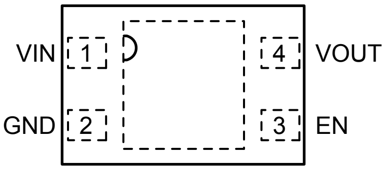
Ordering Information

Part Number	Marking(1)	Voltage(2)	Temperature Range	Package(3)
MIC5327-2.8YMT	2O8	2.8V	–40° to +125°C	4-Pin 1.2mm x 1.6mm Thin MLF®
MIC5327-1.8YMT	1Q8	1.8V	–40° to +125°C	4-Pin 1.2mm x 1.6mm Thin MLF®

Note:

1. Pin 1 identifier = "▲".
2. For other voltage options contact Micrel Marketing.
3. MLF is a GREEN RoHS compliant package. Lead finish is NiPdAu, Mold compound is Halogen Free.

Pin Configuration



4-Pin 1.2mm x 1.6mm Thin MLF® (MT)

Pin Description

Pin Number	Pin Name	Pin Function
1	VIN	Supply Input.
2	GND	Ground.
3	EN	Enable Input: Active High Input. Logic High = On; Logic Low = Off. Do not leave floating.
4	VOUT	Output Voltage.
HSPAD	EPAD	Exposed heatsink pad connected to ground internally.

Absolute Maximum Ratings[1]

Supply Voltage (V_{IN})	–0.3V to +6V
Enable Voltage (V_{EN}).	–0.3V to V_{IN}
Power Dissipation (P_D)	Internally Limited[3]
Lead Temperature (soldering, 5 sec.)	260°C
Junction Temperature (T_J)	-40°C to +125°C
Storage Temperature (T_S)	-65°C to +150°C
ESD Rating[4]	2kV

Operating Ratings[2]

Supply Voltage (V_{IN})	+2.3V to 5.5V
Enable Voltage (V_{EN}).	0V to V_{IN}
Junction Temperature (T_J)	–40°C to +125°C
Junction Thermal Resistance 1.2mm x 1.6mm Thin MLF-4 (θ_{JA})	173°C/W

Electrical Characteristics[5]

$V_{IN} = V_{EN} = V_{OUT} + 1V$; $C_{OUT} = C_{IN} = 1\mu F$; $I_{OUT} = 100\mu A$; $T_J = 25°C$, **bold** values indicate –40°C to +125°C unless noted.

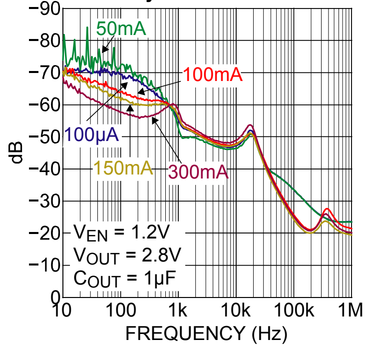
Parameter	Condition	Min	Typ	Max	Units
Output Voltage Accuracy	Variation from nominal V_{OUT}	–1.5		+1.5	%
	Variation from nominal V_{OUT}	**–2.0**		**+2.0**	%
Line Regulation	$V_{IN} = V_{OUT}$ +1V to 5.5V, $I_{OUT} = 100\mu A$		0.01	0.3	%/V
	$V_{IN} = V_{OUT}$ +1V to 5.5V, $I_{OUT} = 100\mu A$			**0.5**	%/V
Load Regulation[6]	I_{OUT} = 100µA to 300mA		0.05	**1**	%
Dropout Voltage[7]	I_{OUT} = 50mA		30		mV
	I_{OUT} = 100mA		55		mV
	I_{OUT} = 150mA		85	**150**	mV
	I_{OUT} = 300mA		180	**300**	mV
Ground Pin Current[8]	I_{OUT} = 100µA to 300mA		24	**35**	µA
Ground Pin Current in Shutdown	V_{EN} = 0V		0.01	1	µA
Ripple Rejection	f = 1kHz; C_{OUT} = 1µF; I_{OUT} = 300mA		60		dB
	f = 20kHz; C_{OUT} = 1µF; I_{OUT} = 300mA		50		dB
Current Limit	V_{OUT} = 0V	400	600	950	mA
Output Voltage Noise	C_{OUT} = 1µF, 10Hz to 100kHz		90		μV_{RMS}
Enable Voltage					
Enable Voltage	Logic Low			**0.2**	V
	Logic High	**1.2**			V
Enable Current	$V_{IL} \leq 0.2V$		0.01	**1**	µA
	$V_{IH} \geq 1.2V$		0.01	**1**	µA
Turn-on Time	C_{OUT} = 1µF; I_{OUT} = 300mA		150	**500**	µs

