

thm_2Emachine_ieee_2Efp16_mul_add_with_flags
(TMHj1o3q5G5bSrwDozyevASAprPch5MDG8F)

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Let $c_2Enum_2EZERO_REP : \iota$ be given. Assume the following.

$$c_2Enum_2EZERO_REP \in \omega \tag{1}$$

Let $ty_2Enum_2Enum : \iota$ be given. Assume the following.

$$nonempty\ ty_2Enum_2Enum \tag{2}$$

Let $c_2Enum_2EABS_num : \iota$ be given. Assume the following.

$$c_2Enum_2EABS_num \in (ty_2Enum_2Enum^{\omega}) \tag{3}$$

Definition 1 We define $c_2Emin_2E_3D$ to be $\lambda A.\lambda x \in A.\lambda y \in A.inj_o (x = y)$ of type $\iota \Rightarrow \iota$.

Definition 2 We define c_2Enum_2E0 to be $(ap\ c_2Enum_2EABS_num\ c_2Enum_2EZERO_REP)$.

Definition 3 We define $c_2Earithmic_2EZERO$ to be c_2Enum_2E0 .

Let $c_2Enum_2EREP_num : \iota$ be given. Assume the following.

$$c_2Enum_2EREP_num \in (\omega^{ty_2Enum_2Enum}) \tag{4}$$

Let $c_2Enum_2ESUC_REP : \iota$ be given. Assume the following.

$$c_2Enum_2ESUC_REP \in (\omega^{\omega}) \tag{5}$$

Definition 4 We define c_2Ebool_2ET to be $(ap\ (ap\ (c_2Emin_2E_3D\ (2^2))\ (\lambda V0x \in 2.V0x))\ (\lambda V1x \in 2.V1x))$

Definition 5 We define $c_2Ebool_2E_21$ to be $\lambda A.\lambda 27a : \iota.(\lambda V0P \in (2^{A-27a}).(ap\ (ap\ (c_2Emin_2E_3D\ (2^{A-27a}))\ (\lambda V1P \in 2.V1P))\ (\lambda V2P \in 2.V2P))$

Definition 6 We define c_2Enum_2ESUC to be $\lambda V0m \in ty_2Enum_2Enum.(ap\ c_2Enum_2EABS_num\ (ap\ (ap\ (c_2Emin_2E_3D\ (2^2))\ (\lambda V0x \in 2.V0x))\ (\lambda V1x \in 2.V1x))\ (ap\ (ap\ (c_2Emin_2E_3D\ (2^{A-27a}))\ (\lambda V0P \in 2.V0P))\ (\lambda V1P \in 2.V1P))\ (\lambda V2P \in 2.V2P))$

Let $c_2Earithmetic_2E_2B : \iota$ be given. Assume the following.

$$c_2Earithmetic_2E_2B \in ((ty_2Enum_2Enum^{ty_2Enum_2Enum})^{ty_2Enum_2Enum}) \quad (6)$$

Definition 7 We define $c_2Earithmetic_2EBIT1$ to be $\lambda V0n \in ty_2Enum_2Enum.(ap (ap c_2Earithmetic_2E_2B))$

Definition 8 We define $c_2Earithmetic_2ENUMERAL$ to be $\lambda V0x \in ty_2Enum_2Enum.V0x$.

Definition 9 We define $c_2Earithmetic_2EBIT2$ to be $\lambda V0n \in ty_2Enum_2Enum.(ap (ap c_2Earithmetic_2E_2B))$

Let $c_2Earithmetic_2EEXP : \iota$ be given. Assume the following.

$$c_2Earithmetic_2EEXP \in ((ty_2Enum_2Enum^{ty_2Enum_2Enum})^{ty_2Enum_2Enum}) \quad (7)$$

Let $c_2Earithmetic_2EDIV : \iota$ be given. Assume the following.

$$c_2Earithmetic_2EDIV \in ((ty_2Enum_2Enum^{ty_2Enum_2Enum})^{ty_2Enum_2Enum}) \quad (8)$$

Definition 10 We define $c_2Ebit_2EDIV_2EXP$ to be $\lambda V0x \in ty_2Enum_2Enum.\lambda V1n \in ty_2Enum_2Enum$

Let $c_2Earithmetic_2E_2D : \iota$ be given. Assume the following.

$$c_2Earithmetic_2E_2D \in ((ty_2Enum_2Enum^{ty_2Enum_2Enum})^{ty_2Enum_2Enum}) \quad (9)$$

Let $c_2Earithmetic_2EMOD : \iota$ be given. Assume the following.

$$c_2Earithmetic_2EMOD \in ((ty_2Enum_2Enum^{ty_2Enum_2Enum})^{ty_2Enum_2Enum}) \quad (10)$$

Definition 11 We define $c_2Ebit_2EMOD_2EXP$ to be $\lambda V0x \in ty_2Enum_2Enum.\lambda V1n \in ty_2Enum_2Enum$

Definition 12 We define c_2Ebit_2EBITS to be $\lambda V0h \in ty_2Enum_2Enum.\lambda V1l \in ty_2Enum_2Enum.\lambda V$

Definition 13 We define c_2Ebit_2EBIT to be $\lambda V0b \in ty_2Enum_2Enum.\lambda V1n \in ty_2Enum_2Enum.(ap$

Let $ty_2Efc_2Efinite_image : \iota \Rightarrow \iota$ be given. Assume the following.

$$\forall A0.nonempty A0 \Rightarrow nonempty (ty_2Efc_2Efinite_image A0) \quad (11)$$

Let $ty_2Ebool_2Eitself : \iota \Rightarrow \iota$ be given. Assume the following.

$$\forall A0.nonempty A0 \Rightarrow nonempty (ty_2Ebool_2Eitself A0) \quad (12)$$

Let $c_2Ebool_2Ethe_value : \iota \Rightarrow \iota$ be given. Assume the following.

$$\forall A_27a.nonempty A_27a \Rightarrow c_2Ebool_2Ethe_value A_27a \in (ty_2Ebool_2Eitself A_27a) \quad (13)$$

Let $c_2Efc_2Edimindex : \iota \Rightarrow \iota$ be given. Assume the following.

$$\forall A_27a.nonempty A_27a \Rightarrow c_2Efc_2Edimindex A_27a \in (ty_2Enum_2Enum^{(ty_2Ebool_2Eitself A_27a)}) \quad (14)$$

Definition 14 We define c_2Ebool_2EF to be $(ap (c_2Ebool_2E_21\ 2) (\lambda V0t \in 2.V0t))$.

Definition 15 We define $c_2Emin_2E_3D_3D_3E$ to be $\lambda P \in 2.\lambda Q \in 2.inj_o (p P \Rightarrow p Q)$ of type ι .

Definition 16 We define $c_2Ebool_2E_7E$ to be $(\lambda V0t \in 2.(ap (ap c_2Emin_2E_3D_3D_3E V0t) c_2Ebool_2E_21\ 2))$

Definition 17 We define $c_2Ebool_2E_2F_5C$ to be $(\lambda V0t1 \in 2.(\lambda V1t2 \in 2.(ap (c_2Ebool_2E_21\ 2) (\lambda V2t \in 2.V2t))))$

Definition 18 We define $c_2Emin_2E_40$ to be $\lambda A.\lambda P \in 2^A.\mathbf{if} (\exists x \in A.p (ap P x)) \mathbf{then} (the (\lambda x.x \in A \wedge p x))$ of type $\iota \Rightarrow \iota$.

