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# NCV7357

## CAN FD Transceiver, High Speed

### Description

The NCV7357 CAN transceiver is the interface between a controller area network (CAN) protocol controller and the physical bus. The transceiver provides differential transmit capability to the bus and differential receive capability to the CAN controller.

The NCV7357 is an addition to the CAN high-speed transceiver family complementing NCV7344 CAN stand-alone transceivers and previous generations such as AMIS42665, AMIS3066x, etc.

The NCV7357 guarantees additional timing parameters to ensure robust communication at data rates beyond 1 Mbps to cope with CAN flexible data rate requirements (CAN FD). These features make the NCV7357 an excellent choice for all types of HS-CAN networks, in nodes that require only a basic CAN capability.

### Features

- Compatible with ISO 11898-2:2016
- CAN FD Timing Specified up to 5 Mbps
- V<sub>IO</sub> Pin on NCV7357-3 Version Allowing Direct Interfacing with 3 V to 5 V Microcontrollers
- Low Current, Listen Only Silent Mode
- Low Electromagnetic Emission (EME) and High Electromagnetic Immunity
- Very Low EME without Common-mode (CM) Choke
- No Disturbance of the Bus Lines with an Unpowered Node
- Transmit Data (TxD) Dominant Timeout Function
- Under All Supply Conditions the Chip Behaves Predictably
- Very High ESD Robustness of Bus Pins, >8 kV System ESD Pulses
- Thermal Protection
- Bus Pins Short Circuit Proof to Supply Voltage and Ground
- Bus Pins Protected Against Transients in an Automotive Environment
- These are Pb-free Devices

### Quality

- Wettable Flank Package for Enhanced Optical Inspection
- NCV Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q100 Qualified and PPAP Capable

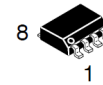
### Typical Applications

- Automotive
- Industrial Networks



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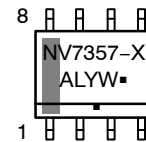
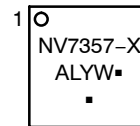


SOIC-8  
D SUFFIX  
CASE 751AZ



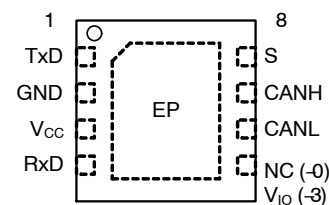
DFNW8  
MW SUFFIX  
CASE 507AB

### MARKING DIAGRAM

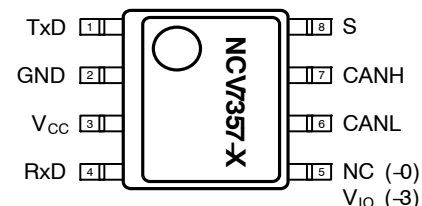


NV7357-X = Specific Device Code  
A = Assembly Location  
L = Wafer Lot  
Y = Year  
W = Work Week  
▪ = Pb-Free Package

### PIN ASSIGNMENT



NCV7357D1x  
(Top View)



NCV7357MWx  
(Top View)

### ORDERING INFORMATION

See detailed ordering, marking and shipping information on page 11 of this data sheet.

