

## GENERAL FEATURES

- $V_{DS} = 50V, I_D = 0.22A$

$$R_{DS(ON)} < 6\Omega @ V_{GS}=4.5V$$

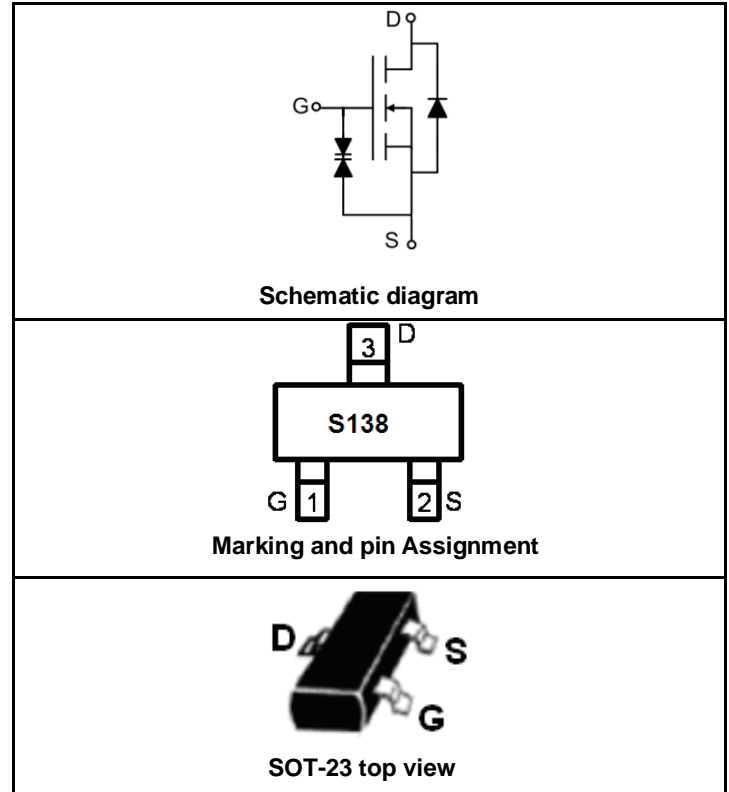
$$R_{DS(ON)} < 3.5\Omega @ V_{GS}=10V$$

ESD Rating: 1000V HBM

- High Power and current handling capability
- Lead free product is acquired
- Surface Mount Package

## APPLICATION

- Direct Logic-Level Interface: TTL/CMOS
- Drivers: Relays, Solenoids, Lamps, Hammers, Display, Memories, Transistors, etc.
- Battery Operated Systems
- Solid-State Relays



## PACKAGE MARKING AND ORDERING INFORMATION

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
S138	BSS138	SOT-23	Ø180mm	8 mm	3000 units

## ABSOLUTE MAXIMUM RATINGS(TA=25°C unless otherwise noted)

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	$V_{DS}$	50	V
Gate-Source Voltage	$V_{GS}$	±20	V
Drain Current-Continuous@ Current-Pulsed (Note 1)	$I_D$	0.22	A
	$I_D(70^\circ C)$	0.18	
	$I_{DM}$	0.88	A
Maximum Power Dissipation	$P_D$	0.43	W
Operating Junction and Storage Temperature Range	$T_J, T_{STG}$	-55 To 175	°C

## THERMAL CHARACTERISTICS

Thermal Resistance, Junction-to-Ambient (Note 2)	$R_{\theta JA}$	350	°C/W
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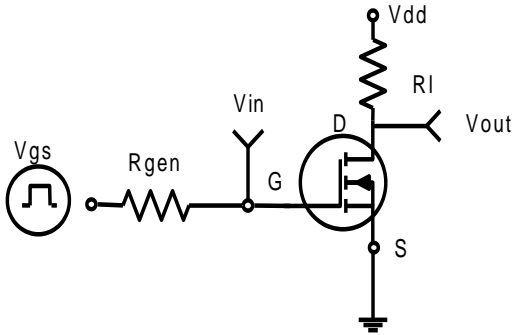
## ELECTRICAL CHARACTERISTICS (TA=25°C unless otherwise noted)

