

Programmable Current Limit High-Side Switches

Features

- 2.7V to 5.5V Input
- Adjustable Current Limit Up to 1.5A
- Reverse Current Flow Blocking (No “Body Diode”)
- 90 μ A Typical On-State Supply Current
- 1 μ A Typical Off-State Supply Current
- 120 m Ω Maximum On-Resistance
- Open-Drain Fault Flag
- Thermal Shutdown
- Thermal Shutdown Output Latch (MIC2548A)
- 2 ms (Slow) Turn-On and Fast Turn-Off
- Available with Active-High or Active-Low Enable

Applications

- USB Power Distribution
- PCI Bus Power Switching
- Notebook PCs
- ACPI Power Distribution
- PC Card Hot Swap
- Inrush Current Limiting

General Description

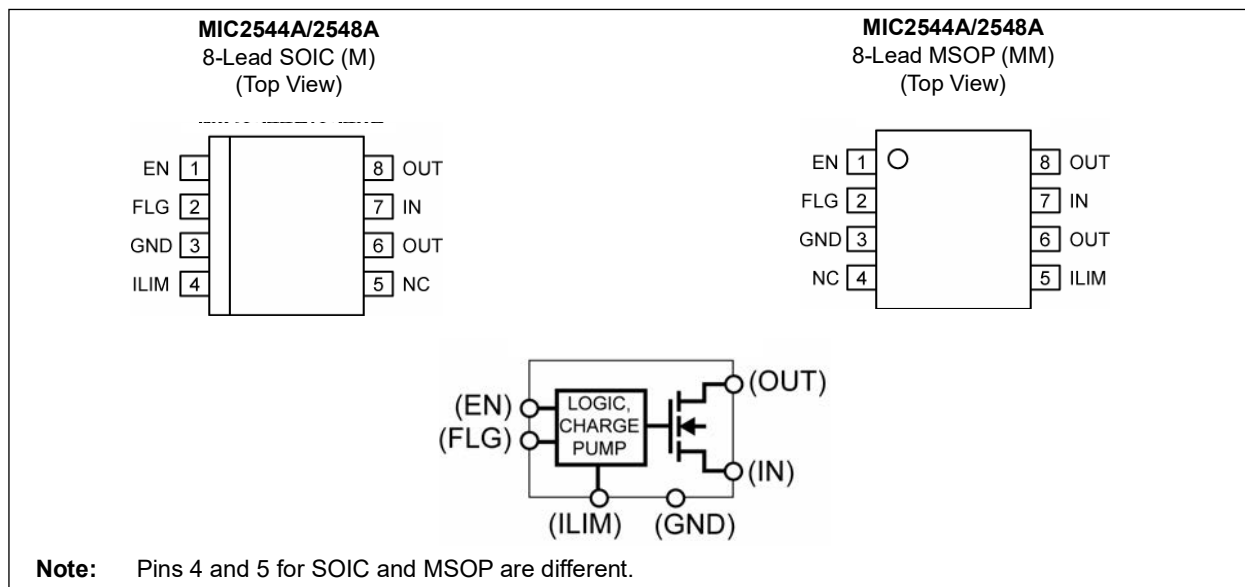
The MIC2544A and MIC2548A are integrated, high-side power switches optimized for low loss DC power switching and other power management applications, including Advanced Configuration and Power Interface (ACPI). The MIC2544A/48A is a cost-effective, highly integrated solution that requires few external components to satisfy USB and ACPI requirements.

Load current management features include a precision resistor-programmable output current-limit and a soft-start circuit which minimizes inrush current when the switch is enabled. Thermal shutdown, along with current-limit, protects the switch and the attached device.

The MIC2544A/48A's open-drain flag output is used to indicate current-limiting or thermal shutdown to a local controller. The MIC2548A has an additional internal latch which turns the output off upon thermal shutdown providing robust fault control. The enable signal is compatible with both 3V and 5V logic, and is also used as the thermal shutdown latch reset for the MIC2548A.

The MIC2544A and MIC2548A are available in active-high and active-low enable versions in the 8-lead SOIC and 8-lead MSOP package options.

Package Types



Typical Application Circuit

Diagram illustrating the connection of the MIC2544A LDO regulator. The input is +5V, connected to the FLG pin through a resistor R_{FLG} . The On/Off pin is connected to the input. The EN pin is connected to the input. The output is connected to the IN pin of the MIC2544A. The output is also connected to a 1.0µF capacitor to ground and a 33µF capacitor to ground. The output is connected to a Peripheral block. The GND pin is connected to ground. The ILIM pin is connected to ground through a resistor R_{SET} . The OUT pin is connected to the output. The NC pin is not connected.

1.0 ELECTRICAL CHARACTERISTICS

Absolute Maximum Ratings †

Supply Voltage (V_{IN})	.....	–0.3V to +6.0V
Output Voltage (V_{OUT})	.....	–0.3V to V_{IN}
Output Current (I_{OUT})	.....	Internally Limited
Enable Input (V_{EN})	.....	–0.3V to V_{IN} + 0.3V
Fault Flag Voltage (V_{FLG})	.....	–0.3V to +6.0V
Fault Flag Current (I_{FLG})	.....	50 mA
ESD Rating (Note 1)	.....	2 kV

Operating Ratings ‡

Supply Voltage (V_{IN})	.....	+2.7V to +5.5V
Enable Voltage (V_{EN})	.....	0V to V_{IN}
Current Limit Set Range	.....	0.1A to 1.5A

† **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.

‡ **Notice:** The device is not guaranteed to function outside its operating ratings.

Note 1: Devices are ESD sensitive. Handling precautions recommended. Human body model, 1.5 k Ω in series with 100 pF.

ELECTRICAL CHARACTERISTICS

V_{IN} = +5V; T_A = +25°C, **Bold** values valid for –40°C to +85°C, unless noted.

Parameter	Symbol	Min.	Typ.	Max.	Units	Conditions
Power Input Supply						
Input Voltage Range	V_{IN}	2.7	—	5.5	V	—
Shutdown Current	I_{SHDN}	—	0.75	5	μ A	Switch off, V_{OUT} = Open, Note 1
Supply Current	I_{IN}	—	90	160	μ A	Switch on, V_{OUT} = Open, Note 1
Enable Input						
EN Logic Level High	V_{IH}	2.4	1.7	—	V	—
EN Logic Level Low	V_{IL}	—	1.5	0.8	V	—
EN Bias Current	I_{BIAS}	—	0.1	1.0	μ A	V_{EN} = 2.4V, Note 1
		—	0.1	1.0	μ A	V_{EN} = 0.8V, Note 1
EN Input Capacitance	C_{IN}	—	1	—	pF	Note 2
EN Pulse Reset Width		5	—	—	μ s	MIC2548A Thermal Shutdown Latch, Note 2
V_{IN} -to-EN Set-up		0	—	—	μ s	MIC2548A, Note 2
Internal Switch						
On Resistance	$R_{DS(ON)}$	—	80	120	m Ω	I_{OUT} = 500 mA
Output Leakage Current	I_{LEAK}	—	1	10	μ A	Switch off
Current Limit						
Current Limit Factor	I_{LIM}	161	230	299	V	I_{OUT} = 100 mA to 500 mA, V_{OUT} = 1V to 4V, Note 3
		184	230	276	V	I_{OUT} = 500 mA to 1.5A, V_{OUT} = 1V to 4V, Note 3
Current Limit Response Time	t_{ILIM}	—	25	—	μ s	V_{OUT} = 0V, Note 2 , Note 3

MIC2544A/48A

ELECTRICAL CHARACTERISTICS (CONTINUED)

$V_{IN} = +5V$; $T_A = +25^{\circ}C$, **Bold** values valid for $-40^{\circ}C$ to $+85^{\circ}C$, unless noted.

Parameter	Symbol	Min.	Typ.	Max.	Units	Conditions
Output Response Times						
Output Turn-On Delay	$t_{ON(DLY)}$	1	2	5	ms	$R_L = 10\Omega$, $C_L = 1\mu F$, Figure 2-1 , Figure 2-2
Output Turn-On Rise Time	t_R	1	2	5	ms	$R_L = 10\Omega$, $C_L = 1\mu F$, Figure 2-1 , Figure 2-2
Output Turn-Off Delay	$t_{OFF(DLY)}$	—	30	—	μs	$R_L = 10\Omega$, $C_L = 1\mu F$, Figure 2-1 , Figure 2-2
Output Turn-Off Fall Time	t_F	—	30	—	μs	$R_L = 10\Omega$, $C_L = 1\mu F$, Figure 2-1 , Figure 2-2
Error Flag						
Error Flag Output Resistance	R_{FLG}	—	7	15	Ω	$V_{IN} = 5V$, $I_L = 10\mu A$
		—	9	20	Ω	$V_{IN} = 3.3V$, $I_L = 10\mu A$
Error Flag Off Current	I_{FLG}	—	0.01	1	μA	$V_{FLG} = 5.0V$
Thermal Protection						
Overtemperature Shutdown	t_{SHDN}	—	150	—	$^{\circ}C$	T_J rising
Overtemperature Shutdown Hysteresis	$t_{SHDN(HYS)}$	—	5	—	$^{\circ}C$	—

Note 1: Off is $\leq 0.8V$ and on is $\geq 2.4V$ for the MIC2544A-1 and MIC2548A-1. Off is $\geq 2.4V$ and on is $\leq 0.8V$ for the MIC2544A-2 and MIC2548A-2. The enable input has about 200 mV of hysteresis.

2: Ensured by design, but not production tested.

3: Current limit threshold is determined by $I_{LIM} = 230V/R_{SET}$, where R_{SET} is measured in Ohms.

TEMPERATURE SPECIFICATIONS

Parameters	Sym.	Min.	Typ.	Max.	Units	Conditions
Temperature Ranges						
Maximum Junction Temperature	$T_{J(MAX)}$	Internally Limited				—
Ambient Temperature Range	T_A	-40	—	$+85$	$^{\circ}C$	—
Storage Temperature Range	T_S	-65	—	$+150$	$^{\circ}C$	—
Lead Temperature	T_{LEAD}	—	—	$+260$	$^{\circ}C$	Soldering, 10 sec.
Package Thermal Resistances						
Thermal Resistance, SOIC-8Ld	θ_{JA}	—	160	—	$^{\circ}C/W$	—
Thermal Resistance, MSOP-8Ld	θ_{JA}	—	206	—	$^{\circ}C/W$	—

2.0 TIMING DIAGRAMS

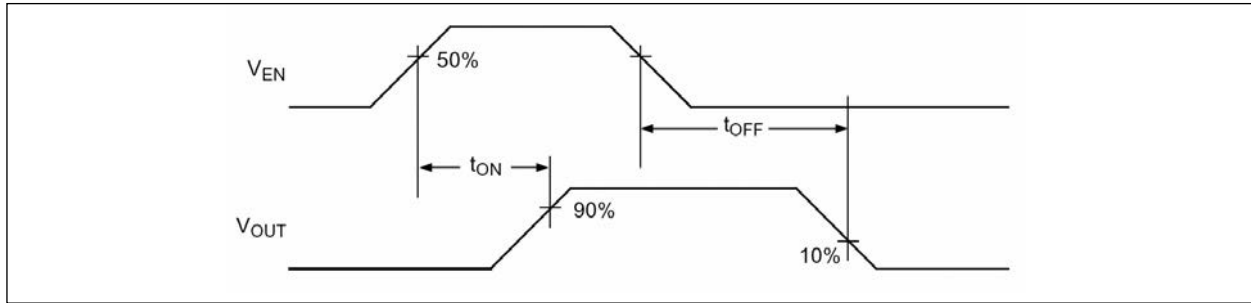


FIGURE 2-1: MIC2544A-1/MIC2548A-1.