# NCV7357

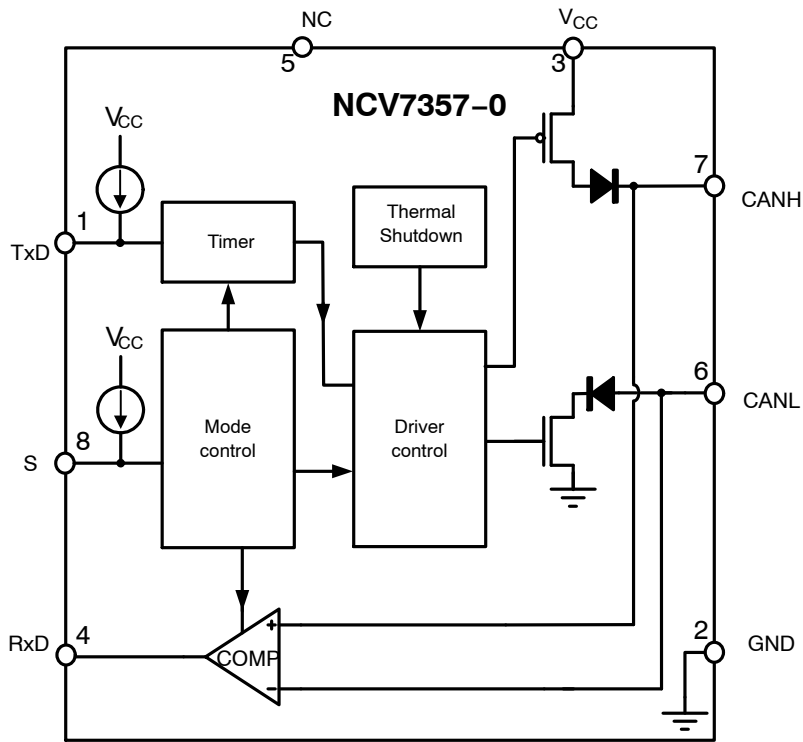


Figure 1. NCV7357-0 Block Diagram

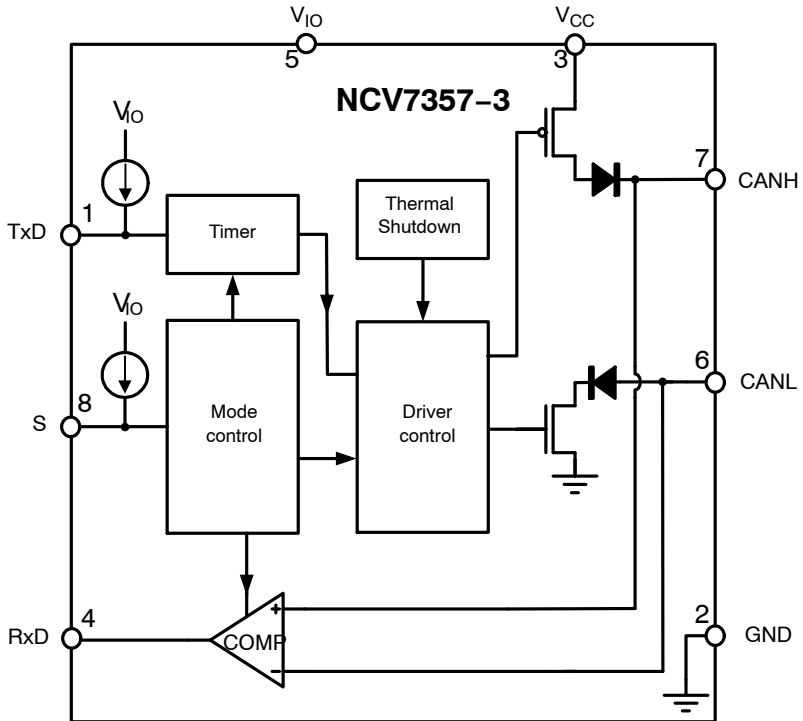


Figure 2. NCV7357-3 Block Diagram

# NCV7357

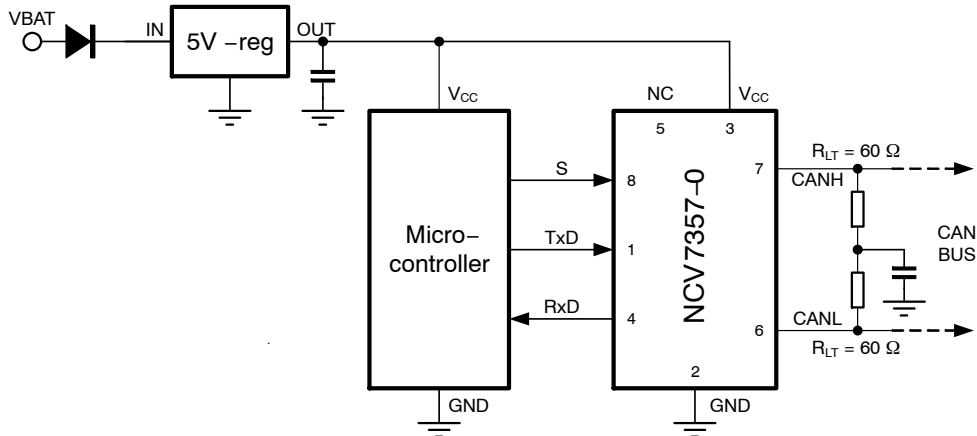


Figure 3. Application Diagram NCV7357-0

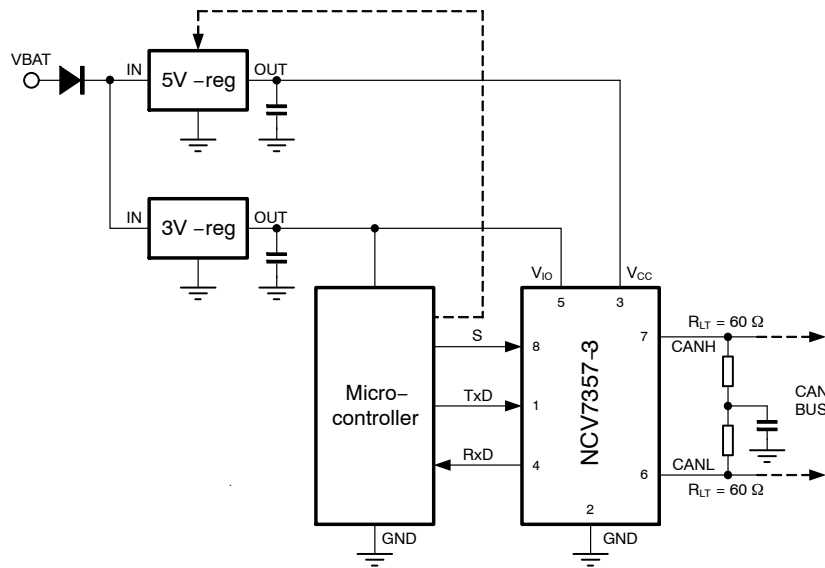


Figure 4. Application Diagram NCV7357-3

Table 1. PIN FUNCTION DESCRIPTION

Pin	Name	Description
1	TxD	Transmit data input; low input → dominant driver; internal pull-up current
2	GND	Ground
3	V <sub>CC</sub>	Supply voltage
4	RxD	Receive data output; dominant transmitter → low output
5	NC	Not connected. On NCV7357-0 only
5	V <sub>IO</sub>	Digital Input / Output pins supply voltage. On NCV7357-3 only
6	CANL	Low-level CAN bus line (low in dominant mode)
7	CANH	High-level CAN bus line (high in dominant mode)
8	S	Silent mode control input; internal pull-up current
	EP	Exposed Pad. Recommended to connect to GND or left floating in application (DFNW8 package only).

**FUNCTIONAL DESCRIPTION**

**High speed CAN FD transceiver**

NCV7357 implements high-speed physical layer CAN FD transceiver compatible with ISO11898-2, implementing following optional features or alternatives:

- Extended bus load range

- Transmit dominant timeout, long
- Support of bit rates up to 5 Mbps
- Normal Bus biasing

**Operating Modes**

NCV7357 provides two modes of operation as illustrated in Table 2. These modes are selectable through pin S.

**Table 2. OPERATING MODES**

Pin S	Mode	Pin TxD	BUS	Pin RxD
Low	Normal	0	Dominant	0
		1	Recessive	1
High	Silent	X	Dominant (1)	0
		X	Recessive	1

1. CAN BUS driven by another transceiver on the BUS
2. 'X' = don't care

**Power-off**

This virtual mode is entered as soon as the  $V_{CC}$  or  $V_{IO}$  undervoltage condition is detected. The internal logic is reset and the transceiver is disabled. CAN bus pins are kept floating. As soon as both  $V_{CC}$  and  $V_{IO}$  voltages rise above corresponding undervoltage recovery thresholds, the device proceeds to Normal or Silent mode, depending on S pin state.

**Normal Mode**

In the normal mode, the transceiver is able to communicate via the bus lines. The signals are transmitted and received to the CAN controller via the pins TxD and RxD. The slopes on the bus lines outputs are optimized to give low EME.

**Silent Mode**

In the silent mode, the transmitter is disabled. The bus pins are in recessive state independent of TxD input. Transceiver listens to the bus and provides data to controller, but controller is prevented from sending any data to the bus.

**Overtemperature Detection**

A thermal protection circuit protects the IC from damage by switching off the transmitter if the junction temperature exceeds  $T_{J(sd)}$  value. Because the transmitter dissipates most of the power, the power dissipation and temperature of the IC is reduced. All other IC functions continue to operate. The transmitter off-state resets when the temperature decreases below the shutdown threshold and pin TxD goes high. The thermal protection circuit is particularly needed when a bus line short circuits.

**TxD Dominant Timeout Function**

A TxD dominant timeout timer circuit prevents the bus lines being driven to a permanent dominant state (blocking all network communication) if pin TxD is forced permanently low by a hardware and/or software application failure. The timer is triggered by a negative edge on pin TxD. If the duration of the low-level on pin TxD exceeds the internal timer value  $t_{dom(TxD)}$ , the transmitter is disabled, driving the bus into a recessive state. The timer is reset by a positive edge on pin TxD.