Parameter	Symbol	Condition	Min	Typ	Max	Unit
<b>OFF CHARACTERISTICS</b>						
Drain-Source Breakdown Voltage	$BV_{DSS}$	$V_{GS}=0V, I_D=250\mu A$	50			V
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS}=50V, V_{GS}=0V$			1	$\mu A$
Gate-Body Leakage Current	$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0V$			10	$\mu A$
Gate-Source Breakdown Voltage	$BV_{GSO}$	$V_{DS}=0V, I_G=\pm 250\mu A$	$\pm 20$			V
<b>ON CHARACTERISTICS (Note 3)</b>						
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=250\mu A$	0.8		1.5	V
Drain-Source On-State Resistance	$R_{DS(on)}$	$V_{GS}=10V, I_D=0.22A$			3.5	$\Omega$
		$V_{GS}=4.5V, I_D=0.22A$			6	
Forward Transconductance	$g_{FS}$	$V_{DS}=10V, I_D=0.22A$		0.1		S
<b>DYNAMIC CHARACTERISTICS (Note4)</b>						
Input Capacitance	$C_{iss}$	$V_{DS}=25V, V_{GS}=0V, F=1.0MHz$		30		PF
Output Capacitance	$C_{oss}$			15		
Reverse Transfer Capacitance	$C_{rss}$			6		
<b>SWITCHING CHARACTERISTICS (Note 4)</b>						
Turn-on Delay Time	$t_{d(on)}$	$V_{DD}=30V, V_{GS}=10V, R_{GEN}=6\Omega, I_D=0.22A$		2.6		nS
Turn-On Rise Time	$t_r$			9		
Turn-Off Delay Time	$t_{d(off)}$			20		
Turn-Off Fall Time	$t_f$			6		
Total Gate Charge	$Q_g$	$V_{DS}=25V, I_D=0.22A, V_{GS}=10V$		1.7	2.4	nC
Gate-Source Charge	$Q_{gs}$			0.1		
Gate-Drain Charge	$Q_{gd}$			0.4		
<b>DRAIN-SOURCE DIODE CHARACTERISTICS</b>						
Diode Forward Voltage (Note 3)	$V_{SD}$	$V_{GS}=0V, I_S=0.44A$			1.4	V

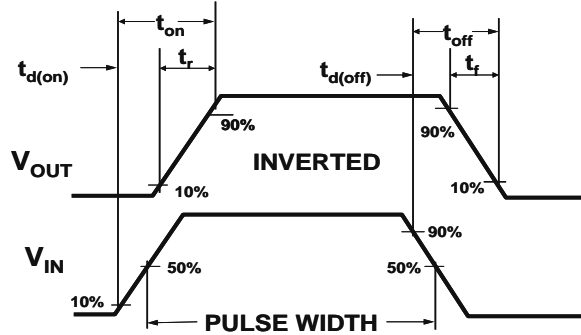
### NOTES:

1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Surface Mounted on FR4 Board,  $t \leq 10$  sec.
3. Pulse Test: Pulse Width  $\leq 300\mu s$ , Duty Cycle  $\leq 2\%$ .
4. Guaranteed by design, not subject to production testing.

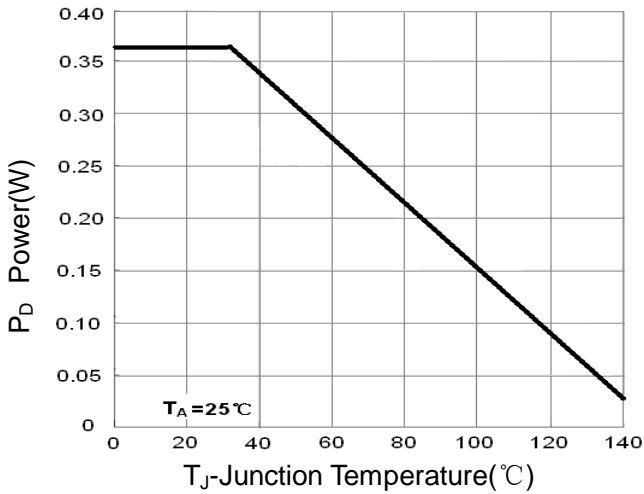
## TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS



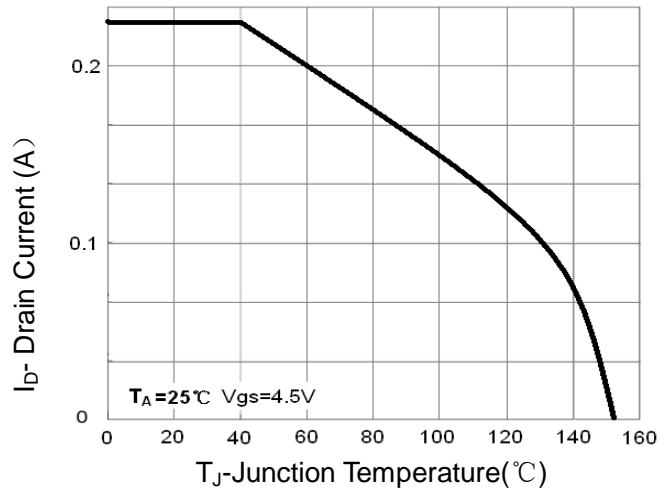
**Figure 1: Switching Test Circuit**



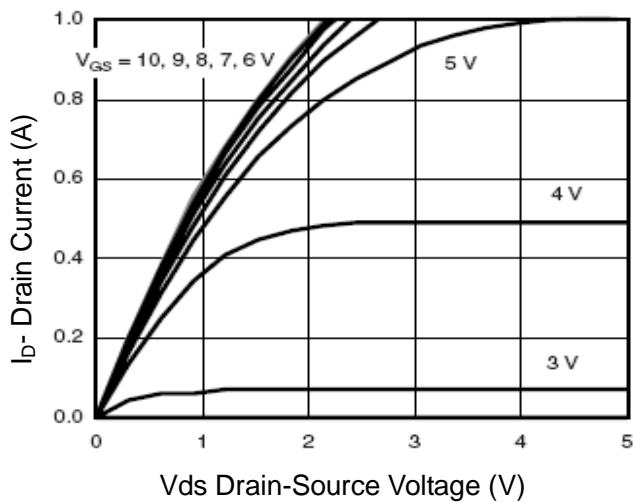
**Figure 2: Switching Waveforms**



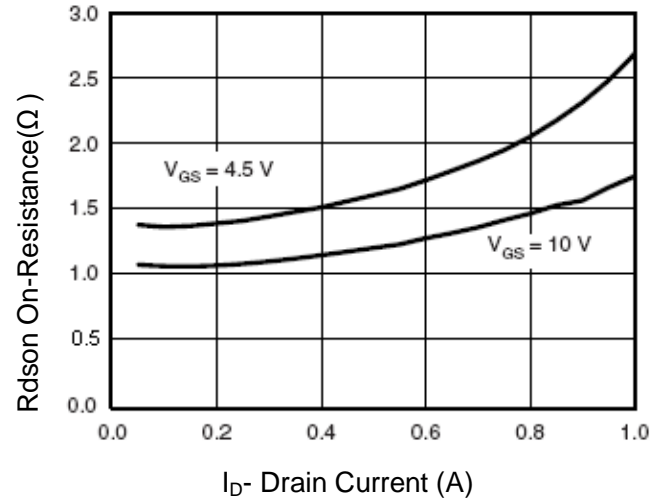
**Figure 3 Power Dissipation**



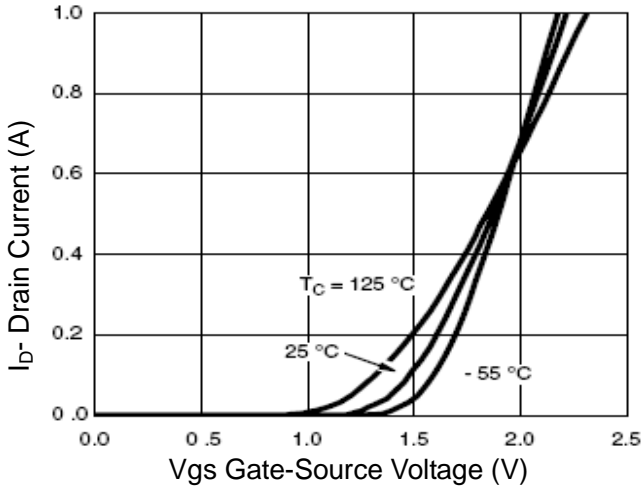