Notes:

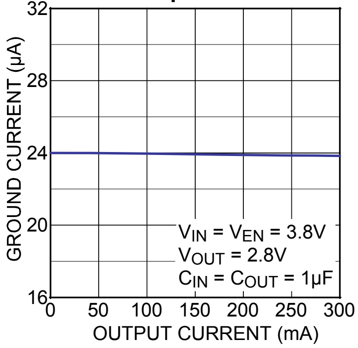
1. Exceeding the absolute maximum rating may damage the device.
2. The device is not guaranteed to function outside its operating rating.
3. The maximum allowable power dissipation of any T_A (ambient temperature) is $P_{D(max)} = (T_{J(max)} – T_A) / \theta_{JA}$. Exceeding the maximum allowable power dissipation will result in excessive die temperature, and the regulator will go into thermal shutdown.
4. Devices are ESD sensitive. Handling precautions recommended. Human body model, 1.5kΩ in series with 100pF.
5. Specification for packaged product only.
6. Regulation is measured at constant junction temperature using low duty cycle pulse testing.
7. Dropout voltage is defined as the input-to-output differential at which the output voltage drops 2% below its nominal $V_{OUT.}$
8. Ground pin current is the regulator quiescent current. The total current drawn from the supply is the sum of the load current plus the ground pin current.

