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MIC5021

High-Speed, High-Side MOSFET Driver with Charge Pump and Overcurrent Limit

Features

- 12V to 36V Operation
- 550 ns Rise/Fall Time Driving 2000 pF
- TTL-Compatible Input with Internal Pull-Down Resistor
- Overcurrent Limit
- Gate-to-Source Protection
- Internal Charge Pump
- 100 kHz Operation Guaranteed Over Full Temperature and Operating Voltage Range
- Compatible with Current-Sensing MOSFETs
- Current-Source Drive Reduces EMI

Applications

- Lamp Control
- Heater Control
- Motor Control
- Solenoid Switching
- Switch-Mode Power Supplies
- Circuit Breaker

General Description

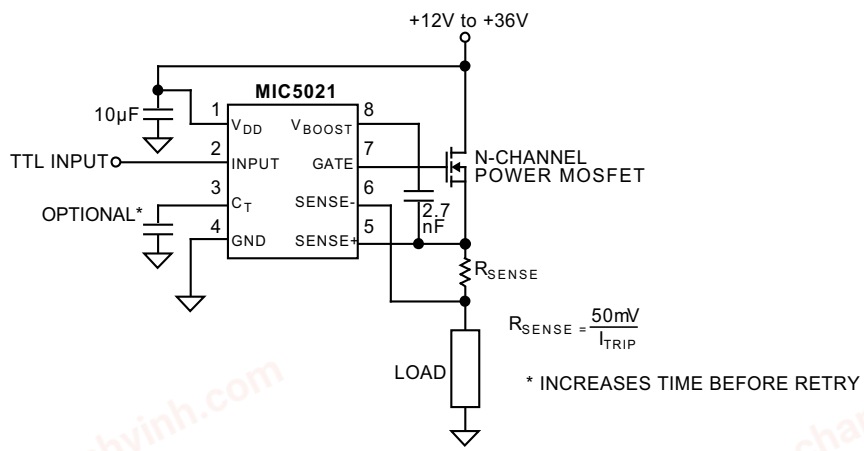
The MIC5021 high-side MOSFET driver is designed to operate at frequencies up to 100 kHz (5 kHz PWM for 2% to 100% duty cycle) and is an ideal choice for high speed applications such as motor control, SMPS (switch mode power supplies), and applications using IGBTs. The MIC5021 can also operate as a circuit breaker with or without automatic retry.

A rising or falling edge on the input results in a current source pulse or sink pulse on the gate output. This output current pulse can turn on a 2000 pF MOSFET in approximately 550 ns. The MIC5021 then supplies a limited current (<2 mA), if necessary, to maintain the output state.

An overcurrent comparator with a trip voltage of 50 mV makes the MIC5021 ideal for use with a current-sensing MOSFET. An external low value resistor may be used instead of a sensing MOSFET for more precise overcurrent control. An optional external capacitor placed from the C_T pin to ground may be used to control the current shutdown duty cycle (dead time) from 20% to <1%. A duty cycle from 20% to about 75% is possible with an optional pull-up resistor from C_T to V_{DD}. Additional parts of the MIC502x family include the MIC5020 low-side driver and the MIC5022 half-bridge driver with a cross-conduction interlock. The MIC5021 is available in 8-pin SOIC and plastic DIP packages.

Typical Application Circuit

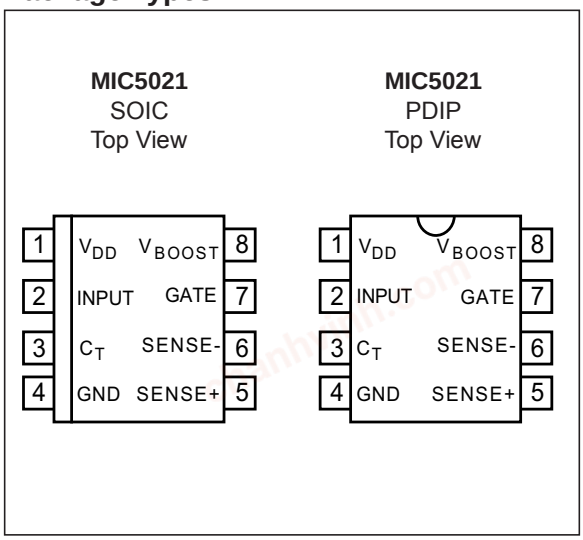
MIC5021
PDIP & SOIC
High-Side Driver with Overcurrent Trip and Retry



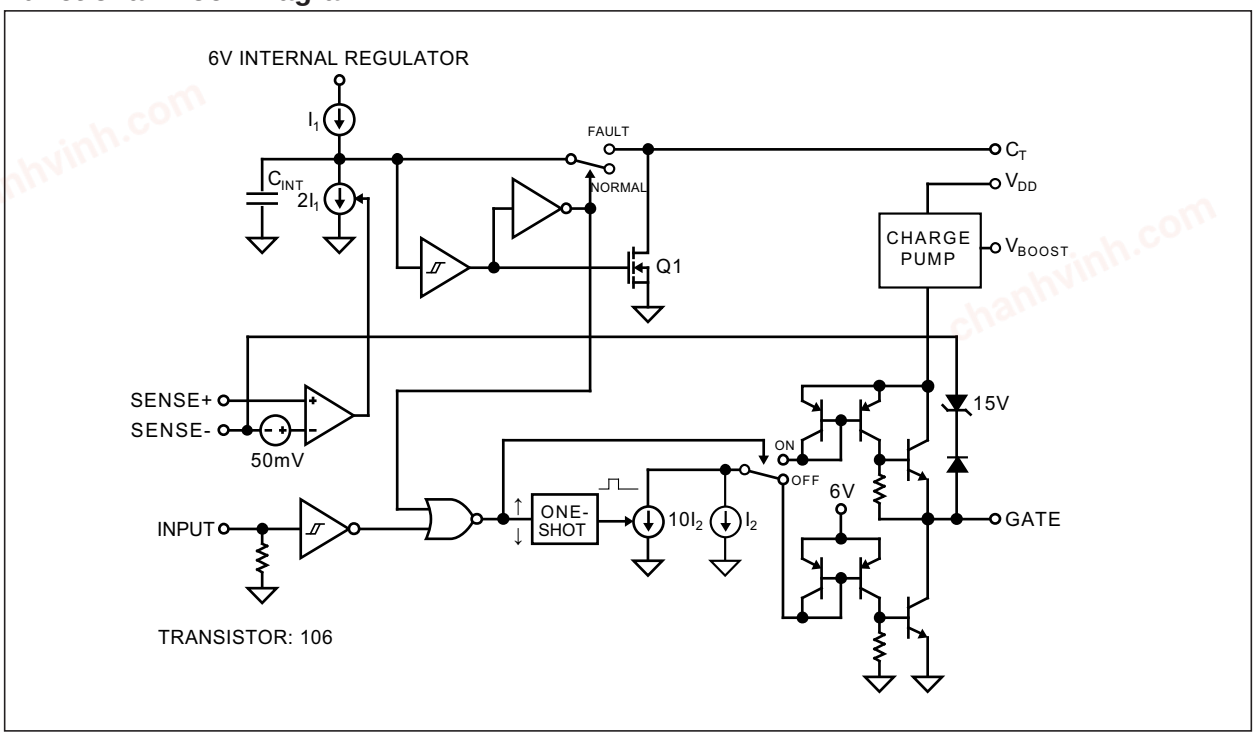
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Package Types



Functional Block Diagram



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1.0 ELECTRICAL CHARACTERISTICS

Absolute Maximum Ratings †

Supply Voltage, V_{DD} ..... +40V
Input Voltage, V_{IN} ..... –0.5V to +15V
Sense Differential Voltage ..... ±6.5V
SENSE+ or SENSE– to GND ..... –0.5V to +36V
Timer Voltage ..... +5.5V
V_{BOOST} Capacitor ..... 0.01 µF

Operating Ratings

Supply Voltage, V_{DD} ..... +12V to +36V

† **Notice:** Stresses above those listed under “Absolute Maximum Ratings” may cause permanent damage to the device. This is a stress rating only and functional operation of the device at those or any other conditions above those indicated in the operational sections of this specification is not intended. Exposure to maximum rating conditions for extended periods may affect device reliability.

