

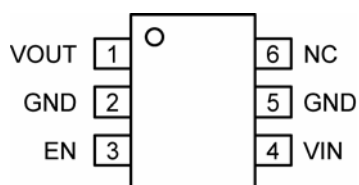
## Ordering Information

| Part Number |             | Part Marking <sup>(1)</sup> |         | Fast Turn On | Soft-Start | Load Discharge | Package                             |
|-------------|-------------|-----------------------------|---------|--------------|------------|----------------|-------------------------------------|
| Standard    | Pb-Free     | Standard                    | Pb-Free |              |            |                |                                     |
| —           | MIC94070YC6 | —                           | 70P     | •            |            |                | SC-70-6                             |
| —           | MIC94071YC6 | —                           | 71P     | •            |            | •              | SC-70-6                             |
| —           | MIC94072YC6 | —                           | 72P     |              | •          |                | SC-70-6                             |
| —           | MIC94073YC6 | —                           | 73P     |              | •          | •              | SC-70-6                             |
| —           | MIC94070YMT | —                           | P70     | •            |            |                | 1.2mm x 1.6mm Thin MLF <sup>®</sup> |
| —           | MIC94071YMT | —                           | P71     | •            |            | •              | 1.2mm x 1.6mm Thin MLF <sup>®</sup> |
| —           | MIC94072YMT | —                           | P72     |              | •          |                | 1.2mm x 1.6mm Thin MLF <sup>®</sup> |
| —           | MIC94073YMT | —                           | P73     |              | •          | •              | 1.2mm x 1.6mm Thin MLF <sup>®</sup> |

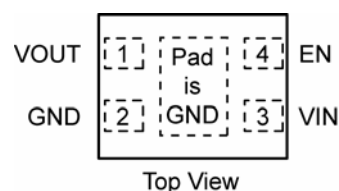
### Notes

- Under-bar symbol on SC-70 Pb-free packages may not be to scale.

## Pin Configuration



SC-70-6 (C6)



Top View

1.2x1.6 mm Thin MLF<sup>®</sup> (MT)

## Pin Description

| Pin Number |     | Pin Name         | Pin Function                                                                                             |
|------------|-----|------------------|----------------------------------------------------------------------------------------------------------|
| SC-70      | MLF |                  |                                                                                                          |
| 1          | 1   | V <sub>OUT</sub> | Drain of P-channel MOSFET.                                                                               |
| 2,5        | 2   | GND              | Ground and the backside pad (MLF only) should both be connected to electrical ground.                    |
| 4          | 3   | V <sub>IN</sub>  | Source of P-channel MOSFET.                                                                              |
| 3          | 4   | EN               | Enable (Input): Active-high CMOS compatible control input for switch A. Do not leave floating.           |
| 6          | --  | NIC              | No Internal Connection. A signal or voltage applied to this pin will have no effect on device operation. |

**Absolute Maximum Ratings <sup>(1)</sup>**

|                                                         |                   |
|---------------------------------------------------------|-------------------|
| Input Voltage ( $V_{IN}$ ).....                         | +6V               |
| Enable Voltage ( $V_{EN}$ ) .....                       | +6V               |
| Continuous Drain Current ( $I_D$ ) <sup>(3)</sup>       |                   |
| $T_A = 25^\circ\text{C}$ (MLF <sup>®</sup> ) .....      | $\pm 1.2\text{A}$ |
| $T_A = 25^\circ\text{C}$ (SC-70) .....                  | $\pm 1.2\text{A}$ |
| Pulsed Drain Current ( $I_{DP}$ ) <sup>(4)</sup> .....  | $\pm 3.0\text{A}$ |
| Continuous Diode Current ( $I_S$ ) <sup>(4)</sup> ..... | -50mA             |
| Storage Temperature ( $T_S$ ).....                      | -55°C to +150°C   |
| ESD Rating – HBM <sup>(6)</sup> .....                   | 4KV               |

**Operating Ratings <sup>(2)</sup>**

|                                                                       |                 |
|-----------------------------------------------------------------------|-----------------|
| Input Voltage ( $V_{IN}$ ) .....                                      | +1.7 to +5.5V   |
| Junction Temperature ( $T_J$ ).....                                   | -40°C to +125°C |
| Package Thermal Resistance                                            |                 |
| SC-70-6 ( $\theta_{JA}$ ) .....                                       | 240°C/W         |
| 1.2mm × 1.6mm MLF <sup>®</sup> ( $\theta_{JA}$ ).....                 | 172°C/W         |
| 1.2mm × 1.6mm MLF <sup>®</sup> ( $\theta_{JC}$ ) <sup>(3)</sup> ..... | 134°C/W         |

**Electrical Characteristics**

$T_A = 25^\circ\text{C}$ , bold values indicate  $-40^\circ\text{C} \leq T_A \leq +85^\circ\text{C}$ , unless noted.

