

30 V, N-Channel FemtoFET™ MOSFET

Check for Samples: [CSD17381F4](#)

FEATURES

- **Ultra-Low On Resistance**
- **Ultra-Low Q_g and Q_{gd}**
- **Low Threshold Voltage**
- **Ultra-Small Footprint (0402 Case Size)**
 - 1.0 mm × 0.6 mm
- **Ultra-Low Profile**
 - 0.35 mm Height
- **Integrated ESD Protection Diode**
 - Rated > 4 kV HBM
 - Rated > 2 kV CDM
- **Pb and Halogen Free**
- **RoHS Compliant**

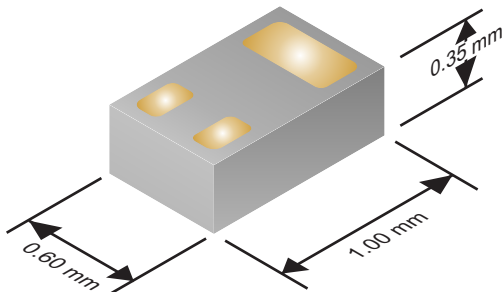
APPLICATIONS

- **Optimized for Load Switch Applications**
- **Optimized for General Purpose Switching Applications**
- **Single-Cell Battery Applications**
- **Handheld and Mobile Applications**

DESCRIPTION

The FemtoFET™ MOSFET technology has been designed and optimized to minimize the footprint in many handheld and mobile applications. This technology is capable of replacing standard small signal MOSFETs while providing at least a 60% reduction in footprint size.

Typical Part Dimensions



PRODUCT SUMMARY

V_{DS}	Drain-to-Source Voltage	30	V
Q_g	Gate Charge Total (4.5 V)	1040	pC
Q_{gd}	Gate Charge Gate to Drain	133	pC
$R_{DS(on)}$	Drain-to-Source On Resistance	$V_{GS} = 1.8\text{ V}$	160
		$V_{GS} = 2.5\text{ V}$	110
		$V_{GS} = 4.5\text{ V}$	90
$V_{GS(th)}$	Threshold Voltage	0.85	V

ORDERING INFORMATION

Device	Qty	Media	Package	Ship
CSD17381F4	3000	7-Inch Reel	Femto(0402) 1.0 mm x 0.6 mm SMD Lead Less	Tape and Reel
CSD17381F4T	250	7-Inch Reel		

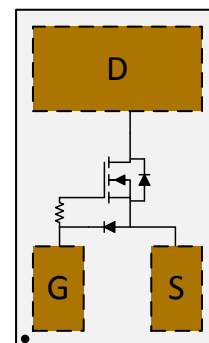
ABSOLUTE MAXIMUM RATINGS

$T_A = 25^\circ\text{C}$ unless otherwise stated		VALUE	UNIT
V_{DS}	Drain-to-Source Voltage	30	V
V_{GS}	Gate-to-Source Voltage	12	V
I_D	Continuous Drain Current, $T_A = 25^\circ\text{C}^{(1)}$	3.1	A
I_{DM}	Pulsed Drain Current, $T_A = 25^\circ\text{C}^{(2)}$	10	A
P_D	Power Dissipation ⁽¹⁾	500	mW
ESD Rating	Human Body Model (HBM)	4	kV
	Charged Device Model (CDM)	2	kV
T_J, T_{STG}	Operating Junction and Storage Temperature Range	-55 to 150	$^\circ\text{C}$
E_{AS}	Avalanche Energy, single pulse $I_D = 7.4\text{ A}$, $L = 0.1\text{ mH}$, $R_G = 25\ \Omega$	2.7	mJ

(1) Typical $R_{\theta JA} = 90^\circ\text{C/W}$ on 1-inch² (6.45-cm²), 2-oz. (0.071-mm thick) Cu pad on a 0.06-inch (1.52-mm) thick FR4 PCB.

(2) Pulse duration $\leq 300\ \mu\text{s}$, duty cycle $\leq 2\%$

Top View



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These devices have limited built-in ESD protection. The leads should be shorted together or the device placed in conductive foam during storage or handling to prevent electrostatic damage to the MOS gates.