DC CHARACTERISTICS

Electrical Characteristics: Unless otherwise indicated, T_A = +25°C, GND = 0V, V_{DD} = 12V, C_T = OPEN, Gate C_L = 1500 pF (IRF540 MOSFET).

Parameters	Sym.	Min.	Typ.	Max.	Units	Conditions
DC Supply Current	—	—	1.8	4	mA	V_{DD} = 12V, Input = 0V
	—	—	2.5	6		V_{DD} = 36V, Input = 0V
	—	—	1.7	4		V_{DD} = 12V, Input = 5V
	—	—	2.5	6		V_{DD} = 36V, Input = 5V
Input Threshold	—	0.8	1.4	2.0	V	—
Input Hysteresis	—	—	0.1	—	V	—
Input Pull-Down Current	—	10	20	40	µA	Input = 5V
Current-Limit Threshold	—	30	50	70	mV	Note 1
Gate On Voltage	—	16	18	21	V	V_{DD} = 12V (Note 2)
	—	46	50	52		V_{DD} = 36V (Note 2)
Gate On-Time (Fixed)	$t_{G(ON)}$	2	6	10	µs	Sense Differential > 70 mV (Note 8)
Gate Off-Time (Adjustable)	$t_{G(OFF)}$	10	20	50	µs	Sense Differential > 70 mV, C_T = 0 pF (Note 8)
Gate Turn-On Delay	t_{DLH}	—	500	1000	ns	Note 3
Gate Rise Time	t_R	—	400	500	ns	Note 4
Gate Turn-Off Delay	t_{DLH}	—	800	1500	ns	Note 5

Note 1: When using sense MOSFETs, it is recommended that R_{SENSE} < 50Ω. Higher values may affect the sense MOSFET’s current transfer ratio.

2: DC measurement.

3: Input switched from 0.8V (TTL low) to 2.0V (TTL high), time for gate transition from 0V to 2V.

4: Input switched from 0.8V (TTL low) to 2.0V (TTL high), time for gate transition from 2V to 17V.

5: Input switched from 2.0V (TTL high) to 0.8V (TTL low), time for gate transition from 20V (gate on voltage) to 17V.

6: Input switched from 2.0V (TTL high) to 0.8V (TTL low), time for gate transition from 17V to 2V.

7: Frequency where gate on voltage reduces to 17V with 50% input duty cycle.

8: Gate on time $t_{G(ON)}$ and $t_{G(OFF)}$ are not 100% production tested.

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DC CHARACTERISTICS (CONTINUED)

Electrical Characteristics: Unless otherwise indicated, T_A = +25°C, GND = 0V, V_{DD} = 12V, C_T = OPEN, Gate C_L = 1500 pF (IRF540 MOSFET).

Parameters	Sym.	Min.	Typ.	Max.	Units	Conditions
Gate Fall Time	t_F	—	400	500	ns	Note 6
Max. Operating Frequency	f_{MAX}	100	150	—	kHz	Note 7

Note 1: When using sense MOSFETs, it is recommended that R_{SENSE} < 50Ω. Higher values may affect the sense MOSFET's current transfer ratio.

2: DC measurement.

3: Input switched from 0.8V (TTL low) to 2.0V (TTL high), time for gate transition from 0V to 2V.

4: Input switched from 0.8V (TTL low) to 2.0V (TTL high), time for gate transition from 2V to 17V.

5: Input switched from 2.0V (TTL high) to 0.8V (TTL low), time for gate transition from 20V (gate on voltage) to 17V.

6: Input switched from 2.0V (TTL high) to 0.8V (TTL low), time for gate transition from 17V to 2V.

7: Frequency where gate on voltage reduces to 17V with 50% input duty cycle.

8: Gate on time $t_{G(ON)}$ and $t_{G(OFF)}$ are not 100% production tested.

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TEMPERATURE SPECIFICATIONS (Note 1)

Parameters	Sym.	Min.	Typ.	Max.	Units	Conditions
Junction Thermal Resistances						
Thermal Resistance, PDIP-8Ld	θ_{JA}	–40	—	85	°C	Maximum Ambient Temperature
Thermal Resistance, SOIC-8Ld	θ_{JA}	–40	—	85	°C	Maximum Ambient Temperature

Note 1: The maximum allowable power dissipation is a function of ambient temperature, the maximum allowable junction temperature and the thermal resistance from junction to air (i.e., T_A, T_J, θ_{JA}). Exceeding the maximum allowable power dissipation will cause the device operating junction temperature to exceed the maximum rating. Sustained junction temperatures above the maximum rating can impact the device reliability.

