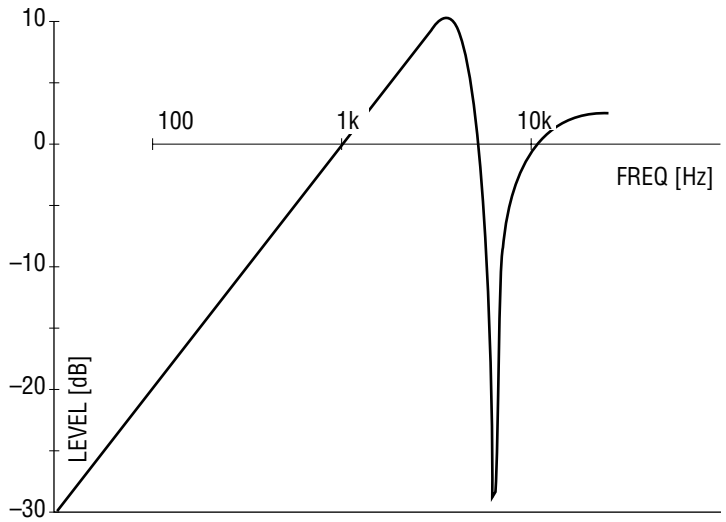


Figure 4 MSM7557 Pre–Emphasis

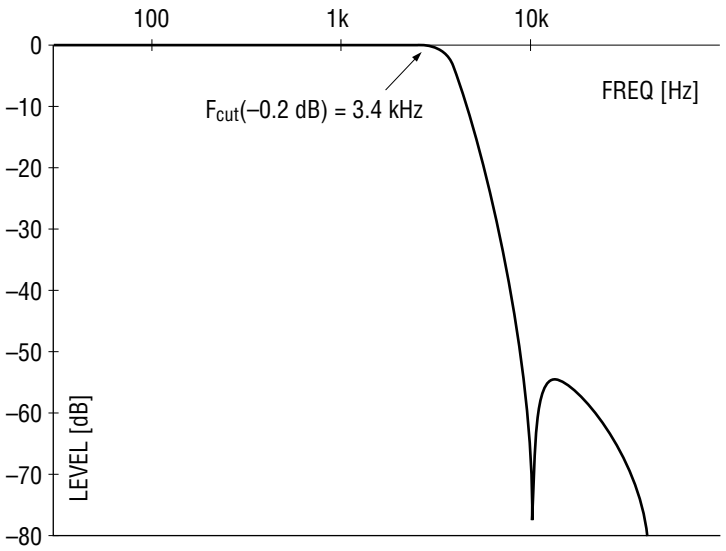


Figure 5 MSM7557 Splatter Filter

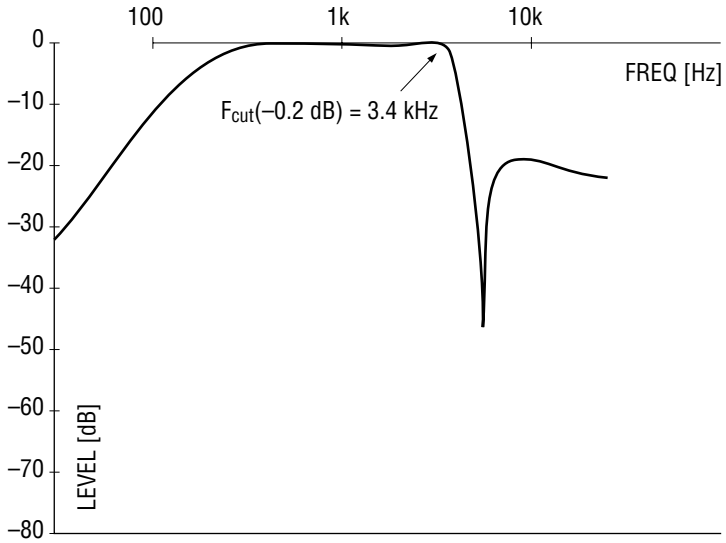


Figure 6 MSM7557 RBPF

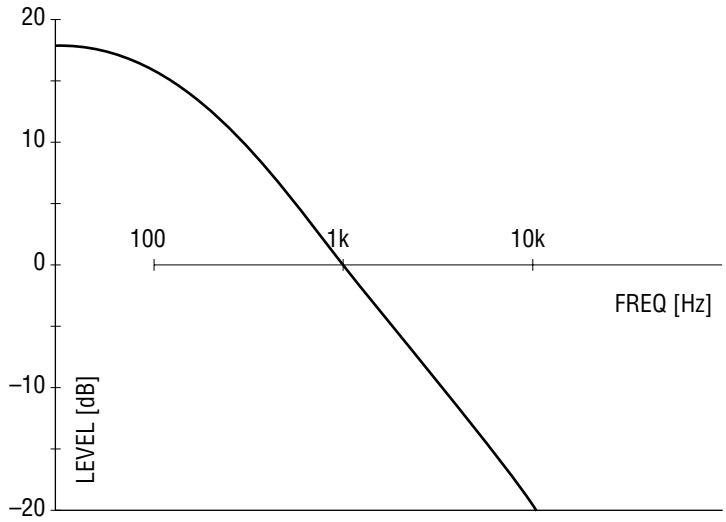