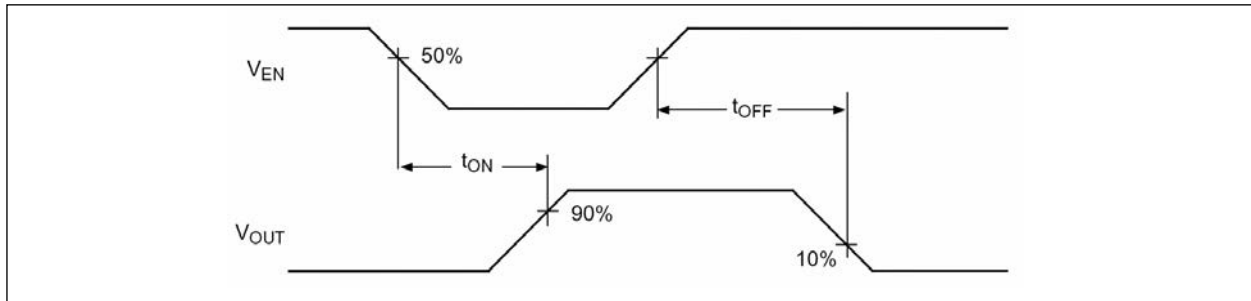


FIGURE 2-2: MIC2544A-2/MIC2548A-2.

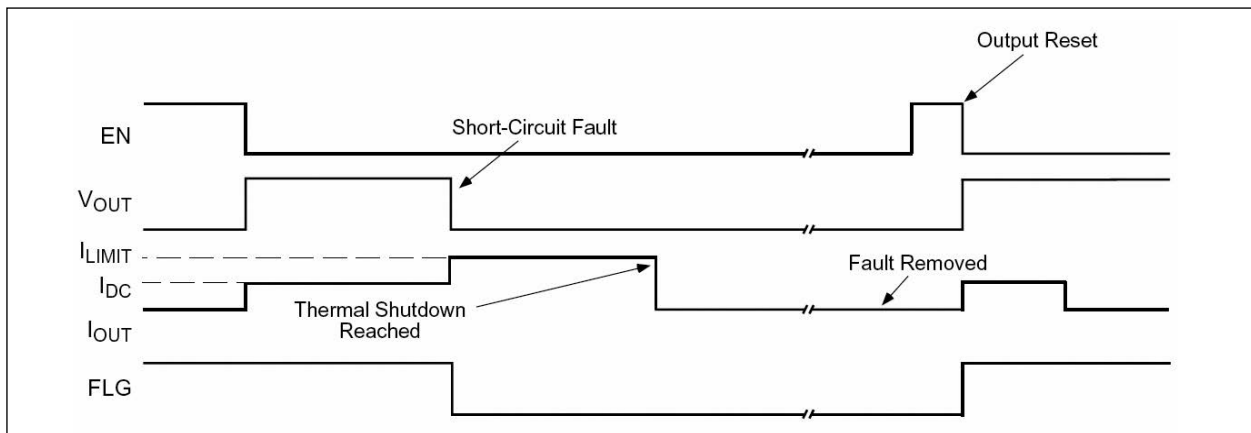


FIGURE 2-3: MIC2548A-2 Timing: Output is Reset by Toggling EN .

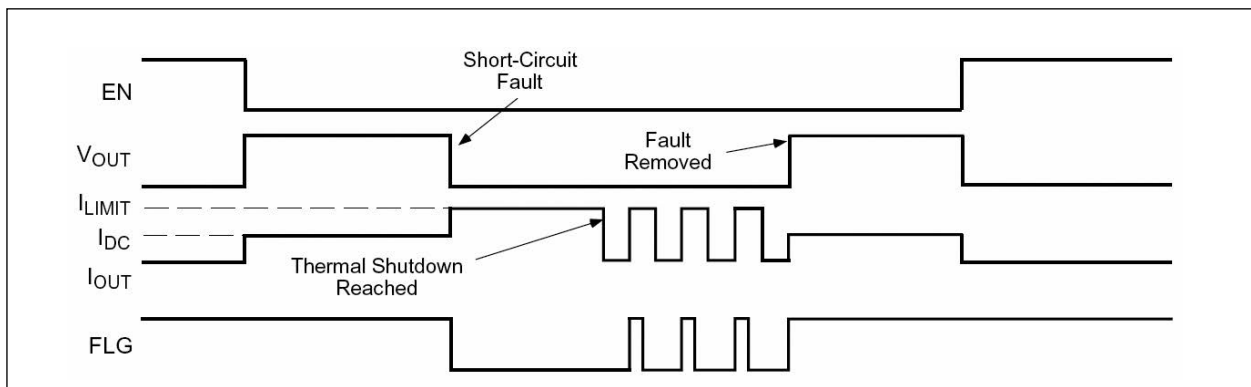


FIGURE 2-4: MIC2544A-2 Timing.

MIC2544A/48A

Test Circuit

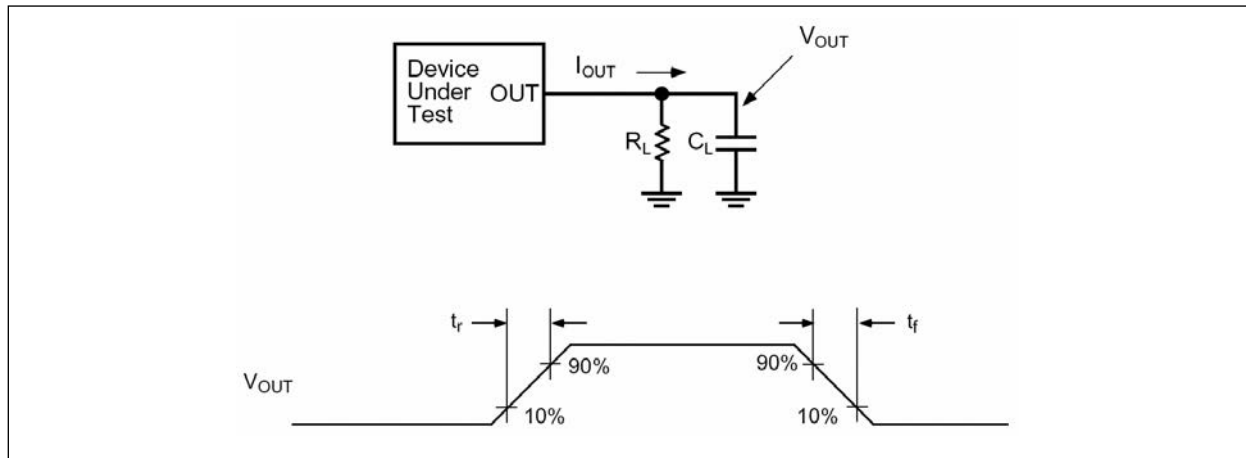


FIGURE 2-5: Functional Characteristics Test Circuit.

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.

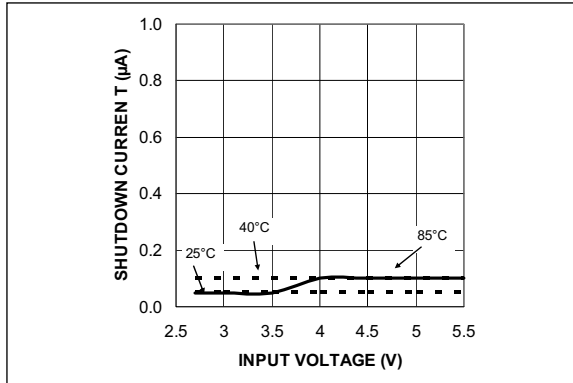


FIGURE 3-1: Shutdown Current vs. Input Voltage.

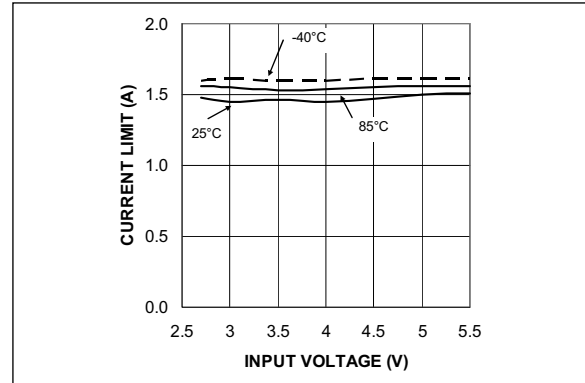


FIGURE 3-4: Current Limit vs. Input Voltage.

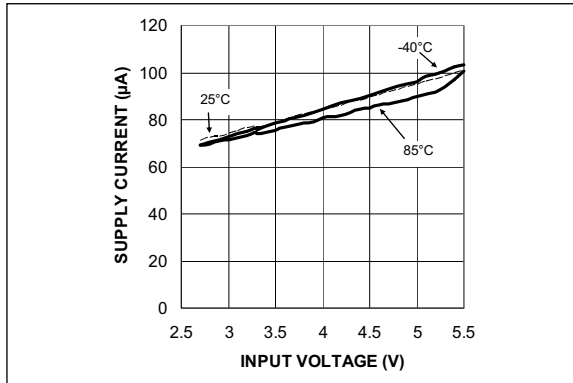


FIGURE 3-2: Supply Current vs. Input Voltage.

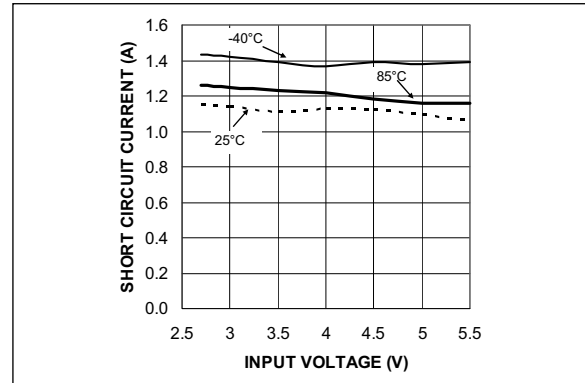


FIGURE 3-5: Short Circuit Current vs. Input Voltage.

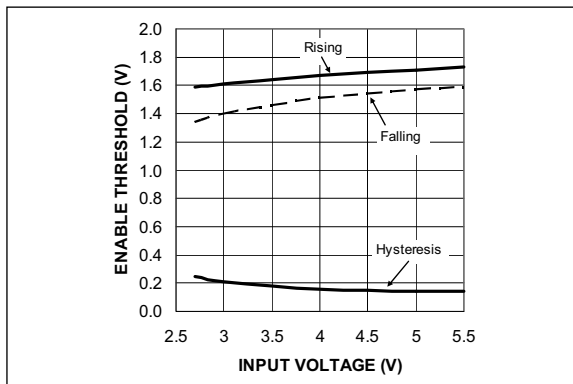


FIGURE 3-3: Enable Threshold vs. Input Voltage.