Definition 19 We define $c_2Ebool_2E_3F$ to be $\lambda A_27a : \iota.(\lambda V0P \in (2^{A_27a}).(ap V0P (ap (c_2Emin_2E_40 A_27a) P)))$

Definition 20 We define $c_2Eprim_rec_2E_3C$ to be $\lambda V0m \in ty_2Enum_2Enum.\lambda V1n \in ty_2Enum_2Enum$

Definition 21 We define $c_2Ebool_2E_3F_21$ to be $\lambda A_27a : \iota.(\lambda V0P \in (2^{A_27a}).(ap (ap c_2Ebool_2E_2F_5C A_27a) P))$

Definition 22 We define $c_2Efcp_2Efinite_index$ to be $\lambda A_27a : \iota.(ap (c_2Emin_2E_40 (A_27a)^{ty_2Enum_2Enum}))$

Let $ty_2Efcp_2Ecart : \iota \Rightarrow \iota \Rightarrow \iota$ be given. Assume the following.

$$\forall A0.nonempty\ A0 \Rightarrow \forall A1.nonempty\ A1 \Rightarrow nonempty\ (ty_2Efcp_2Ecart\ A0\ A1) \quad (15)$$

Let $c_2Efcp_2Edest_cart : \iota \Rightarrow \iota \Rightarrow \iota$ be given. Assume the following.

$$\forall A_27a.nonempty\ A_27a \Rightarrow \forall A_27b.nonempty\ A_27b \Rightarrow c_2Efcp_2Edest_cart\ A_27a\ A_27b \in ((A_27a^{(ty_2Efcp_2Efinite_image\ A_27b)})^{(ty_2Efcp_2Ecart\ A_27a\ A_27b)}) \quad (16)$$

Definition 23 We define $c_2Efcp_2Efcp_index$ to be $\lambda A_27a : \iota.\lambda A_27b : \iota.\lambda V0x \in (ty_2Efcp_2Ecart\ A_27a\ A_27b)$

Definition 24 We define c_2Efcp_2EFCP to be $\lambda A_27a : \iota.\lambda A_27b : \iota.(\lambda V0g \in (A_27a^{ty_2Enum_2Enum}).(ap (c_2Efcp_2Efcp_index\ A_27a\ A_27b) g))$

Definition 25 We define $c_2Ewords_2En2w$ to be $\lambda A_27a : \iota.\lambda V0n \in ty_2Enum_2Enum.(ap (c_2Efcp_2EFCP\ A_27a) n)$

Let $ty_2Eone_2Eone : \iota$ be given. Assume the following.

$$nonempty\ ty_2Eone_2Eone \quad (17)$$

Let $ty_2Ebinary_ieee_2Efloat : \iota \Rightarrow \iota \Rightarrow \iota$ be given. Assume the following.

$$\forall A0.nonempty\ A0 \Rightarrow \forall A1.nonempty\ A1 \Rightarrow nonempty\ (ty_2Ebinary_ieee_2Efloat\ A0\ A1) \quad (18)$$

Let $c_2Ebinary_ieee_2Efloat_Sign : \iota \Rightarrow \iota \Rightarrow \iota$ be given. Assume the following.

$$\forall A_27t.nonempty\ A_27t \Rightarrow \forall A_27w.nonempty\ A_27w \Rightarrow c_2Ebinary_ieee_2Efloat_Sign\ A_27t\ A_27w \in ((ty_2Efcp_2Ecart\ 2\ ty_2Eone_2Eone)^{(ty_2Ebinary_ieee_2Efloat\ A_27t\ A_27w)}) \quad (19)$$

Definition 26 We define $c_2Ewords_2Eword_xor$ to be $\lambda A_27a : \iota. \lambda V0v \in (ty_2EfcP_2Ecart\ 2\ A_27a). \lambda V1$
 Let $ty_2Erealax_2Ereal : \iota$ be given. Assume the following.

$$nonempty\ ty_2Erealax_2Ereal \quad (20)$$

Let $c_2Ereal_2Ereal_of_num : \iota$ be given. Assume the following.

$$c_2Ereal_2Ereal_of_num \in (ty_2Erealax_2Ereal^{ty_2Enum_2Enum}) \quad (21)$$

Let $c_2Ereal_2Epow : \iota$ be given. Assume the following.

$$c_2Ereal_2Epow \in ((ty_2Erealax_2Ereal^{ty_2Enum_2Enum})^{ty_2Erealax_2Ereal}) \quad (22)$$

Let $c_2Ebinary_ieee_2Efloat_Significand : \iota \Rightarrow \iota \Rightarrow \iota$ be given. Assume the following.

$$\forall A_27t. nonempty\ A_27t \Rightarrow \forall A_27w. nonempty\ A_27w \Rightarrow c_2Ebinary_ieee_2Efloat_Significand\ A_27t\ A_27w \in ((ty_2EfcP_2Ecart\ 2\ A_27t)^{(ty_2Ebinary_ieee_2Efloat\ A_27t\ A_27w)}) \quad (23)$$

Definition 27 We define c_2Ebool_2ECOND to be $\lambda A_27a : \iota. (\lambda V0t \in 2. (\lambda V1t1 \in A_27a. (\lambda V2t2 \in A_27a. ($

Definition 28 We define c_2Ebit_2ESBIT to be $\lambda V0b \in 2. \lambda V1n \in ty_2Enum_2Enum. (ap\ (ap\ (ap\ (c_2Ebo$

Let $c_2Esum_num_2ESUM : \iota$ be given. Assume the following.

$$c_2Esum_num_2ESUM \in ((ty_2Enum_2Enum^{(ty_2Enum_2Enum^{ty_2Enum_2Enum})})^{ty_2Enum_2Enum}) \quad (24)$$

Definition 29 We define $c_2Ewords_2Ew2n$ to be $\lambda A_27a : \iota. \lambda V0w \in (ty_2EfcP_2Ecart\ 2\ A_27a). (ap\ (ap\ c$

Let $ty_2Ehreal_2Ehreal : \iota$ be given. Assume the following.

$$nonempty\ ty_2Ehreal_2Ehreal \quad (25)$$

Let $ty_2Epair_2Eprod : \iota \Rightarrow \iota \Rightarrow \iota$ be given. Assume the following.

$$\forall A0. nonempty\ A0 \Rightarrow \forall A1. nonempty\ A1 \Rightarrow nonempty\ (ty_2Epair_2Eprod\ A0\ A1) \quad (26)$$

Let $c_2Erealax_2Ereal_REP_CLASS : \iota$ be given. Assume the following.

$$c_2Erealax_2Ereal_REP_CLASS \in ((2^{(ty_2Epair_2Eprod\ ty_2Ehreal_2Ehreal\ ty_2Ehreal_2Ehreal)})^{ty_2Erealax}) \quad (27)$$

Definition 30 We define $c_2Erealax_2Ereal_REP$ to be $\lambda V0a \in ty_2Erealax_2Ereal. (ap\ (c_2Emin_2E40\ (t$

Let $c_2Erealax_2Etreal_inv : \iota$ be given. Assume the following.

$$c_2Erealax_2Etreal_inv \in ((ty_2Epair_2Eprod\ ty_2Ehreal_2Ehreal\ ty_2Ehreal_2Ehreal)^{(ty_2Epair_2Eprod\ ty_2Ehreal_2Ehreal\ ty_2Ehreal_2Ehreal)}) \quad (28)$$

