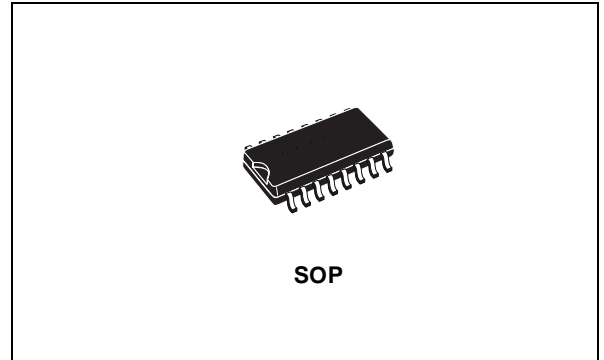


## CURRENT LIMITED POWER DISTRIBUTION SWITCHES

- 80mΩ HIGH-SIDE MOSFET SWITCH
- 500mA CONTINUOUS CURRENT PER CHANNEL
- INDEPENDENT THERMAL AND SHORT-CIRCUIT PROTECTION WITH OVERCURRENT LOGIC OUTPUT
- OPERATING RANGE FROM 2.7V TO 5.5V
- CMOS- AND TTL-COMPATIBLE ENABLE INPUTS
- 10 ms OC\_N FAULT BLANKING
- 2.5ms TYPICAL RISE TIME
- UNDERVOLTAGE LOCKOUT
- 20μA MAXIMUM STANDBY SUPPLY CURRENT
- AMBIENT TEMPERATURE RANGE, 0°C TO 85°C
- ESD PROTECTION

### DESCRIPTION

The ST2054 power distribution switches is intended for application where heavy capacitive loads and short circuits are likely to be encountered. These devices incorporate 80mΩ N-channel MOSFET high-side power switches for power-distribution systems that require multiple powers switches in a single package. Each switch is controlled by an independent logic enable input. Gate drive is provided by an internal charge pump designed to control the power-switch rise times and fall times to minimize current surges during switching. The charge pump requires no external



components and allows operation from supplies as low as 2.7 V.

When the output load exceeds the current-limit threshold or a short is present, these devices limit the output current to a safe level by switching into a constant-current mode, pulling the overcurrent (OCx) logic output low. A 10ms deglitching circuit provides fault-blanking feature, preventing the OC\_N pin to be asserted during hot-insertion or short spikes of overcurrent conditions.

When continuous heavy overloads and short circuits increase the power dissipation in the switch, causing the junction temperature to rise, a thermal protection circuit shuts off the switch to prevent damage. Recovery from a thermal shutdown is automatic once the device has cooled sufficiently. Internal circuitry ensures the switch remains off until valid input voltage is present. These power-distribution switches are designed to current limit at 0.9 A.

**Table 1: Order Codes**

Type	Temperature Range	Package	Comments
ST2054BD	-40 to 85 °C	SO-16 (Tube)	50parts per tube / 40tube per box
ST2054BDR	-40 to 85 °C	SO-16 (Tape & Reel)	2500 parts per reel