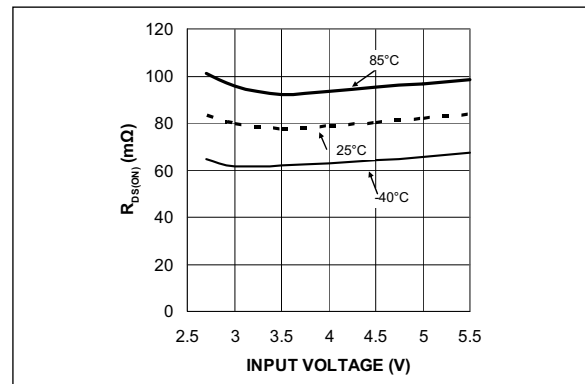


FIGURE 3-6: $R_{DS(ON)}$ vs. Input Voltage.

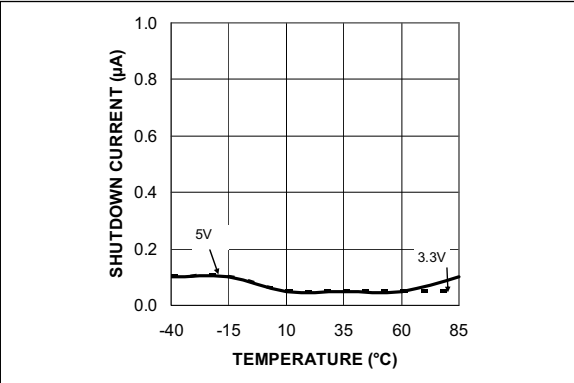


FIGURE 3-7: Shutdown Current vs. Temperature.

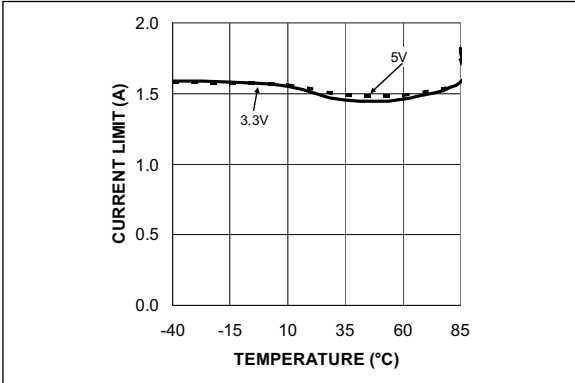


FIGURE 3-10: Current Limit vs. Temperature.

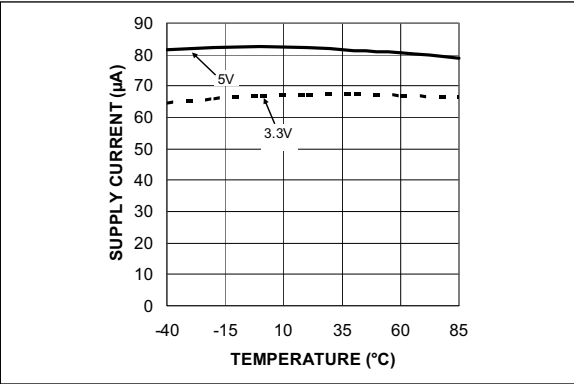


FIGURE 3-8: Supply Current vs. Temperature.

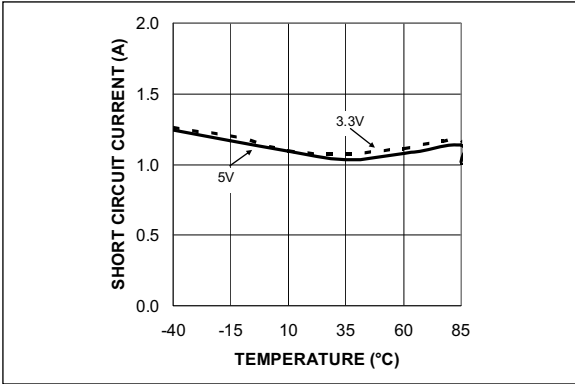


FIGURE 3-11: Short Circuit Current vs. Temperature.

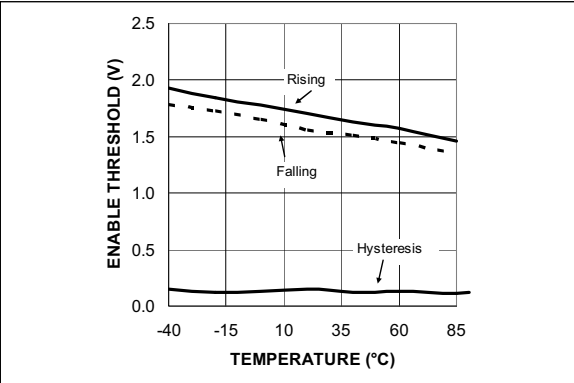


FIGURE 3-9: Enable Threshold vs. Temperature.

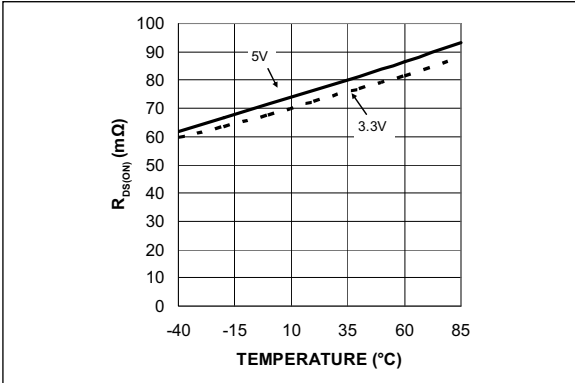


FIGURE 3-12: $R_{DS(ON)}$ vs. Temperature.

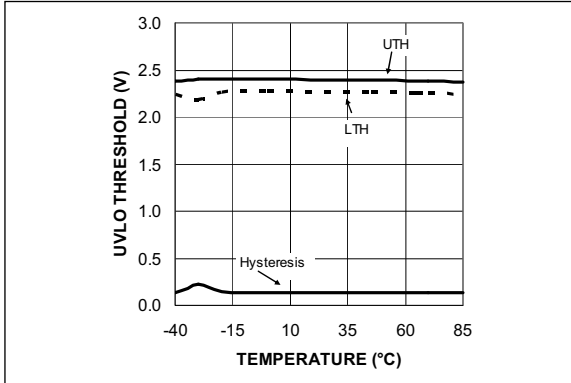


FIGURE 3-13: UVLO Threshold vs. Temperature.

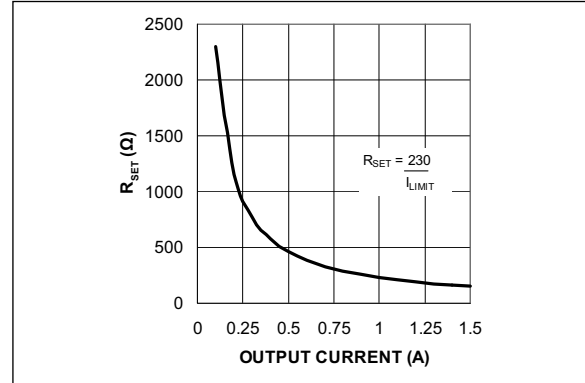


FIGURE 3-16: R_{SET} vs. Output Current.

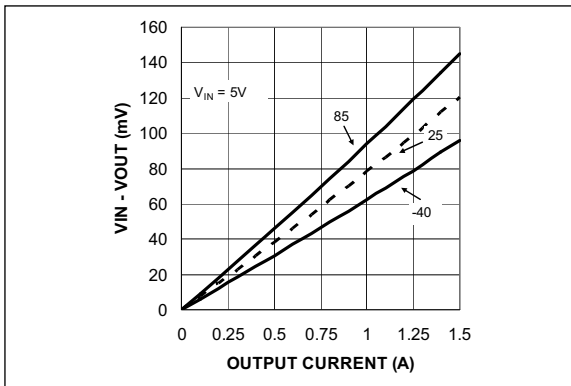


FIGURE 3-14: $V_{IN} - V_{OUT}$ vs. Output Current.

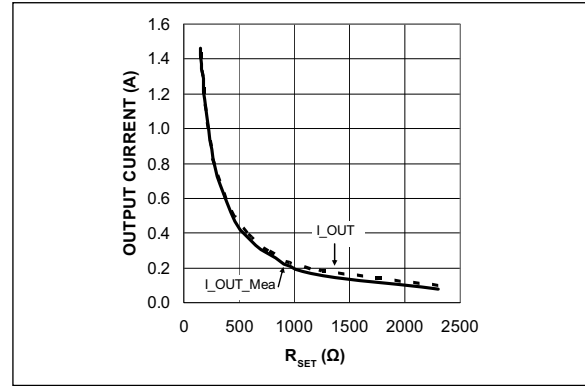


FIGURE 3-17: Output Current vs. R_{SET} .

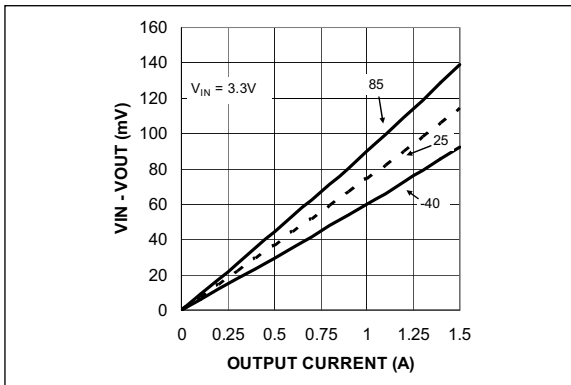


FIGURE 3-15: $V_{IN} - V_{OUT}$ vs. Output Current.

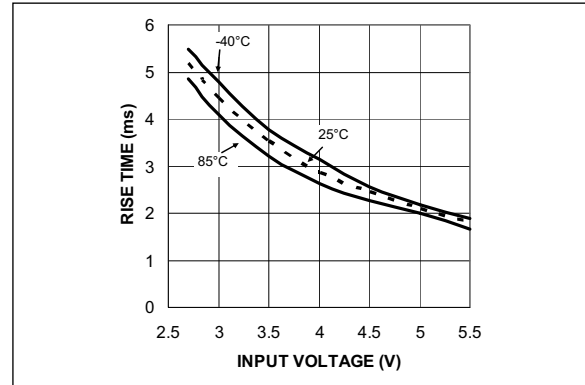


FIGURE 3-18: Rise Time vs. Input Voltage.

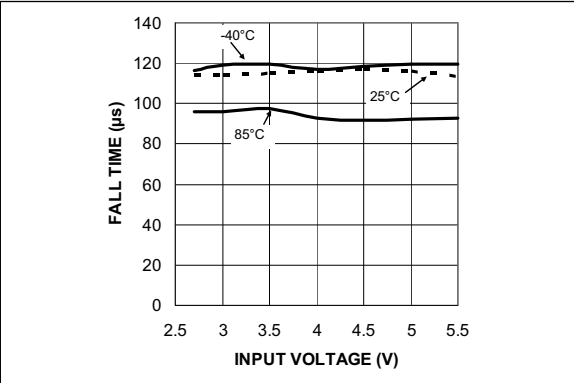


FIGURE 3-19: Fall Time vs. Input Voltage.