Let $c_2Erealax_2Etreal_eq : \iota$ be given. Assume the following.

$$c_2Erealax_2Etreal_eq \in ((2^{(ty_2Epair_2Eprod\ ty_2Ehreal_2Ehreal\ ty_2Ehreal_2Ehreal)})^{(ty_2Epair_2Eprod\ ty_2Ehreal_2Ehreal)}) \quad (29)$$

Let $c_2Erealax_2Ereal_ABS_CLASS : \iota$ be given. Assume the following.

$$c_2Erealax_2Ereal_ABS_CLASS \in (ty_2Erealax_2Ereal)^{(2^{(ty_2Epair_2Eprod\ ty_2Ehreal_2Ehreal\ ty_2Ehreal_2Ehreal)})} \quad (30)$$

Definition 31 We define $c_2Erealax_2Ereal_ABS$ to be $\lambda V0r \in (ty_2Epair_2Eprod\ ty_2Ehreal_2Ehreal\ ty_2Ehreal_2Ehreal)$

Definition 32 We define $c_2Erealax_2Einv$ to be $\lambda V0T1 \in ty_2Erealax_2Ereal.(ap\ c_2Erealax_2Ereal_ABS$

Let $c_2Erealax_2Etreal_mul : \iota$ be given. Assume the following.

$$c_2Erealax_2Etreal_mul \in (((ty_2Epair_2Eprod\ ty_2Ehreal_2Ehreal\ ty_2Ehreal_2Ehreal)^{(ty_2Epair_2Eprod\ ty_2Ehreal_2Ehreal\ ty_2Ehreal_2Ehreal)})^{(ty_2Epair_2Eprod\ ty_2Ehreal_2Ehreal)}) \quad (31)$$

Definition 33 We define $c_2Erealax_2Ereal_mul$ to be $\lambda V0T1 \in ty_2Erealax_2Ereal.\lambda V1T2 \in ty_2Erealax_2Ereal.$

Definition 34 We define $c_2Ereal_2E_2F$ to be $\lambda V0x \in ty_2Erealax_2Ereal.\lambda V1y \in ty_2Erealax_2Ereal.$

Let $c_2Erealax_2Etreal_add : \iota$ be given. Assume the following.

$$c_2Erealax_2Etreal_add \in (((ty_2Epair_2Eprod\ ty_2Ehreal_2Ehreal\ ty_2Ehreal_2Ehreal)^{(ty_2Epair_2Eprod\ ty_2Ehreal_2Ehreal\ ty_2Ehreal_2Ehreal)})^{(ty_2Epair_2Eprod\ ty_2Ehreal_2Ehreal)}) \quad (32)$$

Definition 35 We define $c_2Erealax_2Ereal_add$ to be $\lambda V0T1 \in ty_2Erealax_2Ereal.\lambda V1T2 \in ty_2Erealax_2Ereal.$

Let $c_2Ewords_2EINT_MAX : \iota \Rightarrow \iota$ be given. Assume the following.

$$\forall A_27a.nonempty\ A_27a \Rightarrow c_2Ewords_2EINT_MAX\ A_27a \in (ty_2Enum_2Enum)^{(ty_2Ebool_2Eitself\ A_27a)} \quad (33)$$

Let $c_2Ebinary_ieee_2Efloat_Exponent : \iota \Rightarrow \iota \Rightarrow \iota$ be given. Assume the following.

$$\forall A_27t.nonempty\ A_27t \Rightarrow \forall A_27w.nonempty\ A_27w \Rightarrow c_2Ebinary_ieee_2Efloat_Exponent\ A_27t\ A_27w \in ((ty_2Efc_2Ecart\ 2\ A_27w)^{(ty_2Ebinary_ieee_2Efloat\ A_27t\ A_27w)}) \quad (34)$$

Let $c_2Erealax_2Etreal_neg : \iota$ be given. Assume the following.

$$c_2Erealax_2Etreal_neg \in ((ty_2Epair_2Eprod\ ty_2Ehreal_2Ehreal\ ty_2Ehreal_2Ehreal)^{(ty_2Epair_2Eprod\ ty_2Ehreal_2Ehreal\ ty_2Ehreal_2Ehreal)}) \quad (35)$$

Definition 36 We define $c_Erealax_Ereal_neg$ to be $\lambda V0T1 \in ty_Erealax_Ereal.(ap\ c_Erealax_Ereal$

Definition 37 We define $c_Ebinary_ieee_Efloat_to_real$ to be $\lambda A_27t : \iota.\lambda A_27w : \iota.\lambda V0x \in (ty_Ebinary_$

Let $ty_Ebinary_ieee_Efloat_value : \iota$ be given. Assume the following.

$$nonempty\ ty_Ebinary_ieee_Efloat_value \quad (36)$$

Let $c_Ebinary_ieee_Efloat : \iota$ be given. Assume the following.

$$c_Ebinary_ieee_Efloat \in (ty_Ebinary_ieee_Efloat_value^{ty_Erealax_Ereal}) \quad (37)$$

Let $c_Ebinary_ieee_ENaN : \iota$ be given. Assume the following.

$$c_Ebinary_ieee_ENaN \in ty_Ebinary_ieee_Efloat_value \quad (38)$$

Let $c_Ebinary_ieee_EInfinity : \iota$ be given. Assume the following.

$$c_Ebinary_ieee_EInfinity \in ty_Ebinary_ieee_Efloat_value \quad (39)$$

Let $c_Ewords_EUINT_MAX : \iota \Rightarrow \iota$ be given. Assume the following.

$$\forall A_27a.nonempty\ A_27a \Rightarrow c_Ewords_EUINT_MAX\ A_27a \in (ty_Eenum_Eenum^{(ty_Ebool_Eitself\ A_27a)}) \quad (40)$$

Definition 38 We define $c_Ewords_Eword_T$ to be $\lambda A_27a : \iota.(ap\ (c_Ewords_Een2w\ A_27a)\ (ap\ (c_Ew$

Definition 39 We define $c_Ebinary_ieee_Efloat_value$ to be $\lambda A_27t : \iota.\lambda A_27w : \iota.\lambda V0x \in (ty_Ebinary_$

Let $c_Ebinary_ieee_Efloat_value_CASE : \iota \Rightarrow \iota$ be given. Assume the following.

$$\forall A_27a.nonempty\ A_27a \Rightarrow c_Ebinary_ieee_Efloat_value_CASE\ A_27a \in (((A_27a^{A_27a})^{A_27a})^{(A_27a^{ty_Erealax_Ereal})})^{ty_Ebinary_ieee_Efloat_value} \quad (41)$$

Definition 40 We define $c_Ebinary_ieee_Efloat_is_infinite$ to be $\lambda A_27t : \iota.\lambda A_27w : \iota.\lambda V0x \in (ty_Ebin$

Definition 41 We define $c_Ebool_E5C_2F$ to be $(\lambda V0t1 \in 2.(\lambda V1t2 \in 2.(ap\ (c_Ebool_E21\ 2)\ (\lambda V2t \in$

Let $ty_Ebinary_ieee_ERounding : \iota$ be given. Assume the following.

$$nonempty\ ty_Ebinary_ieee_ERounding \quad (42)$$

Let $c_Ebinary_ieee_ERoundTowardNegative : \iota$ be given. Assume the following.

$$c_Ebinary_ieee_ERoundTowardNegative \in ty_Ebinary_ieee_ERounding \quad (43)$$

Let $c_Erealax_Etrealm : \iota$ be given. Assume the following.

$$c_Erealax_Etrealm \in ((2^{(ty_Epair_Eprod\ ty_Ehreal_Ehreal\ ty_Ehreal_Ehreal)})^{(ty_Epair_Eprod\ ty_Ehreal_Ehreal)}) \quad (44)$$

Definition 42 We define $c_2Erealax_2Ereal_lt$ to be $\lambda V0T1 \in ty_2Erealax_2Ereal.\lambda V1T2 \in ty_2Erealax_2Ereal$.