| Symbol            | Parameter                                                       | Condition                                                                                          | Min | Typ  | Max | Units         |
|-------------------|-----------------------------------------------------------------|----------------------------------------------------------------------------------------------------|-----|------|-----|---------------|
| $V_{EN\_TH}$      | Enable Threshold Voltage                                        | $V_{IN} = 1.8\text{V to } 4.5\text{V}, I_D = -250\mu\text{A}$                                      | 0.5 |      | 1.2 | V             |
|                   |                                                                 | $V_{IN} = 1.7\text{V to } 4.5\text{V}, I_D = -250\mu\text{A}$                                      | 0.4 |      | 1.2 | V             |
| $I_Q$             | Supply Current                                                  | $V_{IN} = V_{EN} = 5.5\text{V}, I_D = \text{OPEN}$<br>Measured on the $V_{IN}$ pin (7)             |     | 50nA | 5   | $\mu\text{A}$ |
| $I_{EN}$          | Enable Input Current                                            | $V_{IN} = V_{EN} = 5.5\text{V}, I_D = \text{OPEN}$                                                 |     | 2    | 4   | $\mu\text{A}$ |
| $I_{SHUT-Q}$      | Shutdown Current                                                | $V_{IN} = +5.5\text{V}, V_{EN} = 0\text{V}, I_D = \text{OPEN}$<br>Measured on the $V_{IN}$ pin (7) |     | 25nA | 1   | $\mu\text{A}$ |
| $I_{SHUT-SWITCH}$ | OFF State Leakage Current                                       | $V_{IN} = +5.5\text{V}, V_{EN} = 0\text{V}, I_D = \text{SHORT}$<br>Measured on $V_{OUT}$ (7)       |     | 50nA | 1   | $\mu\text{A}$ |
| $R_{DS(ON)}$      | P-Channel Drain to Source<br>ON Resistance<br><br>SC-70 Package | $V_{IN} = +5.0\text{V}, I_D = -100\text{mA}, V_{EN} = 1.5\text{V}$                                 |     | 120  | 170 | m $\Omega$    |
|                   |                                                                 | $V_{IN} = +4.5\text{V}, I_D = -100\text{mA}, V_{EN} = 1.5\text{V}$                                 |     | 130  | 185 | m $\Omega$    |
|                   |                                                                 | $V_{IN} = +3.6\text{V}, I_D = -100\text{mA}, V_{EN} = 1.5\text{V}$                                 |     | 145  | 210 | m $\Omega$    |
|                   |                                                                 | $V_{IN} = +2.5\text{V}, I_D = -100\text{mA}, V_{EN} = 1.5\text{V}$                                 |     | 165  | 225 | m $\Omega$    |
|                   |                                                                 | $V_{IN} = +1.8\text{V}, I_D = -100\text{mA}, V_{EN} = 1.5\text{V}$                                 |     | 200  | 260 | m $\Omega$    |
|                   |                                                                 | $V_{IN} = +1.7\text{V}, I_D = -100\text{mA}, V_{EN} = 1.5\text{V}$                                 |     | 210  | 285 | m $\Omega$    |
| $R_{DS(ON)}$      | P-Channel Drain to Source<br>ON Resistance<br><br>MLF Package   | $V_{IN} = +5.0\text{V}, I_D = -100\text{mA}, V_{EN} = 1.5\text{V}$                                 |     | 100  | 160 | m $\Omega$    |
|                   |                                                                 | $V_{IN} = +4.5\text{V}, I_D = -100\text{mA}, V_{EN} = 1.5\text{V}$                                 |     | 110  | 165 | m $\Omega$    |
|                   |                                                                 | $V_{IN} = +3.6\text{V}, I_D = -100\text{mA}, V_{EN} = 1.5\text{V}$                                 |     | 125  | 180 | m $\Omega$    |
|                   |                                                                 | $V_{IN} = +2.5\text{V}, I_D = -100\text{mA}, V_{EN} = 1.5\text{V}$                                 |     | 145  | 200 | m $\Omega$    |
|                   |                                                                 | $V_{IN} = +1.8\text{V}, I_D = -100\text{mA}, V_{EN} = 1.5\text{V}$                                 |     | 180  | 240 | m $\Omega$    |
|                   |                                                                 | $V_{IN} = +1.7\text{V}, I_D = -100\text{mA}, V_{EN} = 1.5\text{V}$                                 |     | 190  | 265 | m $\Omega$    |
| $R_{SHUTDOWN}$    | Turn-Off Resistance                                             | $V_{IN} = +3.6\text{V}, I_{TEST} = 1\text{mA}, V_{EN} = 0\text{V}$<br>MIC94071, 73                 |     | 200  | 400 | $\Omega$      |

## Electrical Characteristics (Dynamic)

$V_{IN} = 5V$ ;  $T_A = 25^\circ C$ , bold values indicate  $-40^\circ C \leq T_A \leq +85^\circ C$ , unless noted.