Typical Characteristics

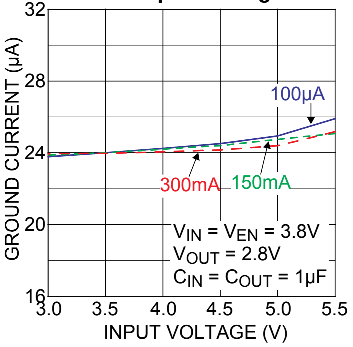
Power Supply Rejection Ratio



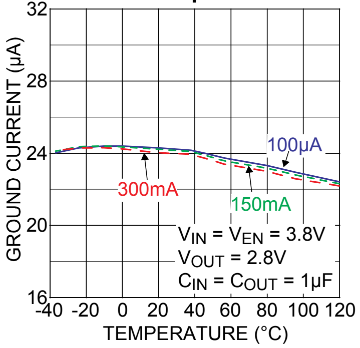
Ground Current vs. Output Current



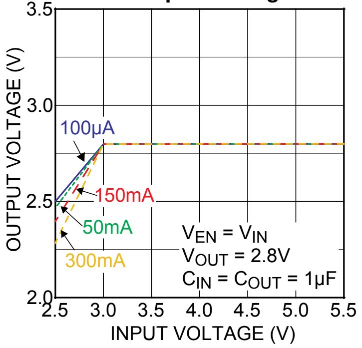
Ground Current vs. Input Voltage



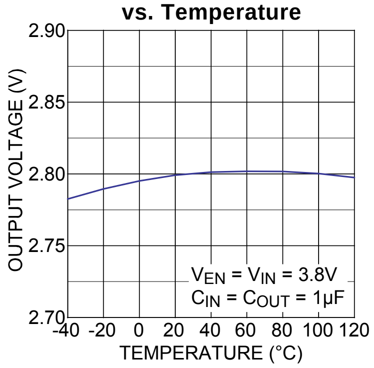
Ground Current vs. Temperature



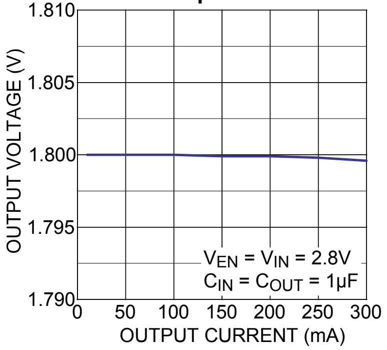
Output Voltage vs. Input Voltage



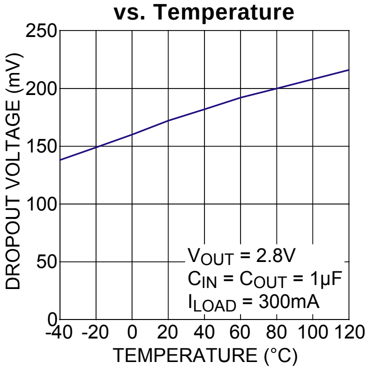
Output Voltage vs. Temperature



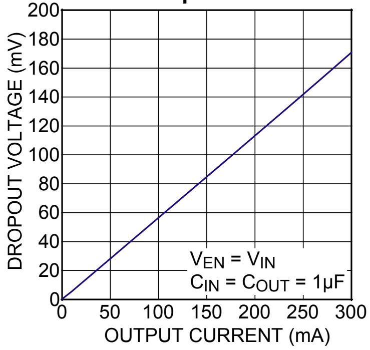
Output Voltage vs. Output Current



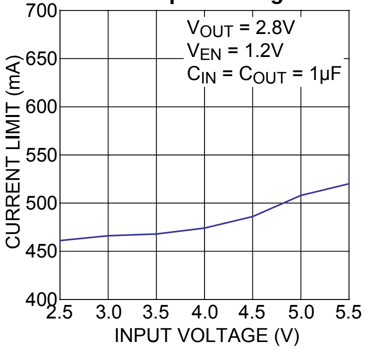
Dropout Voltage vs. Temperature



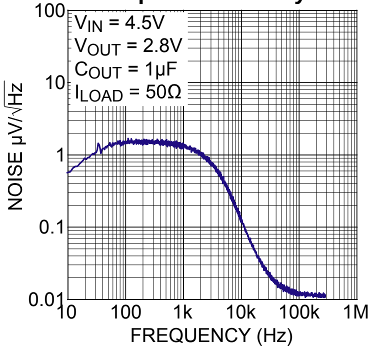
Dropout Voltage vs. Output Current



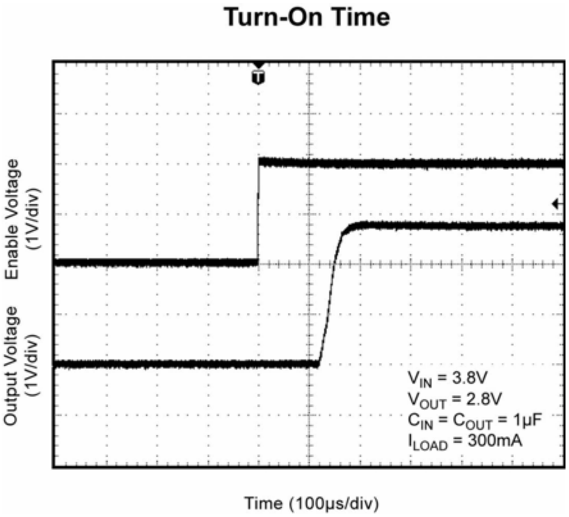
Current Limit vs. Input Voltage

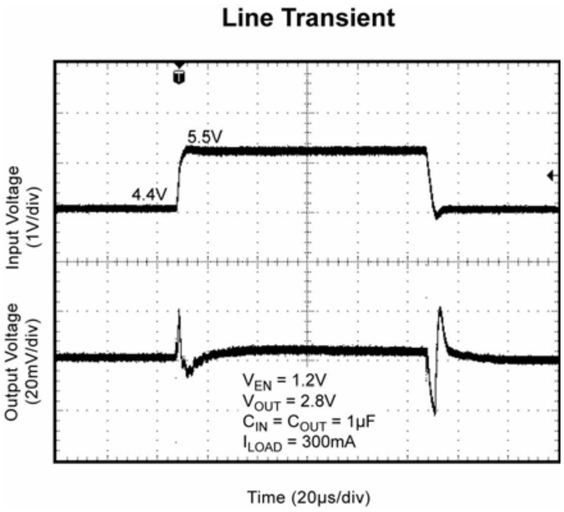


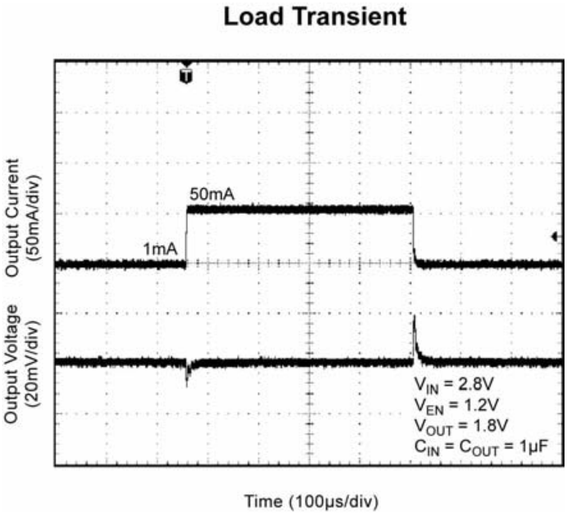
Output Noise Spectral Density

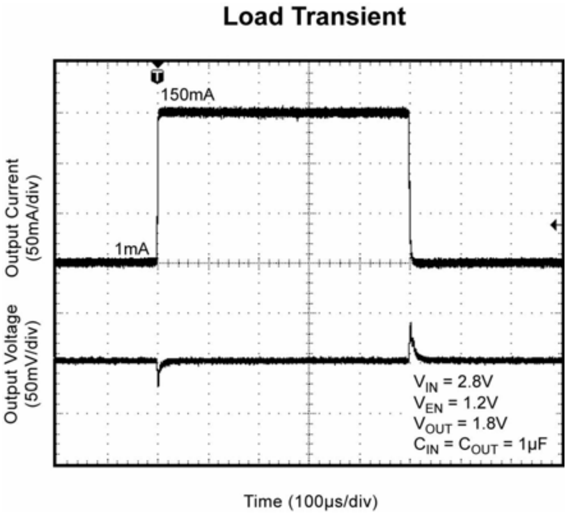


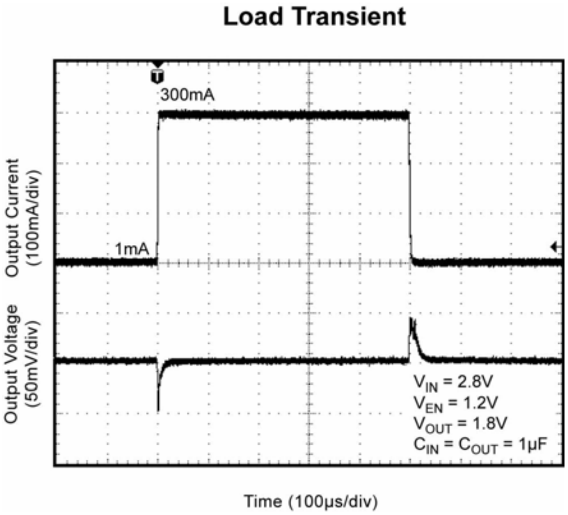
Functional Characteristics



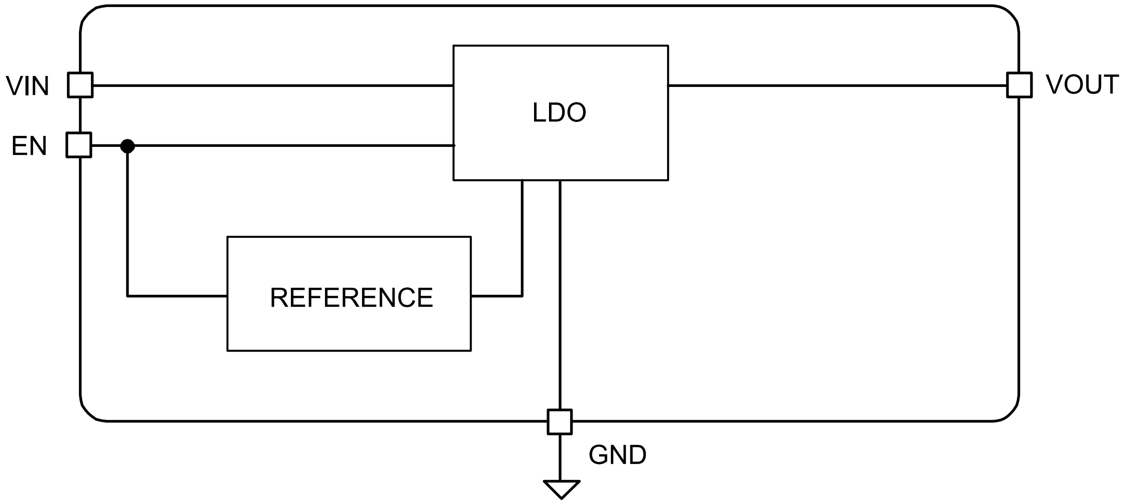








Functional Diagram



Applications Information

The MIC5327 is a low quiescent current, low dropout regulator designed for optimal performance in a small space. The MIC5327 regulator is fully protected from damage due to fault conditions, offering linear current limiting and thermal shutdown.

Input Supply Voltage

V_{IN} provides the supply to power the LDO. The minimum input voltage is 2.3V allowing conversion from typical lithium ion batteries and low voltage supplies.

Input Capacitor