Figure 1: Pin Configuration

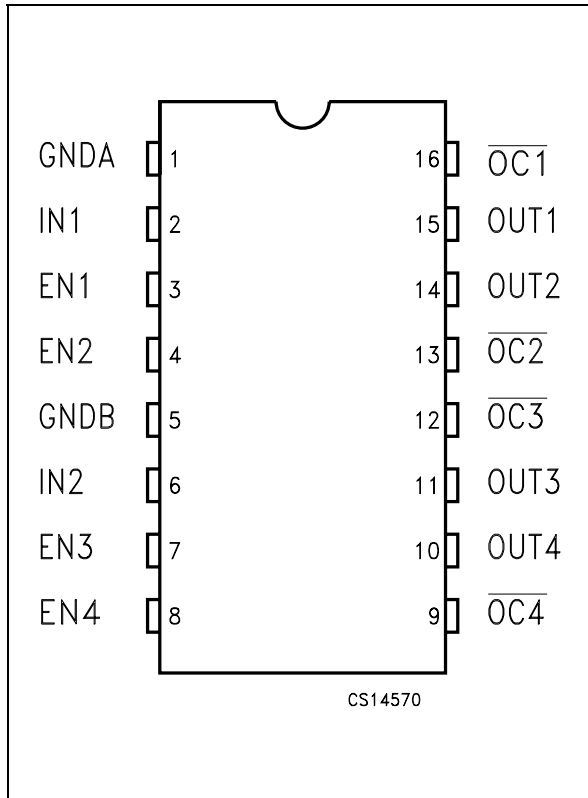


Table 2: Pin Description

Pin N°	Symbol	Name And Function
1	GNDA	Ground
2	IN1	Input Voltage
3	EN1	Enable Input. Logic High Turns On Power Switch IN-OUT1
4	EN2	Enable Input. Logic High Turns On Power Switch IN-OUT2
5	GNDB	Ground
6	IN2	Input Voltage
7	EN3	Enable Input. Logic High Turns On Power Switch IN-OUT3
8	EN4	Enable Input. Logic High Turns On Power Switch IN-OUT4
9	$\overline{OC4}$	Overcurrent. Logic Output Active Low IN-OUT4
10	OUT4	Power Switch Output
11	OUT3	Power Switch Output
12	$\overline{OC3}$	Overcurrent. Logic Output Active Low IN-OUT3
13	$\overline{OC2}$	Overcurrent. Logic Output Active Low IN-OUT2
14	OUT2	Power Switch Output
15	$\overline{OUT1}$	Power Switch Output
16	$\overline{OC1}$	Overcurrent. Logic Output Active Low IN-OUT1

Table 3: Absolute Maximum Ratings

Symbol	Parameter	Value	Unit
$V_I$	Input Voltage Range (Note 1)	-0.3 to 6	V
$V_O$	Output Voltage Range (Note 1)	-0.3 to ( $V_I + 0.3$ )	V
$V_{IENX}$	Input Voltage Range	-0.3 to 6	V
$I_O$	Continuous Output Current	Internally Limited	
ESD	Electrostatic Discharge	2	kV
$T_J$	Operating Junction Temperature	-40 to 125	°C