ELECTRICAL CHARACTERISTICS

(T_A = 25°C unless otherwise stated)

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
Static Characteristics						
BV _{DSS}	Drain-to-Source Voltage	V _{GS} = 0 V, I _{DS} = 250 μA	30			V
I _{DSS}	Drain-to-Source Leakage Current	V _{GS} = 0 V, V _{DS} = 24 V			1	μA
I _{GSS}	Gate-to-Source Leakage Current	V _{DS} = 0 V, V _{GS} = 10 V			100	nA
V _{GS(th)}	Gate-to-Source Threshold Voltage	V _{DS} = V _{GS} , I _{DS} = 250 μA	0.65	0.85	1.10	V
R _{DS(on)}	Drain-to-Source On Resistance	V _{GS} = 1.8 V, I _{DS} =0.5 A	160		250	mΩ
		V _{GS} = 2.5 V, I _{DS} =0.5 A	110		143	mΩ
		V _{GS} = 4.5 V, I _{DS} = 0.5 A	90		117	mΩ
		V _{GS} = 8 V, I _{DS} =0.5 A	84		109	mΩ
g _{fs}	Transconductance	V _{DS} = 15 V, I _{DS} = 0.5 A	4.8			S
Dynamic Characteristics						
C _{iSS}	Input Capacitance	V _{GS} = 0 V, V _{DS} = 15 V, f = 1 MHz	150		195	pF
C _{oSS}	Output Capacitance		44		57	pF
C _{rSS}	Reverse Transfer Capacitance		2.2		2.9	pF
R _G	Series Gate Resistance	V _{DS} = 15 V, I _{DS} = 0.5 A	23			Ω
Q _g	Gate Charge Total (4.5 V)		1040		1350	pC
Q _{gd}	Gate Charge Gate to Drain		133			pC
Q _{gs}	Gate Charge Gate to Source		226			pC
Q _{g(th)}	Gate Charge at V _{th}		150			pC
Q _{oSS}	Output Charge	V _{DS} = 15 V, V _{GS} = 0 V	1110			pC
t _{d(on)}	Turn On Delay Time	V _{DS} = 0 V, V _{GS} = 4.5 V, I _{DS} = 0.5 A, R _G = 2 Ω	3.4			ns
t _r	Rise Time		1.4			ns
t _{d(off)}	Turn Off Delay Time		10.8			ns
t _f	Fall Time		3.6			ns
Diode Characteristics						
V _{SD}	Diode Forward Voltage	I _{SD} = 0.5 A, V _{GS} = 0 V	0.73		0.9	V
Q _{rr}	Reverse Recovery Charge	V _{DS} = 15 V, I _F = 0.5 A, di/dt = 300 A/μs	1500			pC
t _{rr}	Reverse Recovery Time		5.6			ns

THERMAL CHARACTERISTICS

(T_A = 25°C unless otherwise stated)

PARAMETER		Typical Values	UNIT
R _{θJA}	Thermal Resistance Junction to Ambient ⁽¹⁾	90	°C/W
	Thermal Resistance Junction to Ambient ⁽²⁾	250	°C/W

(1) Device mounted on FR4 material with 1-inch² (6.45-cm²), 2-oz. (0.071-mm thick) Cu.

(2) Device mounted on FR4 material with minimum Cu mounting area.

TYPICAL MOSFET CHARACTERISTICS

($T_A = 25^\circ\text{C}$ unless otherwise stated)