**Figure 4 Drain Current**



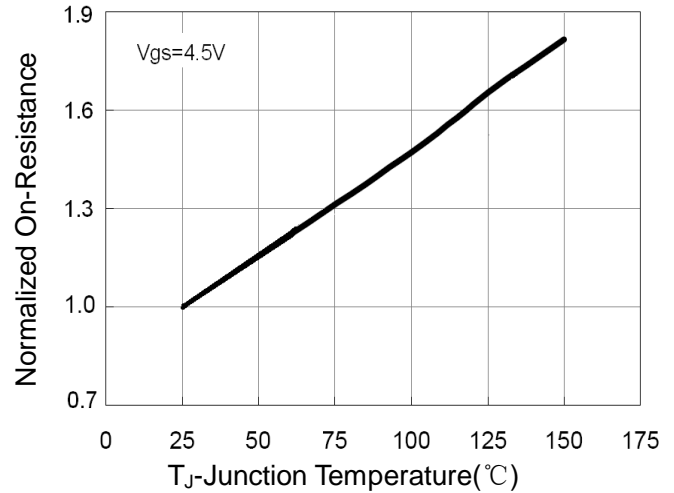
**Figure 5 Output CHARACTERISTICS**



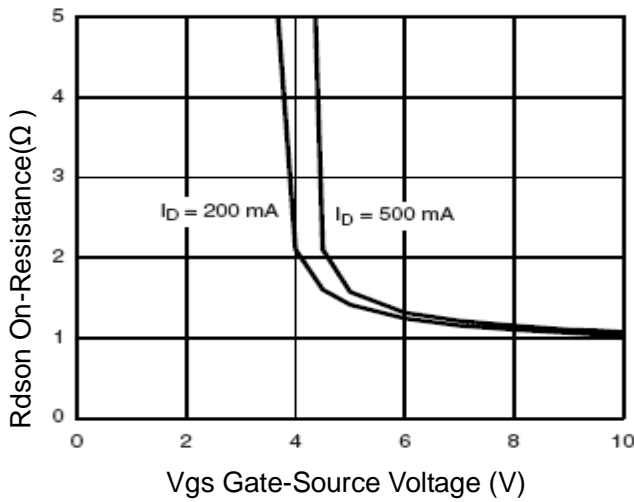
**Figure 6 Drain-Source On-Resistance**



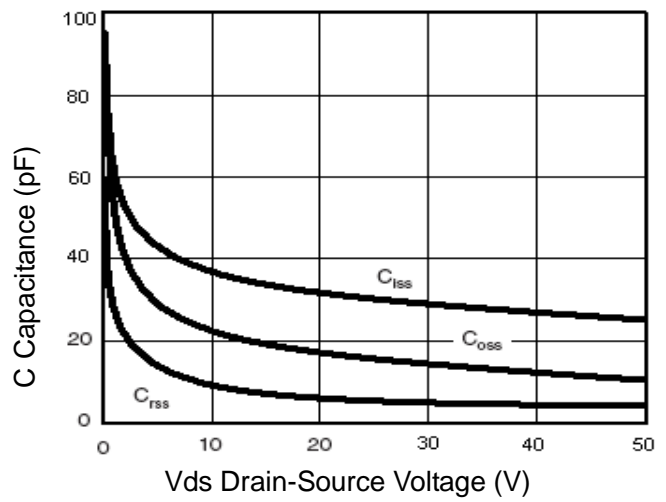
**Figure 7 Transfer Characteristics**



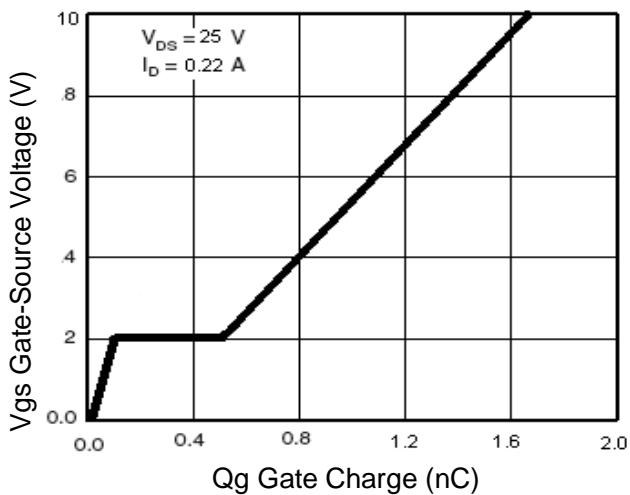