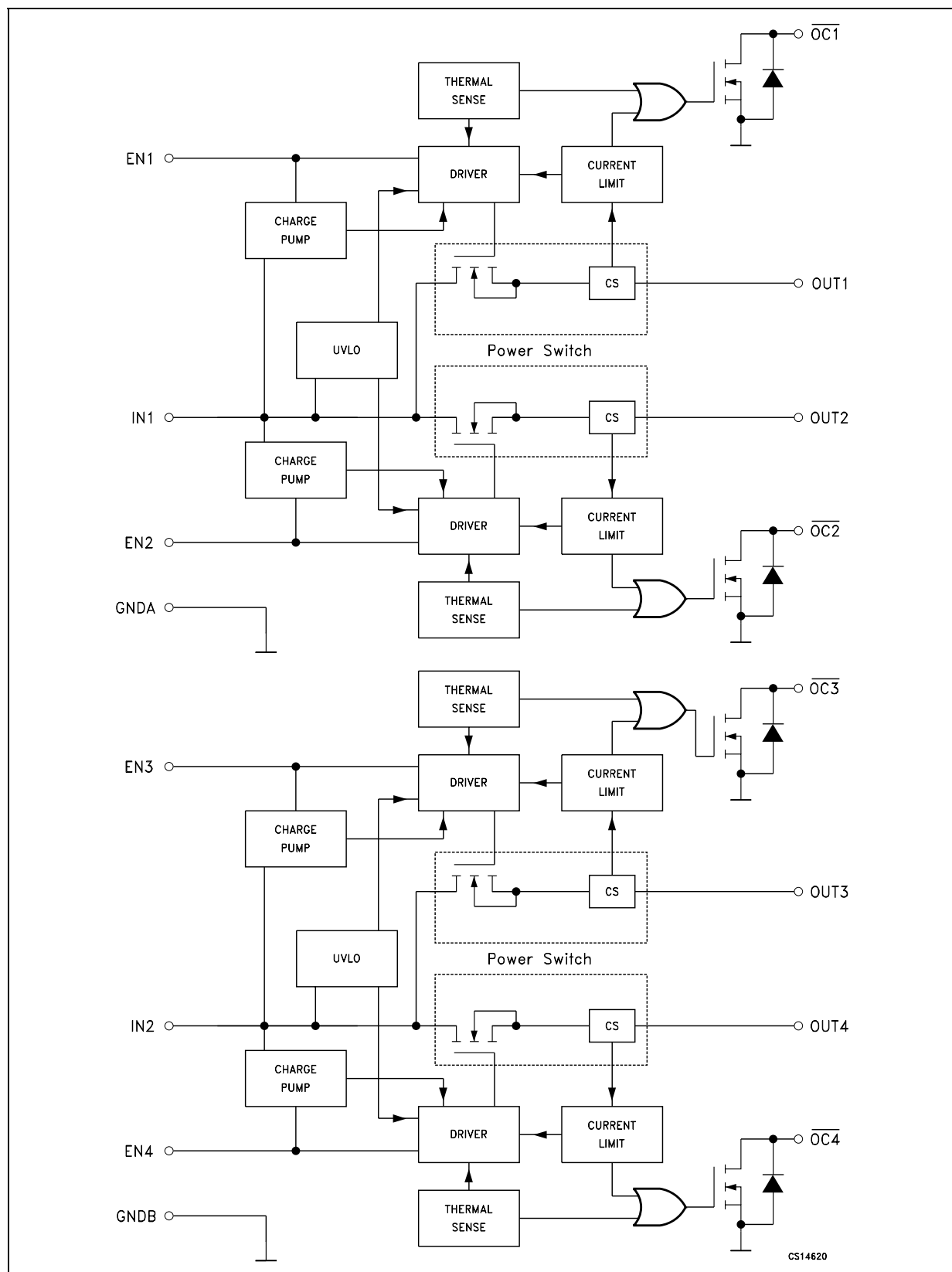
Absolute Maximum Ratings are those values beyond which damage to the device may occur. Functional operation under these condition is not implied.

Note1: All voltage are referred to GND

Table 4: Recommended Operating Condition

Symbol	Parameter	Min.	Typ.	Max.	Unit
$V_I$	Input Voltage Range (Note 1)	2.7		5.5	V
$V_O$	Output Voltage Range (Note 1)	0		5.5	V
$I_O$	Continuous Output Current (Per Switch)	0		500	mA

Figure 2: Block Diagram



**Table 5: Power Switch Electrical Characteristics** ( $V_I = 5.5V$ ,  $I_O = \text{rated current}$ ,  $V_{IEN} = V_I$ ,  $T_J = 25^\circ C$ , unless otherwise specified.) (See Note 1)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$R_{DS(ON)}$	Static Drain-Source ON-State Resistance	$V_I = 5V$ $I_O = 0.5A$		80	100	m $\Omega$
		$V_I = 5V$ $I_O = 0.5A$ $T_J = 85^\circ C$		90	120	
		$V_I = 5V$ $I_O = 0.5A$ $T_J = 125^\circ C$		100	135	
		$V_I = 3.3V$ $I_O = 0.5A$		90	125	
		$V_I = 3.3V$ $I_O = 0.5A$ $T_J = 85^\circ C$		110	145	
		$V_I = 3.3V$ $I_O = 0.5A$ $T_J = 125^\circ C$		120	160	
$t_r$	Output Rise Time	$V_I = 5.5V$ $R_L = 10\Omega$ $C_L = 1\mu F$		2.5		ms
		$V_I = 2.7V$ $R_L = 10\Omega$ $C_L = 1\mu F$		3		
$t_f$	Output Fall Time	$V_I = 5.5V$ $R_L = 10\Omega$ $C_L = 1\mu F$		0.3		ms
		$V_I = 2.7V$ $R_L = 10\Omega$ $C_L = 1\mu F$		0.2		