Definition 43 We define $c_2Ereal_2Ereal_lte$ to be $\lambda V0x \in ty_2Erealax_2Ereal.\lambda V1y \in ty_2Erealax_2Ereal$.

Definition 44 We define c_2Ereal_2Eabs to be $\lambda V0x \in ty_2Erealax_2Ereal.(ap (ap (ap (c_2Ebool_2ECONJ$

Let $c_2Ebinary_ieee_2Elargest : \iota \Rightarrow \iota \Rightarrow \iota$ be given. Assume the following.

$$\begin{aligned} \forall A_27t.nonempty A_27t \Rightarrow \forall A_27w.nonempty A_27w \Rightarrow c_2Ebinary_ieee_2Elargest \\ A_27t A_27w \in (ty_2Erealax_2Ereal^{(ty_2Ebool_2Eitself (ty_2Epair_2Eprod A_27t A_27w))}) \end{aligned} \quad (45)$$

Definition 45 We define $c_2Ebinary_ieee_2Efloat_is_finite$ to be $\lambda A_27t : \iota.\lambda A_27w : \iota.\lambda V0x \in (ty_2Ebina$

Let $c_2Epair_2EABS_prod : \iota \Rightarrow \iota \Rightarrow \iota$ be given. Assume the following.

$$\begin{aligned} \forall A_27a.nonempty A_27a \Rightarrow \forall A_27b.nonempty A_27b \Rightarrow c_2Epair_2EABS_prod \\ A_27a A_27b \in ((ty_2Epair_2Eprod A_27a A_27b)^{(2^{A_27b})^{A_27a}}) \end{aligned} \quad (46)$$

Definition 46 We define $c_2Epair_2E_2C$ to be $\lambda A_27a : \iota.\lambda A_27b : \iota.\lambda V0x \in A_27a.\lambda V1y \in A_27b.(ap (c_2$

Let $c_2Epred_set_2EGSPEC : \iota \Rightarrow \iota \Rightarrow \iota$ be given. Assume the following.

$$\begin{aligned} \forall A_27a.nonempty A_27a \Rightarrow \forall A_27b.nonempty A_27b \Rightarrow c_2Epred_set_2EGSPEC \\ A_27a A_27b \in ((2^{A_27a})^{(ty_2Epair_2Eprod A_27a 2)^{A_27b}}) \end{aligned} \quad (47)$$

Definition 47 We define $c_2Ecombin_2EK$ to be $\lambda A_27a : \iota.\lambda A_27b : \iota.(\lambda V0x \in A_27a.(\lambda V1y \in A_27b.V0x)$

Definition 48 We define $c_2Ereal_2Ereal_sub$ to be $\lambda V0x \in ty_2Erealax_2Ereal.\lambda V1y \in ty_2Erealax_2Ereal$

Definition 49 We define c_2Ebool_2EIN to be $\lambda A_27a : \iota.(\lambda V0x \in A_27a.(\lambda V1f \in (2^{A_27a}).(ap V1f V0x))$

Definition 50 We define $c_2Ebinary_ieee_2Eis_closest$ to be $\lambda A_27a : \iota.\lambda A_27b : \iota.\lambda V0s \in (2^{(ty_2Ebina$

Definition 51 We define $c_2Ebinary_ieee_2Eclosest_such$ to be $\lambda A_27a : \iota.\lambda A_27b : \iota.\lambda V0p \in (2^{(ty_2Ebina$

Definition 52 We define $c_2Ebinary_ieee_2Eclosest$ to be $\lambda A_27a : \iota.\lambda A_27b : \iota.(ap (c_2Ebina$

Let $c_2Ebinary_ieee_2Efloat_top : \iota \Rightarrow \iota \Rightarrow \iota$ be given. Assume the following.

$$\begin{aligned} \forall A_27t.nonempty A_27t \Rightarrow \forall A_27w.nonempty A_27w \Rightarrow c_2Ebinary_ieee_2Efloat_top \\ A_27t A_27w \in ((ty_2Ebina$$

Definition 53 We define $c_2Ereal_2Ereal_gt$ to be $\lambda V0x \in ty_2Erealax_2Ereal.\lambda V1y \in ty_2Erealax_2Ereal$

Let $c_2Ebinary_ieee_2Efloat_bottom : \iota \Rightarrow \iota \Rightarrow \iota$ be given. Assume the following.

$$\begin{aligned} \forall A_27t.nonempty A_27t \Rightarrow \forall A_27w.nonempty A_27w \Rightarrow c_2Ebina$$

Definition 54 We define c_2Ebool_2ELET to be $\lambda A_27a : \iota.\lambda A_27b : \iota.(\lambda V0f \in (A_27b^{A_27a}).(\lambda V1x \in A_27w$

Let $c_2Ebinary_ieee_2Efloat_minus_infinity : \iota \Rightarrow \iota \Rightarrow \iota$ be given. Assume the following.

$$\forall A_27t.nonempty\ A_27t \Rightarrow \forall A_27w.nonempty\ A_27w \Rightarrow c_2Ebinary_ieee_2Efloat_minus_infinity\ A_27t\ A_27w \in ((ty_2Ebinary_ieee_2Efloat\ A_27t\ A_27w)^{(ty_2Ebool_2Eitself\ (ty_2Epair_2Eprod\ A_27t\ A_27w))}) \quad (50)$$

Definition 55 We define $c_2Ereal_2Ereal_ge$ to be $\lambda V0x \in ty_2Erealax_2Ereal.\lambda V1y \in ty_2Erealax_2Ereal$

Let $c_2Ebinary_ieee_2Efloat_plus_infinity : \iota \Rightarrow \iota \Rightarrow \iota$ be given. Assume the following.

$$\forall A_27t.nonempty\ A_27t \Rightarrow \forall A_27w.nonempty\ A_27w \Rightarrow c_2Ebinary_ieee_2Efloat_plus_infinity\ A_27t\ A_27w \in ((ty_2Ebinary_ieee_2Efloat\ A_27t\ A_27w)^{(ty_2Ebool_2Eitself\ (ty_2Epair_2Eprod\ A_27t\ A_27w))}) \quad (51)$$

Let $c_2Ebinary_ieee_2Ethreshold : \iota \Rightarrow \iota \Rightarrow \iota$ be given. Assume the following.

$$\forall A_27t.nonempty\ A_27t \Rightarrow \forall A_27w.nonempty\ A_27w \Rightarrow c_2Ebinary_ieee_2Ethreshold\ A_27t\ A_27w \in (ty_2Erealax_2Ereal^{(ty_2Ebool_2Eitself\ (ty_2Epair_2Eprod\ A_27t\ A_27w))}) \quad (52)$$