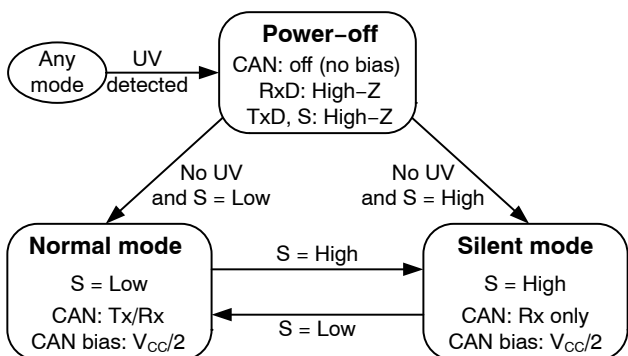
This TxD dominant timeout time  $t_{dom(TxD)}$  defines the minimum possible bit rate to 17 kbps.

**Fail Safe Features**

A current-limiting circuit protects the transmitter output stage from damage caused by accidental short circuit to either positive or negative supply voltage, although power dissipation increases during this fault condition.

Detection of undervoltage on supply pin ( $V_{CC}$  or  $V_{IO}$ ) causes switching off device. After supply voltage is recovered TxD pin must be first released to high to allow sending dominant bits again.

The pins CANH and CANL are protected from automotive electrical transients (according to ISO 7637; see



Notes:  
 NCV7357-0  
 UV detected:  $V_{CC} < V_{UVdVCC}$   
 No UV:  $V_{CC} > V_{UVdVCC}$   
 NCV7357-3  
 UV detected:  $V_{CC} < V_{UVdVCC}$  and/or  $V_{IO} < V_{UVdVIO}$   
 No UV:  $V_{CC} > V_{UVdVCC}$  and  $V_{IO} > V_{UVdVIO}$

## NCV7357

Figure 7). Pins TxD and S are biased internally should the input become disconnected. Pins TxD, S and RxD will be floating, preventing reverse supply should the VCC supply be removed.

### V<sub>IO</sub> Supply Pin

The V<sub>IO</sub> pin (available only on NCV7357-3 version) should be connected to microcontroller supply pin. By using V<sub>IO</sub> supply pin shared with microcontroller the I/O levels

between microcontroller and transceiver are properly adjusted. See Figure 4.

### Definitions

All voltages are referenced to GND (pin 2). Positive currents flow into the IC. Sinking current means the current is flowing into the pin; sourcing current means the current is flowing out of the pin.

## ABSOLUTE MAXIMUM RATINGS

**Table 3. ABSOLUTE MAXIMUM RATINGS**

Symbol	Parameter	Conditions	Min.	Max.	Unit
V <sub>SUP</sub>	Supply voltage V <sub>CC</sub> , V <sub>IO</sub>		-0.3	+6.0	V
V <sub>CANH</sub>	DC voltage at pin CANH	0 < V <sub>CC</sub> < 5.5 V; no time limit	-42	+42	V
V <sub>CANL</sub>	DC voltage at pin CANL	0 < V <sub>CC</sub> < 5.5 V; no time limit	-42	+42	V
V <sub>CANH - CANL</sub>	DC voltage between CANH and CANL		-42	+42	V
V <sub>I/O</sub>	DC voltage at pin TxD, RxD, S		-0.3	+6.0	V
V <sub>esdHBM</sub>	Electrostatic discharge voltage at all pins, Component HBM	(Note 3)	-6	+6	kV
V <sub>esdCDM</sub>	Electrostatic discharge voltage at all pins, Component CDM	(Note 4)	-750	+750	V
V <sub>esdIEC</sub>	Electrostatic discharge voltage at pins CANH and CANL, System HBM (Note 6)	(Note 5)	-8	+8	kV
V <sub>schaff</sub>	Voltage transients, pins CANH, CANL. According to ISO7637-3, Class C (Note 6)	test pulses 1	-100		V
		test pulses 2a		+75	V
		test pulses 3a	-150		V
		test pulses 3b		+100	V
Latch-up	Static latch-up at all pins	(Note 7)		150	mA
T <sub>stg</sub>	Storage temperature		-55	+150	°C
T <sub>J</sub>	Maximum junction temperature		-40	+170	°C
MSL <sub>SOIC</sub>	Moisture sensitivity level for SOIC-8		2		-
MSL <sub>DFN</sub>	Moisture sensitivity level for DFNW8		1		-

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

- Standardized human body model electrostatic discharge (ESD) pulses in accordance to EIA-JESD22. Equivalent to discharging a 100 pF capacitor through a 1.5 kΩ resistor
- Standardized charged device model ESD pulses when tested according to AEC-Q100-011
- System human body model electrostatic discharge (ESD) pulses in accordance to IEC 61000-4-2. Equivalent to discharging a 150 pF capacitor through a 330 Ω resistor referenced to GND
- Results were verified by external test house
- Static latch-up immunity: Static latch-up protection level when tested according to EIA/JESD78

**Table 4. THERMAL CHARACTERISTICS**

Parameter	Symbol	Value	Unit
Thermal characteristics SOIC-8 (Note 8)			
Thermal Resistance Junction-to-Air, Free air, 1S0P PCB (Note 9)	$R_{\theta JA}$	131	$^{\circ}\text{C}/\text{W}$
Thermal Resistance Junction-to-Air, Free air, 2S2P PCB (Note 10)	$R_{\theta JA}$	81	$^{\circ}\text{C}/\text{W}$
Thermal characteristics DFNW8 (Note 8)			
Thermal Resistance Junction-to-Air, Free air, 1S0P PCB (Note 9)	$R_{\theta JA}$	125	$^{\circ}\text{C}/\text{W}$
Thermal Resistance Junction-to-Air, Free air, 2S2P PCB (Note 10)	$R_{\theta JA}$	58	$^{\circ}\text{C}/\text{W}$

8. Refer to ELECTRICAL CHARACTERISTICS, RECOMMENDED OPERATING RANGES and/or APPLICATION INFORMATION for Safe Operating parameters

9. Values based on test board according to EIA/JEDEC Standard JESD51-3, signal layer with 10% trace coverage

10. Values based on test board according to EIA/JEDEC Standard JESD51-7, signal layers with 10% trace coverage

**Table 5. ELECTRICAL CHARACTERISTICS** ( $V_{CC} = 4.75\text{ V}$  to  $5.25\text{ V}$ ;  $V_{IO} = 2.8\text{ V}$  to  $5.25\text{ V}$ ; for typical values  $T_A = 25^{\circ}\text{C}$ , for min/max values  $T_J = -40$  to  $+150^{\circ}\text{C}$ ;  $R_{LT} = 60\ \Omega$ ,  $C_{RXD} = 15\text{ pF}$ ; unless otherwise noted. All voltages are referenced to GND (pin 2). Positive currents flow into the respective pin; (Notes 11))