**Figure 8 Drain-Source On-Resistance**



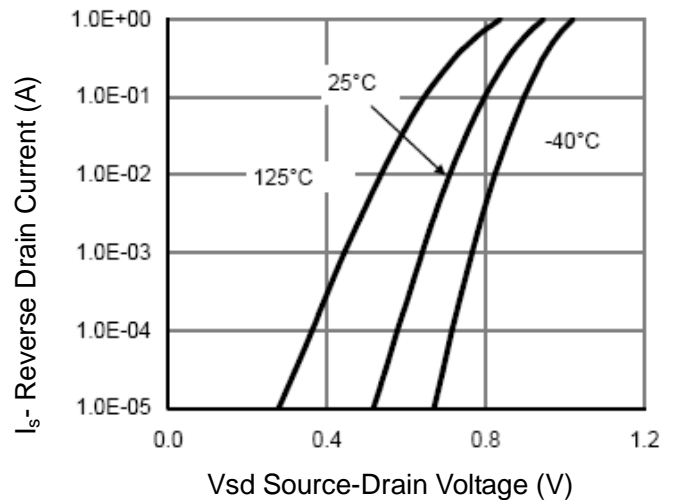
**Figure 9 Rdson vs Vgs**



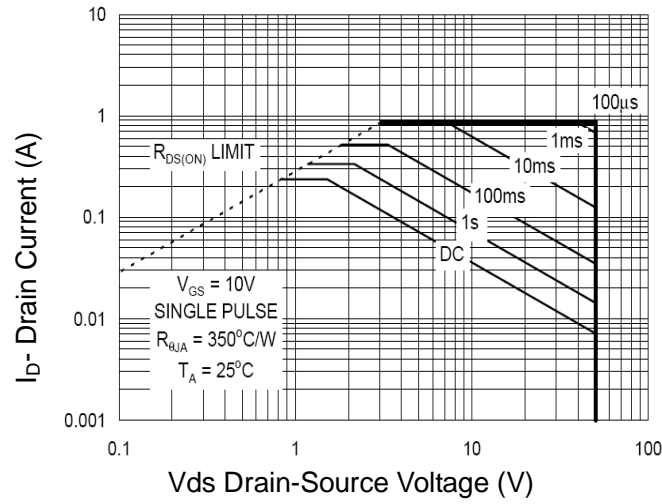
**Figure 10 Capacitance vs Vds**



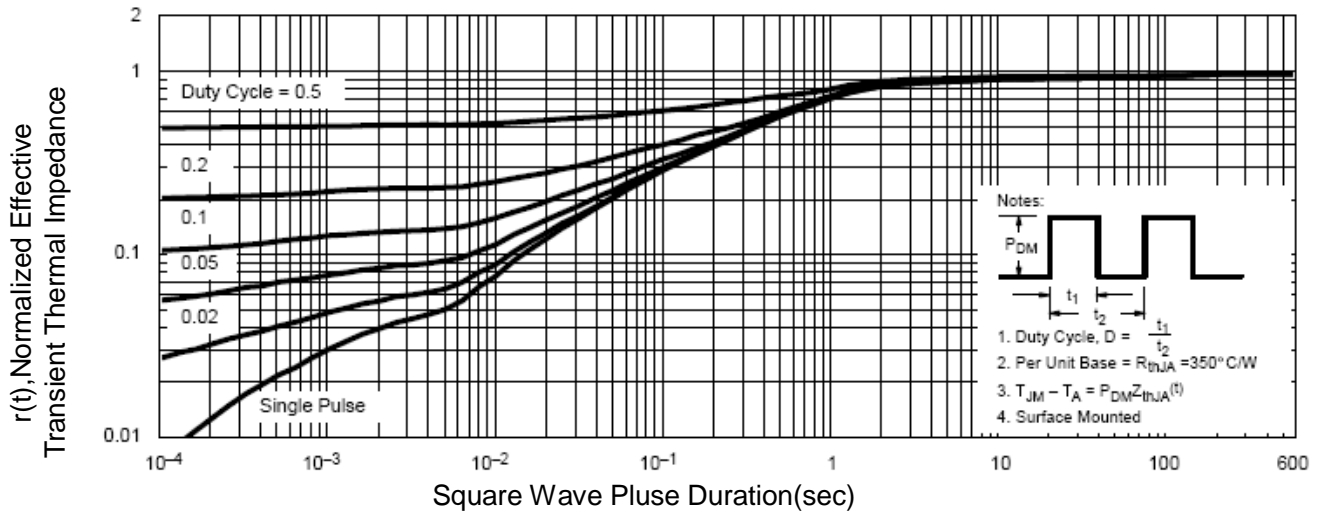
**Figure 11 Gate Charge**



**Figure 12 Source- Drain Diode Forward**