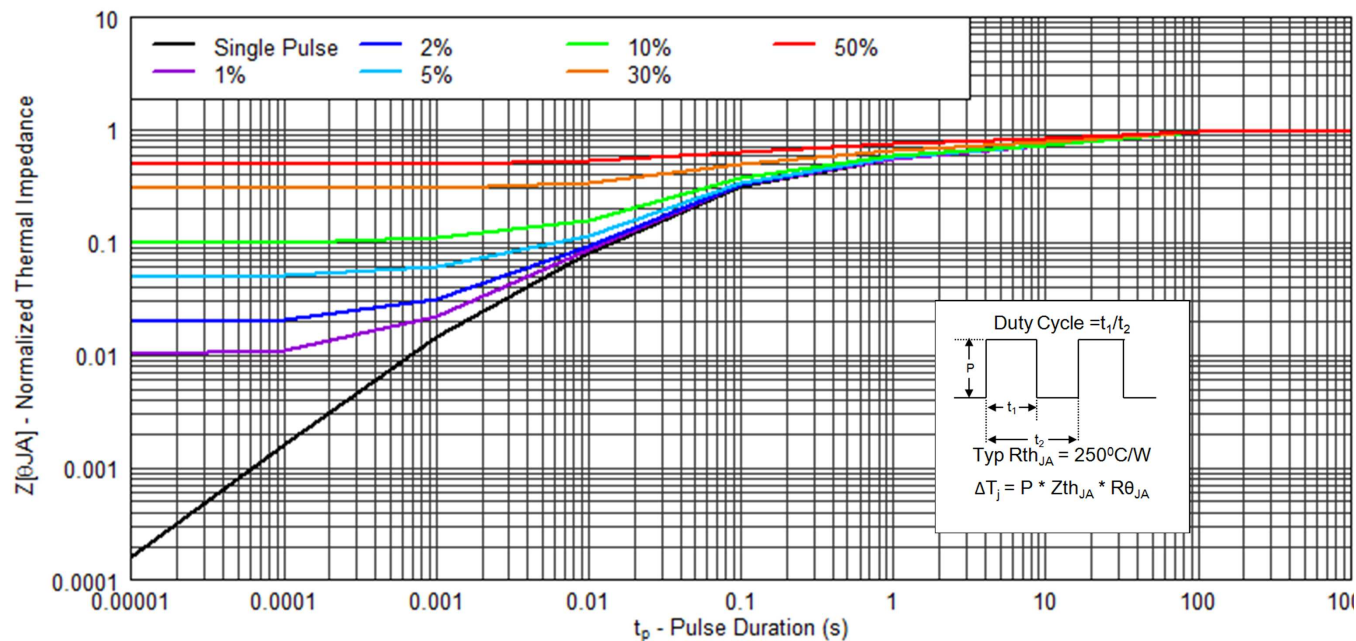


Figure 1. Transient Thermal Impedance

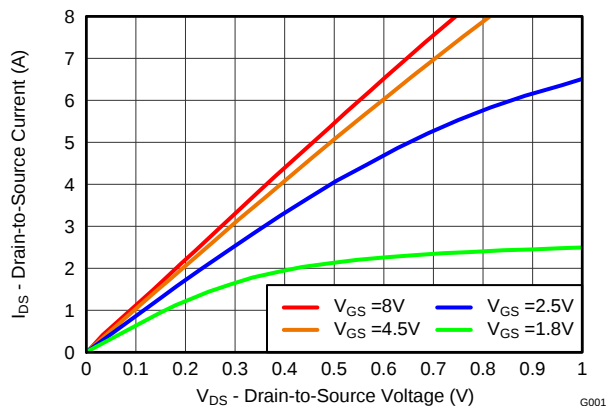


Figure 2. Saturation Characteristics

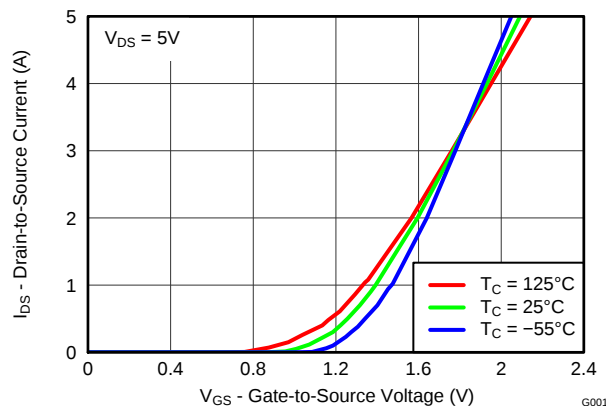


Figure 3. Transfer Characteristics

TYPICAL MOSFET CHARACTERISTICS (continued)

($T_A = 25^\circ\text{C}$ unless otherwise stated)