**Table 6: Enable Input ENx Characteristics** ( $V_I = 5.5V$ ,  $I_O = \text{rated current}$ ,  $V_{IEN} = V_I$ ,  $T_J = 25^\circ C$ , unless otherwise specified.) (See Note 1)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{IH}$	High level Input Voltage	$V_I = 2.7V$ to $5.5V$	2			V
$V_{IL}$	Low level Input Voltage	$V_I = 4.5V$ to $5.5V$			0.8	V
		$V_I = 2.7V$ to $4.5V$			0.4	
$I_I$	Input Current	$V_{IENX} = V_I$ or $0V$	-0.5		0.5	$\mu A$
$t_{on}$	Turn-on Time	$R_L = 10\Omega$ $C_L = 100\mu F$			20	ms
$t_{off}$	Turn-off Time	$R_L = 10\Omega$ $C_L = 100\mu F$			40	ms

**Table 7: Current Limit Characteristics** ( $V_I = 5.5V$ ,  $I_O = \text{rated current}$ ,  $V_{IEN} = V_I$ ,  $T_J = 25^\circ C$ , unless otherwise specified.) (See Note 1)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$I_{OS}$	Short Circuit Output Current	$V_I = 5V$ , OUT connected to GND, device enabled into short circuit	0.7	1	1.3	A

**Table 8: Supply Current Characteristics** ( $V_I = 5.5V$ ,  $I_O = \text{rated current}$ ,  $V_{IEN} = V_I$ ,  $T_J = 25^\circ C$ , unless otherwise specified.) (See Note 1)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$I_{SOL}$	Current Low Level Output	$V_{IENX} = 0$ , No Load,		0.05	2	$\mu A$
		$V_{IENX} = 0$ , No Load, $T_J = -40$ to $125^\circ C$			20	
$I_{SOH}$	Current Low High Output	$V_{IENX} = V_I$ , No Load,		140	180	$\mu A$
		$V_{IENX} = V_I$ , No Load, $T_J = -40$ to $125^\circ C$			200	
$I_L$	Output Leakage Current	$V_{IENX} = 0$ , Output Connected to GND, $T_J = -40$ to $125^\circ C$			20	$\mu A$

**Table 9: Undervoltage Characteristics** ( $V_I = 5.5V$ ,  $I_O = \text{rated current}$ ,  $V_{IEN} = V_I$ ,  $T_J = 25^\circ C$ , unless otherwise specified.) (See Note 1)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{IL}$	Low Level Input Voltage		2		2.5	V
$V_{HYS}$	Hysteresys			100		mV

**Table 10: Overcurrent ( $\overline{OC}$ ) Characteristics** ( $V_I = 5.5V$ ,  $I_O = \text{rated current}$ ,  $V_{IEN} = V_I$ ,  $T_J = 25^\circ C$ , unless otherwise specified.) (See Note 1)