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
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**SUPPLY (Pin  $V_{CC}$ )**

$V_{CC}$	Power supply voltage	(Note 12)	4.75	5.0	5.25	V
$I_{CC}$	Supply current in Normal mode	Dominant; $V_{TXD} = \text{Low}$	30	45	55	mA
		Recessive; $V_{TXD} = \text{High}$	2.0	5.0	10	mA
		Normal mode, Dominant; $V_{TXD} = 0\text{ V}$ ; one of bus wires shorted $-3\text{ V} \leq (V_{CANH}, V_{CANL}) \leq +18\text{ V}$	2.0	-	105	mA
$I_{CCS}$	Supply current in silent mode NCV7357-3 version		0.1	-	1.3	mA
	Supply current in silent mode NCV7357-0 version		0.1	-	1.5	mA
$V_{UVDVCC}$	Undervoltage detection on $V_{CC}$ pin		3.5	4.0	4.3	V

**$V_{IO}$  SUPPLY VOLTAGE (Pin  $V_{IO}$ )** Only for NCV7357-3 version

$V_{IO}$	Supply voltage on pin $V_{IO}$		2.8	-	5.5	V
$I_{IOS}$	Supply current on pin $V_{IO}$ in silent mode	$V_{TXD} = V_{IO}$	-	120	200	$\mu\text{A}$
$I_{IONM}$	Supply current on pin $V_{IO}$ during normal mode	Dominant; $V_{TXD} = \text{Low}$	-	700	900	$\mu\text{A}$
		Recessive; $V_{TXD} = \text{High}$	-	460	600	
$V_{UVDVIO}$	Undervoltage detection voltage on $V_{IO}$ pin		2.0	2.3	2.6	V

**TRANSMITTER DATA INPUT (Pin  $TxD$ )**

$V_{IH}$	High-level input voltage	Output recessive	2.0	-	-	V
$V_{IL}$	Low-level input voltage	Output dominant	-0.3	-	0.8	V
$I_{IH}$	High-level input current	$V_{TXD} = V_{CC} / V_{IO}$	-5.0	0	5.0	$\mu\text{A}$
$I_{IL}$	Low-level input current	$V_{TXD} = 0\text{ V}$	-300	-150	-75	$\mu\text{A}$
$C_i$	Input capacitance	(Note 13)	-	5	10	pF

**TRANSMITTER DATA INPUT (Pin  $S$ )**

$V_{IH}$	High-level input voltage	Silent mode	2.0	-	-	V
$V_{IL}$	Low-level input voltage	Normal mode	-0.3	-	0.8	V
$I_{IH}$	High-level input current	$V_S = V_{CC} / V_{IO}$	-1.0	0	1.0	$\mu\text{A}$
$I_{IL}$	Low-level input current	$V_S = 0\text{ V}$	-15	-	-1.0	$\mu\text{A}$
$C_i$	Input capacitance	(Note 13)	-	5	10	pF

**Table 5. ELECTRICAL CHARACTERISTICS** ( $V_{CC} = 4.75\text{ V to }5.25\text{ V}$ ;  $V_{IO} = 2.8\text{ V to }5.25\text{ V}$ ; for typical values  $T_A = 25^\circ\text{C}$ , for min/max values  $T_J = -40\text{ to }+150^\circ\text{C}$ ;  $R_{LT} = 60\ \Omega$ ,  $C_{RxD} = 15\text{ pF}$ ; unless otherwise noted. All voltages are referenced to GND (pin 2). Positive currents flow into the respective pin; (Notes 11))

**RECEIVER DATA OUTPUT (Pin RxD)**

$I_{OH}$	High-level output current	Normal mode $V_{RxD} = V_{CC} / V_{IO} - 0.4\text{ V}$	-8.0	-3.0	-1.0	mA
$I_{OL}$	Low-level output current	$V_{RxD} = 0.4\text{ V}$	1.0	6.0	12	mA

**CAN TRANSMITTER (PINS CANH AND CANL)**

$V_{o(dom)}(CANH)$	Dominant output voltage at pin CANH	Normal mode; $V_{TxD} = \text{Low}$ ; $t < t_{dom}(TxD)$ ; $50\ \Omega < R_{LT} < 65\ \Omega$	2.75	3.5	4.5	V
$V_{o(dom)}(CANL)$	Dominant output voltage at pin CANL	Normal mode; $V_{TxD} = \text{Low}$ ; $t < t_{dom}(TxD)$ ; $50\ \Omega < R_{LT} < 65\ \Omega$	0.5	1.5	2.25	V
$V_{o(rec)}$	Recessive output voltage at pins CANH and CANL	Normal or Silent mode; $V_{TxD} = \text{High}$ or $V_{TxD} = \text{Low}$ and $t > t_{dom}(TxD)$ ; no load	2.0	2.5	3.0	V
$V_{o(dom)}(diff)$	Differential dominant output voltage ( $V_{CANH} - V_{CANL}$ )	Normal mode; $V_{TxD} = \text{Low}$ ; $t < t_{dom}(TxD)$ ; $45\ \Omega < R_{LT} < 65\ \Omega$	1.5	2.25	3.0	V
$V_{o(dom)}(diff\_ARB)$		Normal mode; $V_{TxD} = \text{Low}$ ; $t < t_{dom}(TxD)$ ; $R_{LT} = 2\ 240\ \Omega$ (Note 13)	1.5	-	5.0	V
$V_{o(rec)}(diff)$	Differential recessive output voltage ( $V_{CANH} - V_{CANL}$ )	Normal or Silent mode; $V_{TxD} = \text{High}$ or $V_{TxD} = \text{Low}$ and $t > t_{dom}(TxD)$ ; no load	-50	0	+50	mV
$V_{o(dom)}(sym)$	Dominant output voltage driver symmetry $V_{o(dom)}(sym) = V_{o(CANH)}(dom) + V_{o(CANL)}(dom)$	$TxD = \text{square wave up to } 1\text{ MHz}$ ; $C_{ST} = 4.7\text{ nF}$	0.9	1.0	1.1	$V_{CC}$
$I_{o(sc)}(CANH)$	Short circuit output current at pin CANH in dominant	Normal mode; $TxD = \text{Low}$ , $t < t_{dom}(TxD)$ ; $-3\text{ V} \leq V_{CANH} \leq +18\text{ V}$	-100	-70	+1.0	mA
$I_{o(sc)}(CANL)$	Short circuit output current at pin CANL in dominant	Normal mode; $TxD = \text{Low}$ , $t < t_{dom}(TxD)$ ; $-3\text{ V} \leq V_{CANL} \leq +36\text{ V}$	-1.0	+70	+100	mA
$I_{o(sc)}(rec)$	Short circuit output current at pins CANH and CANL in recessive	Normal or Silent mode; $TxD = \text{High}$ , $-27\text{ V} < V_{CANH}$ , $V_{CANL} < +32\text{ V}$	-5.0	-	+5.0	mA