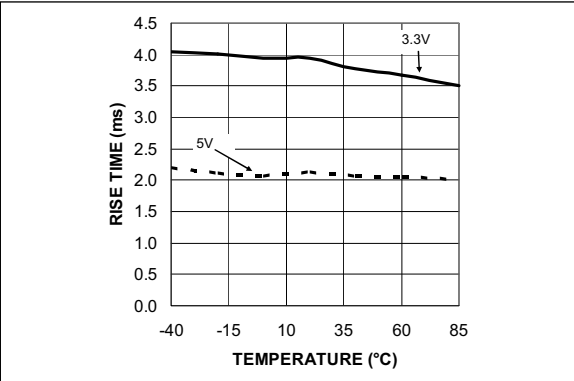


FIGURE 3-20: Rise Time vs. Temperature.

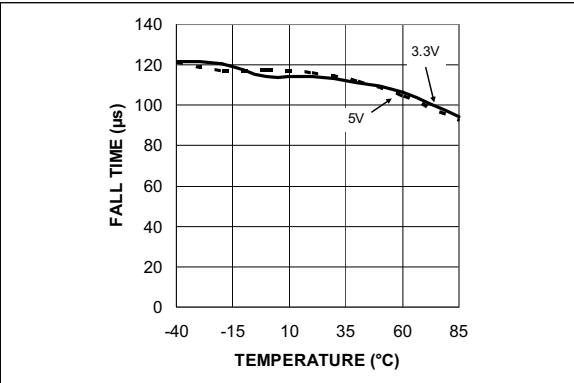


FIGURE 3-21: Fall Time vs. Temperature.

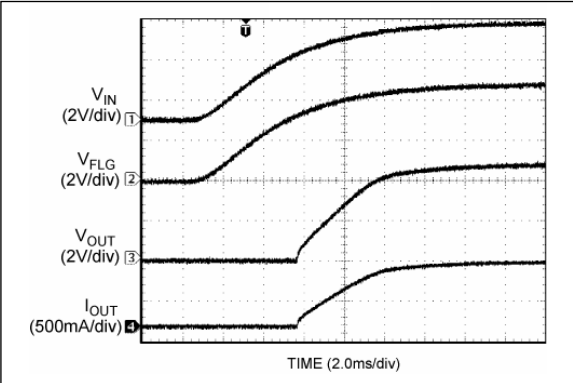


FIGURE 3-22: V_{IN} Soft Turn-On.

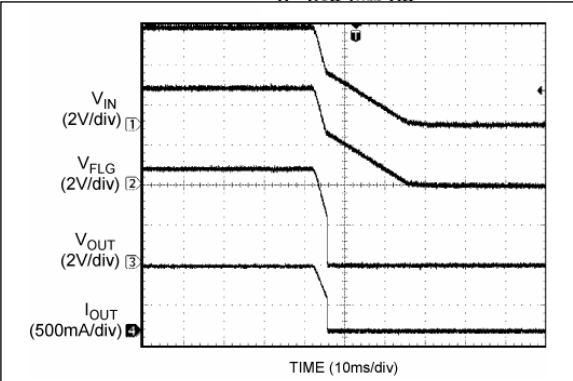


FIGURE 3-23: V_{IN} Soft Turn-Off.

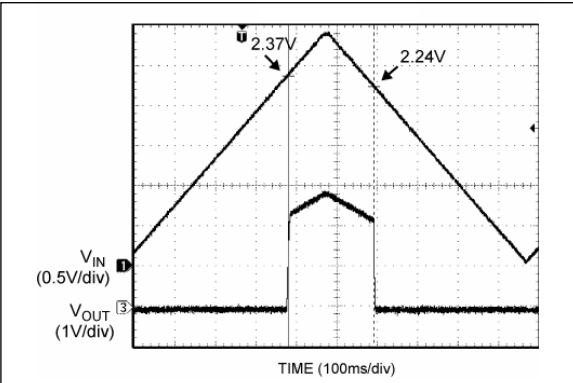


FIGURE 3-24: UVLO Thresholds.

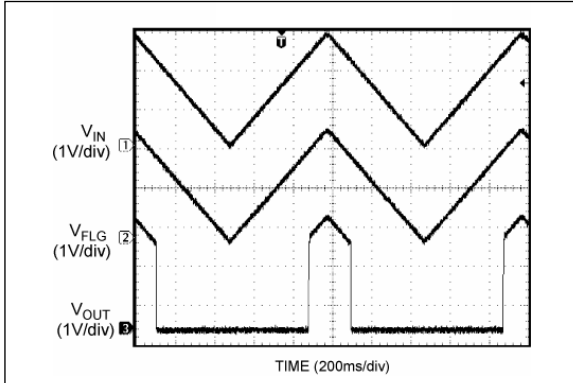


FIGURE 3-25: UVLO Thresholds with Flag.

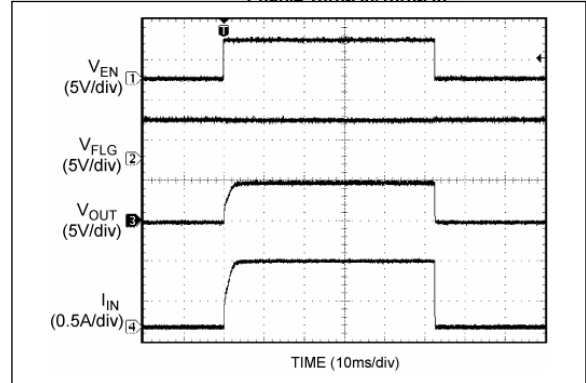


FIGURE 3-28: Enable Turn-On/Turn-Off.

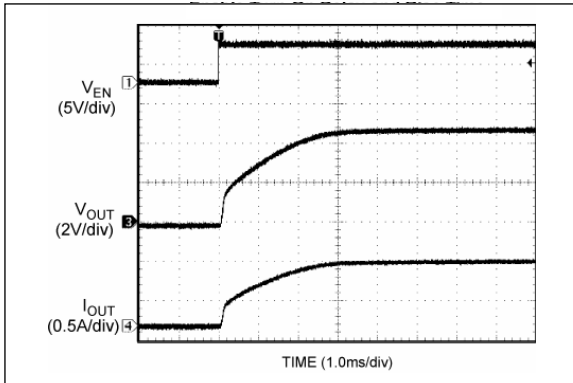


FIGURE 3-26: Enable Turn-On Delay and Rise Time.

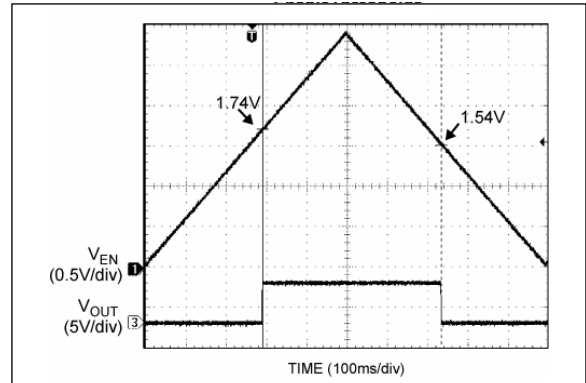


FIGURE 3-29: Enable Thresholds.

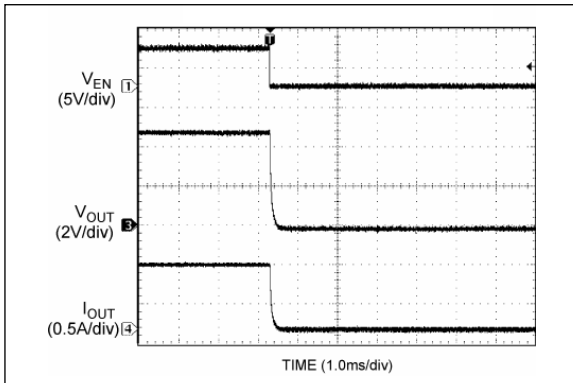


FIGURE 3-27: Enable Turn-Off Delay and Fall Time.

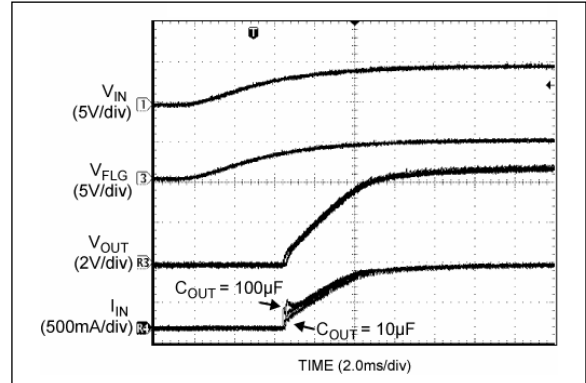


FIGURE 3-30: V_{IN} Soft Turn-On Inrush Current Response.

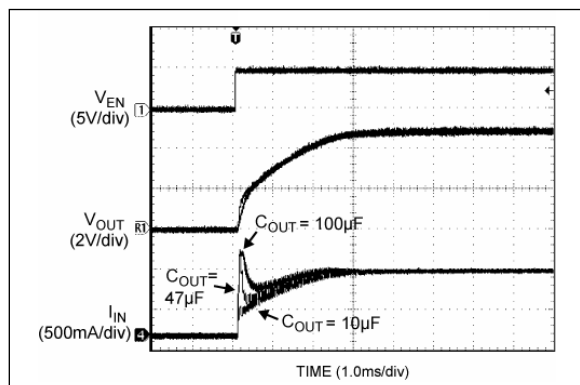


FIGURE 3-31: Inrush Current Response.

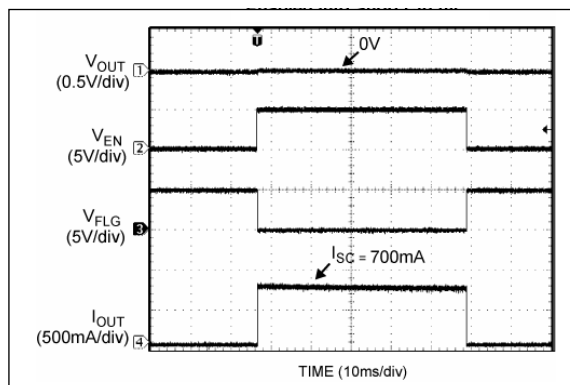


FIGURE 3-34: Enabled into Short Circuit.

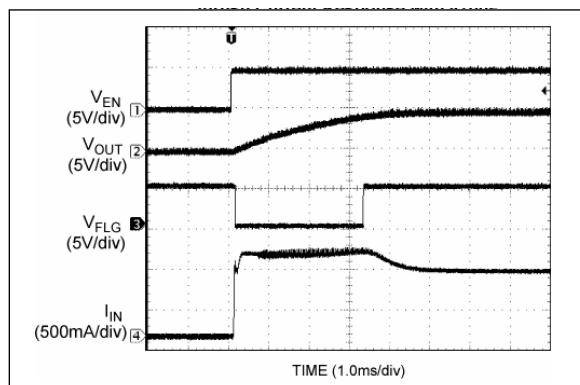


FIGURE 3-32: Inrush Current Response with 470 μ F.