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2.0 TIMING DIAGRAMS

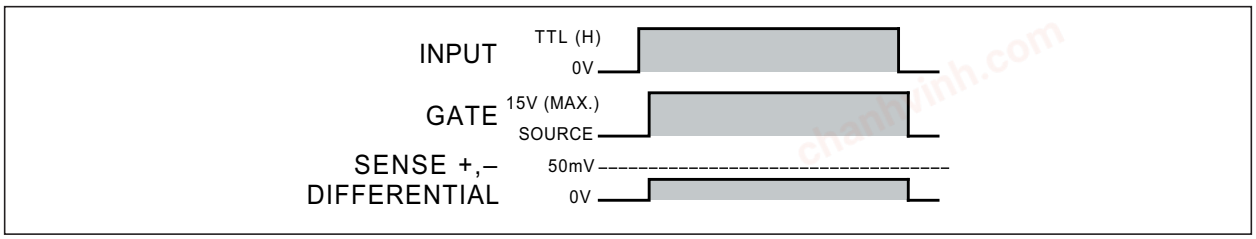


FIGURE 2-1: *Normal operation.*

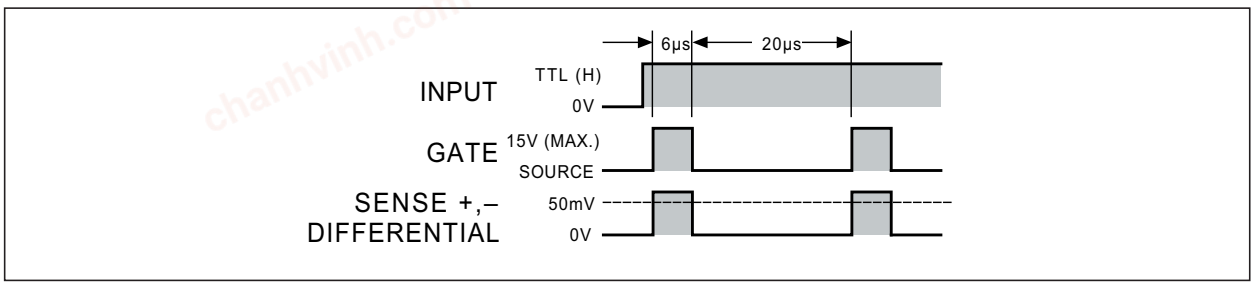


FIGURE 2-2: *Fault Operation, C_T = Open.*

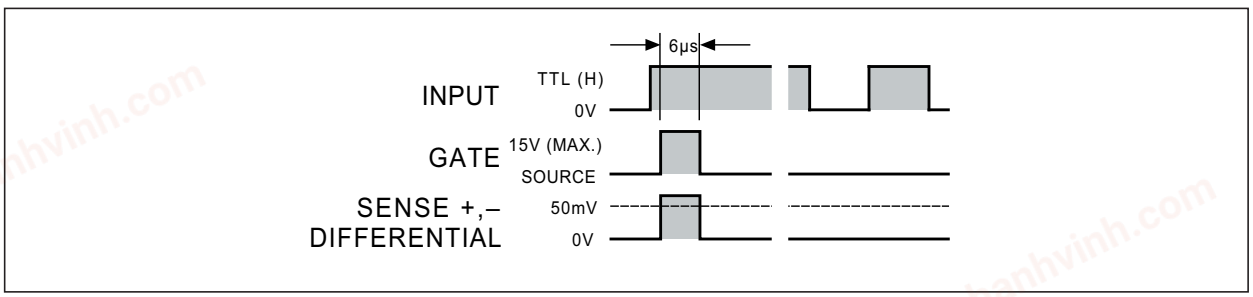


FIGURE 2-3: *Fault Condition, C_T = Grounded.*

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3.0 TYPICAL PERFORMANCE CURVES

Note: The graphs and tables provided following this note are a statistical summary based on a limited number of samples and are provided for informational purposes only. The performance characteristics listed herein are not tested or guaranteed. In some graphs or tables, the data presented may be outside the specified operating range (e.g., outside specified power supply range) and therefore outside the warranted range.

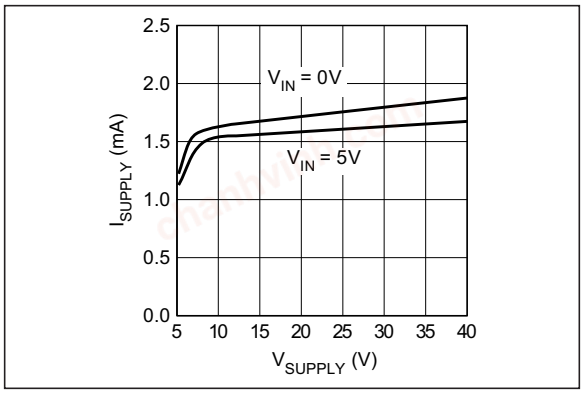


FIGURE 3-1: *Supply Current vs. Supply Voltage.*

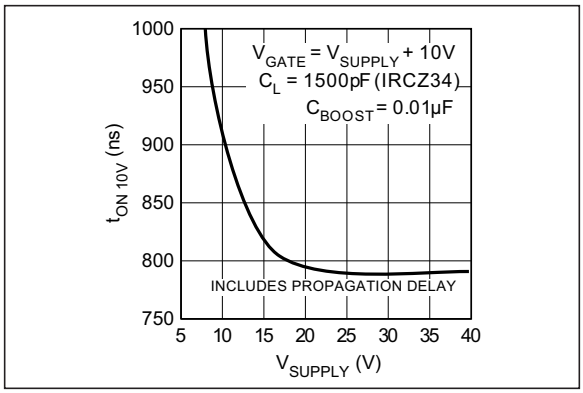


FIGURE 3-4: *Gate Turn-On Delay vs. Supply Voltage.*

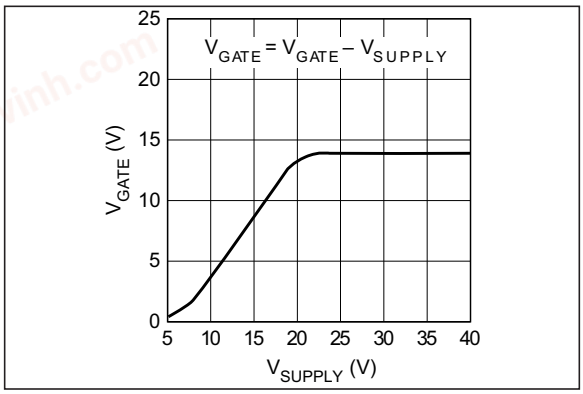


FIGURE 3-2: *Gate Voltage Change vs. Supply Voltage.*

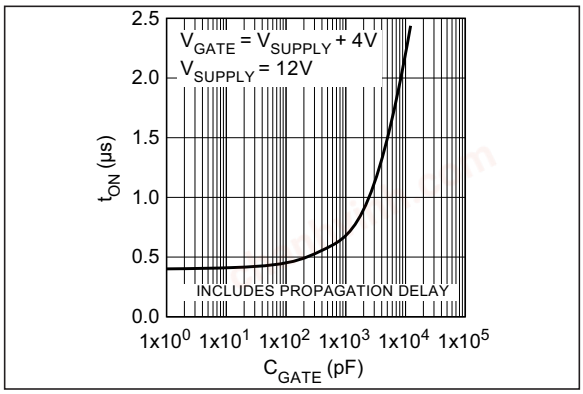


FIGURE 3-5: *Gate Turn-On Delay vs. Gate Capacitance.*

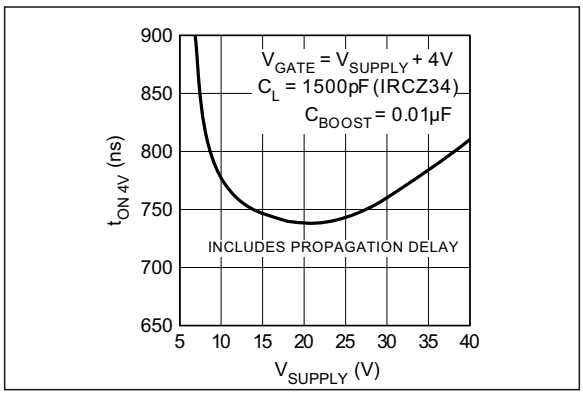


FIGURE 3-3: *Gate Turn-On Delay vs. Supply Voltage.*

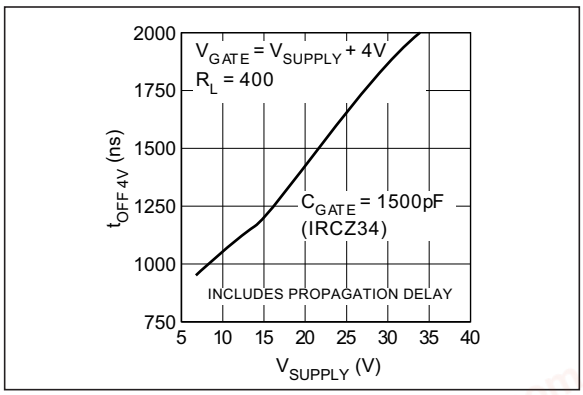


FIGURE 3-6: *Gate Turn-Off Delay vs. Supply Voltage.*

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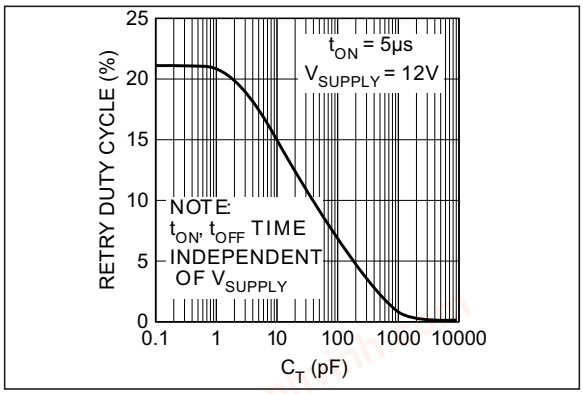