**CAN RECEIVER (Pins CANH and CANL)**

$I_{LEAK(off)}$	Input leakage current	$0\ \Omega < R(V_{CC}\text{ to GND}) < 1\text{ M}\Omega$ $V_{CANH} = V_{CANL} = 5\text{ V}$	-5.0	0	+5.0	$\mu\text{A}$
		$V_{CC} = V_{IO} = 0\text{ V}$ $V_{CANH} = V_{CANL} = 5\text{ V}$	-5.0	0	+5.0	$\mu\text{A}$
$V_{i(rec)}(diff\_NM)$	Differential input voltage range recessive state	Normal or Silent mode; $-12\text{ V} \leq V_{CANH}$ , $V_{CANL} \leq +12\text{ V}$ ; no load	-3.0	-	0.5	V
$V_{i(dom)}(diff\_NM)$	Differential input voltage range dominant state	Normal or Silent mode; $-12\text{ V} \leq V_{CANH}$ , $V_{CANL} \leq +12\text{ V}$ ; no load	0.9	-	8.0	V
$V_{i(th)}(diff\_NM)$	Differential receiver threshold voltage	Normal or Silent mode; $-12\text{ V} \leq V_{CANH}$ , $V_{CANL} \leq +12\text{ V}$ ; no load	0.5	-	0.9	V
$V_{i(th)}(diff\_NM\_E)$		Normal or Silent mode; extended, $-30\text{ V} \leq V_{CANH}$ , $V_{CANL} \leq +35\text{ V}$ ; no load	0.4	-	1.0	V
$R_{i(cm)}$	Common-mode input resistance at pins CANH and CANL	$-2\text{ V} \leq V_{CANH}$ , $V_{CANL} \leq +7\text{ V}$	15	25	37	$\text{k}\Omega$



**Table 5. ELECTRICAL CHARACTERISTICS** ( $V_{CC} = 4.75\text{ V to }5.25\text{ V}$ ;  $V_{IO} = 2.8\text{ V to }5.25\text{ V}$ ; for typical values  $T_A = 25^\circ\text{C}$ , for min/max values  $T_J = -40\text{ to }+150^\circ\text{C}$ ;  $R_{LT} = 60\ \Omega$ ,  $C_{RxD} = 15\text{ pF}$ ; unless otherwise noted. All voltages are referenced to GND (pin 2). Positive currents flow into the respective pin; (Notes 11))

$R_{i(cm)(m)}$	Matching between pin CANH and pin CANL common mode input resistance	$V_{CANH} = V_{CANL} = +5\text{ V}$	-1	0	+1	%
$R_{i(diff)}$	Differential input resistance	$R_{i(diff)} = R_{i(cm)(CANH)} + R_{i(cm)(CANL)}$ $-2\text{ V} \leq V_{CANH}, V_{CANL} \leq +7\text{ V}$	25	50	75	k $\Omega$
$C_i$	Input capacitance at pins CANH and CANL	$V_{TxD} = \text{High}$ ; (Note 13)	-	7.5	20	pF
$C_{i(diff)}$	Differential input capacitance	$V_{TxD} = \text{High}$ ; (Note 13)	-	3.75	10	pF

**TIMING CHARACTERISTICS (see Figure 5, Figure 6 and Figure 8)**

$t_{d(TxD-BUSon)}$	Propagation delay TxD to bus active	Normal mode (Note 14)	-	75	-	ns
$t_{d(TxD-BUSoff)}$	Propagation delay TxD to bus inactive	Normal mode (Note 14)	-	85	-	ns
$t_{d(BUSon-RxD)}$	Propagation delay bus active to RxD	Normal or Silent mode (Note 14)	-	24	-	ns
$t_{d(BUSoff-RxD)}$	Propagation delay bus inactive to RxD	Normal or Silent mode (Note 14)	-	32	-	ns
$t_{pd\_dr}$	Propagation delay TxD to RxD dominant to recessive transition	Normal mode (Note 14)	50	100	210	ns
$t_{pd\_rd}$	Propagation delay TxD to RxD recessive to dominant transition	Normal mode (Note 14)	50	120	210	ns
$t_{d(s-nm)}$	Operating mode change delay	Silent mode to Normal mode	5.0	11	50	$\mu\text{s}$
$t_{dom(TxD)}$	TxD dominant timeout	Normal mode; $V_{TxD} = \text{Low}$	1.0	-	10	ms
$t_{bit(RxD)}$	Bit time on RxD pin	$t_{bit(TxD)} = 500\text{ ns}$ (Note 14)	400	-	550	ns
		$t_{bit(TxD)} = 200\text{ ns}$ (Note 14)	120	-	220	ns
$t_{bit(Vi(diff))}$	Bit time on bus (CANH – CANL pin)	$t_{bit(TxD)} = 500\text{ ns}$ (Note 14)	435	-	530	ns
		$t_{bit(TxD)} = 200\text{ ns}$ (Note 14)	155	-	210	ns
$\Delta t_{rec}$	Receiver timing symmetry $\Delta t_{rec} = t_{bit(RxD)} - t_{bit(Vi(diff))}$	$t_{bit(TxD)} = 500\text{ ns}$ (Note 14)	-65	-	40	ns
		$t_{bit(TxD)} = 200\text{ ns}$ (Note 14)	-45	-	15	ns

**THERMAL SHUTDOWN**

$T_{J(sd)}$	Shutdown junction temperature	Junction temperature rising	160	180	200	$^\circ\text{C}$
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Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

11. Performance guaranteed over the indicated operating temperature range by design and/or characterization tested at  $T_J = T_A = 25^\circ\text{C}$ . Low duty cycle pulse techniques are used during testing to maintain the junction temperature as close to ambient as possible.