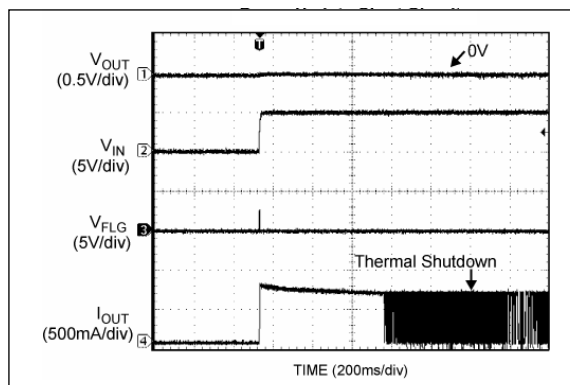


FIGURE 3-35: Power-Up into Short Circuit.

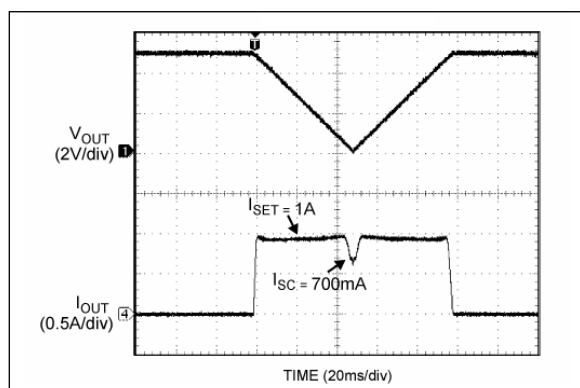


FIGURE 3-33: Output VI Curve.

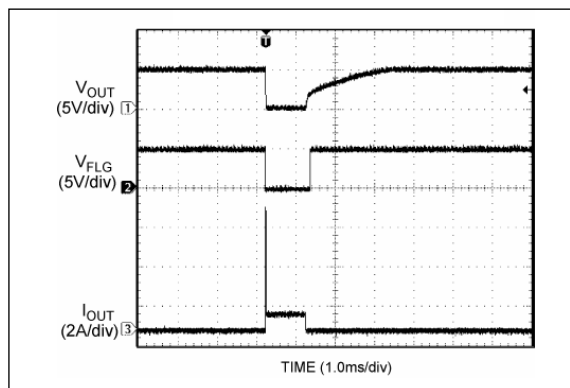


FIGURE 3-36: Current Limit Response, Stepped Short.

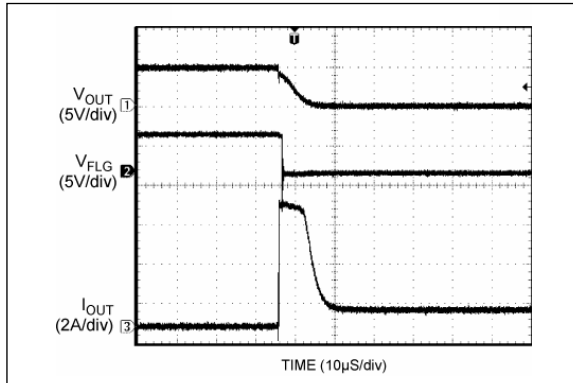


FIGURE 3-37: Current Limit and Flag Response Time.

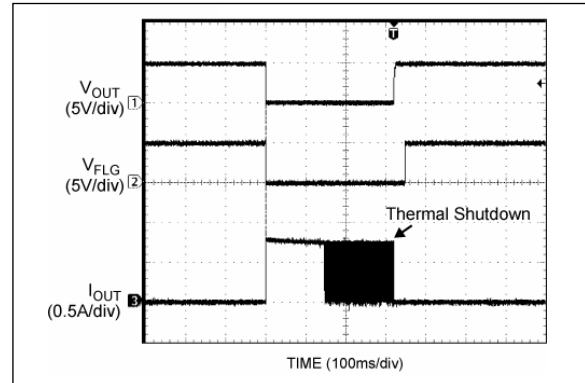


FIGURE 3-40: Thermal Shutdown Response.

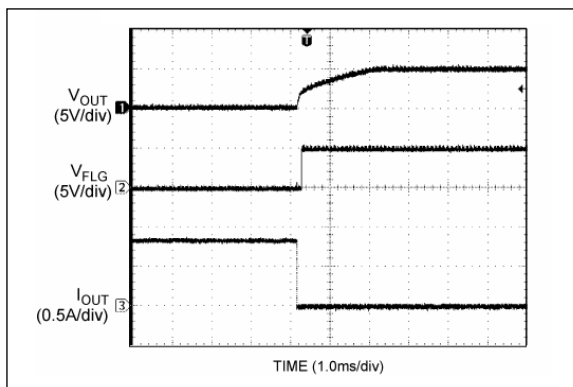


FIGURE 3-38: Output Recovery from Short Circuit and Flag Response.

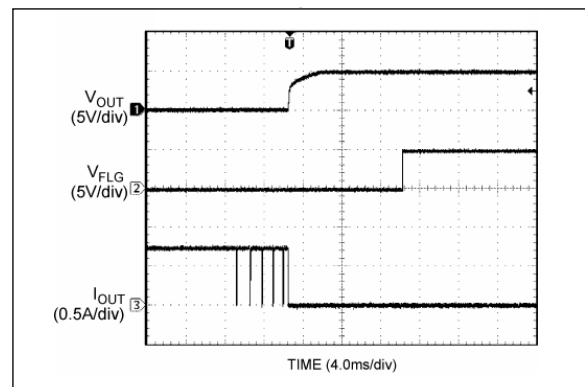


FIGURE 3-41: Output Recovery from Thermal Shutdown and Flag Response.

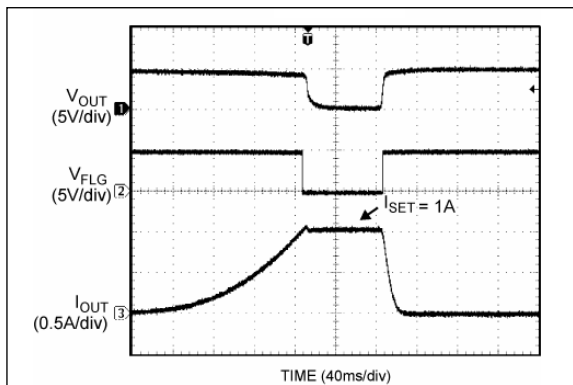


FIGURE 3-39: Current Limit.

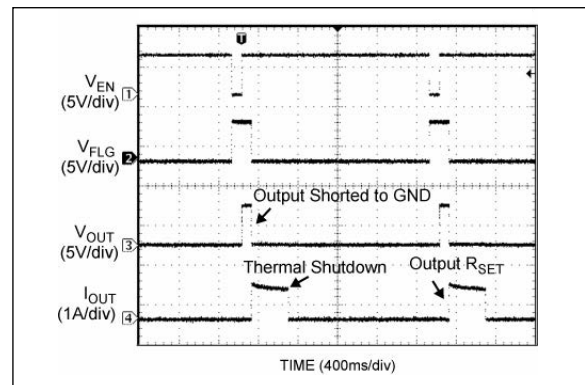


FIGURE 3-42: MIC2548A-1 Thermal Shutdown Output Latched.

MIC2544A/48A

4.0 PIN DESCRIPTIONS

The descriptions of the pins are listed in [Table 4-1](#).

TABLE 4-1: PIN FUNCTION TABLE

Pin Number MSOP-8	Pin Number SOIC-8	Pin Name	Description
1	1	EN	Enable (Input): Logic-compatible enable input. Active-high (-1) or active-low (-2). High input >1.7V typical; low input <1.5V typical. Do not float. MIC2548A only: Also resets thermal shutdown latch.
2	2	FLG	Fault Flag (Output): Active-low, open-drain output. Indicates overcurrent or thermal shutdown conditions. MIC2548A only: latched low on thermal shutdown.
3	3	GND	Ground.
5	4	ILIM	Current Limit: Sets current-limit threshold using an external resistor, R_{SET}^1 , connected to ground. $154\Omega < R_{SET} < 2.29\text{ k}\Omega$.
7	7	IN	Input: Output MOSFET drain. Also powers internal circuitry.
6, 8	6, 8	OUT	Switch (Output): Output MOSFET source. Pins 6 and 8 must be externally connected.
4	5	NC	Not internally connected.

5.0 FUNCTIONAL DESCRIPTION

The MIC2544A and MIC2548A are high-side N-channel switches available with either active-high or active-low enable inputs. Fault conditions turn off or inhibit turn-on of the output transistor and activate the open-drain error flag transistor making it sink current-to-ground.

5.1 Input and Output

IN is the power supply connection to the logic circuitry and the drain of the output MOSFET. OUT is the source of the output MOSFET. In a typical circuit, current flows from IN to OUT toward the load. If V_{OUT} is greater than V_{IN} , current will flow from OUT to IN because the switch is bidirectional when enabled.

The output MOSFET and driver circuitry are also designed to allow the MOSFET source to be externally forced to a higher voltage than the drain ($V_{OUT} > V_{IN}$) when the switch is disabled. In this situation, the MIC2544A/48A avoid undesirable current flow from OUT to IN. Both OUT pins must be connected together.

5.2 Thermal Shutdown

Thermal shutdown shuts off the output MOSFET and signals the fault flag if the die temperature exceeds 150°C. 5°C of hysteresis prevents the switch from turning on until the die temperature drops to 145°C. Overtemperature detection functions only when the switch is enabled.

The MIC2548A features an internal latch that causes the part to remain off after thermal shutdown and until a reset pulse is provided via the enable pin (Pin 1). While in current-limit, the thermal shutdown latch prevents on/off cycling of the output.

Refer to [Figure 2-3](#) and [Figure 2-4](#) for timing diagrams. The flag remains low until reset.

5.3 Enable Input

EN must be driven logic high or logic low, or be pulled high or low for a clearly defined input. Floating the input may cause unpredictable operation. EN should not be allowed to go negative with respect to GND and V_{EN} should be less than or equal to V_{IN} .

5.4 Setting I_{LIM}

The MIC2544A/48A's current limit is programmable by the user and controlled by a resistor that's connected between the ILIM pin and ground. The value of this resistor is determined by the following equation:

EQUATION 5-1:

$$I_{LIM} = \frac{\text{CurrentLimitFactor}(CLF)}{R_{SET}}$$

OR

$$R_{SET} = \frac{\text{CurrentLimitFactor}(V)}{I_{LIM}(A)}$$

For example: Set I_{LIM} to 1.0A.

The electrical specifications show the CLF at $I_{LIM} = 1A$.

TABLE 5-1: CLF AT $I_{LIM} = 1A$

Min.	Typ.	Max.
184V	230V	276V

For the sake of this example, treat the typical value of CLF at an I_{OUT} of 1A as 230V. Applying the equation above:

EQUATION 5-2:

$$R_{SET} = \frac{230V}{1.0A} = 230\Omega$$

$$R_{SET} = 232\Omega$$

(the closest standard 1% value)

Designers should be aware that variations in the measured I_{LIM} for a given R_{SET} resistor will occur because of small differences between individual ICs (inherent in silicon processing) resulting in a spread of I_{LIM} values. In the example above, a typical value of CLF was used to calculate R_{SET} . One can determine I_{LIM} 's spread by using the minimum and maximum values of CLF and the calculated value of R_{SET} .