FIGURE 3-7: *Overcurrent Retry Duty Cycle vs. Timing Capacitance.*

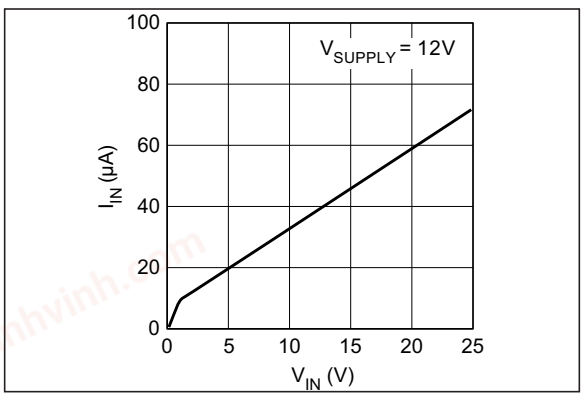


FIGURE 3-8: *Input Current vs. Input Voltage.*

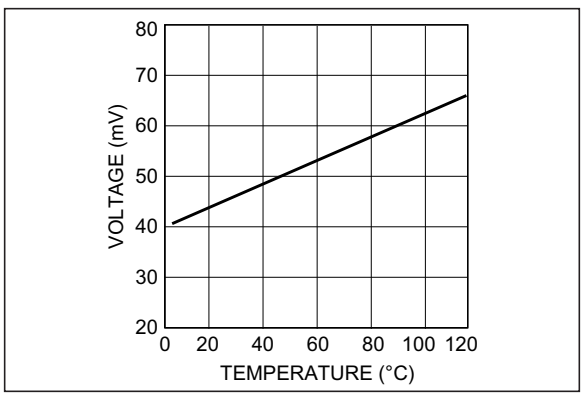


FIGURE 3-9: *Sense Threshold vs. Temperature.*

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4.0 PIN DESCRIPTIONS

The descriptions of the pins are listed in Table 4-1.

TABLE 4-1: PIN FUNCTION TABLE

Pin Number	Pin Name	Description
1	V_{DD}	Supply (+12V to 36V). Decouple with ≥ 10 µF capacitor.
2	INPUT	TTL-Compatible Input. Logic high turns the external MOSFET on. An internal pull-down returns an open pin logic low.
3	CT	Retry Timing Capacitor. Controls the off time ($t_{G(OFF)}$) of the overcurrent retry cycle (duty cycle adjustment): Open = Approximately 20% duty cycle. Capacitor-to-Ground = Approximately 20% to <1% duty cycle. Pull-Up Resistor = Approximately 20% to approximately 75% duty cycle. Ground = Maintained shutdown upon overcurrent condition.
4	GND	Circuit Ground.
5	SENSE+	Current-Sense Comparator (+) Input. Connect to high side of sense resistor or current sensing MOSFET sense lead. A built-in offset in conjunction with RSENSE sets the load overcurrent trip point.
6	SENSE–	Current-Sense Comparator (–) Input. Connect to the low side of the sense resistor (usually the high side of the load).
7	GATE	Gate Drive. Drives the gate of an external power MOSFET. Also limits V_{GS} to 15V maximum to prevent gate-to-source damage. Will sink-and-source current.
8	V_{BOOST}	Charge Pump Boost Capacitor. A bootstrap capacitor from V_{BOOST} to the FET source pin supplies charge to quickly enhance the gate output during turn-on.

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5.0 FUNCTIONAL DESCRIPTION

Refer to the MIC5021 Functional Block Diagram.

5.1 Input

A signal greater than 1.4V (nominal) applied to the MIC5021 INPUT causes gate enhancement on an external MOSFET turning the MOSFET on.

An internal pull-down resistor ensures that an open input remains low, keeping the external MOSFET turned off.

5.2 Gate Output

Rapid rise and fall times on the gate output are possible because each input state change triggers a one-shot which activates a high-value current sink ($10I_2$) for a short time. This draws a high current though a current mirror circuit causing the output transistors to quickly charge or discharge the external MOSFET's gate.

A second current sink continuously draws the lower value of current used to maintain the gate voltage for the selected state.

An internal charge pump utilizes an external "boost" capacitor connected between V_{BOOST} and the source of the external MOSFET (Refer to the Typical Application Circuit). The boost capacitor stores charge when the MOSFET is off. As the MOSFET turns on, its source to ground voltage increases and is added to the voltage across the capacitor, raising the V_{BOOST} pin voltage. The boost capacitor charge is directed through the gate pin to quickly charge the MOSFET's gate to 16V maximum above V_{DD}. The internal charge pump maintains the gate voltage.

An internal Zener diode protects the external MOSFET by limiting the gate to source voltage.

5.3 SENSE Inputs

The MIC5021's 50 mV (nominal) trip voltage is created by internal current sources that force approximately 5 µA out of SENSE+ and approximately 15 µA (at trip) out of SENSE–. When SENSE– is 50mV or more below SENSE+, SENSE– steals base current from an internal drive transistor shutting off the external MOSFET.

5.4 Overcurrent Limiting

Current source I1 charges C_{INT} upon power up. An optional external capacitor connected to C_T is kept discharged through a MOSFET Q1.

A fault condition (>50 mV from SENSE+ to SENSE–) causes the overcurrent comparator to enable current sink $2I_1$ which overcomes current source I1 to discharge C_{INT} in a short time. When C_{INT} is discharged, the input is disabled, which turns off the gate output, and C_{INT} and C_T are ready to be charged.

When the gate output turns the MOSFET off, the overcurrent signal is removed from the sense inputs which deactivates current sink $2I_1$.This allows C_{INT} and the optional capacitor connected to C_T to recharge. A Schmitt trigger delays the retry while the capacitor(s) recharge. Retry delay is increased by connecting a capacitor to C_T (optional).

The retry cycle will continue until the fault is removed or the input is changed to TTL low.

If C_T is connected to ground, the circuit will not retry upon a fault condition.

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6.0 APPLICATION INFORMATION

The MIC5021 MOSFET driver is intended for high-side switching applications where overcurrent limiting and high speed are required. The MIC5021 can control MOSFETs that switch voltages up to 36V.

6.1 High-Side Switch Circuit Advantages

High-side switching allows more of the load related components and wiring to remain near ground potential when compared to low-side switching. This reduces the chances of short-to-ground accidents or failures.

6.2 Speed Advantage

The MIC5021 is about two orders of magnitude faster than the low cost MIC5014 making it suitable for high-frequency high-efficiency circuit operation in PWM (pulse width modulation) designs used for motor control, SMPS (switch-mode power supply) and heating element control.

Switched loads (on/off) benefit from the MIC5021's fast switching times by allowing use of MOSFETs with smaller safe operating areas. Larger MOSFETs are often required when using slower drivers.

6.3 Supply Voltage

The MIC5021's supply input (V_{DD}) is rated up to 36V. The supply voltage must be equal to or greater than the voltage applied to the drain of the external N-channel MOSFET.