12. In the range between  $V_{UVDVCC}$  and 4.75 V and from 5.25 V to 6 V the chip is fully functional; some parameters may be outside of the specification

13. Values based on design and characterization, not tested in production

14.  $C_{LT} = 100\text{ pF}$ ,  $C_{ST}$  not present,  $C_{RxD} = 15\text{ pF}$

MEASUREMENTS SETUPS AND DEFINITIONS

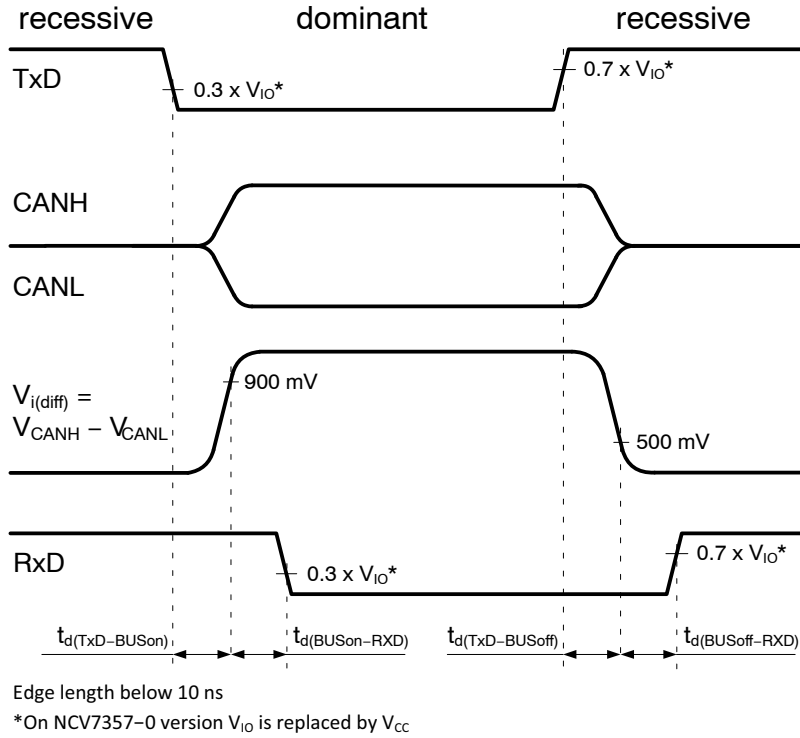


Figure 5. Transceiver Timing Diagram – Propagation Delays

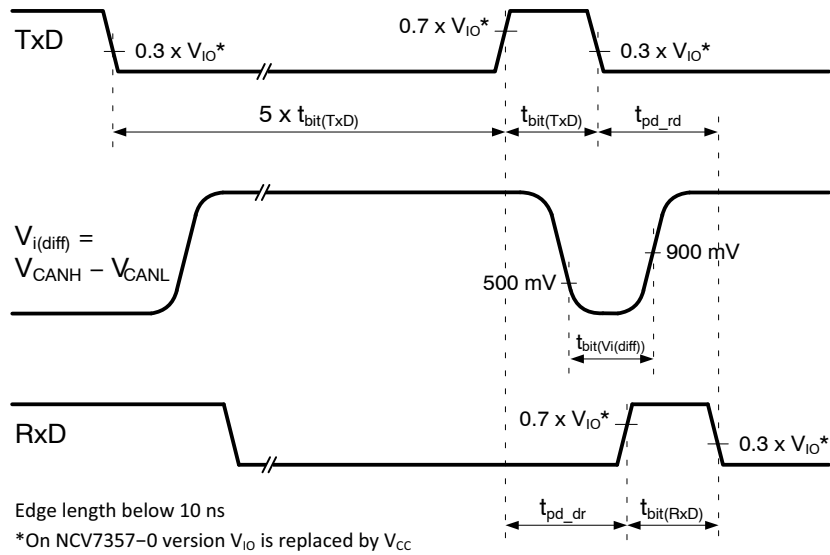


Figure 6. Transceiver Timing Diagram – Loop Delay and Recessive Bit Time

# NCV7357

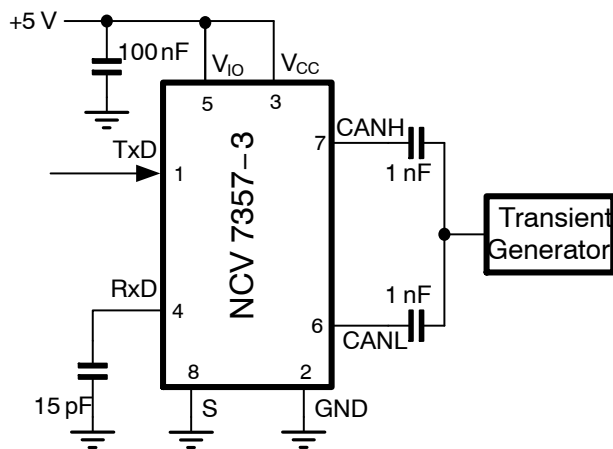


Figure 7. Test Circuit for Automotive Transients

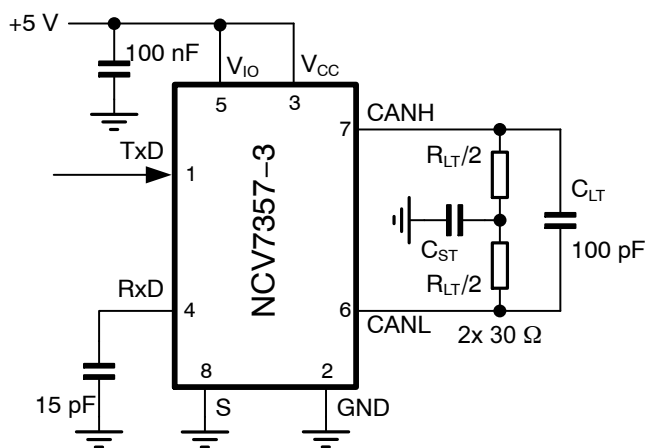


Figure 8. Test Circuit for Timing Characteristics

Table 6. ISO 11898–2:2016 Parameter Cross–Reference Table

ISO 11898–2:2016 Specification		NCV7357 Datasheet	
Parameter	Notation	Symbol	
<b>DOMINANT OUTPUT CHARACTERISTICS</b>			
Single ended voltage on CAN_H	$V_{CAN\_H}$	$V_{o(dom)}(CANH)$	
Single ended voltage on CAN_L	$V_{CAN\_L}$	$V_{o(dom)}(CANL)$	
Differential voltage on normal bus load	$V_{Diff}$	$V_{o(dom)}(diff)$	
Differential voltage on effective resistance during arbitration	$V_{Diff}$	$V_{o(dom)}(diff\_ARB)$	
Differential voltage on extended bus load range (optional)	$V_{Diff}$	$V_{o(dom)}(diff)$	
<b>DRIVER SYMMETRY</b>			
Driver symmetry	$V_{SYM}$	$V_{o(dom)}(sym)$	
<b>DRIVER OUTPUT CURRENT</b>			
Absolute current on CAN_H	$I_{CAN\_H}$	$I_{o(SC)}(CANH)$	
Absolute current on CAN_L	$I_{CAN\_L}$	$I_{o(SC)}(CANL)$	
<b>RECEIVER OUTPUT CHARACTERISTICS, BUS BIASING ACTIVE</b>			
Single ended output voltage on CAN_H	$V_{CAN\_H}$	NA	
Single ended output voltage on CAN_L	$V_{CAN\_L}$	NA	
Differential output voltage	$V_{Diff}$	NA	
<b>RECEIVER OUTPUT CHARACTERISTICS, BUS BIASING INACTIVE</b>			
Single ended output voltage on CAN_H	$V_{CAN\_H}$	$V_{o(off)}(CANH)$	
Single ended output voltage on CAN_L	$V_{CAN\_L}$	$V_{o(off)}(CANL)$	
Differential output voltage	$V_{Diff}$	$V_{o(off)}(diff)$	
<b>OPTIONAL TRANSMIT DOMINANT TIMEOUT</b>			
Transmit dominant timeout, long	$t_{dom}$	$t_{dom}(TxD)$	
Transmit dominant timeout, short	$t_{dom}$	NA	
<b>STATIC RECEIVER INPUT CHARACTERISTICS, BUS BIASING ACTIVE/ INACTIVE</b>			
Recessive state differential input voltage range	$V_{Diff}$	$V_{i(rec)}(diff)\_NM$	
Dominant state differential input voltage range	$V_{Diff}$	$V_{i(dom)}(diff)\_NM$	
<b>RECEIVER INPUT RESISTANCE</b>			
Differential internal resistance	$R_{Diff}$	$R_{i(diff)}$	