The MIC5327 is a high performance, high bandwidth device; therefore it requires a well bypassed input supply for optimal performance. A 1µF capacitor is required from the input to ground to provide stability. Low ESR ceramic capacitors provide optimal performance with minimum space required. Additional high frequency capacitors, such as small value NPO dielectric type capacitors, help filter out high frequency noise and are good practice in any RF circuit.

Output Capacitor

The MIC5327 requires an output capacitor of 1µF or greater to maintain stability. The design is optimized for use with low ESR ceramic chip capacitors. High ESR capacitors may cause high frequency oscillation. The output capacitor can be increased, but performance has been optimized for a 1µF ceramic output capacitor. X7R/X5R dielectric type ceramic capacitors are recommended because of their temperature performance. X7R type capacitors change capacitance by 15% over their operating temperature range. Z5U and Y5V dielectric capacitors change value by as much as 50% and 60% respectively over their operating temperature ranges. To use a ceramic chip capacitor with Y5V dielectric the value must be much higher than an X7R ceramic capacitor to ensure the same minimum capacitance over the equivalent operating temperature range.

Minimum Load Current

The MIC5327 does not require a minimum load to maintain output voltage regulation.

Enable/Shutdown

The MIC5327 comes with an active high enable pin that enables the regulator. Forcing the enable pin low disables the regulator and sends it into a “zero” off mode current state. In this state, current consumed by the regulator goes nearly to zero. The active high enable pin uses CMOS technology and cannot be left floating; a floating enable pin may cause an unknown output state.

Thermal Considerations

The MIC5327 is designed to provide 300mA continuous output current from a very small footprint package. Maximum ambient operating temperature can be calculated based on the output current and the voltage drop across the part. For example: given that the input voltage is 3.6V, the output voltage is 2.8V and the output current is 300mA. The power dissipation of the regulator circuit can be determined using the equation:

$$P_D = (V_{IN} - V_{OUT1})\, I_{OUT} + V_{IN}\, I_{GND}$$

Because this device is CMOS and the ground current is typically <100µA over the load range, the power dissipation contributed by the ground current is < 1% and can be ignored for this calculation.

$$P_D = (3.6V - 2.8V) \times 300mA$$

$$P_D = 0.24W$$

To determine the maximum ambient operating temperature use the junction to ambient thermal resistance of the device and the following basic equation:

$$P_{D(max)} = \left(\frac{T_{J(max)} - T_A}{\theta_{JA}}\right)$$

The maximum junction temperature of the die, $T_{J(max)}$ = 125°C.The package thermal resistance, θ_{JA} = 173°C/W.

Substituting P_D for $P_{D(max)}$ and solving for the ambient operating temperature will give the maximum operating conditions for the regulator circuit.

The maximum power dissipation must not be exceeded for proper operation.