Definition 56 We define $c_2Ewords_2Eword_lsb$ to be $\lambda A_27a : \iota.\lambda V0w \in (ty_2Efcpcart\ 2\ A_27a).(\lambda V1$

Let $c_2Ebinary_ieee_2Erounding2num : \iota$ be given. Assume the following.

$$c_2Ebinary_ieee_2Erounding2num \in (ty_2Enum_2Enum^{ty_2Ebinary_ieee_2Erounding}) \quad (53)$$

Definition 57 We define $c_2Ebinary_ieee_2Erounding_CASE$ to be $\lambda A_27a : \iota.\lambda V0x \in ty_2Ebinary_ieee_2Erounding$

Definition 58 We define $c_2Ebinary_ieee_2Eround$ to be $\lambda A_27t : \iota.\lambda A_27w : \iota.\lambda V0mode \in ty_2Ebinary_ieee_2Eround$

Let $c_2Ebinary_ieee_2Efloat_plus_zero : \iota \Rightarrow \iota \Rightarrow \iota$ be given. Assume the following.

$$\forall A_27t.nonempty\ A_27t \Rightarrow \forall A_27w.nonempty\ A_27w \Rightarrow c_2Ebinary_ieee_2Efloat_plus_zero\ A_27t\ A_27w \in ((ty_2Ebinary_ieee_2Efloat\ A_27t\ A_27w)^{(ty_2Ebool_2Eitself\ (ty_2Epair_2Eprod\ A_27t\ A_27w))}) \quad (54)$$

Let $c_2Ebinary_ieee_2Efloat_minus_zero : \iota \Rightarrow \iota \Rightarrow \iota$ be given. Assume the following.

$$\forall A_27t.nonempty\ A_27t \Rightarrow \forall A_27w.nonempty\ A_27w \Rightarrow c_2Ebinary_ieee_2Efloat_minus_zero\ A_27t\ A_27w \in ((ty_2Ebinary_ieee_2Efloat\ A_27t\ A_27w)^{(ty_2Ebool_2Eitself\ (ty_2Epair_2Eprod\ A_27t\ A_27w))}) \quad (55)$$

Definition 59 We define $c_2Ebinary_ieee_2Efloat_is_zero$ to be $\lambda A_27t : \iota.\lambda A_27w : \iota.\lambda V0x \in (ty_2Ebinary_ieee_2Efloat_is_zero$

Definition 60 We define $c_2Ebinary_ieee_2Efloat_round$ to be $\lambda A_27t : \iota.\lambda A_27w : \iota.\lambda V0mode \in ty_2Ebinary_ieee_2Efloat_round$

Let $ty_2Ebinary_ieee_2Eflags : \iota$ be given. Assume the following.

$$nonempty\ ty_2Ebinary_ieee_2Eflags \quad (56)$$

Let $c_2Ebool_2EARB : \iota \Rightarrow \iota$ be given. Assume the following.

$$\forall A_27a. nonempty\ A_27a \Rightarrow c_2Ebool_2EARB\ A_27a \in A_27a \quad (57)$$

Let $c_2Ebinary_ieee_2Eflags_Underflow_AfterRounding_fupd : \iota$ be given. Assume the following.

$$c_2Ebinary_ieee_2Eflags_Underflow_AfterRounding_fupd \in ((ty_2Ebinary_ieee_2Eflags^{ty_2Ebinary_ieee_2Eflags})^{(2^2)}) \quad (58)$$

Let $c_2Ebinary_ieee_2Eflags_Underflow_BeforeRounding_fupd : \iota$ be given. Assume the following.

$$c_2Ebinary_ieee_2Eflags_Underflow_BeforeRounding_fupd \in ((ty_2Ebinary_ieee_2Eflags^{ty_2Ebinary_ieee_2Eflags})^{(2^2)}) \quad (59)$$

Let $c_2Ebinary_ieee_2Eflags_Precision_fupd : \iota$ be given. Assume the following.

$$c_2Ebinary_ieee_2Eflags_Precision_fupd \in ((ty_2Ebinary_ieee_2Eflags^{ty_2Ebinary_ieee_2Eflags})^{(2^2)}) \quad (60)$$

Let $c_2Ebinary_ieee_2Eflags_Overflow_fupd : \iota$ be given. Assume the following.

$$c_2Ebinary_ieee_2Eflags_Overflow_fupd \in ((ty_2Ebinary_ieee_2Eflags^{ty_2Ebinary_ieee_2Eflags})^{(2^2)}) \quad (61)$$

Let $c_2Ebinary_ieee_2Eflags_InvalidOp_fupd : \iota$ be given. Assume the following.

$$c_2Ebinary_ieee_2Eflags_InvalidOp_fupd \in ((ty_2Ebinary_ieee_2Eflags^{ty_2Ebinary_ieee_2Eflags})^{(2^2)}) \quad (62)$$

Let $c_2Ebinary_ieee_2Eflags_DivideByZero_fupd : \iota$ be given. Assume the following.

$$c_2Ebinary_ieee_2Eflags_DivideByZero_fupd \in ((ty_2Ebinary_ieee_2Eflags^{ty_2Ebinary_ieee_2Eflags})^{(2^2)}) \quad (63)$$

Definition 61 We define $c_2Ebinary_ieee_2Eclear_flags$ to be $(ap\ (ap\ c_2Ebinary_ieee_2Eflags_DivideByZero_fupd))$

Let $c_2Ewords_2EINT_MIN : \iota \Rightarrow \iota$ be given. Assume the following.

$$\forall A_27a. nonempty\ A_27a \Rightarrow c_2Ewords_2EINT_MIN\ A_27a \in (ty_2Enum_2Enum^{(ty_2Ebool_2Eitself\ A_27a)}) \quad (64)$$

Let $ty_2Esum_2Esum : \iota \Rightarrow \iota \Rightarrow \iota$ be given. Assume the following.

$$\forall A0. nonempty\ A0 \Rightarrow \forall A1. nonempty\ A1 \Rightarrow nonempty\ (ty_2Esum_2Esum\ A0\ A1) \quad (65)$$

Let $c_2Ewords_2Edimword : \iota \Rightarrow \iota$ be given. Assume the following.

$$\forall A_27a.nonempty\ A_27a \Rightarrow c_2Ewords_2Edimword\ A_27a \in (ty_2Enum_2Enum^{(ty_2Ebool_2Eitself\ A_27a)}) \quad (66)$$

Definition 62 We define $c_2Ewords_2Eword_2comp$ to be $\lambda A_27a : \iota.\lambda V0w \in (ty_2Efc_2Ecart\ 2\ A_27a).$

Definition 63 We define $c_2Ewords_2Eword_2msb$ to be $\lambda A_27a : \iota.\lambda V0w \in (ty_2Efc_2Ecart\ 2\ A_27a).$

Definition 64 We define $c_2Ewords_2Enzcv$ to be $\lambda A_27a : \iota.\lambda V0a \in (ty_2Efc_2Ecart\ 2\ A_27a).\lambda V1b \in$

Let $c_2Epair_2ESND : \iota \Rightarrow \iota \Rightarrow \iota$ be given. Assume the following.

$$\forall A_27a.nonempty\ A_27a \Rightarrow \forall A_27b.nonempty\ A_27b \Rightarrow c_2Epair_2ESND\ A_27a\ A_27b \in (A_27b^{(ty_2Epair_2Eprod\ A_27a\ A_27b)}) \quad (67)$$