EQUATION 5-3:

$$I_{LIM(MIN)} = \frac{184V}{232\Omega} = 0.79A$$

$$I_{LIM(MAX)} = \frac{276V}{232\Omega} = 1.19A$$

This gives one a maximum I_{LIM} variation over temperature of:

$I_{LIM(MIN)}$	$I_{LIM(TYP)}$	$I_{LIM(MAX)}$
0.79A (–21%)	1.0A	1.19A (+19%)

MIC2544A/48A

TABLE 5-2: MIC2544A/48A R_{SET} TABLE

I_{OUT}	R_{SET}	$I_{OUT(MIN)}$	$I_{OUT(MAX)}$
0.2A	1150 Ω	0.140A	0.260A
0.3A	767 Ω	0.210A	0.390A
0.4A	575 Ω	0.280A	0.520A
0.5A	460 Ω	0.350A	0.650A
0.6A	383 Ω	0.480A	0.720A
0.7A	329 Ω	0.560A	0.840A
0.8A	288 Ω	0.640A	0.960A
0.9A	256 Ω	0.720A	1.080A
1.0A	230 Ω	0.800A	1.200A
1.1A	209 Ω	0.880A	1.320A
1.2A	192 Ω	0.960A	1.440A
1.3A	177 Ω	1.040A	1.560A
1.4A	164 Ω	1.120A	1.680A
1.5A	153 Ω	1.200A	1.800A

5.5 Short-Circuit Protection

In the event of a short circuit, the output current will fold back to approximately 70% of the short circuit current limit.

5.6 Fault Flag

FLG is an N-channel, open-drain MOSFET output. The fault flag is active-low for current-limit or thermal shutdown conditions. The flag output MOSFET is capable of sinking a 10 mA load to typically 100 mV above ground. The FLG response delay time (t_D) is typically 5 μ s.

6.0 APPLICATION INFORMATION

6.1 Supply Filtering

A minimum 1 μF bypass capacitor from IN-to-GND, located near the MIC2544A and MIC2548A, is strongly recommended to control supply transients. Without a bypass capacitor, an output short may cause sufficient ringing on the input (from supply lead inductance) to damage internal control circuitry. An additional 22 μF input capacitor placed close to the IC is required if a bulk input capacitor is further than 3 inches away from the IC.

Input transients *must not exceed* the absolute maximum supply voltage ($V_{IN(\text{MAX})} = 6\text{V}$) even for a short duration.

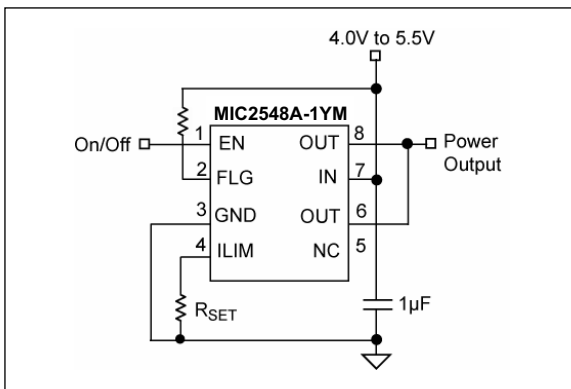


FIGURE 6-1: Supply Bypassing.

6.2 Power Dissipation

The device's junction temperature depends upon several factors such as the load, PCB layout, ambient temperature, and package type. Equations that can be used to calculate power dissipation and junction temperature are found below.

The calculation of power dissipation can be accomplished by the following equation:

EQUATION 6-1:

$$P_D = R_{DS(ON)} \times I_{OUT}^2$$

To relate this to junction temperature, use the following equation:

EQUATION 6-2:

$$T_J = P_D \times \theta_{JA} + T_A$$

Where:

T_J = Junction temperature.

T_A = Ambient temperature.

θ_{JA} = Thermal resistance of the package.

6.3 Transient Overcurrent Filter

The inrush current from the connection of a heavy capacitive load may cause the fault flag to fall for 10 μs to 200 μs while the switch is in a constant-current mode, charging the capacitance, as shown in Figure 6-2.

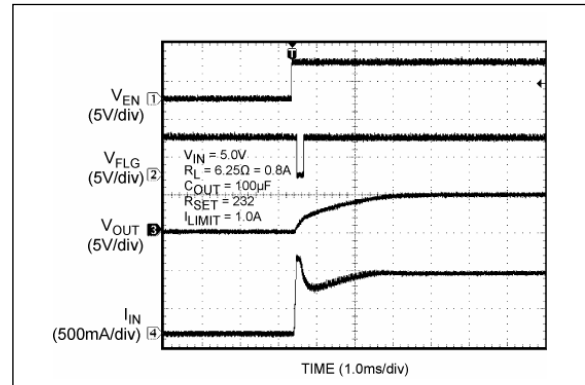


FIGURE 6-2: Flag Glitch with $C_{OUT} = 120 \mu\text{F}$.

Adding an optional series resistor-capacitor (R_{SET2}), in parallel with R_{SET} , and as shown in Figure 6-6, allows the transient current limit to be set to a different value than steady-state. A typical USB hot-plug inrush is 2A to 3A for 10 μs to 20 μs . If R_{SET} is 309 Ω (525 mA), an R_{SET2} of 100 Ω (2.3A) and C_{SET} of 1 μF ($R_C = 100 \mu\text{s}$) allows transient surge of 3A to pass for 100 μs without tripping the over current flag (FLG), as shown in Figure 6-3.

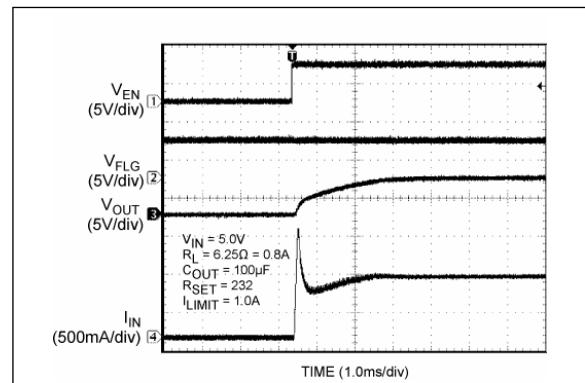


FIGURE 6-3: I_{LIM} Filter with $C_{OUT} = 120 \mu\text{F}$.

The circuit in Figure 6-4 can also be used to filter out transient FLG assertion. The value of the RC time constant should be selected to match the length of transient. Figure 6-5 shows the FLAG pin waveform due to the inrush of current surge.

MIC2544A/48A

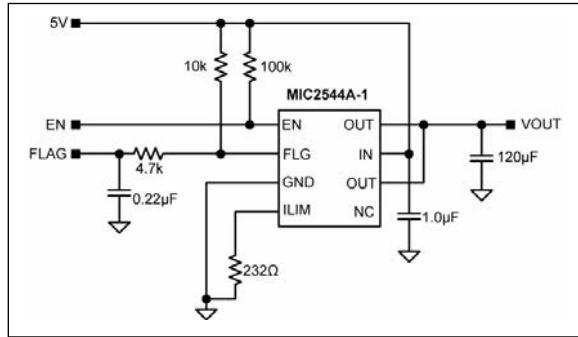


FIGURE 6-4: Flag Filter Circuit.

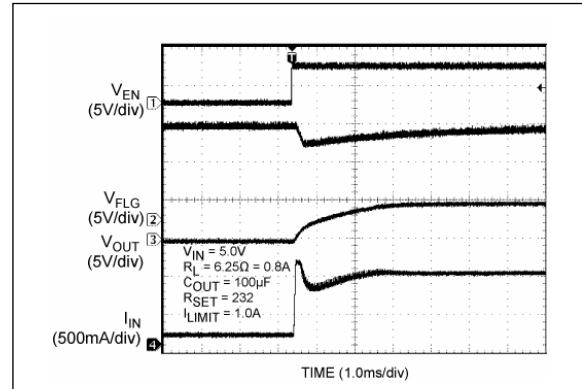


FIGURE 6-5: Flag Filter with $C_{OUT} = 100 \mu F$.

6.4 USB Power Distribution

The MIC2544A is ideal for meeting USB power distribution requirements. Figure 6-6 depicts a USB Host application. R_{SET} should be set to a value providing a current limit >500 mA.

The accurate current limit of the MIC2544A will reduce power supply current requirements. Also, fast reaction to short circuit faults prevent voltage droop in mobile PC applications.

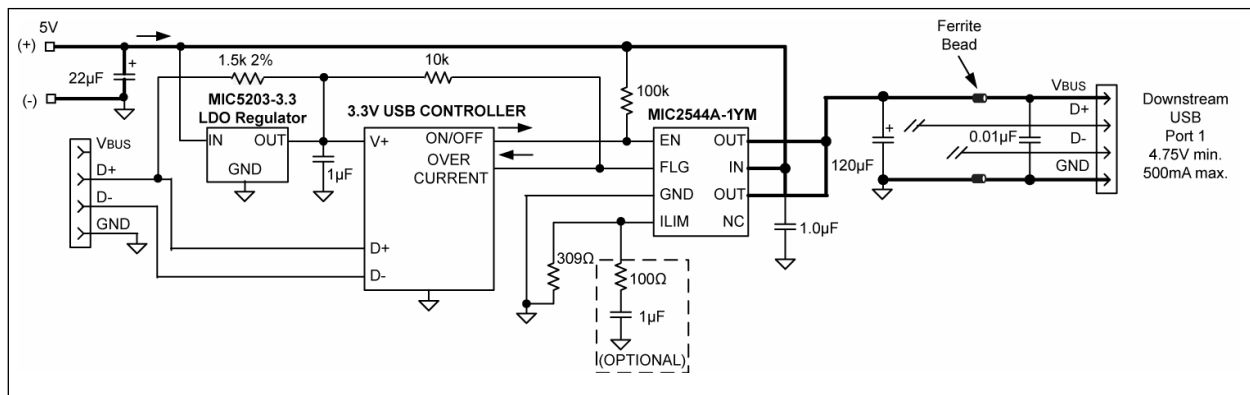


FIGURE 6-6: USB Host Application.

Note: MSOP package option uses pin 5 for ILIM. Pin 4 is not connected (NC). **Bold** lines indicate 0.1" wide, 1 oz. copper high-current traces.

6.5 Printed Circuit Board Hot-Plug

The MIC2544A/48A are ideal inrush current-limiters suitable for hot-plug applications. Due to the integrated charge pump, the MIC2544A/48A present high impedance when off and slowly become low impedance as they turn on. This "soft-start" feature effectively isolates power supplies from highly capacitive loads by reducing inrush current during hot-plug events. Figure 6-7 shows how the MIC2544A may be used in a hot-plug application.

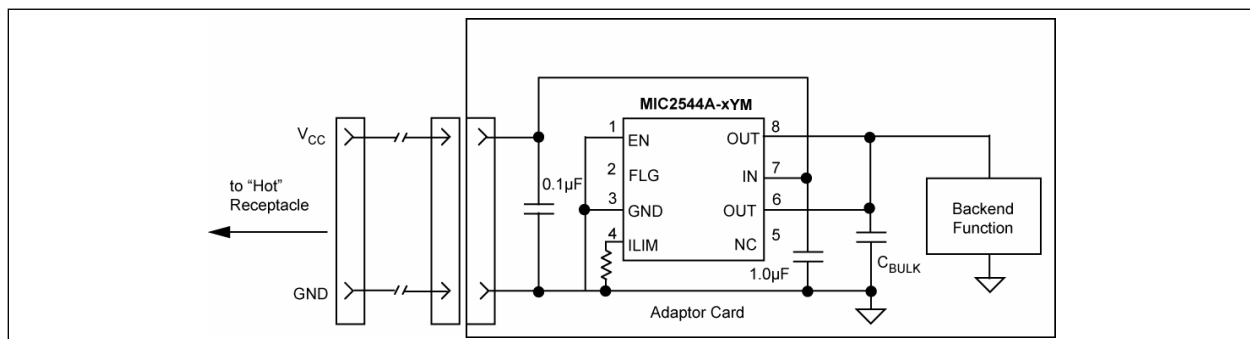
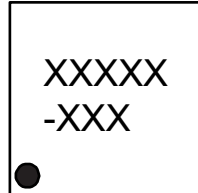


FIGURE 6-7: Hot-Plug Application.