A 16V minimum supply is recommended to produce continuous on-state, gate drive voltage for standard MOSFETs (10V nominal gate enhancement).

When the driver is powered from a 12V to 16V supply, a logic-level MOSFET is recommended (5V nominal gate enhancement).

PWM operation may produce satisfactory gate enhancement at lower supply voltages. This occurs when fast switching repetition makes the boost capacitor a more significant voltage supply than the internal charge pump.

6.4 Logic-Level MOSFET Precautions

Logic-level MOSFETs have lower maximum gate-to-source voltage ratings (typically ±10V) than standard MOSFETs (typically ±20V). When an external MOSFET is turned on, the doubling effect of the boost capacitor can cause the gate-to-source voltage to momentarily exceed 10V. Internal zener diodes clamp this voltage to 16V maximum which is too high for logic-level MOSFETs. To protect logic-level MOSFETs, connect a zener diode ($5V \le V_{ZENER} < 10V$) from gate to source.

6.5 Overcurrent Limiting

A 50 mV comparator is provided for current sensing. The low level trip point minimizes I_2R losses when a power resistor is used for current sensing.

The adjustable retry feature can be used to handle loads with high initial currents, such as lamps or heating elements, and can be adjusted from the C_T connection.

C_T to ground maintains gate drive shutdown following an overcurrent condition.

C_T open, or a capacitor to ground, causes automatic retry. The default duty cycle (C_T open) is approximately 20%. Refer to the Electrical Characteristics when selecting a capacitor for reduced duty cycle.

C_T through a pull-up resistor to V_{DD} increases the duty cycle. Increasing the duty cycle increases the power dissipation in the load and MOSFET under a fault condition. Circuits may become unstable at a duty cycle of about 75% or higher, depending on conditions. Caution: The MIC5021 may be damaged if the voltage applied to C_T exceeds the absolute maximum voltage rating.

6.6 Boost Capacitor Selection

The boost capacitor value will vary depending on the supply voltage range.

A 0.01 µF boost capacitor is recommended for best performance in the 12V to 20V range. (See Figure 6-1.) Larger capacitors may damage the MIC5021.

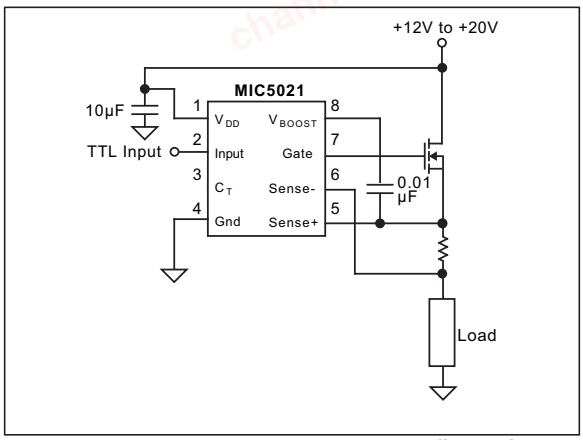


FIGURE 6-1: *12V to 20V Configuration.*

If the full 12V to 36V voltage range is required, the boost capacitor value must be reduced to 2.7 nF (Figure 6-2). The recommended configuration for the 20V to 36V range is to place the capacitor is placed between V_{DD} and V_{BOOST} as shown in Figure 6-3.

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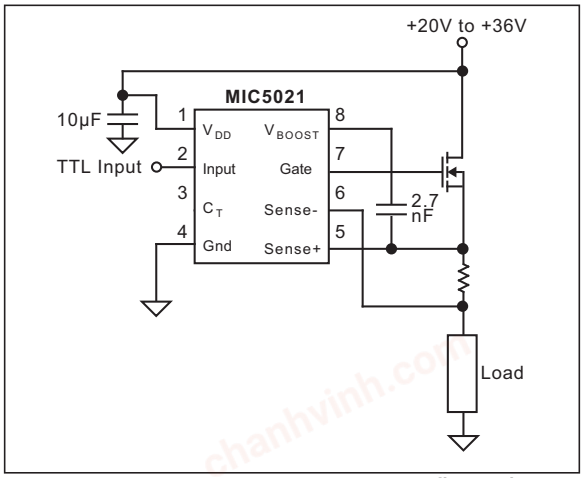


FIGURE 6-2: *12V to 36V Configuration.*

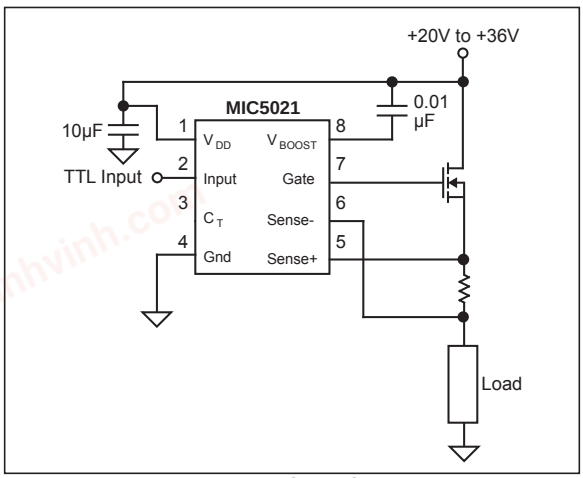


FIGURE 6-3: *Preferred 20V to 36V Configuration.*

Do not use both boost capacitors between V_{BOOST} and the MOSFET source and V_{BOOST} and V_{DD} at the same time.

6.7 Current-Sense Resistors

Lead length can be significant when using low value (<1Ω) resistors for current sensing. Errors caused by lead length can be avoided by using four-terminal current-sensing resistors. Four-terminal resistors are available from several manufacturers.

6.8 Circuits without Current Sensing

Current sensing may be omitted by connecting the SENSE+ and SENSE– pins to the source of the MOSFET or to the supply. Connecting the sense pins to the supply is preferred for inductive loads. Do not connect the sense pins to ground.

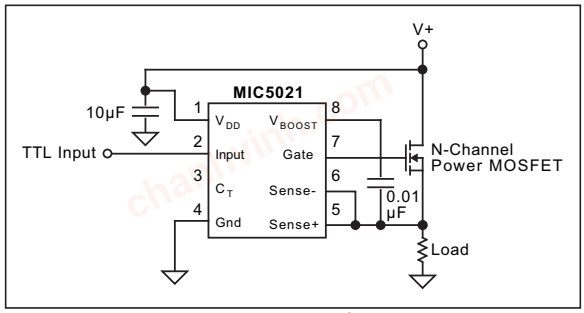


FIGURE 6-4: *Connecting Sense to Source.*

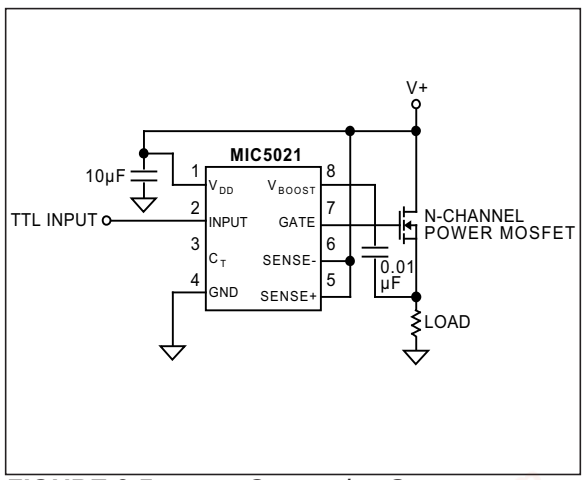


FIGURE 6-5: *Connecting Sense to Supply.*

6.9 Inductive Load Precautions

Circuits controlling inductive loads, such as solenoids (Figure 6-6) and motors, require precautions when controlled by the MIC5021. Wire wound resistors, which are sometimes used to simulate other loads, can also show significant inductive properties.