Let $c_2Epair_2EFST : \iota \Rightarrow \iota \Rightarrow \iota$ be given. Assume the following.

$$\forall A_27a.nonempty\ A_27a \Rightarrow \forall A_27b.nonempty\ A_27b \Rightarrow c_2Epair_2EFST\ A_27a\ A_27b \in (A_27a^{(ty_2Epair_2Eprod\ A_27a\ A_27b)}) \quad (68)$$

Definition 65 We define $c_2Epair_2EUNCURRY$ to be $\lambda A_27a : \iota.\lambda A_27b : \iota.\lambda A_27c : \iota.\lambda V0f \in ((A_27c^{A_27a})$

Definition 66 We define $c_2Ewords_2Eword_2ls$ to be $\lambda A_27a : \iota.\lambda V0a \in (ty_2Efc_2Ecart\ 2\ A_27a).\lambda V1b$

Definition 67 We define $c_2Ebinary_2ieee_2Efloat_2round_2with_2flags$ to be $\lambda A_27t : \iota.\lambda A_27w : \iota.\lambda V0mode$

Let $ty_2Ebinary_2ieee_2Efp_2op : \iota \Rightarrow \iota \Rightarrow \iota$ be given. Assume the following.

$$\forall A0.nonempty\ A0 \Rightarrow \forall A1.nonempty\ A1 \Rightarrow nonempty\ (ty_2Ebinary_2ieee_2Efp_2op\ A0\ A1) \quad (69)$$

Let $c_2Ebinary_2ieee_2EFP_2MulAdd : \iota \Rightarrow \iota \Rightarrow \iota$ be given. Assume the following.

$$A_27t\ A_27w \in ((((((ty_2Ebinary_2ieee_2Efp_2op\ A_27t\ A_27w)^{(ty_2Ebinary_2ieee_2Efloat\ A_27t\ A_27w)})^{(ty_2Efloat\ A_27t\ A_27w)})^{(ty_2Efloat\ A_27t\ A_27w)})^{(ty_2Efloat\ A_27t\ A_27w)})^{(ty_2Efloat\ A_27t\ A_27w)})^{(ty_2Efloat\ A_27t\ A_27w)}) \quad (70)$$

Definition 68 We define $c_2Ebinary_2ieee_2Efloat_2is_2nan$ to be $\lambda A_27t : \iota.\lambda A_27w : \iota.\lambda V0x \in (ty_2Ebinary_2ieee_2Efloat_2is_2nan\ A_27t\ A_27w)$

Definition 69 We define $c_2Ebinary_2ieee_2Efloat_2is_2signalling$ to be $\lambda A_27t : \iota.\lambda A_27w : \iota.\lambda V0x \in (ty_2Ebinary_2ieee_2Efloat_2is_2signalling\ A_27t\ A_27w)$

Definition 70 We define $c_2Ebinary_2ieee_2Efloat_2some_2qnan$ to be $\lambda A_27t : \iota.\lambda A_27w : \iota.\lambda V0fp_2op \in (ty_2Ebinary_2ieee_2Efloat_2some_2qnan\ A_27t\ A_27w\ fp_2op)$

Definition 71 We define $c_2Ebinary_2ieee_2Einvalidop_2flags$ to be $(ap\ (ap\ c_2Ebinary_2ieee_2Efloat_2is_2nan\ A_27t\ A_27w)\ (ap\ c_2Ebinary_2ieee_2Efloat_2is_2signalling\ A_27t\ A_27w))$

Let $ty_2Elist_2Elist : \iota \Rightarrow \iota$ be given. Assume the following.

$$\forall A0.nonempty\ A0 \Rightarrow nonempty\ (ty_2Elist_2Elist\ A0) \quad (71)$$

Let $c_2Elist_2ENIL : \iota \Rightarrow \iota$ be given. Assume the following.

$$\forall A_27a.nonempty\ A_27a \Rightarrow c_2Elist_2ENIL\ A_27a \in (ty_2Elist_2Elist\ A_27a) \quad (72)$$

Let $c_2Elist_2ECONS : \iota \Rightarrow \iota$ be given. Assume the following.

$$\forall A_27a.nonempty\ A_27a \Rightarrow c_2Elist_2ECONS\ A_27a \in (((ty_2Elist_2Elist\ A_27a)^{(ty_2Elist_2Elist\ A_27a)})^{A_27a}) \quad (73)$$

Let $c_2Elist_2EEXISTS : \iota \Rightarrow \iota$ be given. Assume the following.

$$\forall A_27a.nonempty\ A_27a \Rightarrow c_2Elist_2EEXISTS\ A_27a \in ((2^{(ty_2Elist_2Elist\ A_27a)})^{(2^{A_27a})}) \quad (74)$$

Definition 72 We define $c_2Ebinary_ieee_2Echeck_for_signalling$ to be $\lambda A_27a : \iota. \lambda A_27b : \iota. \lambda V0l \in (ty_2Elist_2Elist\ A_27a)$

Definition 73 We define $c_2Ebinary_ieee_2Efloat_mul_add$ to be $\lambda A_27t : \iota. \lambda A_27w : \iota. \lambda V0mode \in ty_2Elist_2Elist\ A_27t$

Definition 74 We define $c_2Ecombin_2ES$ to be $\lambda A_27a : \iota. \lambda A_27b : \iota. \lambda A_27c : \iota. (\lambda V0f \in ((A_27c^{A_27b})^{A_27a}))$

Definition 75 We define $c_2Ecombin_2EI$ to be $\lambda A_27a : \iota. (ap\ (ap\ (c_2Ecombin_2ES\ A_27a\ (A_27a^{A_27a})))\ A_27a)$

Definition 76 We define $c_2Epair_2E_23_23$ to be $\lambda A_27a : \iota. \lambda A_27b : \iota. \lambda A_27c : \iota. \lambda A_27d : \iota. \lambda V0f \in (A_27a\ A_27b\ A_27c\ A_27d)$

Let $ty_2Efcf_2Ebit0 : \iota \Rightarrow \iota$ be given. Assume the following.

$$\forall A0.nonempty\ A0 \Rightarrow nonempty\ (ty_2Efcf_2Ebit0\ A0) \quad (75)$$

Let $ty_2Efcf_2Ebit1 : \iota \Rightarrow \iota$ be given. Assume the following.

$$\forall A0.nonempty\ A0 \Rightarrow nonempty\ (ty_2Efcf_2Ebit1\ A0) \quad (76)$$

Definition 77 We define $c_2Earithmetic_2EMIN$ to be $\lambda V0m \in ty_2Enum_2Enum. \lambda V1n \in ty_2Enum_2Enum$

Definition 78 We define $c_2Earithmetic_2E_3C_3D$ to be $\lambda V0m \in ty_2Enum_2Enum. \lambda V1n \in ty_2Enum_2Enum$

Definition 79 We define $c_2Ewords_2Eword_bits$ to be $\lambda A_27a : \iota. \lambda V0h \in ty_2Enum_2Enum. \lambda V1l \in ty_2Enum_2Enum$

Definition 80 We define $c_2Ewords_2Ew2w$ to be $\lambda A_27a : \iota. \lambda A_27b : \iota. \lambda V0w \in (ty_2Efcf_2Ecart\ 2\ A_27a\ A_27b)$