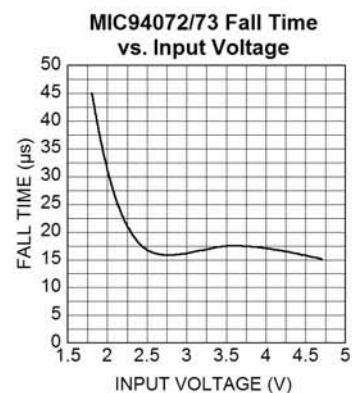
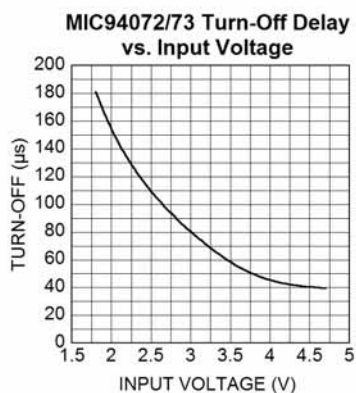
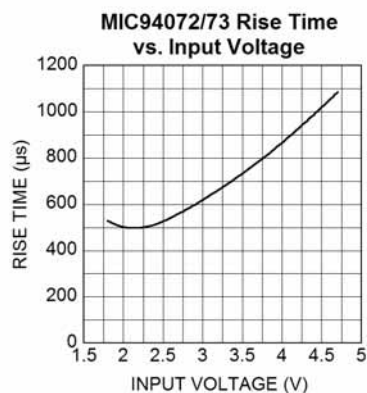
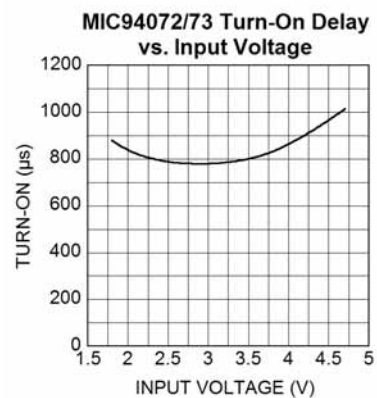
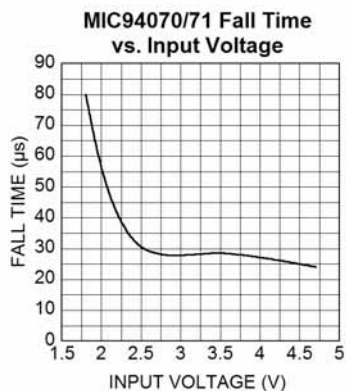
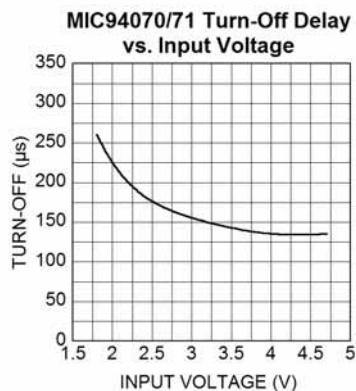
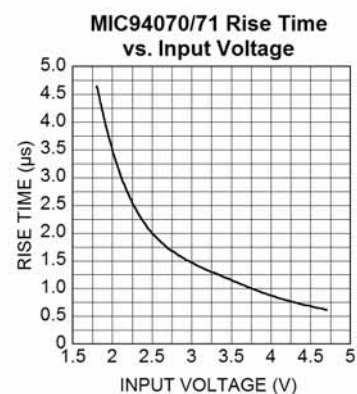
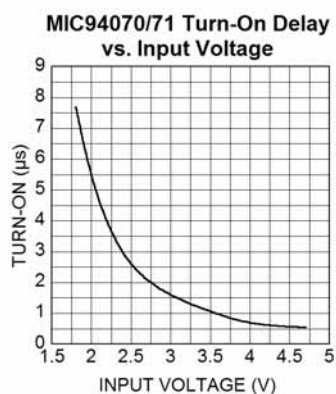
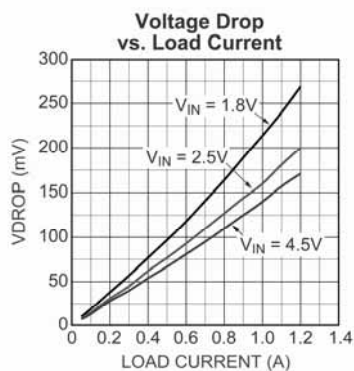
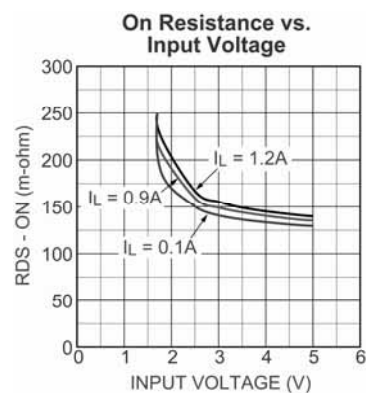
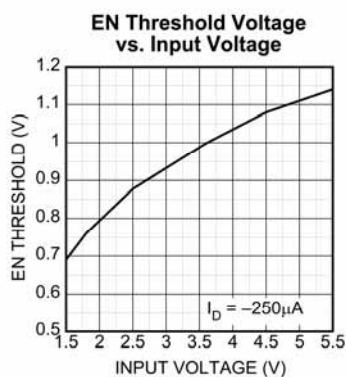
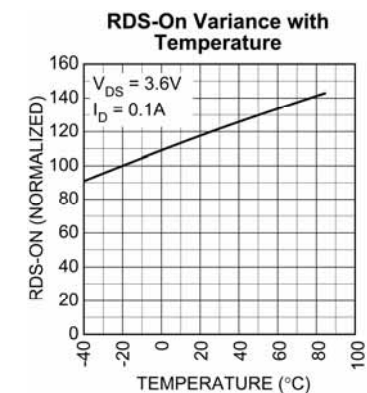
| Symbol         | Parameter          | Condition                                                           | Min | Typ  | Max  | Units   |
|----------------|--------------------|---------------------------------------------------------------------|-----|------|------|---------|
| $t_{ON\_DLY}$  | Turn-On Delay Time | $V_{IN} = +3.6V$ , $I_D = -100mA$ , $V_{EN} = 1.5V$<br>MIC94070, 71 |     | 0.85 | 1.5  | $\mu s$ |
|                |                    | $V_{IN} = +3.6V$ , $I_D = -100mA$ , $V_{EN} = 1.5V$<br>MIC94072, 73 |     | 700  | 1200 | $\mu s$ |
| $t_{ON\_RISE}$ | Turn-On Rise Time  | $V_{IN} = +3.6V$ , $I_D = -100mA$ , $V_{EN} = 1.5V$<br>MIC94070, 71 | 0.5 | 1    | 5    | $\mu s$ |
|                |                    | $V_{IN} = +3.6V$ , $I_D = -100mA$ , $V_{EN} = 1.5V$<br>MIC94072, 73 | 500 | 800  | 1500 | $\mu s$ |