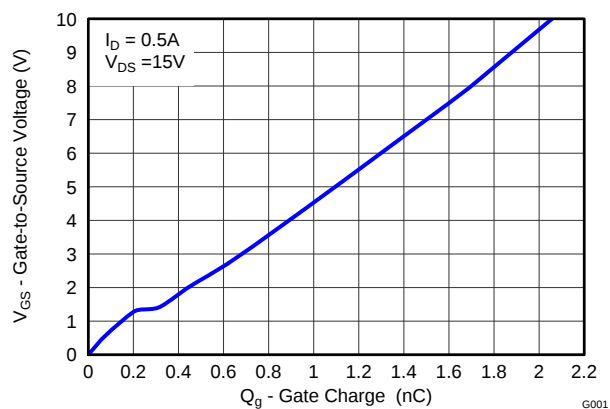


Figure 4. Gate Charge

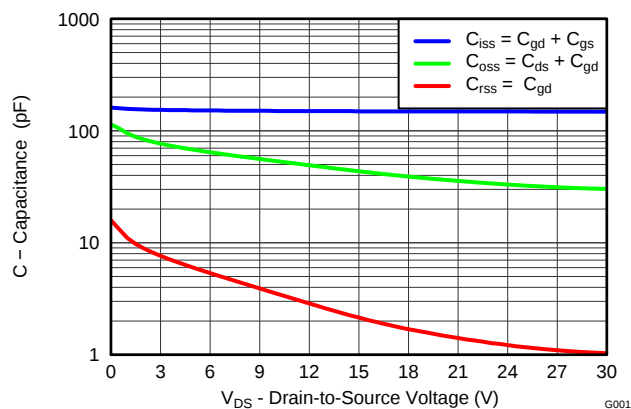


Figure 5. Capacitance

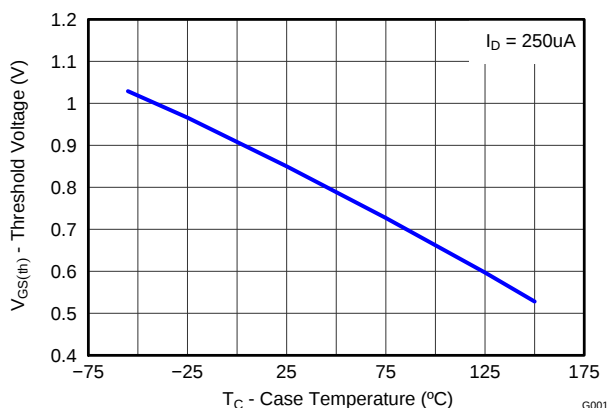


Figure 6. Threshold Voltage vs. Temperature

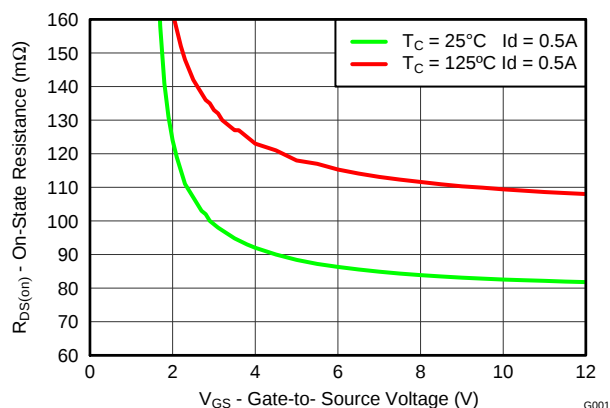


Figure 7. On-State Resistance vs. Gate-to-Source Voltage

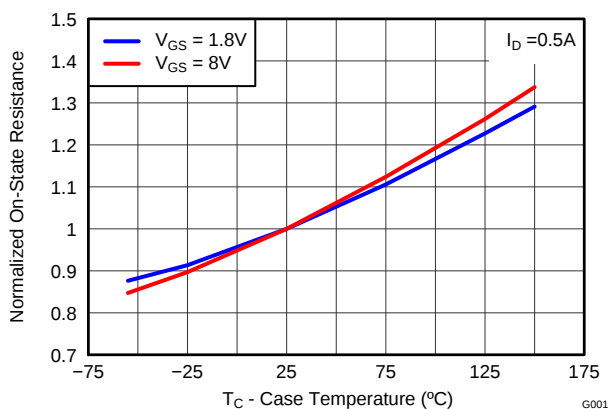


Figure 8. Normalized On-State Resistance vs. Temperature

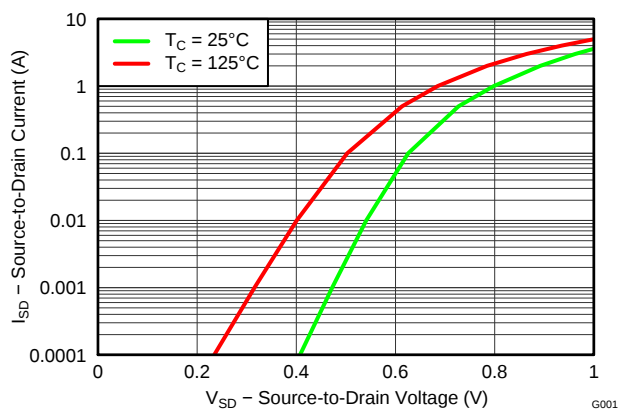


Figure 9. Typical Diode Forward Voltage

TYPICAL MOSFET CHARACTERISTICS (continued)