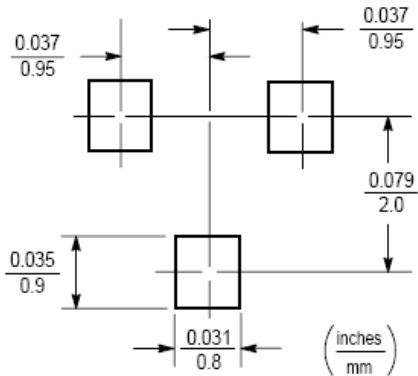
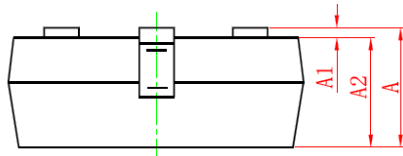
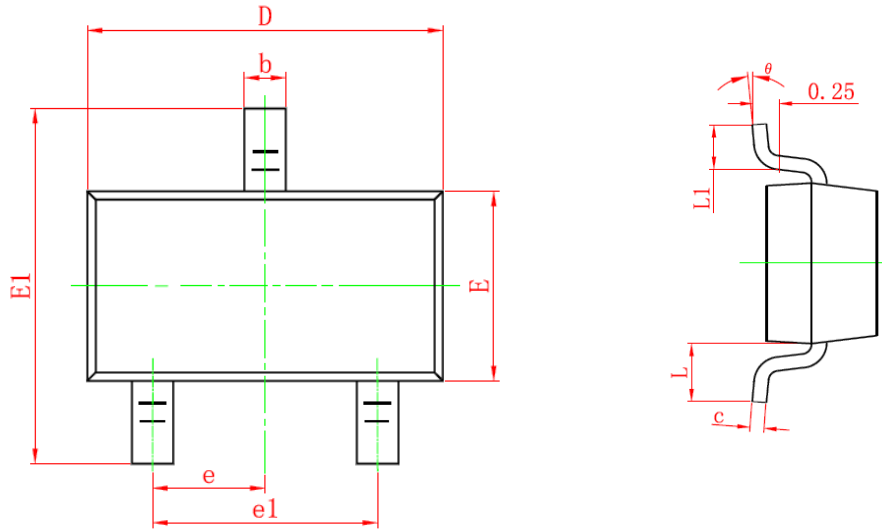
**Figure 13 Safe Operation Area**



**Figure 14 Normalized Maximum Transient Thermal Impedance**

## SOT-23 PACKAGE INFORMATION

Dimensions in Millimeters (UNIT:mm)