An inductive load releases stored energy when its current flow is interrupted (when the MOSFET is switched off). The voltage across the inductor reverses and the inductor attempts to force current flow. Since the circuit appears open (the MOSFET appears as a very high resistance) a very large negative voltage occurs across the inductor.

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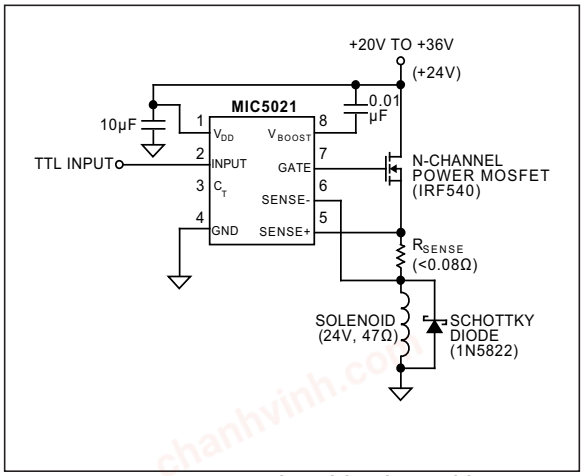


FIGURE 6-6: *Solenoid Driver with Current Sensing.*

6.9.1 LIMITING INDUCTIVE SPIKES

The voltage across the inductor can be limited by connecting a Schottky diode across the load. The diode is forward biased only when the load is switched off. The Schottky diode clamps negative transients to a few volts. This protects the MOSFET from drain-to-source breakdown and prevents the transient from damaging the charge pump by way of the boost capacitor (see Sense Pin Considerations).

The diode should have a peak forward current rating greater than the load current. This is because the current through the diode is the same as the load current at the instant the MOSFET is turned off.

6.9.2 SENSE PIN CONSIDERATIONS

The sense pins of the MIC5021 are sensitive to negative voltages. Forcing the sense pins much below –0.5V effectively reverses the supply voltage on portions of the driver resulting in unpredictable operation or damage.

Figure 6-7 shows current flowing out of the sense leads of an MIC5021 during a negative transient (inductive kick). Internal Schottky diodes attempt to limit the negative transient by maintaining a low forward drop.

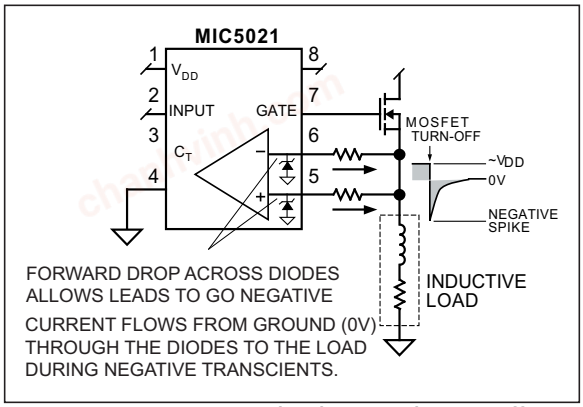


FIGURE 6-7: *Inductive Load Turn-Off.*

Although the internal Schottky diodes can protect the driver in low-current resistive applications, they are inadequate for inductive loads or the lead inductance in high-current resistive loads. Because of their small size, the diodes' forward voltage drop quickly exceeds 0.5V as current increases.

6.9.3 EXTERNAL PROTECTION

Resistors placed in series with each SENSE connection limit the current drawn from the internal Schottky diodes during a negative transient. This minimizes the forward drop across the diodes.

During normal operation, sensing current from the sense pins is unequal (5 µA and 15 µA). The internal Schottky diodes are reverse-biased and have no effect. To avoid skewing the trip voltage, the current limiting resistors must drop equal voltages at the trip point currents (see Figure 6-8). To minimize resistor tolerance error, use a voltage drop lower than the trip voltage of 50 mV. 5 mV is suggested.

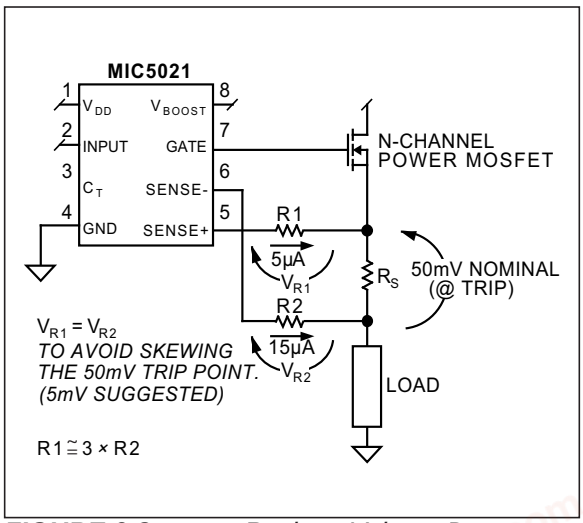


FIGURE 6-8: *Resistor Voltage Drop.*

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External Schottky diodes are also recommended (see D2 and D3 in Figure 6-9). The external diodes clamp negative transients better than the internal diodes because their larger size minimizes the forward voltage drop at higher currents.

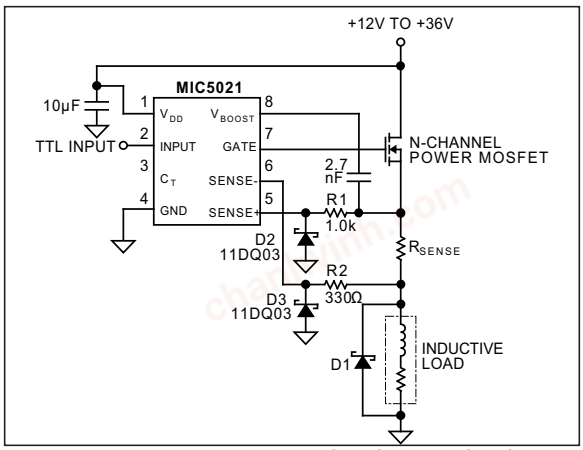


FIGURE 6-9: *Protection from Inductive Kick.*

6.9.4 HIGH-SIDE SENSING

Sensing the current on the high side of the MOSFET isolates the sense pins from the inductive spike.

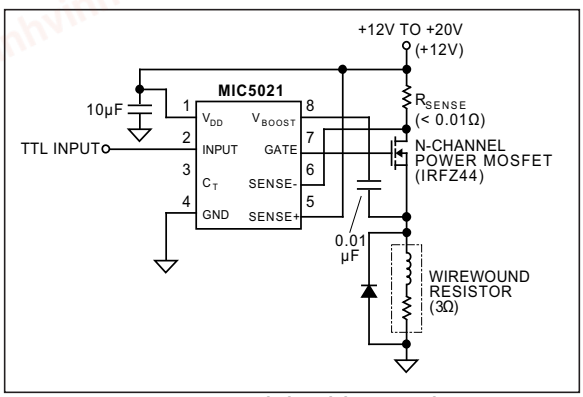


FIGURE 6-10: *High-Side Sensing.*

6.10 Lamp Driver Application

Incandescent lamps have a high inrush current (low resistance) when turned on. The MIC5021 can perform a “soft start” by pulsing the MOSFET (overcurrent condition) until the filament is warm and its current decreases (resistance increases). The sense resistor value is selected so the voltage drop across the sense resistor decreases below the sense threshold (50 mV) as the filament becomes warm. The FET is no longer pulsed and the lamp turns completely on.