Definition 81 We define $c_2Ecombin_2Eo$ to be $\lambda A_27a : \iota. \lambda A_27b : \iota. \lambda A_27c : \iota. \lambda V0f \in (A_27b^{A_27c}). \lambda V1g \in ty_2Enum_2Enum$

Definition 82 We define $c_2Ewords_2Eword_extract$ to be $\lambda A_27a : \iota. \lambda A_27b : \iota. \lambda V0h \in ty_2Enum_2Enum$

Let $c_2Ebinary_ieee_2Efloat_Significand_fupd : \iota \Rightarrow \iota \Rightarrow \iota \Rightarrow \iota$ be given. Assume the following.

$$\begin{aligned} & \forall A_27t.nonempty\ A_27t \Rightarrow \forall A_27u.nonempty\ A_27u \Rightarrow \forall A_27w.nonempty\ A_27w \Rightarrow c_2Ebinary_ieee_2Efloat_Significand_fupd\ A_27t\ A_27u\ A_27w \in \\ & ((ty_2Ebinary_ieee_2Efloat\ A_27u\ A_27w)^{(ty_2Ebinary_ieee_2Efloat\ A_27t\ A_27w)}) \end{aligned} \quad (77)$$

Let $c_2Ebinary_ieee_2Efloat_Exponent_fupd : \iota \Rightarrow \iota \Rightarrow \iota \Rightarrow \iota$ be given. Assume the following.

$$\begin{aligned} & \forall A_27t.nonempty\ A_27t \Rightarrow \forall A_27w.nonempty\ A_27w \Rightarrow \forall A_27x.nonempty\ A_27x \Rightarrow c_2Ebinary_ieee_2Efloat_Exponent_fupd\ A_27t\ A_27w\ A_27x \in \\ & (((ty_2Ebinary_ieee_2Efloat\ A_27t\ A_27x)^{(ty_2Ebinary_ieee_2Efloat\ A_27t\ A_27w)})^{(ty_2Ebinary_ieee_2Efloat\ A_27t\ A_27w)}) \end{aligned} \quad (78)$$

Let $c_2Ebinary_ieee_2Efloat_Sign_fupd : \iota \Rightarrow \iota \Rightarrow \iota$ be given. Assume the following.

$$\begin{aligned} & \forall A_27t.nonempty\ A_27t \Rightarrow \forall A_27w.nonempty\ A_27w \Rightarrow c_2Ebinary_ieee_2Efloat_Sign_fupd\ A_27t\ A_27w \in \\ & (((ty_2Ebinary_ieee_2Efloat\ A_27t\ A_27w)^{(ty_2Ebinary_ieee_2Efloat\ A_27t\ A_27w)})^{(ty_2Ebinary_ieee_2Efloat\ A_27t\ A_27w)}) \end{aligned} \quad (79)$$

Definition 83 We define $c_2Emachine_ieee_2Efp16_to_float$ to be $\lambda V0w \in (ty_2EfcP_2Ecart\ 2\ (ty_2EfcP_2Ebit0\ ty_2Eone_2Eone))$

Definition 84 We define $c_2Ewords_2Eword_lsl$ to be $\lambda A_27a : \iota.\lambda V0w \in (ty_2EfcP_2Ecart\ 2\ A_27a).\lambda V1a \in (ty_2EfcP_2Ebit0\ ty_2Eone_2Eone)$

Definition 85 We define $c_2Ewords_2Eword_or$ to be $\lambda A_27a : \iota.\lambda V0v \in (ty_2EfcP_2Ecart\ 2\ A_27a).\lambda V1a \in (ty_2EfcP_2Ebit0\ ty_2Eone_2Eone)$

Definition 86 We define $c_2Ewords_2Eword_join$ to be $\lambda A_27a : \iota.\lambda A_27b : \iota.\lambda V0v \in (ty_2EfcP_2Ecart\ 2\ A_27a).\lambda V1a \in (ty_2EfcP_2Ebit0\ ty_2Eone_2Eone)$

Definition 87 We define $c_2Ewords_2Eword_concat$ to be $\lambda A_27a : \iota.\lambda A_27b : \iota.\lambda A_27c : \iota.\lambda V0v \in (ty_2EfcP_2Ecart\ 2\ A_27a).\lambda V1a \in (ty_2EfcP_2Ebit0\ ty_2Eone_2Eone)$

Definition 88 We define $c_2Emachine_ieee_2Efloat_to_fp16$ to be $\lambda V0x \in (ty_2Ebinary_ieee_2Efloat\ (ty_2EfcP_2Ebit0\ ty_2Eone_2Eone))$

Definition 89 We define $c_2Emachine_ieee_2Efp16_mul_add_with_flags$ to be $\lambda V0mode \in ty_2Ebinary_ieee_2Erounding.\lambda V1a \in (ty_2EfcP_2Ecart\ 2\ (ty_2EfcP_2Ebit0\ ty_2Eone_2Eone))$

Assume the following.

$$\begin{aligned} & (\forall V0x \in (ty_2Ebinary_ieee_2Efloat\ (ty_2EfcP_2Ebit0\ (ty_2EfcP_2Ebit1\ (ty_2EfcP_2Ebit0\ ty_2Eone_2Eone))))\ (ty_2EfcP_2Ebit1\ (ty_2EfcP_2Ebit0\ ty_2Eone_2Eone))).((ap\ c_2Emachine_ieee_2Efp16_to_float\ (ap\ c_2Emachine_ieee_2Efloat_to_fp16\ V0x)) = V0x) \end{aligned} \quad (80)$$