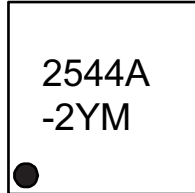
7.0 PACKAGING INFORMATION

7.1 Package Marking Information

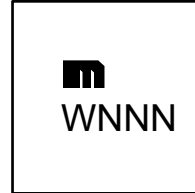
8-Lead MSOP*
(Front)



Example



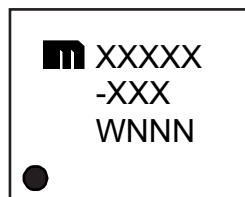
8-Lead MSOP*
(Back)



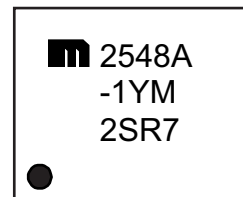
Example



8-Lead SOIC*



Example



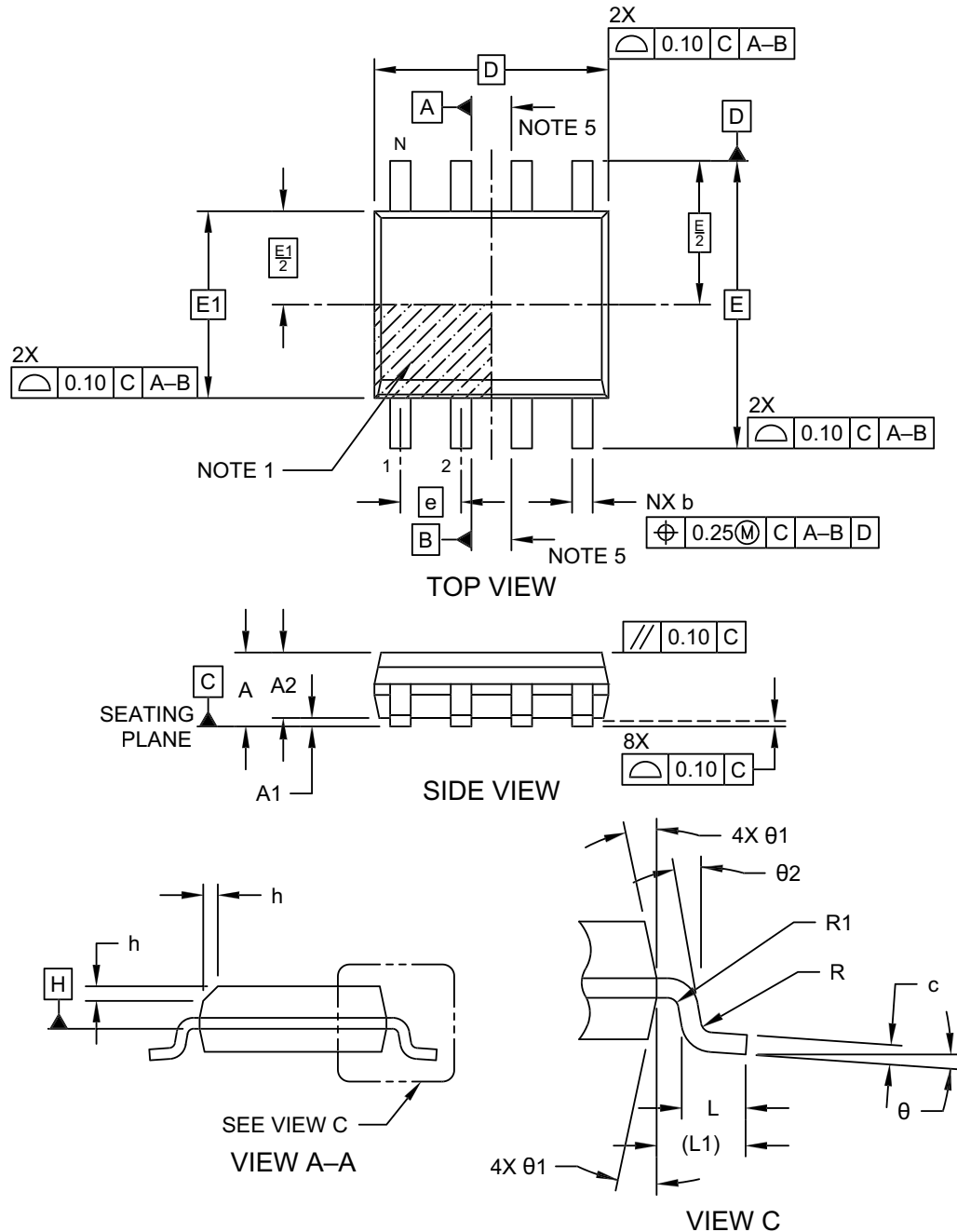
Legend:	XX...X	Product code or customer-specific information
	Y	Year code (last digit of calendar year)
	YY	Year code (last 2 digits of calendar year)
	WW	Week code (week of January 1 is week '01')
	NNN	Alphanumeric traceability code
	(e3)	Pb-free JEDEC® designator for Matte Tin (Sn)
	*	This package 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.	

Note: If the full seven-character YYWWNNN code cannot fit on the package, the following truncated codes are used based on the available marking space:
 6 Characters = YYWWNNN; 5 Characters = WWNNN; 4 Characters = WNNN; 3 Characters = NNN;
 2 Characters = NN; 1 Character = N

MIC2544A/48A

8-Lead Plastic Small Outline (3BX) - Narrow, 3.90 mm (.150 In.) Body [SOIC]

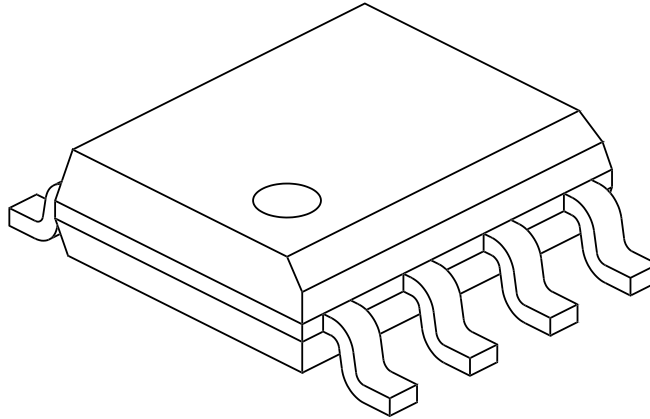
Note: For the most current package drawings, please see the Microchip Packaging Specification located at <http://www.microchip.com/packaging>



Microchip Technology Drawing No. C04-00057-3BX Rev L Sheet 1 of 2

8-Lead Plastic Small Outline (3BX) - Narrow, 3.90 mm (.150 In.) Body [SOIC]

Note: For the most current package drawings, please see the Microchip Packaging Specification located at <http://www.microchip.com/packaging>



Dimension Limits	Units	MILLIMETERS		
		MIN	NOM	MAX
Number of Pins	N	8		
Pitch	e	1.27 BSC		
Overall Height	A	–	–	1.75
Molded Package Thickness	A2	1.25	–	–
Standoff §	A1	0.10	–	0.25
Overall Width	E	6.00 BSC		
Molded Package Width	E1	3.90 BSC		
Overall Length	D	4.90 BSC		
Chamfer (Optional)	h	0.25	–	0.50
Foot Length	L	0.40	–	1.27
Footprint	L1	1.04 REF		
Lead Thickness	c	0.17	–	0.25
Lead Width	b	0.31	–	0.51
Lead Bend Radius	R	0.07	–	–
Lead Bend Radius	R1	0.07	–	–
Foot Angle	θ	0°	–	8°
Mold Draft Angle	θ1	5°	–	15°
Lead Angle	θ2	0°	–	–

Notes:

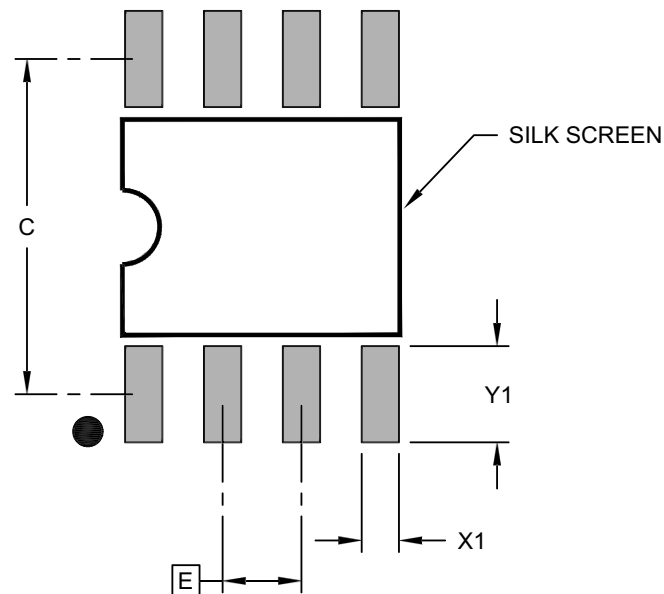
1. The Pin 1 visual index feature may vary, but it must be located within the hatched area.
2. § Significant Characteristic
3. Dimensions D and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed 0.15mm per side.
4. Dimensioning and tolerancing per ASME Y14.5M
BSC: Basic Dimension. Theoretically exact value shown without tolerances.
REF: Reference Dimension, usually without tolerance, for information purposes only.
5. Datums A & B to be determined at Datum H.