($T_A = 25^\circ\text{C}$ unless otherwise stated)

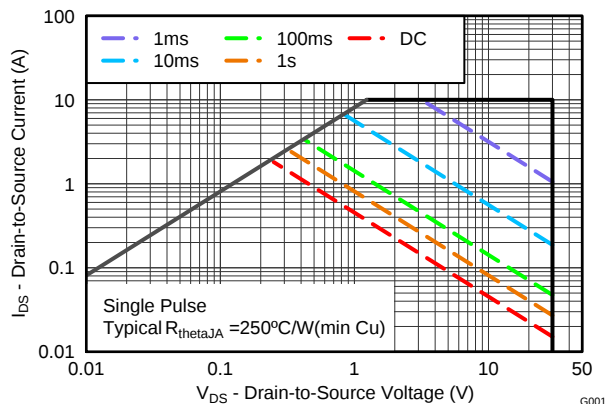


Figure 10. Maximum Safe Operating Area

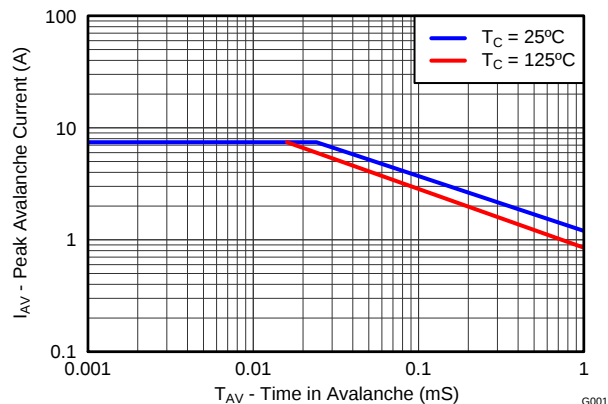


Figure 11. Single Pulse Unclamped Inductive Switching

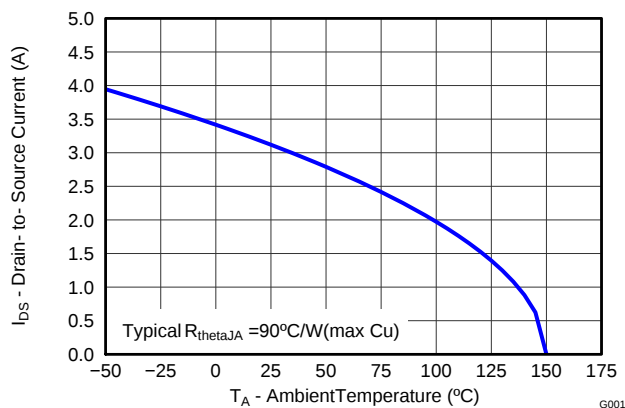
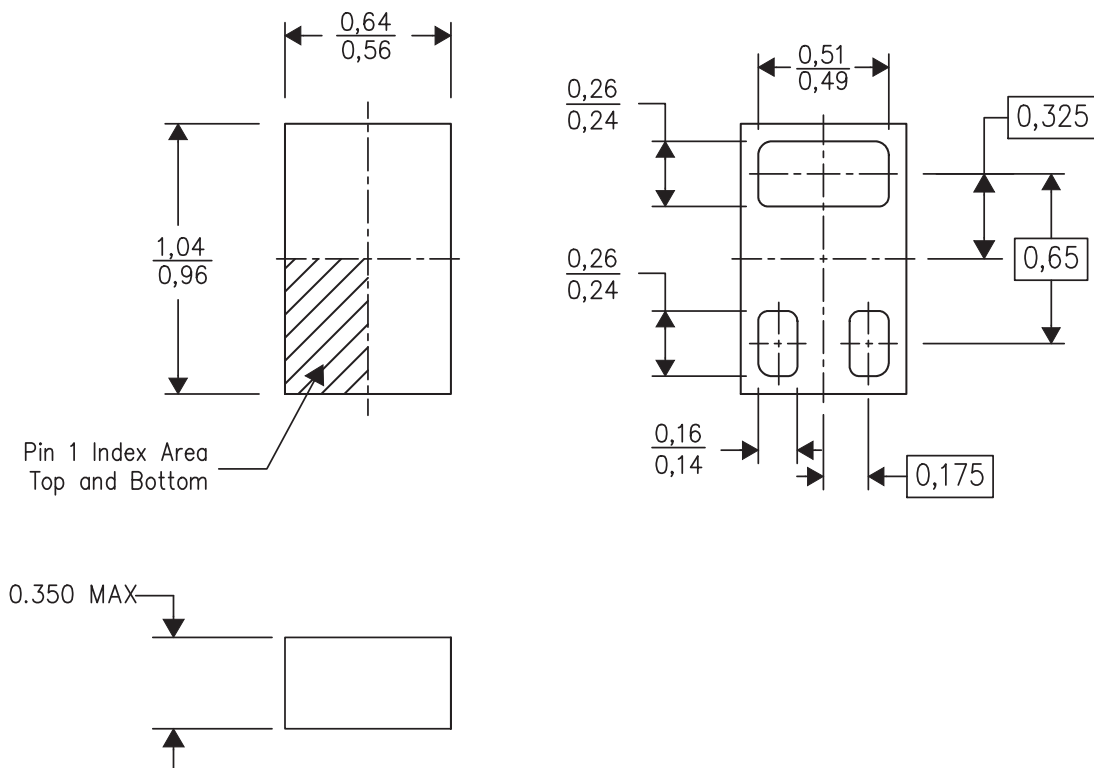