Theorem 1

$$\begin{aligned}
& ((\forall V0mode \in ty_2Ebinary_ieee_2Erounding. (\forall V1c \in \\
& \quad (ty_2Ebinary_ieee_2Efloat (ty_2Efc_2Ebit0 (ty_2Efc_2Ebit1 \\
& \quad (ty_2Efc_2Ebit0 ty_2Eone_2Eone))) (ty_2Efc_2Ebit1 (ty_2Efc_2Ebit0 \\
& \quad \quad ty_2Eone_2Eone))). (\forall V2b \in (ty_2Ebinary_ieee_2Efloat \\
& \quad (ty_2Efc_2Ebit0 (ty_2Efc_2Ebit1 (ty_2Efc_2Ebit0 ty_2Eone_2Eone))) \\
& \quad (ty_2Efc_2Ebit1 (ty_2Efc_2Ebit0 ty_2Eone_2Eone))). (\forall V3a \in \\
& \quad (ty_2Ebinary_ieee_2Efloat (ty_2Efc_2Ebit0 (ty_2Efc_2Ebit1 \\
& \quad (ty_2Efc_2Ebit0 ty_2Eone_2Eone))) (ty_2Efc_2Ebit1 (ty_2Efc_2Ebit0 \\
& \quad \quad ty_2Eone_2Eone))). ((ap (ap (ap (ap c_2Emachine_ieee_2Efp16_mul_add_with_flags \\
V0mode) (ap c_2Emachine_ieee_2Efloat_to_fp16 V3a)) (ap c_2Emachine_ieee_2Efloat_to_fp16 \\
\quad V2b)) (ap c_2Emachine_ieee_2Efloat_to_fp16 V1c)) = (ap (ap \\
\quad (ap (c_2Epair_2E_23_23 ty_2Ebinary_ieee_2Eflags (ty_2Ebinary_ieee_2Efloat \\
\quad (ty_2Efc_2Ebit0 (ty_2Efc_2Ebit1 (ty_2Efc_2Ebit0 ty_2Eone_2Eone))) \\
\quad (ty_2Efc_2Ebit1 (ty_2Efc_2Ebit0 ty_2Eone_2Eone))) ty_2Ebinary_ieee_2Eflags \\
\quad (ty_2Efc_2Ecart 2 (ty_2Efc_2Ebit0 (ty_2Efc_2Ebit0 (ty_2Efc_2Ebit0 \\
\quad (ty_2Efc_2Ebit0 ty_2Eone_2Eone)))))) (c_2Ecombin_2El ty_2Ebinary_ieee_2Eflags)) \\
c_2Emachine_ieee_2Efloat_to_fp16) (ap (ap (ap (ap (c_2Ebinary_ieee_2Efloat_mul_add \\
\quad (ty_2Efc_2Ebit0 (ty_2Efc_2Ebit1 (ty_2Efc_2Ebit0 ty_2Eone_2Eone))) \\
\quad (ty_2Efc_2Ebit1 (ty_2Efc_2Ebit0 ty_2Eone_2Eone))) V0mode) \\
\quad V3a) V2b) V1c)))))) \wedge ((\forall V4mode \in ty_2Ebinary_ieee_2Erounding. \\
\quad (\forall V5c \in ty_2Enum_2Enum. (\forall V6b \in (ty_2Ebinary_ieee_2Efloat \\
\quad (ty_2Efc_2Ebit0 (ty_2Efc_2Ebit1 (ty_2Efc_2Ebit0 ty_2Eone_2Eone))) \\
\quad (ty_2Efc_2Ebit1 (ty_2Efc_2Ebit0 ty_2Eone_2Eone))). (\forall V7a \in \\
\quad (ty_2Ebinary_ieee_2Efloat (ty_2Efc_2Ebit0 (ty_2Efc_2Ebit1 \\
\quad (ty_2Efc_2Ebit0 ty_2Eone_2Eone))) (ty_2Efc_2Ebit1 (ty_2Efc_2Ebit0 \\
\quad \quad ty_2Eone_2Eone))). ((ap (ap (ap (ap c_2Emachine_ieee_2Efp16_mul_add_with_flags \\
V4mode) (ap c_2Emachine_ieee_2Efloat_to_fp16 V7a)) (ap c_2Emachine_ieee_2Efloat_to_fp16 \\
\quad V6b)) (ap (c_2Ewords_2En2w (ty_2Efc_2Ebit0 (ty_2Efc_2Ebit0 \\
\quad (ty_2Efc_2Ebit0 ty_2Eone_2Eone)))))) V5c)) = \\
(ap (ap (ap (c_2Epair_2E_23_23 ty_2Ebinary_ieee_2Eflags (ty_2Ebinary_ieee_2Efloat \\
\quad (ty_2Efc_2Ebit0 (ty_2Efc_2Ebit1 (ty_2Efc_2Ebit0 ty_2Eone_2Eone))) \\
\quad (ty_2Efc_2Ebit1 (ty_2Efc_2Ebit0 ty_2Eone_2Eone))) ty_2Ebinary_ieee_2Eflags \\
\quad (ty_2Efc_2Ecart 2 (ty_2Efc_2Ebit0 (ty_2Efc_2Ebit0 (ty_2Efc_2Ebit0 \\
\quad (ty_2Efc_2Ebit0 ty_2Eone_2Eone)))))) (c_2Ecombin_2El ty_2Ebinary_ieee_2Eflags)) \\
c_2Emachine_ieee_2Efloat_to_fp16) (ap (ap (ap (ap (c_2Ebinary_ieee_2Efloat_mul_add \\
\quad (ty_2Efc_2Ebit0 (ty_2Efc_2Ebit1 (ty_2Efc_2Ebit0 ty_2Eone_2Eone))) \\
\quad (ty_2Efc_2Ebit1 (ty_2Efc_2Ebit0 ty_2Eone_2Eone))) V4mode) \\
\quad V7a) V6b) (ap c_2Emachine_ieee_2Efp16_to_float (ap (c_2Ewords_2En2w \\
\quad (ty_2Efc_2Ebit0 (ty_2Efc_2Ebit0 (ty_2Efc_2Ebit0 (ty_2Efc_2Ebit0 \\
\quad \quad ty_2Eone_2Eone)))))) V5c)))))) \wedge ((\forall V8mode \in ty_2Ebinary_ieee_2Erounding. \\
\quad (\forall V9c \in (ty_2Ebinary_ieee_2Efloat (ty_2Efc_2Ebit0 (\\
\quad ty_2Efc_2Ebit1 (ty_2Efc_2Ebit0 ty_2Eone_2Eone))) (ty_2Efc_2Ebit1 \\
\quad (ty_2Efc_2Ebit0 ty_2Eone_2Eone))). (\forall V10b \in ty_2Enum_2Enum. \\
\quad (\forall V11a \in (ty_2Ebinary_ieee_2Efloat (ty_2Efc_2Ebit0 \\
\quad (ty_2Efc_2Ebit1 (ty_2Efc_2Ebit0 ty_2Eone_2Eone))) (ty_2Efc_2Ebit1 \\
\quad (ty_2Efc_2Ebit0 ty_2Eone_2Eone))). ((ap (ap (ap (ap c_2Emachine_ieee_2Efp16_mul_add_with_flags \\
\quad V8mode) (ap c_2Emachine_ieee_2Efloat_to_fp16 V11a)) (ap (\\
\quad c_2Ewords_2En2w (ty_2Efc_2Ebit0 (ty_2Efc_2Ebit0 (ty_2Efc_2Ebit0 \\
\quad (ty_2Efc_2Ebit0 ty_2Eone_2Eone)))))) V10b)) (ap c_2Emachine_ieee_2Efloat_to_fp16 \\
\quad V9c)) = (ap (ap (ap (c_2Epair_2E_23_23 ty_2Ebinary_ieee_2Eflags \\
\quad (ty_2Ebinary_ieee_2Efloat (ty_2Efc_2Ebit0 (ty_2Efc_2Ebit1 \\
\quad (ty_2Efc_2Ebit0 ty_2Eone_2Eone))) (ty_2Efc_2Ebit1 (ty_2Efc_2Ebit0 \\
\quad \quad ty_2Eone_2Eone))) ty_2Ebinary_ieee_2Eflags (ty_2Efc_2Ecart \\
\quad 2 (ty_2Efc_2Ebit0 (ty_2Efc_2Ebit0 (ty_2Efc_2Ebit0 (ty_2Efc_2Ebit0 \\
\quad \quad ty_2Eone_2Eone)))))) (c_2Ecombin_2El ty_2Ebinary_ieee_2Eflags)) \\
c_2Emachine_ieee_2Efloat_to_fp16) (ap (ap (ap (ap (c_2Ebinary_ieee_2Efloat_mul_add \\
\quad (ty_2Efc_2Ebit0 (ty_2Efc_2Ebit1 (ty_2Efc_2Ebit0 ty_2Eone_2Eone))) \\
\quad (ty_2Efc_2Ebit1 (ty_2Efc_2Ebit0 ty_2Eone_2Eone))) V8mode) \\
\quad V11a) (ap c_2Emachine_ieee_2Efp16_to_float (ap (c_2Ewords_2En2w
\end{aligned}$$