A lamp may not fully turn on if the filament does not heat up adequately. Changing the duty cycle, sense resistor, or both to match the filament characteristics can correct the problem.

Soft start can be demonstrated using a #1157 dual filament automotive lamp. The value of RS shown in Figure 6-11 allows for soft start of the higher-resistance filament (measures approx. 2.1Ω cold or 21Ω hot).

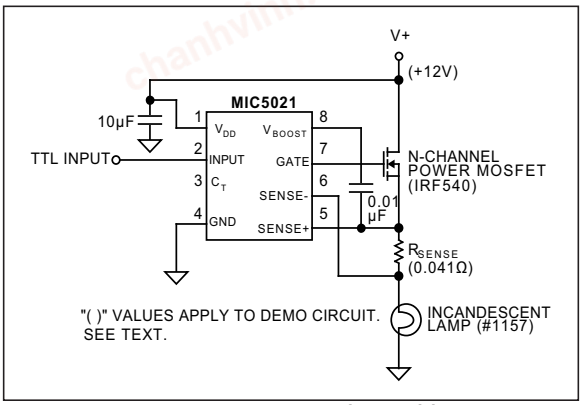


FIGURE 6-11: *Lamp Driver with Current Sensing.*

6.11 Remote Overcurrent Limiting Reset

In circuit breaker applications where the MIC5021 maintains an off condition after an overcurrent condition is sensed, the C_T pin can be used to reset the MIC5021.

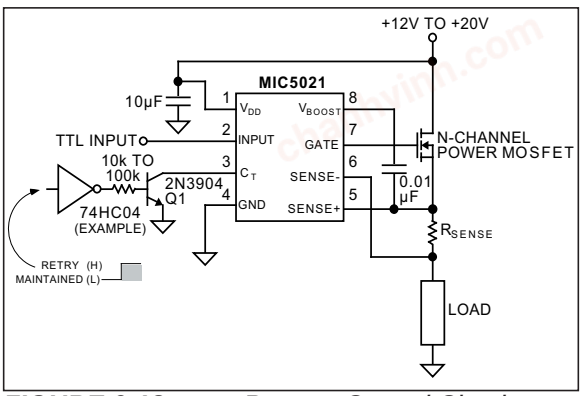


FIGURE 6-12: *Remote Control Circuit.*

Switching Q1 on pulls C_T low which keeps the MIC5021 gate output off when an overcurrent is sensed. Switching Q1 off causes C_T to appear open. The MIC5021 retries in about 20 µs and continues to retry until the overcurrent condition is removed.

For demonstration purposes, a 680Ω load resistor and 3Ω sense resistor will produce an overcurrent condition when the load’s supply (V+) is approximately 12V or greater.

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The gate-to-source configuration (refer to Figure 6-13) is appropriate for resistive and inductive loads. This also causes the smallest decrease in gate output voltage.

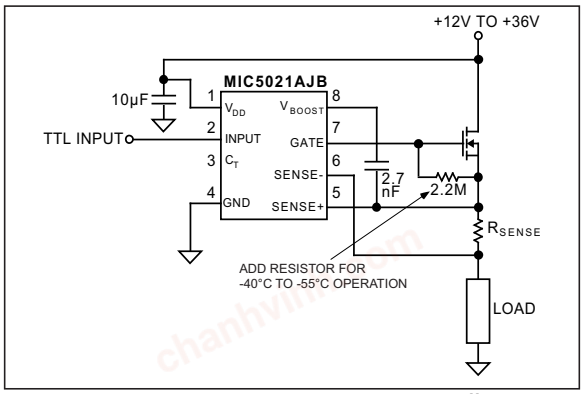


FIGURE 6-13: *Gate-to-Source Pull-Down.*

The gate-to-ground configuration (refer to Figure 6-14) is appropriate for resistive, inductive, or capacitive loads. This configuration will decrease the gate output voltage slightly more than the circuit shown in Figure 6-13.

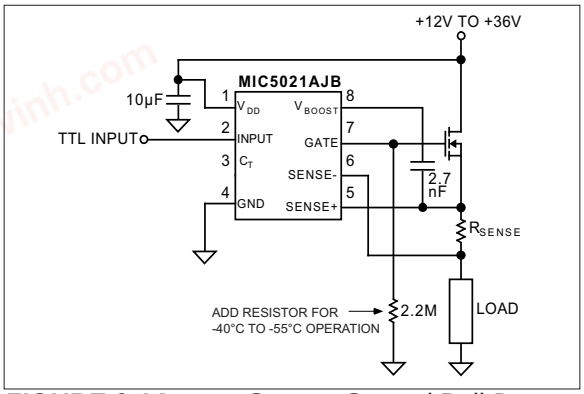


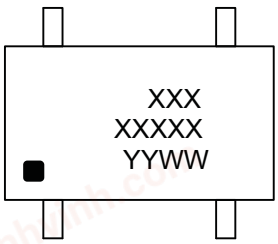
FIGURE 6-14: *Gate-to-Ground Pull-Down.*

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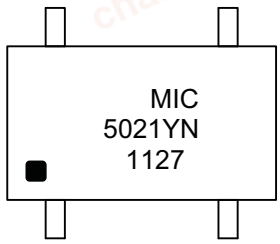
7.0 PACKAGING INFORMATION

7.1 Package Marking Information

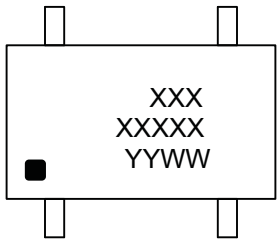
8-lead PDIP*



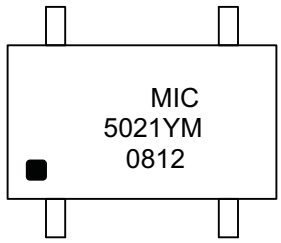
Example



8-lead SOIC*



Example



Legend:	XX...X	Product code or customer-specific information
	Y	Year code (last digit of calendar year)
	YY	Year code (last 2 digits of calendar year)
	WW	Week code (week of January 1 is week ‘01’)
	NNN	Alphanumeric traceability code
	(e3)	Pb-free JEDEC® designator for Matte Tin (Sn)
	*	This package is Pb-free. The Pb-free JEDEC designator ((e3)) can be found on the outer packaging for this package.
	●, ▲, ▼	Pin one index is identified by a dot, delta up, or delta down (triangle mark).
Note:		In the event the full Microchip part number cannot be marked on one line, it will be carried over to the next line, thus limiting the number of available characters for customer-specific information. Package may or may not include the corporate logo.
		Underbar (_) and/or Overbar (¯) symbol may not be to scale.