|                 |                     |                                                                     |  |     |     |    |
|-----------------|---------------------|---------------------------------------------------------------------|--|-----|-----|----|
| $t_{OFF\_DLY}$  | Turn-Off Delay Time | $V_{IN} = +3.6V$ , $I_D = -100mA$ , $V_{EN} = 1.5V$<br>MIC94070, 71 |  | 100 | 200 | ns |
|                 |                     | $V_{IN} = +3.6V$ , $I_D = -100mA$ , $V_{EN} = 1.5V$<br>MIC94072, 73 |  | 60  | 200 | ns |
| $t_{OFF\_FALL}$ | Turn-Off Fall Time  | $V_{IN} = +3.6V$ , $I_D = -100mA$ , $V_{EN} = 1.5V$<br>MIC94070, 71 |  | 60  | 100 | ns |
|                 |                     | $V_{IN} = +3.6V$ , $I_D = -100mA$ , $V_{EN} = 1.5V$<br>MIC94072, 73 |  | 60  | 100 | ns |

### Notes:

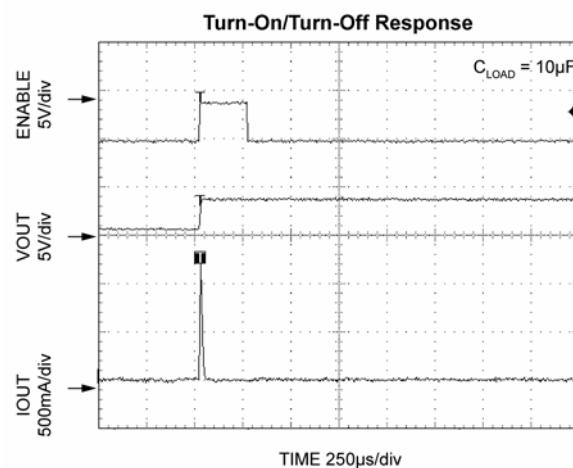
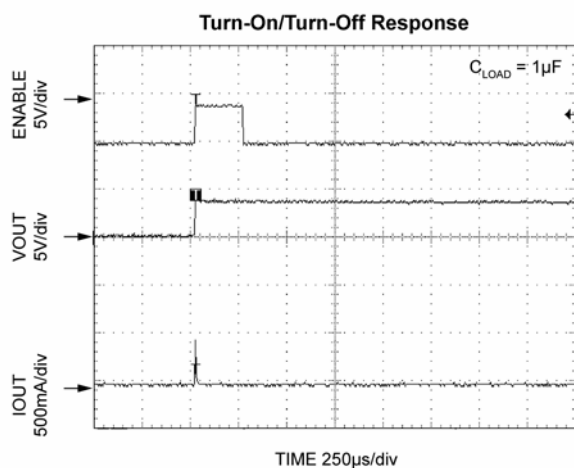
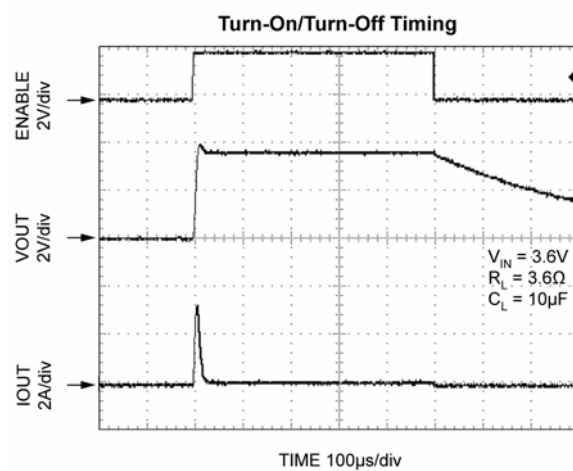
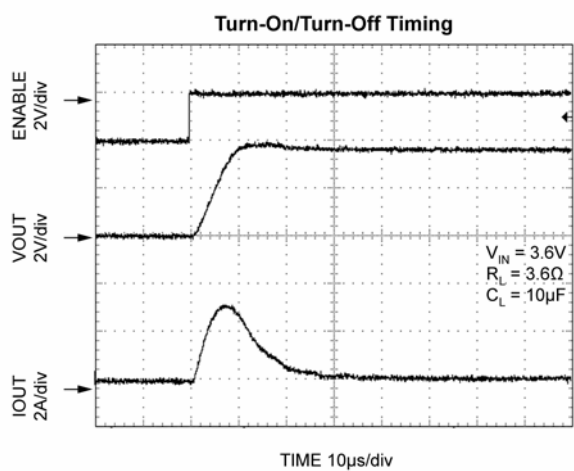
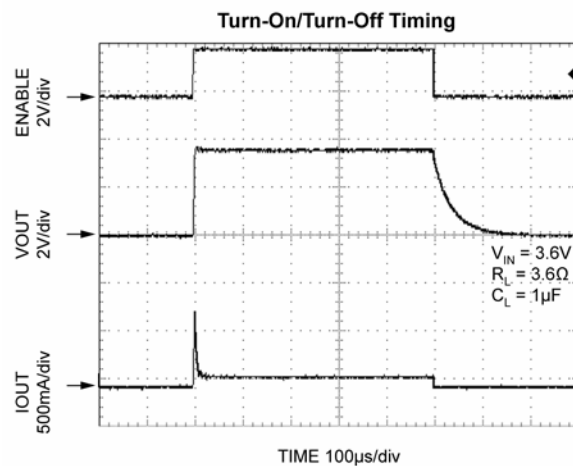
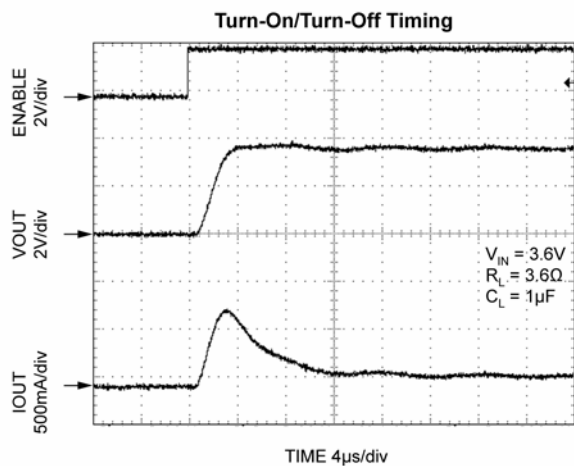
1. Exceeding the absolute maximum rating may damage the device.
2. The device is not guaranteed to function outside its operating rating.
3. With backside thermal contact to PCB.
4. Pulse width  $< 300\mu s$  with  $< 2\%$  duty cycle.
5. Continuous body diode current conduction (reverse conduction, i.e.  $V_{OUT}$  to  $V_{IN}$ ) is not recommended.
6. Devices are ESD sensitive. Handling precautions recommended. HBM (Human body model), 1.5k in series with 100pF.
7. Measured on the MIC94070YMT, for other part numbers, please contact Micrel.