Single ended internal resistance	$R_{CAN\_H}$ $R_{CAN\_L}$	$R_{i(cm)}$ $R_{i(cm)}$	
<b>RECEIVER INPUT RESISTANCE MATCHING</b>			
Matching a of internal resistance	$m_R$	$R_{i(cm)}(m)$	
<b>IMPLEMENTATION LOOP DELAY REQUIREMENT</b>			
Loop delay	$t_{Loop}$	$t_{pd\_rd}$ $t_{pd\_dr}$	
<b>OPTIONAL IMPLEMENTATION DATA SIGNAL TIMING REQUIREMENTS FOR USE WITH BIT RATES ABOVE 1 MBIT/S AND UP TO 2 MBIT/S</b>			
Transmitted recessive bit width @ 2 Mbit/s	$t_{Bit}(Bus)$	$t_{bit}(Vi(diff))$	
Received recessive bit width @ 2 Mbit/s	$t_{Bit}(RXD)$	$t_{bit}(RxD)$	
Receiver timing symmetry @ 2 Mbit/s	$\Delta t_{Rec}$	$\Delta t_{rec}$	
<b>OPTIONAL IMPLEMENTATION DATA SIGNAL TIMING REQUIREMENTS FOR USE WITH BIT RATES ABOVE 2 MBIT/S AND UP TO 5 MBIT/S</b>			
Transmitted recessive bit width @ 5 Mbit/s	$t_{Bit}(Bus)$	$t_{bit}(Vi(diff))$	
Transmitted recessive bit width @ 5 Mbit / s	$t_{Bit}(RXD)$	$t_{bit}(RxD)$	

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Received recessive bit width @ 5 Mbit / s	$\Delta t_{Rec}$	$\Delta t_{rec}$
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### MAXIMUM RATINGS OF $V_{CAN\_H}$ , $V_{CAN\_L}$ AND $V_{DIFF}$

Maximum rating $V_{Diff}$	$V_{Diff}$	$V_{CANH} - CANL$
General maximum rating $V_{CAN\_H}$ and $V_{CAN\_L}$	$V_{CAN\_H}$ $V_{CAN\_L}$	$V_{CANH}$ $V_{CANL}$
Optional: Extended maximum rating $V_{CAN\_H}$ and $V_{CAN\_L}$	$V_{CAN\_H}$ $V_{CAN\_L}$	NA

### MAXIMUM LEAKAGE CURRENTS ON CAN\_H AND CAN\_L, UNPOWERED

Leakage current on CAN_H, CAN_L	$I_{CAN\_H}$ , $I_{CAN\_L}$	$I_{LEAK(off)}$
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### BUS BIASING CONTROL TIMINGS

CAN activity filter time, long	$t_{Filter}$	NA
CAN activity filter time, short	$t_{Filter}$	NA
Wake-up timeout, short	$t_{Wake}$	NA
Wake-up timeout, long	$t_{Wake}$	NA
Timeout for bus inactivity (Required for selective wake-up implementation only)	$t_{Silence}$	NA
Bus Bias reaction time (Required for selective wake-up implementation only)	$t_{Bias}$	NA

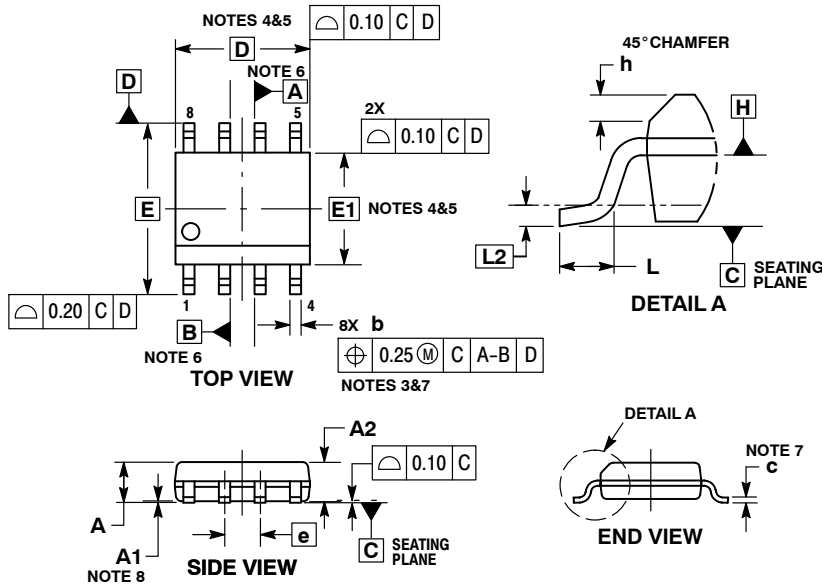
**Table 7. ORDERING INFORMATION**

Part Number	Description	Temperature Range	Package	Shipping
NCV7357D10R2G	High Speed CAN FD Transceiver	-40°C to +150°C	SOIC 150 8 GREEN (Matte Sn, JEDEC MS-012) (Pb-Free)	3000 / Tape & Reel
NCV7357D13R2G	High Speed CAN FD Transceiver with $V_{IO}$ pin			3000 / Tape & Reel
NCV7357MW0R2G	High Speed CAN FD Transceiver	-40°C to +150°C	DFNW8 Wettable Flank (Pb-Free)	3000 / Tape & Reel
NCV7357MW3R2G	High Speed CAN FD Transceiver with $V_{IO}$ pin			3000 / Tape & Reel