Figure 12. Maximum Drain Current vs. Temperature

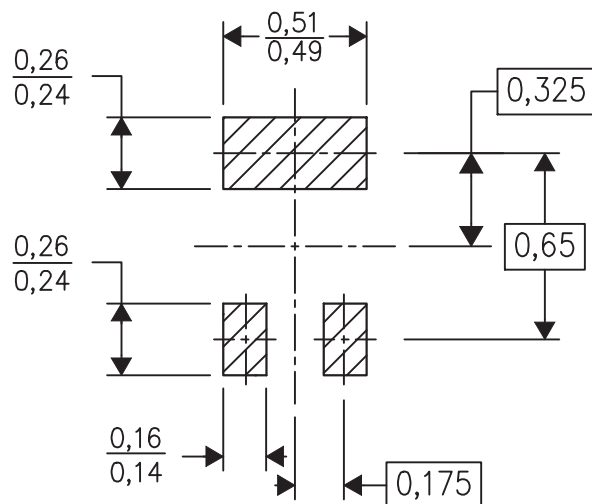
MECHANICAL DATA

0402 Mechanical Dimensions



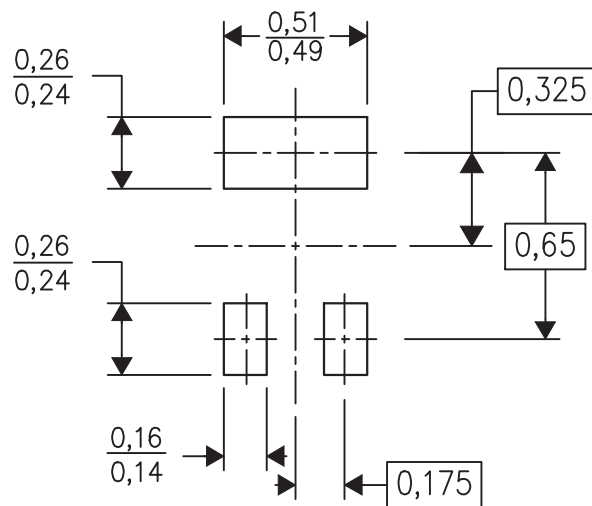
- (1) All linear dimensions are in millimeters (dimensions and tolerancing per AME T14.5M-1994).
- (2) This drawing is subject to change without notice.
- (3) This package is a PB-free solder land design.