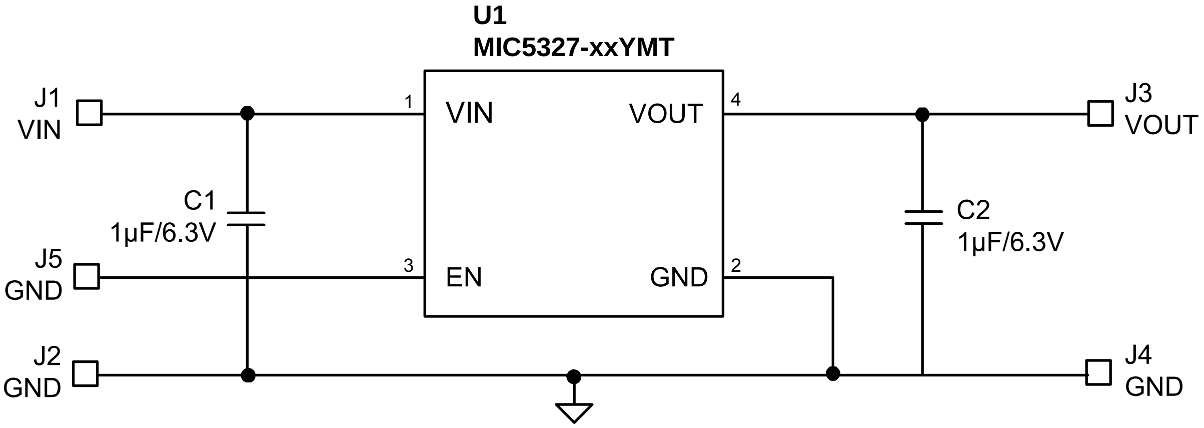
For example, when operating the MIC5327 at an input voltage of 3.6V and 300mA load with a minimum footprint layout, the maximum ambient operating temperature T_A can be determined as follows:

$$0.24W = (125°C - T_A)/(173°C/W)$$

$$T_A = 83°C$$

Therefore a 2.8V 300mA application can accept an ambient operating temperature of 83.0°C in a 1.2mm x 1.6mm Thin MLF® package. For a full discussion of heat sinking and thermal effects on voltage regulators, refer to the “Regulator Thermals” section of *Micrel’s Designing with Low Dropout Voltage Regulators* handbook. This information can be found on Micrel's website at:

http://www.micrel.com/_PDF/other/LDOBk_ds.pdf



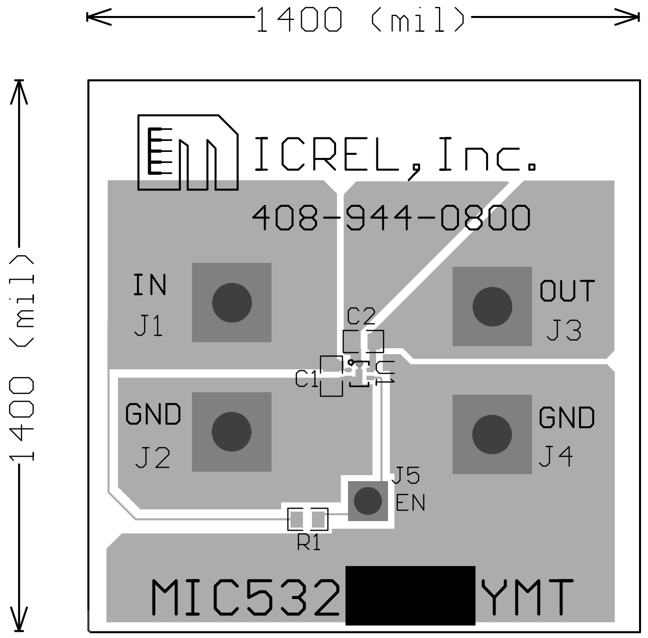
Bill of Materials

Item	Part Number	Manufacturer	Description	Qty.
C1, C2	C1608X5R0J105K	TDK(1)	Capacitor, 1μF, 6.3V, X5R, Size 0603	2
U1	**MIC5327-xxYMT**	**Micrel, Inc.(3)**	**300mA Low operating current LDO**	**1**