## Typical Characteristics



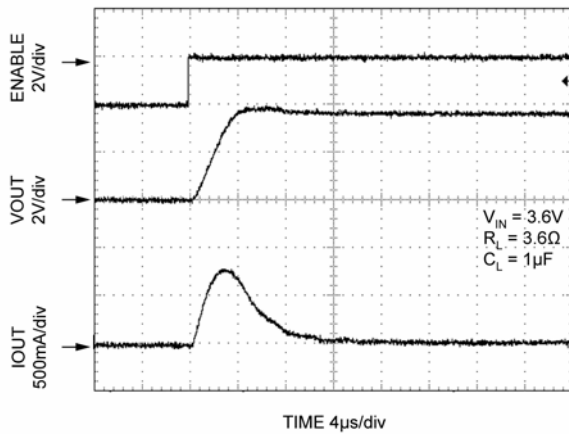
## Functional Characteristics

### MIC94070

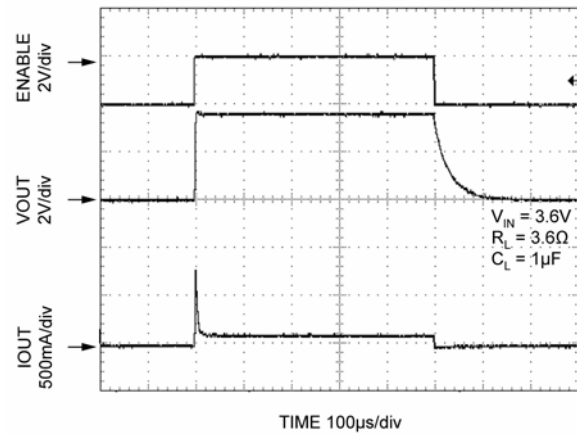


## MIC94071

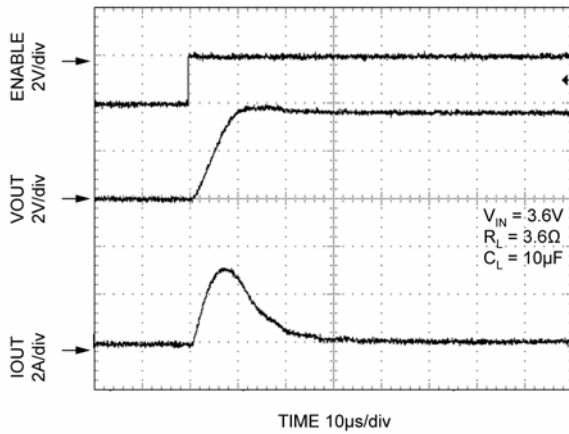
Turn-On/Turn-Off Timing



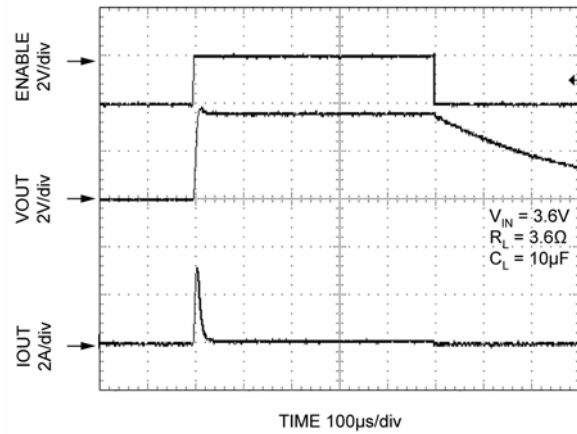
Turn-On/Turn-Off Timing



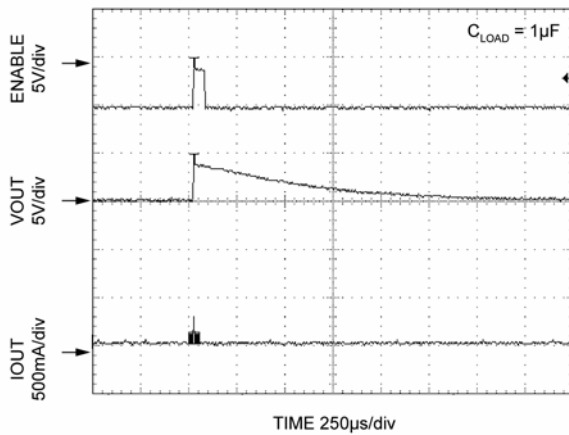