Recommended Minimum PCB Layout



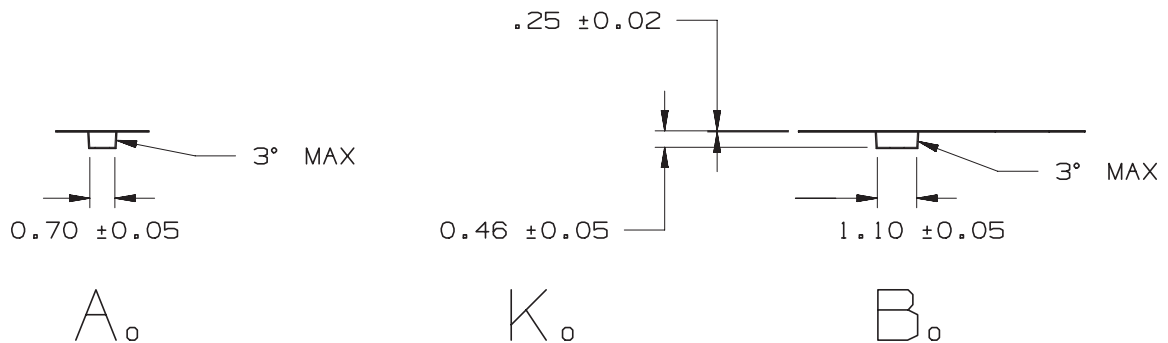
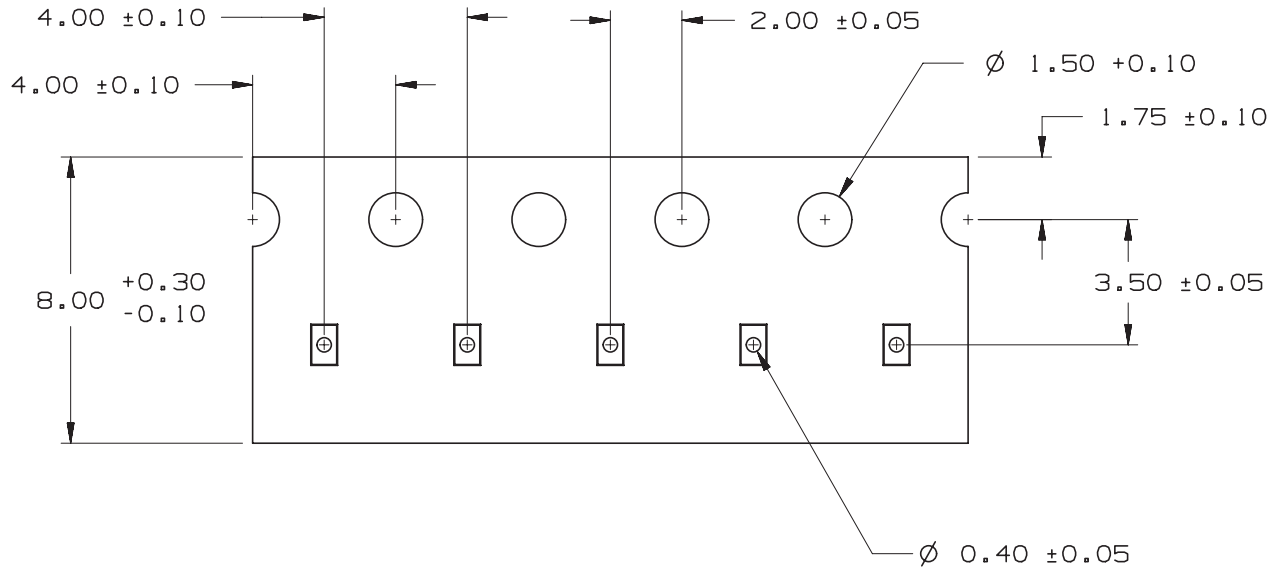
- (1) All dimensions are in millimeters.

Recommended Stencil Pattern



(1) All dimensions are in millimeters.

CSD17381F4 Embossed Carrier Tape Dimensions



- (1) Pin 1 is oriented in the top-right quadrant of the tape enclosure (quadrant 2), closest to the carrier tape sprocket holes.