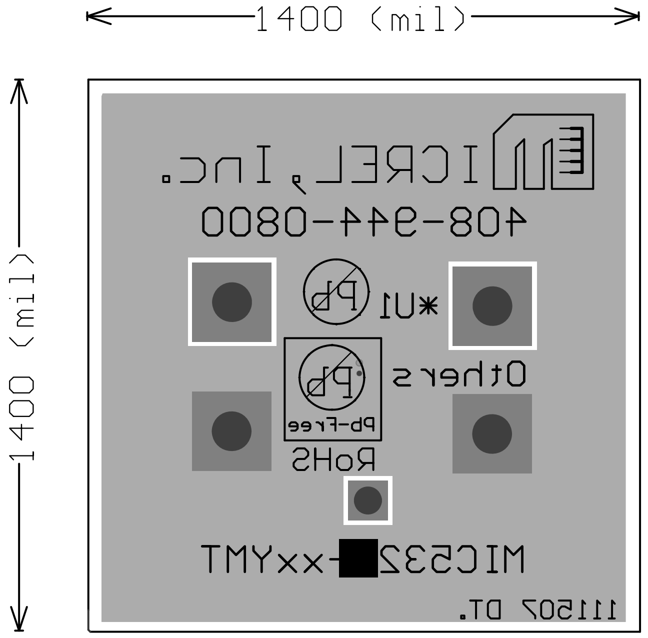
Notes:

1. TDK: www.tdk.com
2. Vishay Dale: Vishay.com
3. **Micrel, Inc.: www.micrel.com**

PCB Layout Recommendations

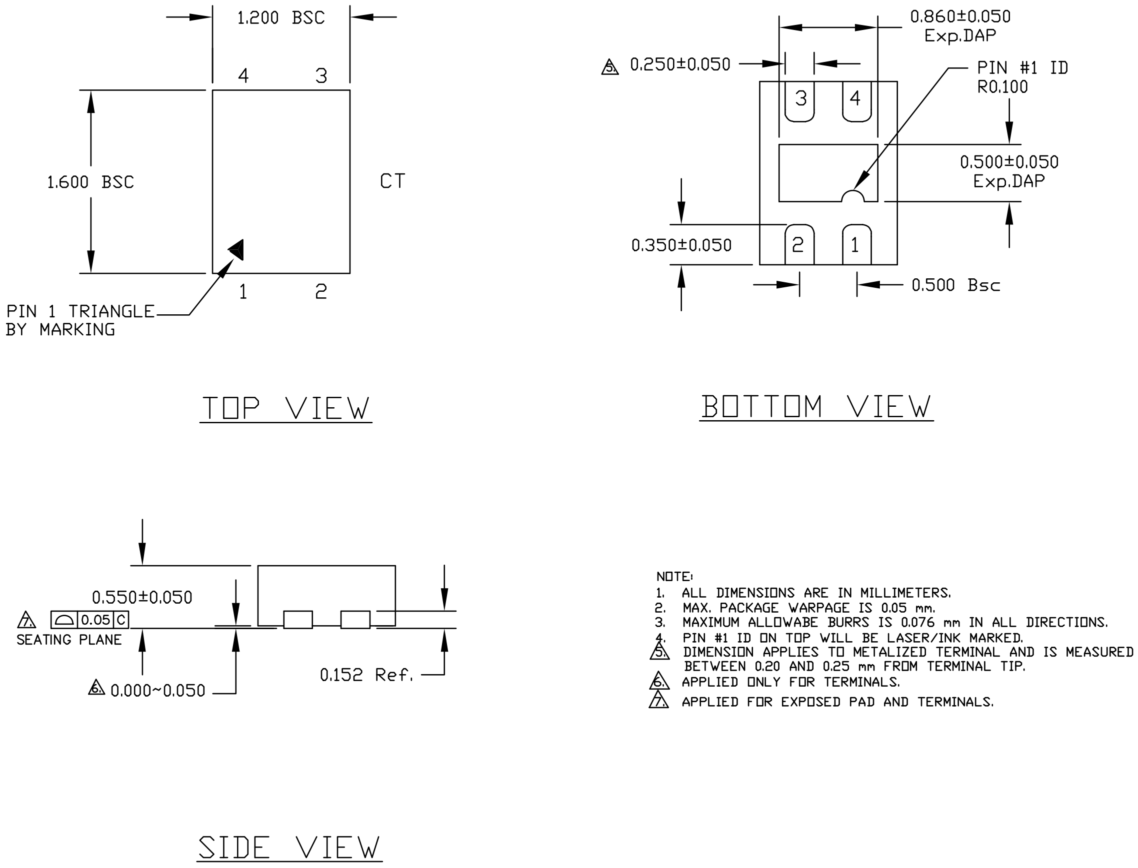


Top Layer



Bottom Layer

Package Information



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

4-Pin 1.2mm x 1.6mm Thin MLF$^{®}$ (MT)

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