Technical Brief

UPGRADING FROM THE CS6420 TO THE CS6422

This document contains information that is useful in transitioning a system from the CS6420 to the CS6422.

Performance Differences

The analog and echo cancelling performance of the CS6422 is identical to the CS6420. The CS6422 incorporates a super-set of features and enhanced configuration options.

Board-level Changes

The CS6420 and CS6422 are 100% pin compatible. No board-level changes are necessary (or recommended) for migrating to the CS6422. However, any circuitry added to a CS6420 system to implement an external sidetone can be eliminated (or remain unpopulated) if the internal programmable sidetones on the CS6422 are used.

Register Definition Changes

A number of CS6420 register bit fields have been renamed and some of the definitions and values have been modified in the CS6422. The register mapping (location and decoding of registers) is completely new.

The CS6422 register map provides for 4 bits of address decoding (compared to 3 bits in the case of the CS6420), or 8 independent addresses (bit 0 is always '0'), 6 of which are implemented. Each register contains 12 bits of configuration information.

Furthermore, all but one of the bit fields reside on nibble boundaries, making conversions to and from hexadecimal very convenient.

The following table summarizes the bit fields that have changed:

CS6420 Reg	CS6422 Reg	CS6420 Values	CS6422 Values	CS6422 Default
HD	HDD	same	same	same (Half duplex allowed)
RVol	RVol	-60dB to +30dB	-12dB to +30dB	same (+18dB)
TVol	TVol	-60dB to +30dB	-12dB to +30dB	same (0dB)
THDet	THDet	3,5,6dB	6,9,12dB	6dB
RHDet	RHDet	3,5,6dB	6,9,12dB	6dB
RSThd	RSThd	3,5,6dB	6,9,12dB	6dB
Taps	Taps	55.5/--- ms	55.5/8 ms	same (39.5/24 ms)
NseRmp	NseRmp	1.5,3,6dB/s	3,6,12dB/s	same (3dB/s)
TSThd	TSThd	9,12,15dB	9,12,15, 18dB	same (15dB)

New Register/Feature Additions:

1) Explicit disable controls AECD and NECD have been added to disable the acoustic and network echo cancellers independently. In the CS6420, the network canceller is disabled by allocating all the Taps to the AEC. In the CS6422, the NEC is disabled by setting NECD. The Taps parameter can be set to any allowed value.

2) Auto network path detect. The CS6422 is able to detect when a network path is present or absent and can automatically enable or disable the network echo canceller as appropriate, even during a call in progress. To enable this feature, NFNse should be set to a non-zero value (this allows the NEC to be disabled if a network path is not detected), and AuNECD should be set to '0' (this

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allows the NEC to be enabled after it has been disabled by NFNse).

3) Transmit Noise Guard. Transmit noise guard is a noise squelch feature that introduces attenuation (set by TSAtt) in the transmit channel when the near-end is silent. This prevents unwanted noise (from a car or other noisy environment) from being transmitted to the far-end listener. Noise guard is enabled by default, and is disabled by setting TSMde to a '1'.

4) Double-talk Attenuation. Double-talk Attenuation introduces a programmable amount of loss into the transmit and/or the receive path during full-duplex double-talk. This feature enhances system stability in hands-free full-duplex to hands-free full-duplex conversations by limiting the gain in the acoustic coupling loop, allowing for higher volume levels at both ends of the connection.

Two parameters (TDbtS and RDbtS) control the amount of attenuation that is added to the transmit and receive channels, respectively. Double-talk attenuation is disabled by default (both attenuators are set to 0 dB).

The decay rate of the attenuation is configurable through TDSRmp and RDSRmp for the transmit and receive channels respectively. Both of these parameters default to the 'slow' setting which provides a decay rate of about 1 second. Most implementations should use the 'normal' setting, which provides a decay rate of about 250 ms.

5) Programmable Sidetones. The parameters ASdt and NSdt allow for a digital path to be created between AO and APO (ASdt) or NO and NI (NSdt). These digital paths are superimposed on the real acoustic or network paths and are canceled by the appropriate echo canceller. In certain environments, most notably the car environment where the acoustic path is weak, inconsistent, or distorted, the presence of a strong linear path can enhance system performance. Both acoustic and network sidetones are disabled by default.

6) Test features. The CS6422 contains a number of features that are useful in the design and debug stages of a system. Separate disable controls (AECD and NECD) allow the acoustic path and the network path to be debugged and tested independently. HwlD and TD allow the howl detector and tone detector to be disabled. APCD and NPCD allow the acoustic and network path change detectors to be disabled, forcing each canceller to train out of a path change rather than training from a cleared state on a major path change. APFD and NPFD allow the pre-emphasis filters on the acoustic and network echo cancellers to be disabled. This enhances results when testing ERLE performance with white noise.