Figure 7 MSM7557 De–Emphasis

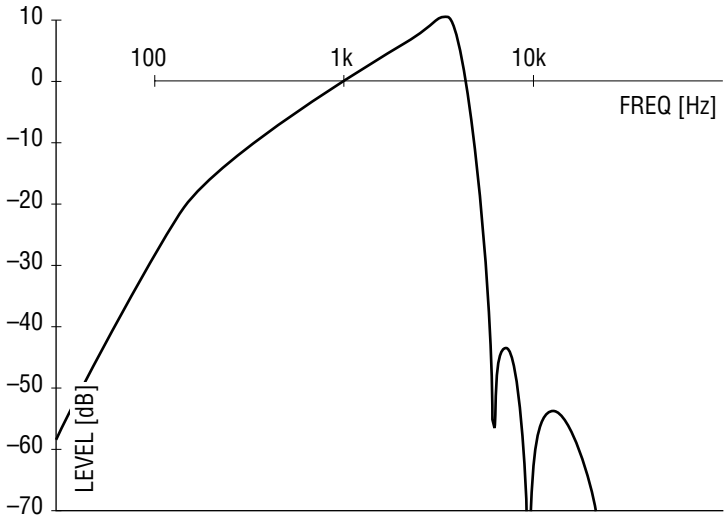


Figure 8 MSM7557 Transmit Total (HPF1 + Pre–Emphasis+Splatter)

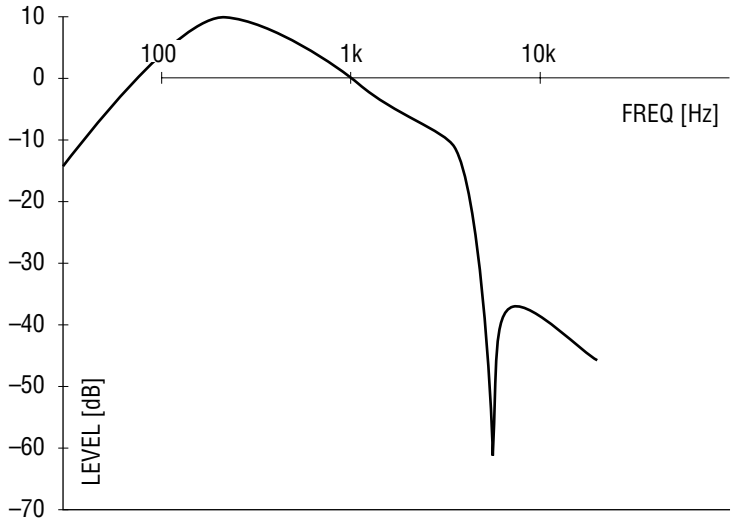


Figure 9 MSM7557 Receive Total (RBPF + De–Emphasis)