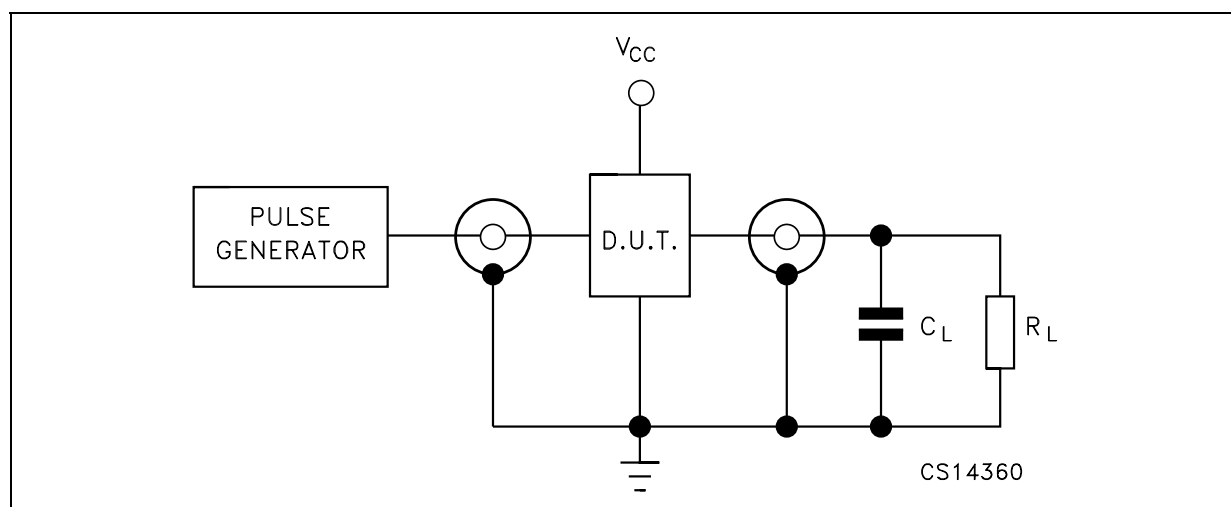
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$I_{SINK}$	Sink Current	$V_O = 5V$	10			mA
$V_O$	Output Low Voltage	$I_O = 5mA$			0.5	V
$I_{OFF}$	OFF-State Current	$V_O = 5V$ $V_O = 3.3V$			1	$\mu A$
$T_{FB}$	Fault-Blanking period	$V_I = 5.5V$ , $T_J = 25^\circ C$ (See Note 2 and 3)	2	10		ms

Note 1: Pulse testing techniques maintain junction temperature close to ambient temperature: thermal effect must be taken into account separately.

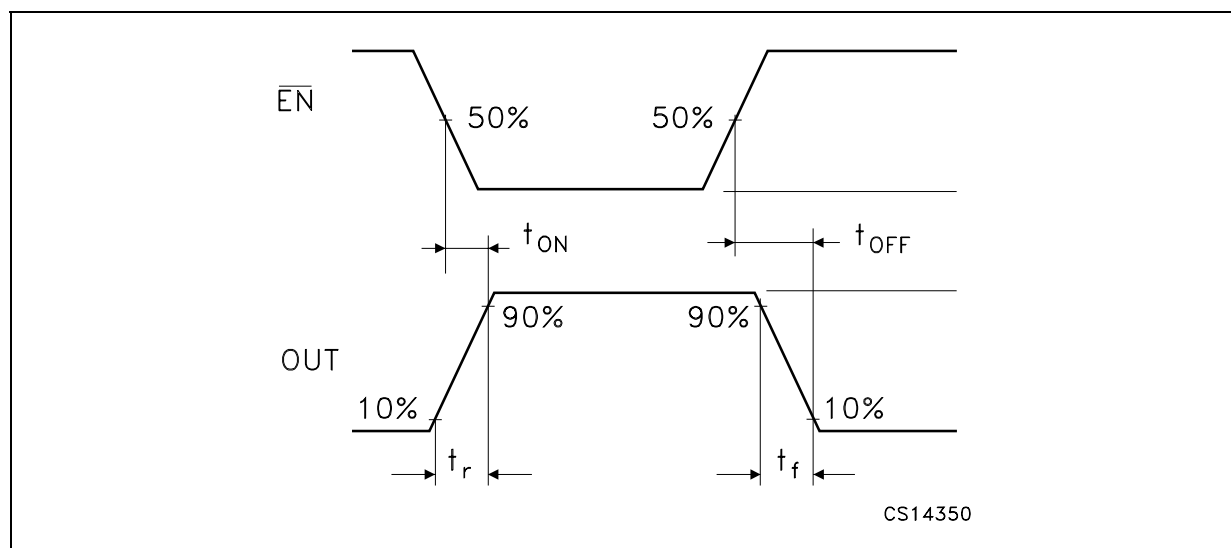
Note 2: Specified by design, not production tested.