# NCV7357

## PACKAGE DIMENSIONS

SOIC-8  
CASE 751AZ  
ISSUE B

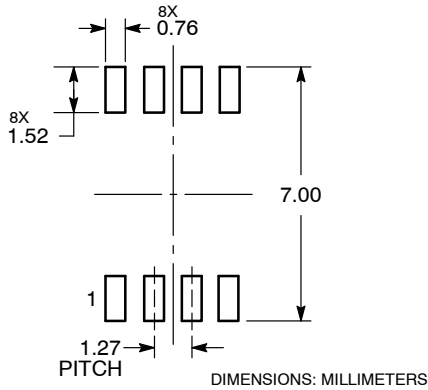


**NOTES:**

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. DIMENSION b DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE PROTRUSION SHALL BE 0.004 mm IN EXCESS OF MAXIMUM MATERIAL CONDITION.
4. DIMENSION D DOES NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS. MOLD FLASH, PROTRUSIONS OR GATE BURRS SHALL NOT EXCEED 0.006 mm PER SIDE. DIMENSION E1 DOES NOT INCLUDE INTERLEAD FLASH OR PROTRUSION. INTERLEAD FLASH OR PROTRUSION SHALL NOT EXCEED 0.010 mm PER SIDE.
5. THE PACKAGE TOP MAY BE SMALLER THAN THE PACKAGE BOTTOM. DIMENSIONS D AND E1 ARE DETERMINED AT THE OUTER-MOST EXTREMES OF THE PLASTIC BODY AT DATUM H.
6. DIMENSIONS A AND B ARE TO BE DETERMINED AT DATUM H.
7. DIMENSIONS b AND c APPLY TO THE FLAT SECTION OF THE LEAD BETWEEN 0.10 TO 0.25 FROM THE LEAD TIP.
8. A1 IS DEFINED AS THE VERTICAL DISTANCE FROM THE SEATING PLANE TO THE LOWEST POINT ON THE PACKAGE BODY.

DIM	MILLIMETERS	
	MIN	MAX
A	---	1.75
A1	0.10	0.25
A2	1.25	---
b	0.31	0.51
c	0.10	0.25
D	4.90 BSC	
E	6.00 BSC	
E1	3.90 BSC	
e	1.27 BSC	
h	0.25	0.41
L	0.40	1.27
L2	0.25 BSC	

**RECOMMENDED SOLDERING FOOTPRINT\***



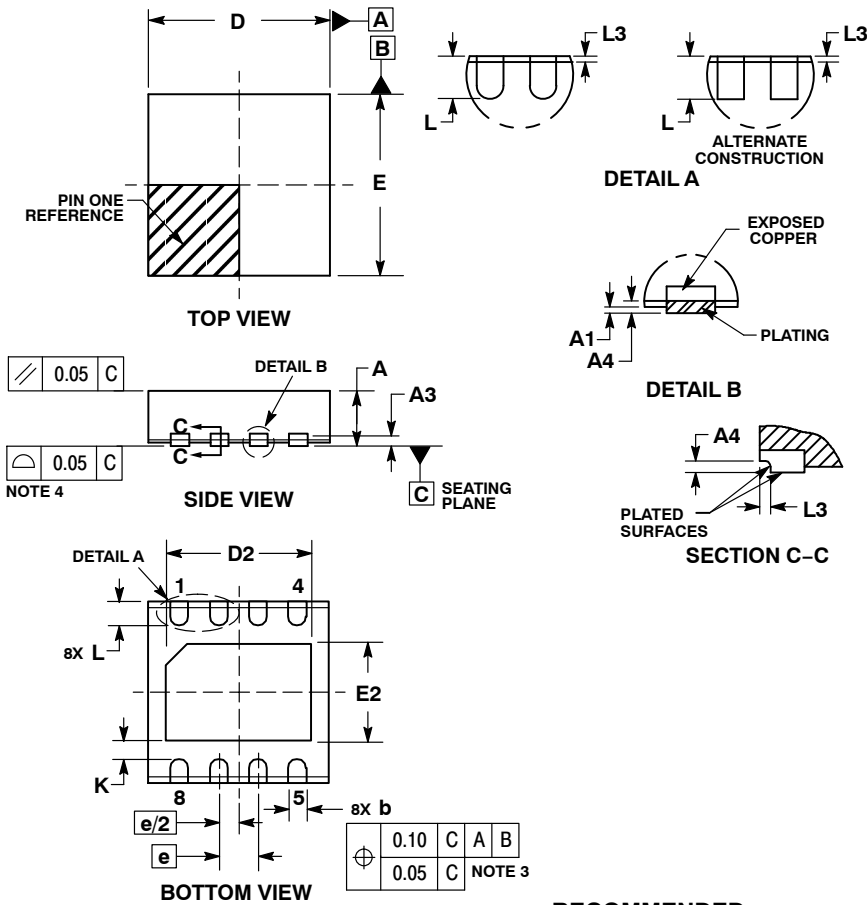
\*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

**GENERIC MARKING DIAGRAM\***

\*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G", may or not be present.

# NCV7357

DFNW8 3x3, 0.65P  
CASE 507AB  
ISSUE D

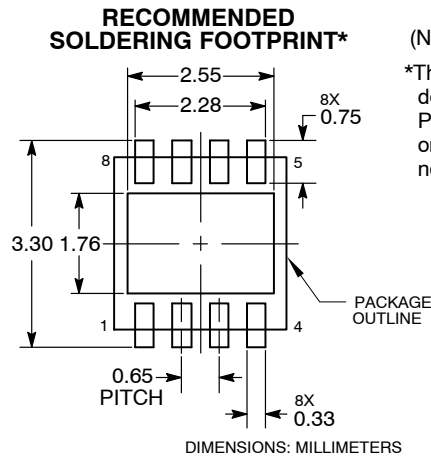


**NOTES:**

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. DIMENSION b APPLIES TO PLATED TERMINAL AND IS MEASURED BETWEEN 0.10 AND 0.20mm FROM THE TERMINAL TIP.
4. COPLANARITY APPLIES TO THE EXPOSED PAD AS WELL AS THE TERMINALS.
5. THIS DEVICE CONTAINS WETTABLE FLANK DESIGN FEATURES TO AID IN FILLET FORMATION ON THE LEADS DURING MOUNTING.

DIM	MILLIMETERS		
	MIN	NOM	MAX
A	0.80	0.85	0.90
A1	---	---	0.05
A3	0.20 REF		
A4	0.10	---	---
b	0.25	0.30	0.35
D	2.95	3.00	3.05
D2	2.30	2.40	2.50
E	2.95	3.00	3.05
E2	1.50	1.60	1.70
e	0.65 BSC		
K	0.30 REF		
L	0.35	0.40	0.45
L3	0.00	0.05	0.10

**GENERIC MARKING DIAGRAM\***



(Note: Microdot may be in either location)

\*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "μ", may or may not be present. Some products may not follow the Generic Marking.

\*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

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