Microchip Technology Drawing No. C04-00057-3BX Rev L Sheet 2 of 2

MIC2544A/48A

8-Lead Plastic Small Outline (3BX) - Narrow, 3.90 mm (.150 In.) Body [SOIC]

Note: For the most current package drawings, please see the Microchip Packaging Specification located at <http://www.microchip.com/packaging>



RECOMMENDED LAND PATTERN

Units		MILLIMETERS		
Dimension Limits		MIN	NOM	MAX
Contact Pitch	E	1.27 BSC		
Contact Pad Spacing	C		5.40	
Contact Pad Width (X8)	X1			0.60
Contact Pad Length (X8)	Y1			1.55

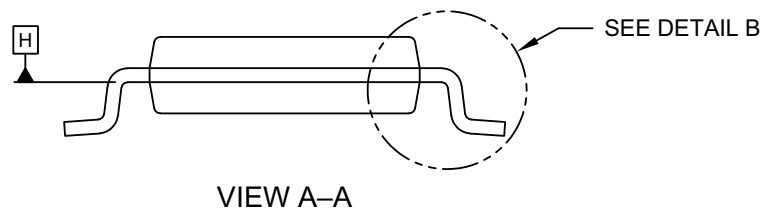
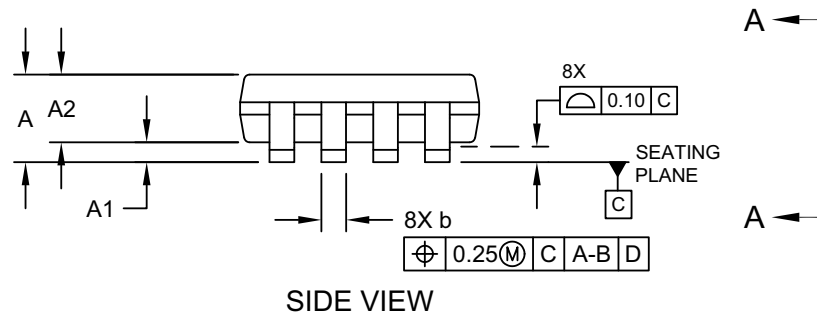
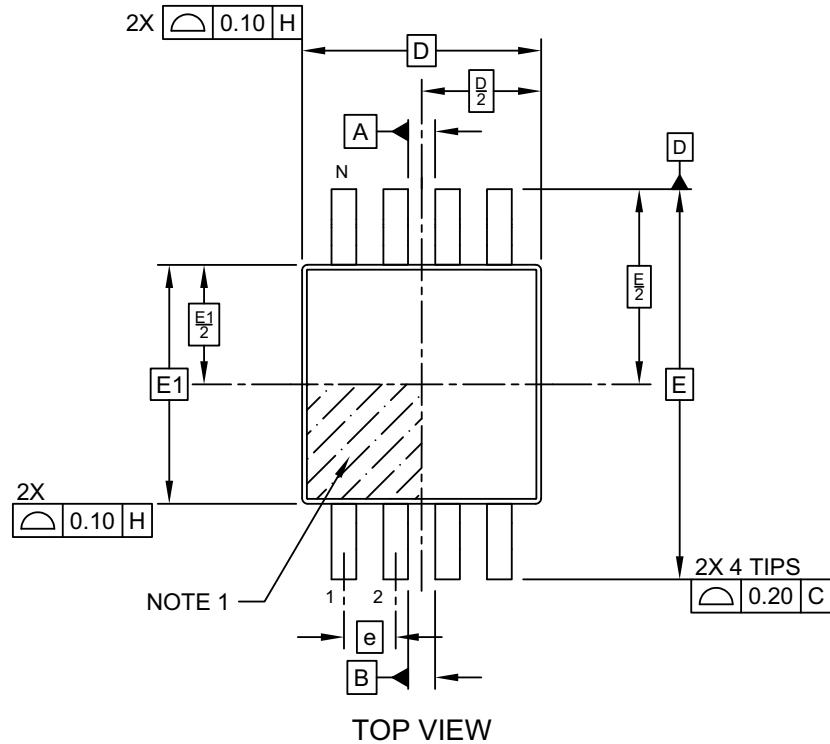
Notes:

1. Dimensioning and tolerancing per ASME Y14.5M
BSC: Basic Dimension. Theoretically exact value shown without tolerances.

Microchip Technology Drawing C04-02057-3BX Rev L

8-Lead Plastic Micro Small Outline Package (DMA) - 3x3 mm Body [MSOP] Micrel Legacy Package MSOP-08L

Note: For the most current package drawings, please see the Microchip Packaging Specification located at <http://www.microchip.com/packaging>

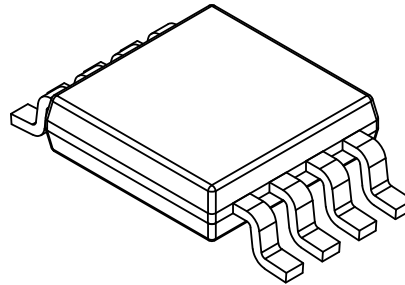
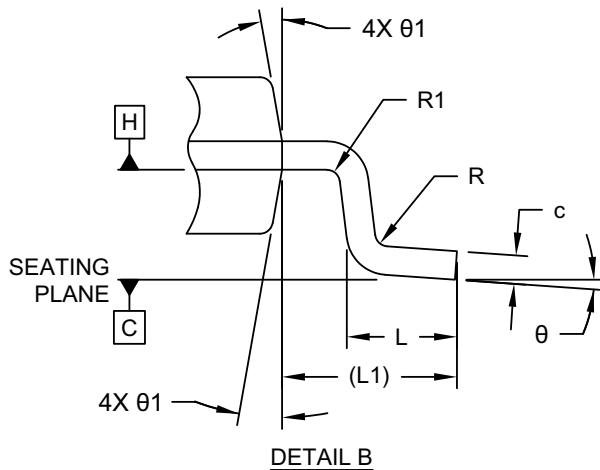


Microchip Technology Drawing C04-1082 Rev A Sheet 1 of 2

MIC2544A/48A

8-Lead Plastic Micro Small Outline Package (DMA) - 3x3 mm Body [MSOP] Micrel Legacy Package MSOP-08L

Note: For the most current package drawings, please see the Microchip Packaging Specification located at <http://www.microchip.com/packaging>



Dimension Limits	Units	MILLIMETERS		
		MIN	NOM	MAX
Number of Terminals	N	8		
Pitch	e	0.65 BSC		
Overall Height	A	0.94	1.02	1.10
Standoff	A1	0.00	—	0.15
Molded Package Thickness	A2	0.75	0.85	0.95
Overall Length	D	3.00 BSC		
Overall Width	E	4.90 BSC		
Molded Package Width	E1	3.00 BSC		
Terminal Width	b	0.25	0.30	0.40
Terminal Thickness	c	0.13	0.15	0.23
Terminal Length	L	0.45	0.55	0.70
Footprint	L1	0.95 REF		
Lead Bend Radius	R	0.07	—	—
Lead Bend Radius	R1	0.07	—	—
Foot Angle	θ	0°	—	8°
Mold Draft Angle	$\theta 1$	5°	—	15°

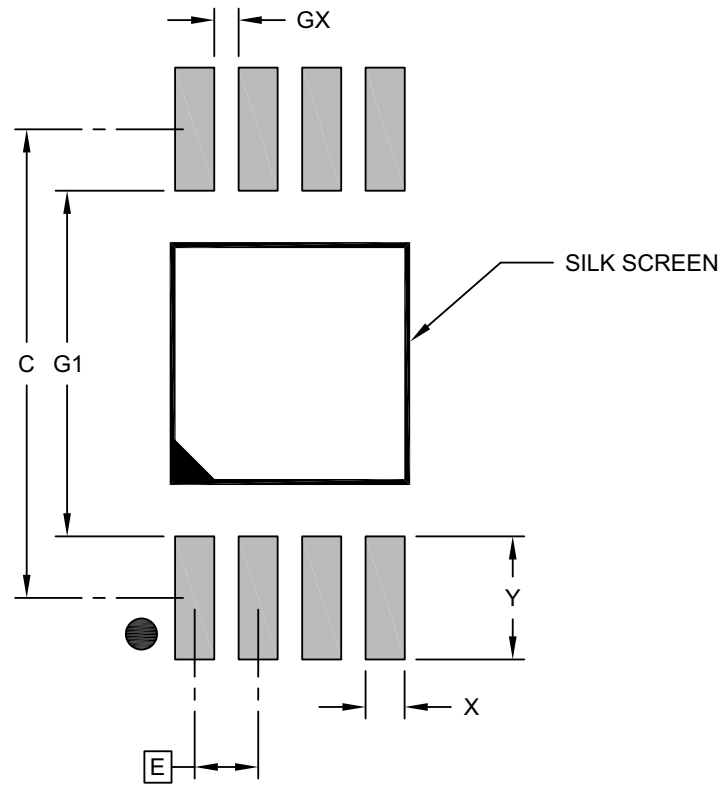
Notes:

- Pin 1 visual index feature may vary, but must be located within the hatched area.
- Dimensions D and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed 0.15mm per side.
- Dimensioning and tolerancing per ASME Y14.5M
BSC: Basic Dimension. Theoretically exact value shown without tolerances.
REF: Reference Dimension, usually without tolerance, for information purposes only.

Microchip Technology Drawing C04-1082 Rev A Sheet 2 of 2

8-Lead Plastic Micro Small Outline Package (DMA) - 3x3 mm Body [MSOP] Micrel Legacy Package MSOP-08L

Note: For the most current package drawings, please see the Microchip Packaging Specification located at <http://www.microchip.com/packaging>



RECOMMENDED LAND PATTERN

		Units	MILLIMETERS		
Dimension Limits			MIN	NOM	MAX
Contact Pitch	E		0.65 BSC		
Contact Pad Spacing	C			4.80	
Contact Pad Width (X8)	X				0.40
Contact Pad Length (X8)	Y				1.26
Contact Pad to Contact Pad (X4)	G1		3.54		
Contact Pad to Contact Pad (X6)	GX		0.25		

Notes:

1. Dimensioning and tolerancing per ASME Y14.5M
BSC: Basic Dimension. Theoretically exact value shown without tolerances.

Microchip Technology Drawing C04-3082 Rev A

MIC2544A/48A

NOTES:

APPENDIX A: REVISION HISTORY

Revision A (June 2026)

- Converted Micrel document MIC2544A/48A to Microchip data sheet DS20007130A.
- Minor text changes throughout.

MIC2544A/48A

NOTES:

PRODUCT IDENTIFICATION SYSTEM

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

<u>Part Number</u>	<u>-X</u>	<u>X</u>	<u>XX</u>	<u>-XX</u>	Examples:
Device	Enable	Temp. Range	Package	Media Type	
Device:	MIC2544A:	Programmable Current Limit High-Side Switch			a) MIC2544A-1YM: MIC2544A, Active High Enable, -40°C to +85°C Temp. Range, 8-Lead SOIC, 95/Tube
	MIC2548A:	Programmable Current Limit High-Side Switch with Thermal Shutdown Latch			b) MIC2544A-2YMM-TR: MIC2544A, Active Low Enable, -40°C to +85°C Temp. Range, 8-Lead MSOP, 2,500/Reel
Enable:	-1	=	Active High		c) MIC2544A-2YM-TR: MIC2544A, Active Low Enable, -40°C to +85°C Temp. Range, 8-Lead SOIC, 2,500/Reel
	-2	=	Active Low		d) MIC2548A-1YMM: MIC2548A, Active High Enable, -40°C to +85°C Temp. Range, 8-Lead MSOP, 100/Tube
Temperature Range:	Y	=	-40°C to +85°C		e) MIC2548A-1YM-TR: MIC2548A, Active High Enable, -40°C to +85°C Temp. Range, 8-Lead SOIC, 2,500/Reel
Package:	M	=	8-Lead SOIC		f) MIC2548A-2YMM: MIC2548A, Active Low Enable, -40°C to +85°C Temp. Range, 8-Lead MSOP, 100/Tube
	MM	=	8-Lead MSOP		
Media Type:	<blank>	=	95/Tube (SOIC only)		
	<blank>	=	100/Tube (MSOP only)		
	TR	=	2,500/Reel		
					Note: Tape and Reel identifier only appears in the catalog part number description. This identifier is used for ordering purposes and is not printed on the device package. Check with your Microchip Sales Office for package availability with the Tape and Reel option.

MIC2544A/48A

NOTES:

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