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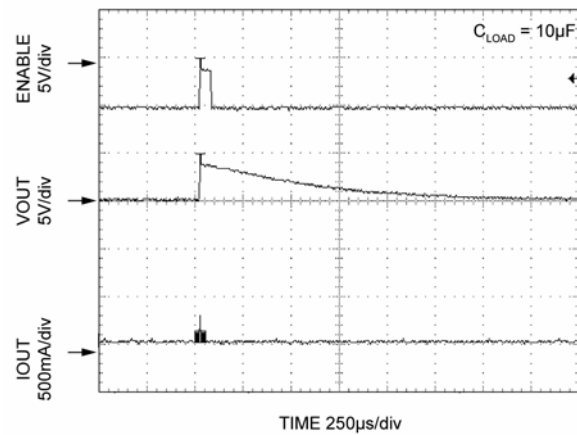
Turn-On/Turn-Off Timing



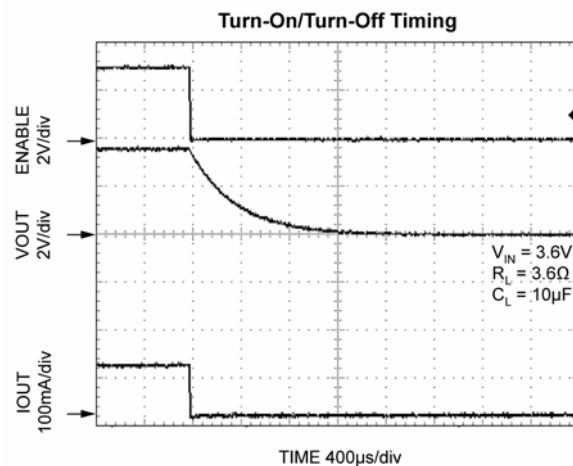
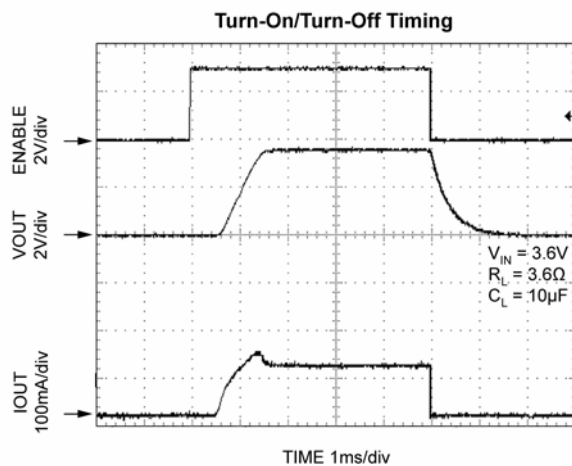
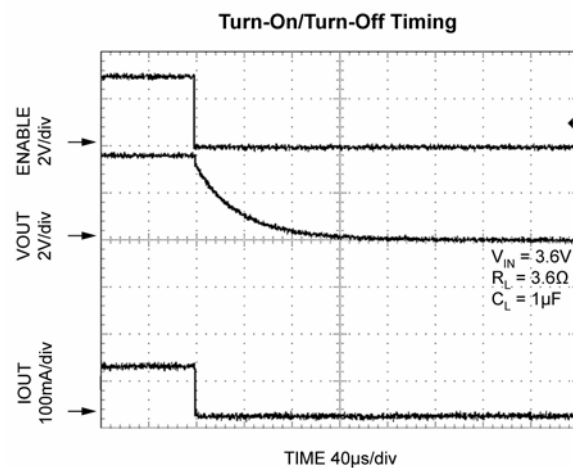
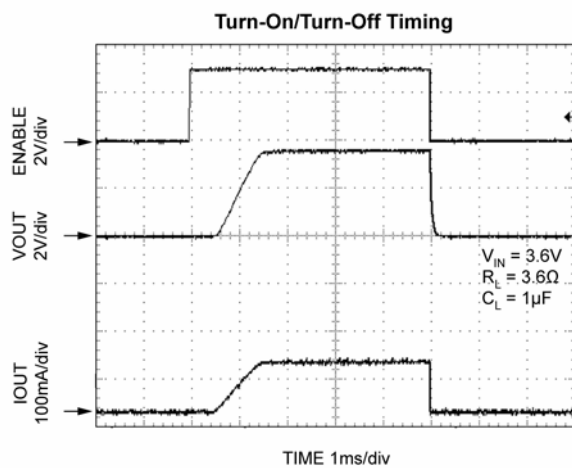
Turn-On/Turn-Off Response