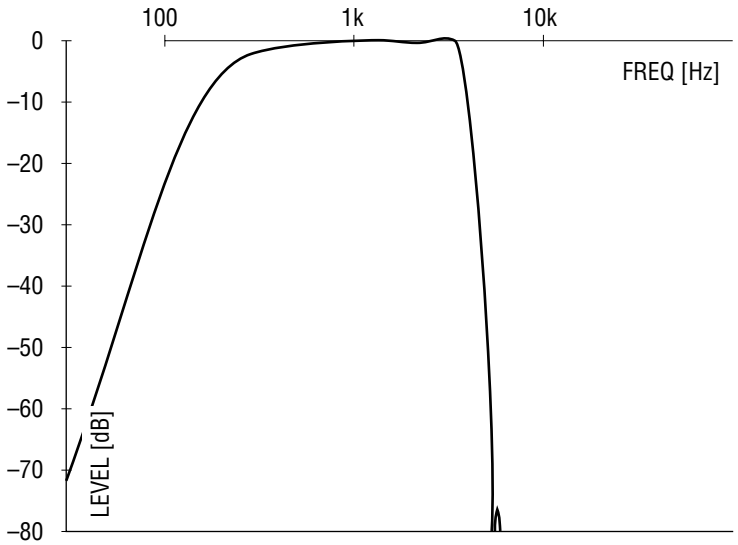
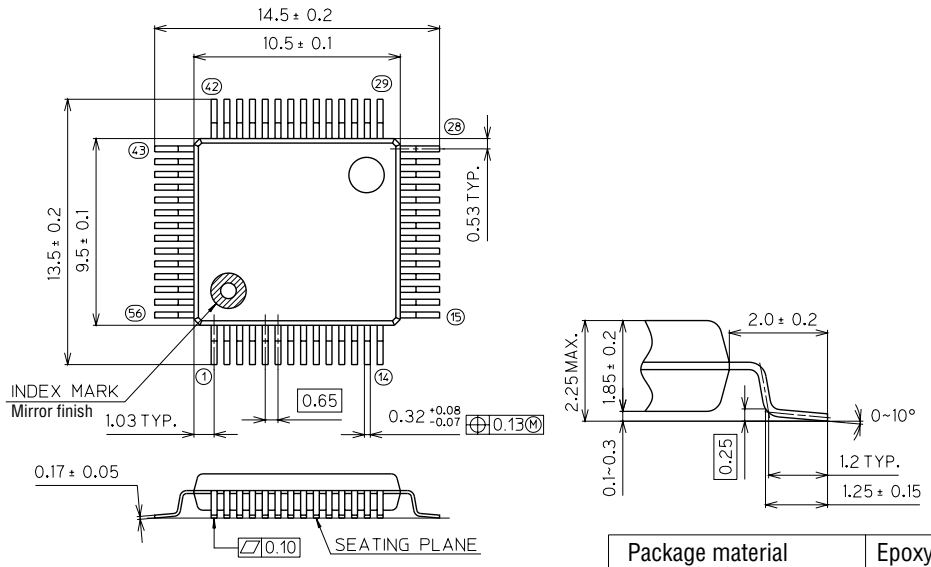


Figure 10 MSM7557 Transmit and Receive Total

PACKAGE DIMENSIONS

(Unit : mm)

QFP56-P-910-0.65-2K



Package material	Epoxy resin
Lead frame material	42 alloy
Pin treatment	Solder plating
Solder plate thickness	5 μm or more
Package weight (g)	0.43 TYP.

Notes for Mounting the Surface Mount Type Package

The SOP, QFP, TSOP, SOJ, QFJ (PLCC), SHP and BGA are surface mount type packages, which are very susceptible to heat in reflow mounting and humidity absorbed in storage.
Therefore, before you perform reflow mounting, contact Oki's responsible sales person for the product name, package name, pin number, package code and desired mounting conditions (reflow method, temperature and times).