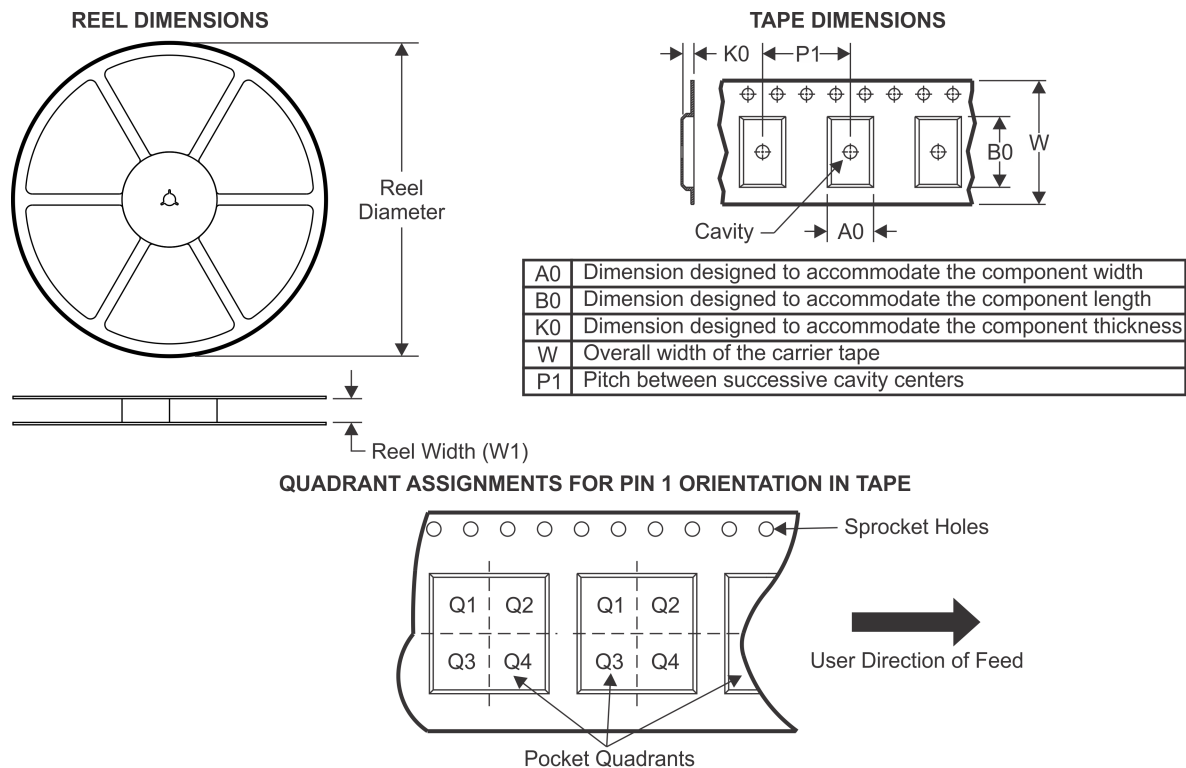
REVISION HISTORY

Changes from Original (April 2013) to Revision A Page

• Added ESD info to Features	1
• Included jumbo reel ordering information	1
• Added ESD rating info to Absolute Maximum Ratings table	1
• Added circuit schematic to pinout view	1

Changes from Revision A (July 2013) to Revision B Page

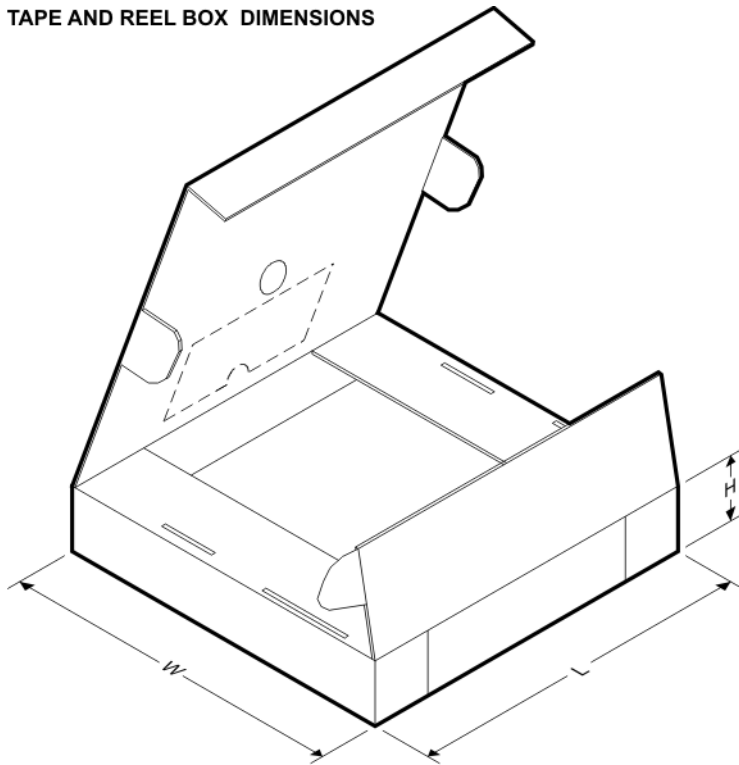
• Updated title	1
• Deleted jumbo reel info	1
• Added short reel info	1

TAPE AND REEL INFORMATION


*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
CSD17381F4	PICOST AR	YJC	3	3000	180.0	8.4	0.7	1.1	0.46	4.0	8.0	Q2

TAPE AND REEL BOX DIMENSIONS



*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
CSD17381F4	PICOSTAR	YJC	3	3000	182.0	182.0	17.0

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