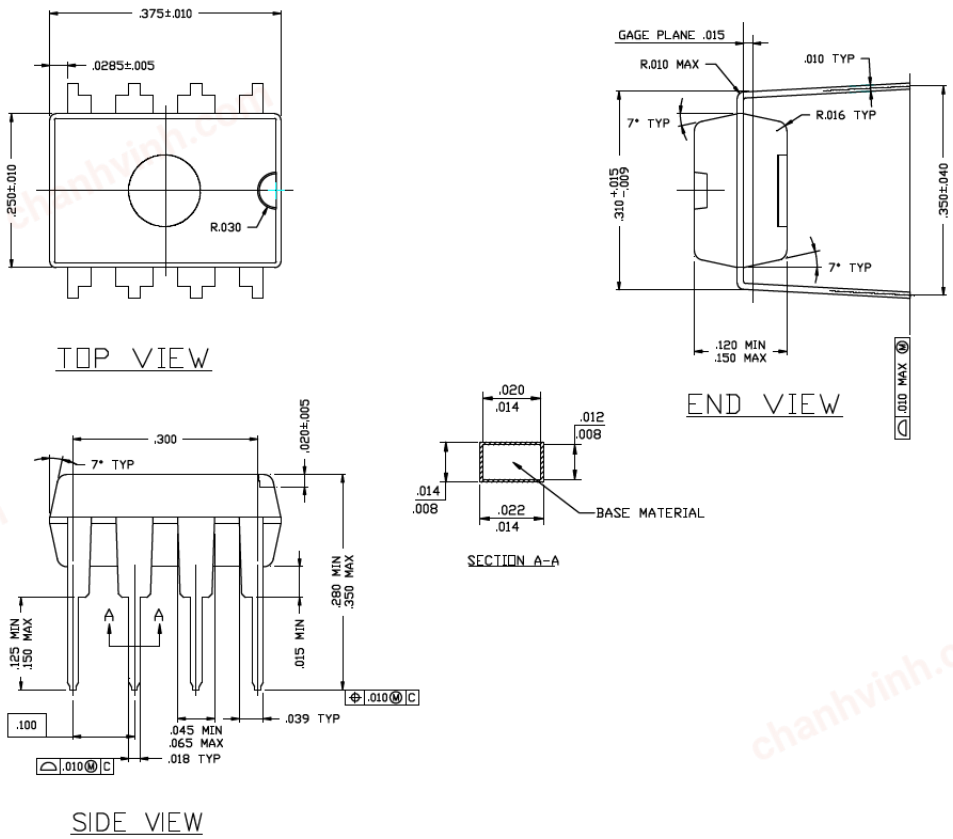
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8-Lead PDIP Package Outline & Recommended Land Pattern

TITLE
8 LEAD PDIP PACKAGE OUTLINE & RECOMMENDED LAND PATTERN

DRAWING #	PDIP-8LD-PL-1	UNIT	INCH
Lead Frame	Copper	Lead Finish	Matte Tin



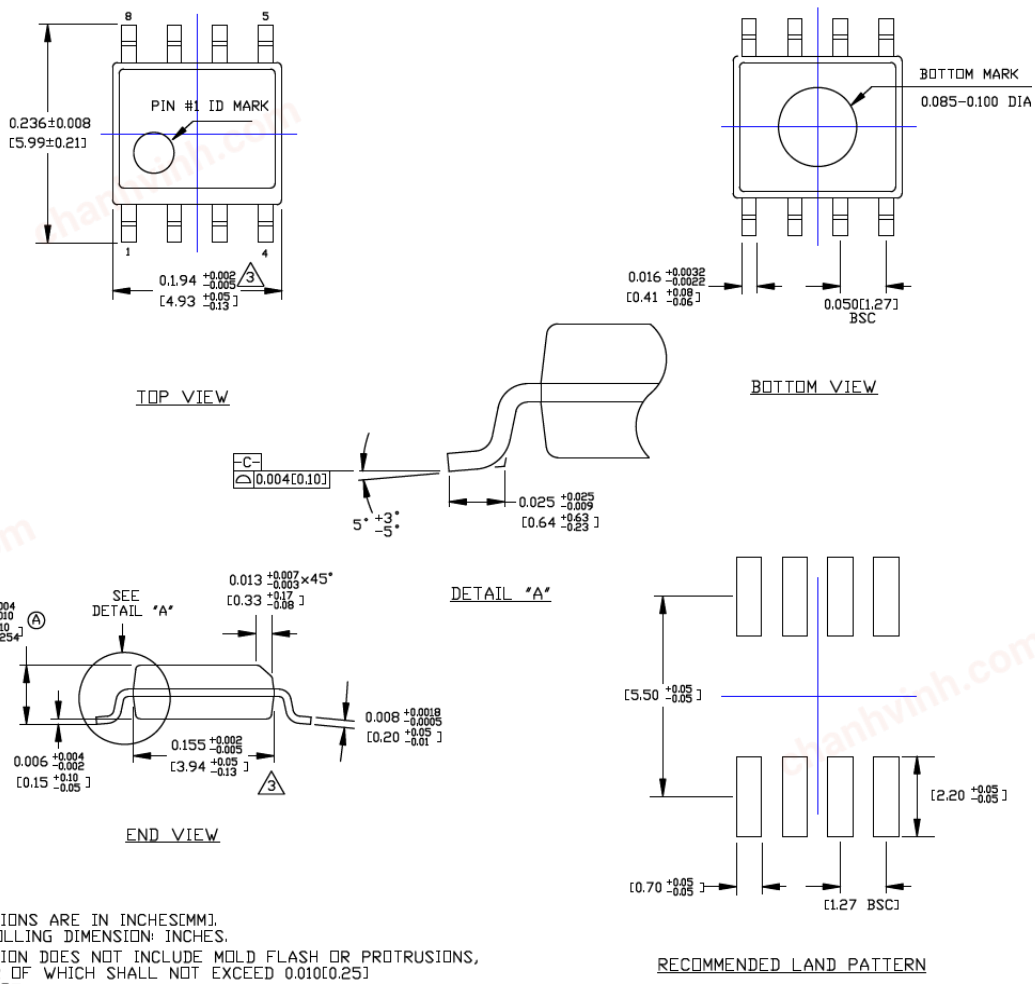
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8-Lead SOICN Package Outline & Recommended Land Pattern

TITLE
8 LEAD SOICN PACKAGE OUTLINE & RECOMMENDED LAND PATTERN

DRAWING #	SOICN-8LD-PL-1	UNIT	INCH [MM]



NOTES:
1. DIMENSIONS ARE IN INCHES[MM].
2. CONTROLLING DIMENSION: INCHES.
3. DIMENSION DOES NOT INCLUDE MOLD FLASH OR PROTRUSIONS, EITHER OF WHICH SHALL NOT EXCEED 0.010[0.25] PER SIDE.

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APPENDIX A: REVISION HISTORY

Revision A (December 2016)

- Converted Micrel document MIC5021 to Microchip data sheet template DS20005677A.
- Minor grammatical text changes throughout.

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PRODUCT IDENTIFICATION SYSTEM

To order or obtain information, e.g., on pricing or delivery, contact your local Microchip representative or sales office.

PART NO.	X	XX
Device	Temperature Range	Package

Device:	MIC5021:		High-Speed, High-Side MOSFET Driver with Charge Pump and Overcurrent Limit
Temperature Range:	Y	=	–40°C to +85°C (RoHS Compliant)
Packages:	M	=	8-Pin SOIC
	N	=	8-Pin Plastic DIP

Examples:

a) MIC5021YM: High-Speed, High-Side MOSFET Driver with Charge Pump and Overcurrent Limit, –40°C to +85°C (RoHS Compliant), 8LD SOIC

b) MIC5021YN: High-Speed, High-Side MOSFET Driver with Charge Pump and Overcurrent Limit, –40°C to +85°C (RoHS Compliant), 8LD Plastic DIP

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