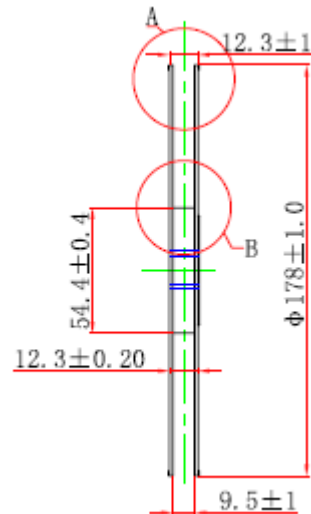
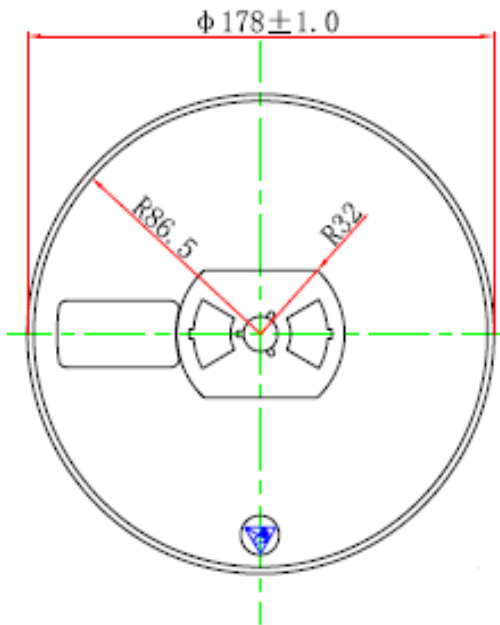
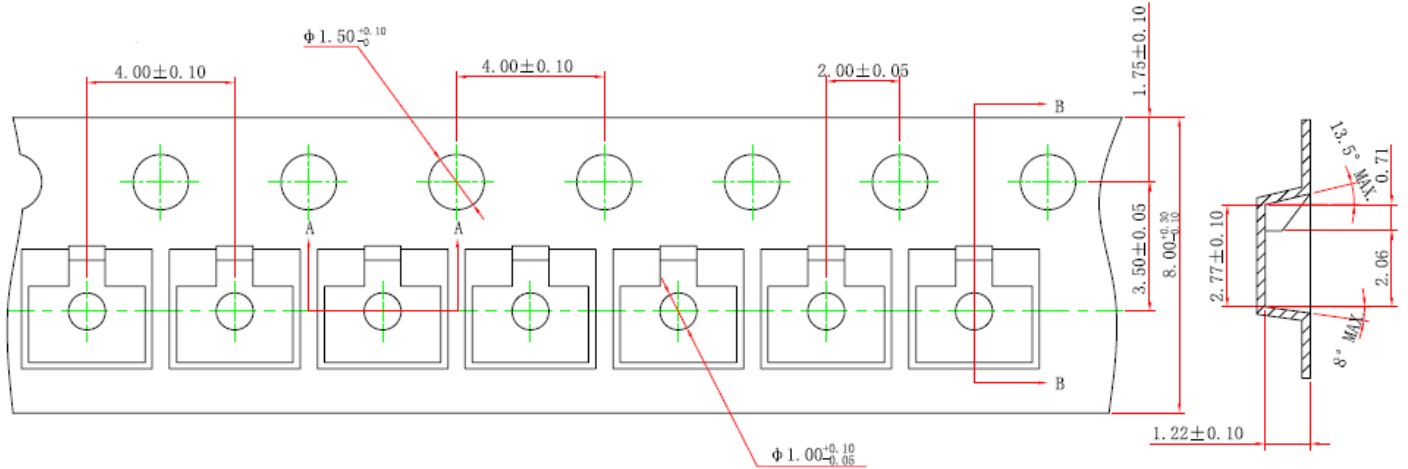
Symbol	Dimensions in Millimeters	
	MIN.	MAX.
A	0.900	1.150
A1	0.000	0.100
A2	0.900	1.050
b	0.300	0.500
c	0.080	0.150
D	2.800	3.000
E	1.200	1.400
E1	2.250	2.550
e	0.950TYP	
e1	1.800	2.000
L	0.550REF	
L1	0.300	0.500
θ	0°	8°

### NOTES

1. All dimensions are in millimeters.
2. Tolerance  $\pm 0.10\text{mm}$  (4 mil) unless otherwise specified
3. Package body sizes exclude mold flash and gate burrs. Mold flash at the non-lead sides should be less than 5 mils.
4. Dimension L is measured in gauge plane.
5. Controlling dimension is millimeter, converted inch dimensions are not necessarily exact.

## SOT 23 Tape and Reel Information

Dimensions in Millimeters (UNIT:mm)



### NOTES:

1. All dimensions are in millimeters.
2. 10 Sprocket hole pitch cumulative tolerance  $\pm 0.20$  MAX
3. General tolerance  $\pm 0.25$

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