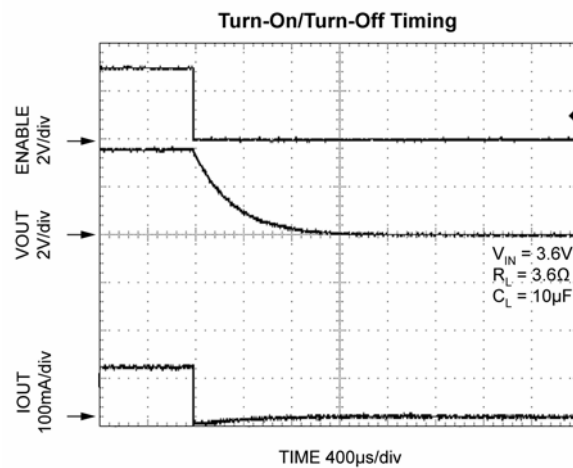
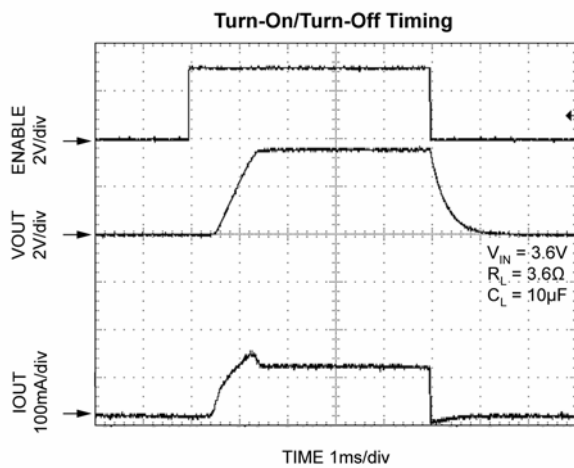
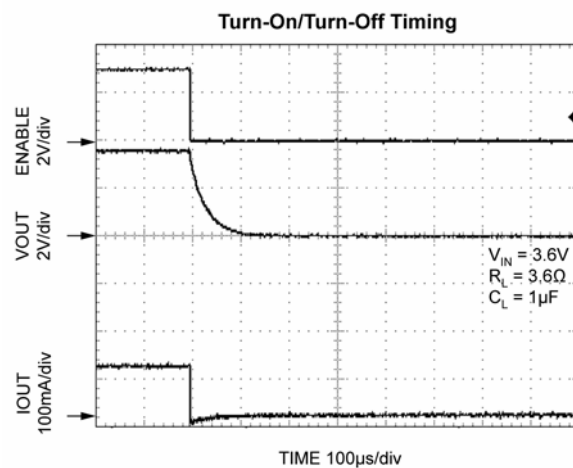
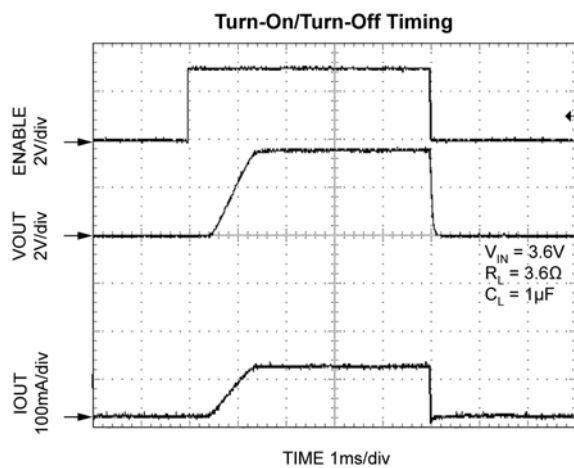
Turn-On/Turn-Off Response