Note 3: Guaranteed by design.

**Figure 3: Test Circuit**

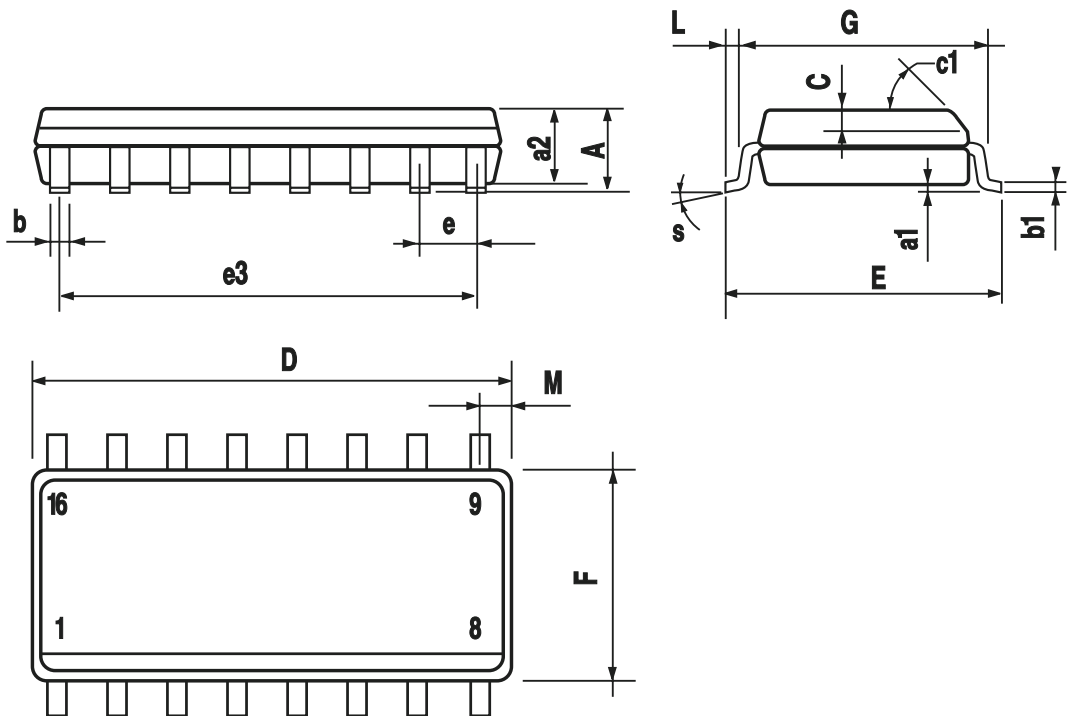


**Figure 4: Waveform - Propagation Delays** ( $f=1MHz$ ; 50% duty cycle)



## SO-16 MECHANICAL DATA

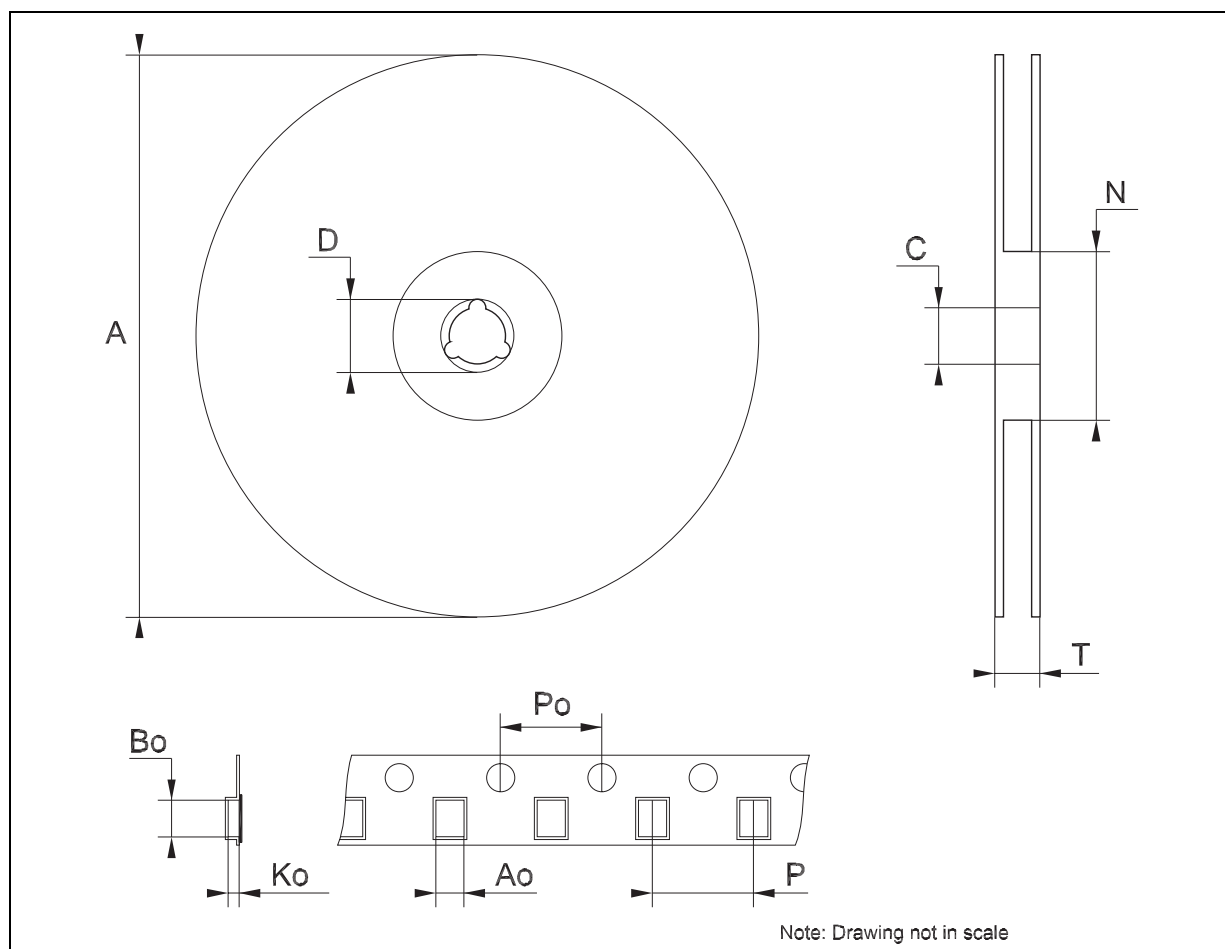
DIM.	mm.			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A			1.75			0.068
a1	0.1		0.25	0.004		0.010
a2			1.64			0.063
b	0.35		0.46	0.013		0.018
b1	0.19		0.25	0.007		0.010
C		0.5			0.019	
c1	45° (typ.)					
D	9.8		10	0.385		0.393
E	5.8		6.2	0.228		0.244
e		1.27			0.050	
e3		8.89			0.350	
F	3.8		4.0	0.149		0.157
G	4.6		5.3	0.181		0.208
L	0.5		1.27	0.019		0.050
M			0.62			0.024
S	8° (max.)					



0016020D

## Tape &amp; Reel SO-16 MECHANICAL DATA

DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A			330			12.992
C	12.8		13.2	0.504		0.519
D	20.2			0.795		
N	60			2.362		
T			22.4			0.882
Ao	6.45		6.65	0.254		0.262
Bo	10.3		10.5	0.406		0.414
Ko	2.1		2.3	0.082		0.090
Po	3.9		4.1	0.153		0.161
P	7.9		8.1	0.311		0.319



**Table 11: Revision History**

<b>Date</b>	<b>Revision</b>	<b>Description of Changes</b>
28-Oct-2004	2	Maturity Change.
13-Jul-2005	3	Add bullet on pag. 1, add paragraph in the description on pag. 1 and add row T <sub>FB</sub> on Table 10.



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