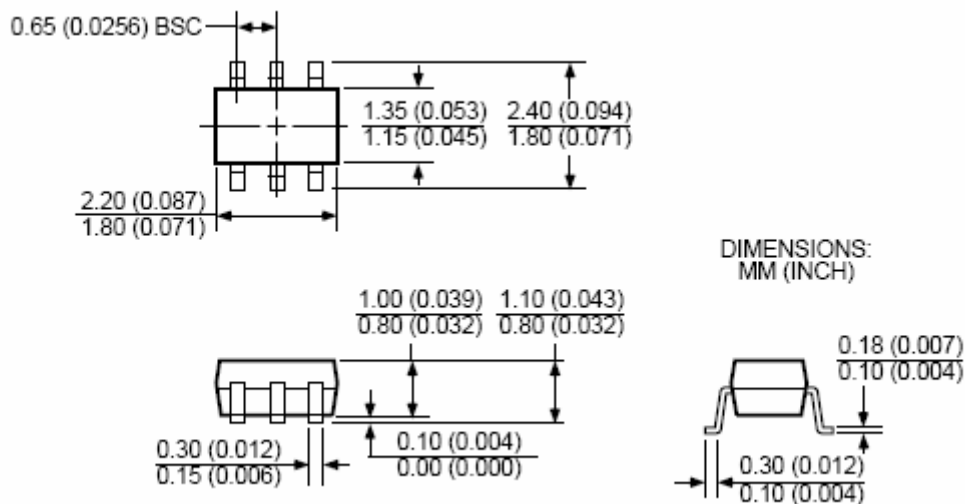
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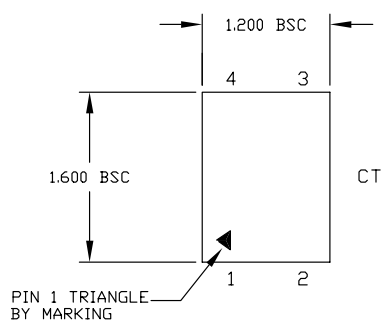
## MIC94073



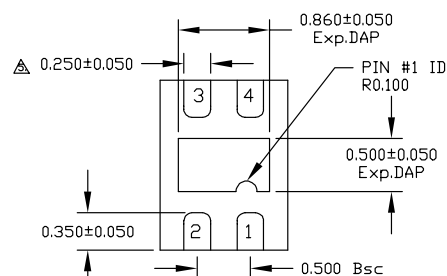
## Package Information



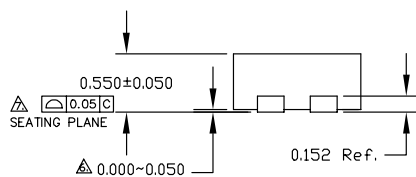
6-Pin SC-70 (C6)



TOP VIEW



BOTTOM VIEW

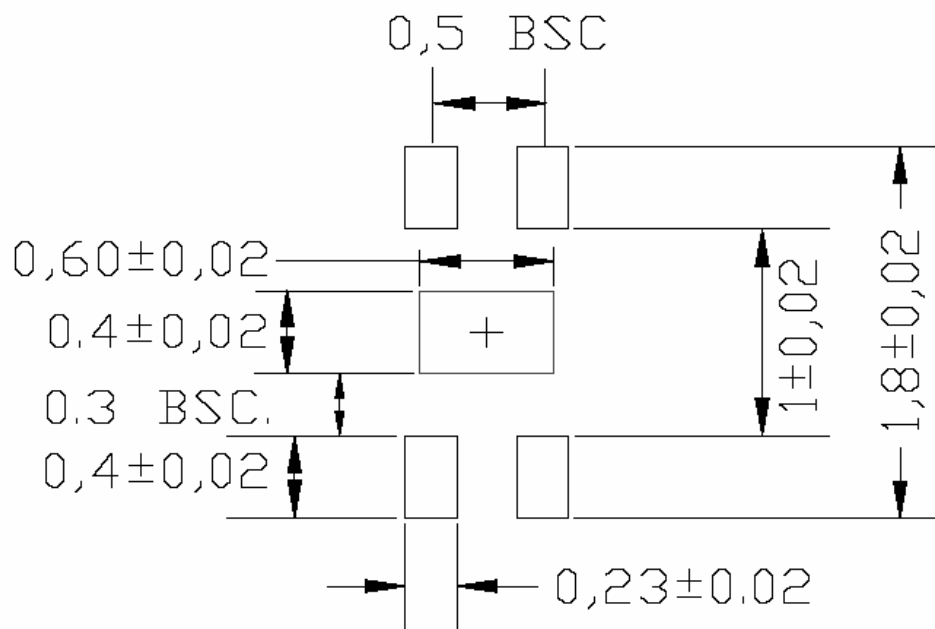


SIDE VIEW

- NOTE:
1. ALL DIMENSIONS ARE IN MILLIMETERS.
  2. MAX. PACKAGE WARPAGE IS 0.05 mm.
  3. MAXIMUM ALLOWABLE BURRS IS 0.076 mm IN ALL DIRECTIONS.
  4. PIN #1 ID ON TOP WILL BE LASER/INK MARKED.
- △ DIMENSION APPLIES TO METALIZED TERMINAL AND IS MEASURED BETWEEN 0.20 AND 0.25 mm FROM TERMINAL TIP.
- △ APPLIED ONLY FOR TERMINALS.
- △ APPLIED FOR EXPOSED PAD AND TERMINALS.

4-Pin Thin MLF® (MT)

## Recommended Land Pattern for MLF 1.2x1.6 4 Lead



Optional for maximum thermal performance. Heatsink should be connected to GND plane of PCB for maximum thermal performance.

Disclaimer: This is only a recommendation based on information available to Micrel from its suppliers. Actual land pattern may have to be significantly different due to various materials and processes used in PCB assembly. Micrel makes no representation or warranty of performance based on the recommended land pattern."

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