



# TN60N20TE

## N-Channel Enhancement Mode Power MOSFET

### Product Summary

- $V_{DS} = 20V, I_D = 60A$
- $R_{DS(on)} < 6m\Omega @ V_{GS} = 4.5V$
- $R_{DS(on)} < 8.5m\Omega @ V_{GS} = 2.5V$

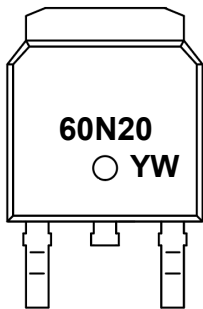
### Features

- Advanced Trench Technology
- 100% Avalanche Tested
- RoHS Compliant
- Halogen and Antimony Free
- Moisture Sensitivity Level 3

### Application

- Load Switch
- PWM Application
- Power Management

### Marking Code



### Absolute Maximum Ratings

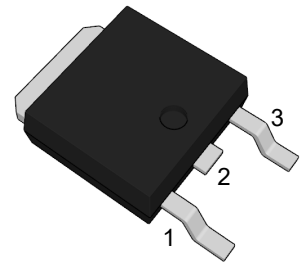
Ratings at 25°C case temperature unless otherwise specified.

Parameter	Symbol	Value	Unit
Drain-Source Voltage	$V_{DS}$	20	V
Gate-Source Voltage	$V_{GS}$	$\pm 12$	V
Drain Current-Continuous	$I_D$	60	A
Drain Current-Pulsed <sup>Note1</sup>	$I_{DM}$	240	A
Maximum Power Dissipation	$P_D$	37	W
Single Pulse Avalanche Energy <sup>Note2</sup>	$E_{AS}$	60	mJ
Junction Temperature	$T_J$	150	°C
Storage Temperature Range	$T_{STG}$	-55 to +150	°C

### Thermal Characteristics

Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	3.4	°C/W
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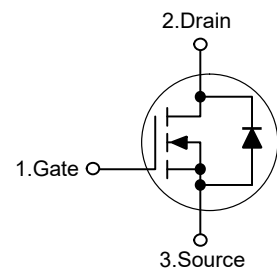
### TO-252



(Top View)

Pin	Description
1	Gate
2	Drain
3	Source

### Schematic Diagram





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### Electrical Characteristics

(T<sub>J</sub>=25°C unless otherwise specified)

Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Static Characteristics						
Drain-Source Breakdown Voltage	V <sub>(BR)DSS</sub>	V <sub>GS</sub> =0V, I <sub>D</sub> =250μA	20	--	--	V
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>DS</sub> =20V, V <sub>GS</sub> =0V	--	--	1	μA
Gate-Body Leakage Current	I <sub>GSS</sub>	V <sub>GS</sub> =±12V, V <sub>DS</sub> =0V	--	--	±100	nA
Gate Threshold Voltage <sup>Note3</sup>	V <sub>GS(th)</sub>	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250μA	0.4	0.65	1	V
Drain-Source On-Resistance <sup>Note3</sup>	R <sub>DS(on)</sub>	V <sub>GS</sub> =4.5V, I <sub>D</sub> =25A	--	4.9	6	mΩ
		V <sub>GS</sub> =2.5V, I <sub>D</sub> =15A	--	6.8	8.5	mΩ
Forward Transconductance <sup>Note3</sup>	g <sub>FS</sub>	V <sub>DS</sub> =5V, I <sub>D</sub> =2A	--	11	--	S
Dynamic Characteristics						
Input Capacitance	C <sub>iss</sub>	V <sub>DS</sub> =10V, V <sub>GS</sub> =0V, f=1MHz	--	1563	--	pF
Output Capacitance	C <sub>oss</sub>		--	234	--	pF
Reverse Transfer Capacitance	C <sub>rss</sub>		--	213	--	pF
Gate Resistance	R <sub>g</sub>	V <sub>DS</sub> =0V, V <sub>GS</sub> =0V, f=1MHz	--	1.5	--	Ω
Total Gate Charge	Q <sub>g</sub>	V <sub>DS</sub> =10V, I <sub>D</sub> =20A, V <sub>GS</sub> =4.5V	--	23	--	nC
Gate-Source Charge	Q <sub>gs</sub>		--	4	--	nC
Gate-Drain Charge	Q <sub>gd</sub>		--	7	--	nC
Switching Characteristics						
Turn-on Delay Time	t <sub>d(on)</sub>	V <sub>DD</sub> =10V, I <sub>D</sub> =20A, V <sub>GS</sub> =4.5V, R <sub>GEN</sub> =3Ω	--	12	--	nS
Turn-on Rise Time	t <sub>r</sub>		--	33	--	nS
Turn-off Delay Time	t <sub>d(off)</sub>		--	48	--	nS
Turn-off Fall Time	t <sub>f</sub>		--	95	--	nS
Source-Drain Diode Characteristics						
Diode Forward Voltage <sup>Note3</sup>	V <sub>SD</sub>	V <sub>GS</sub> =0V, I <sub>S</sub> =30A	--	--	1.2	V
Diode Forward Current	I <sub>S</sub>		--	--	60	A

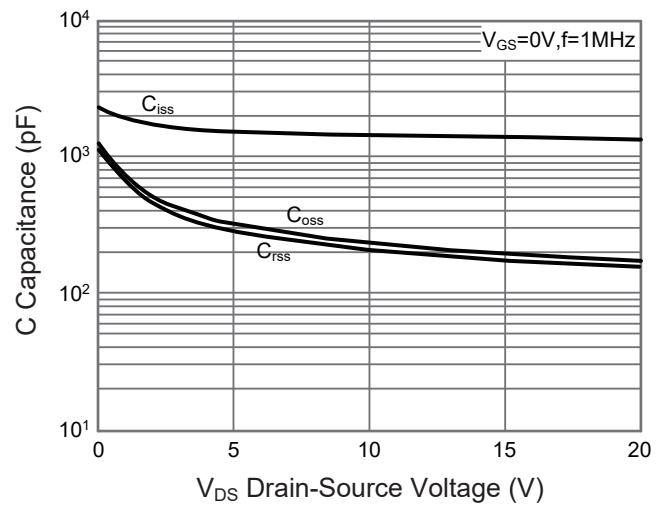
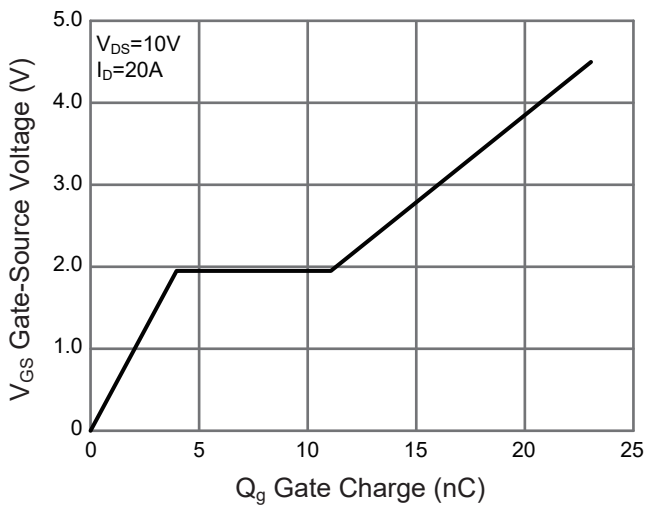
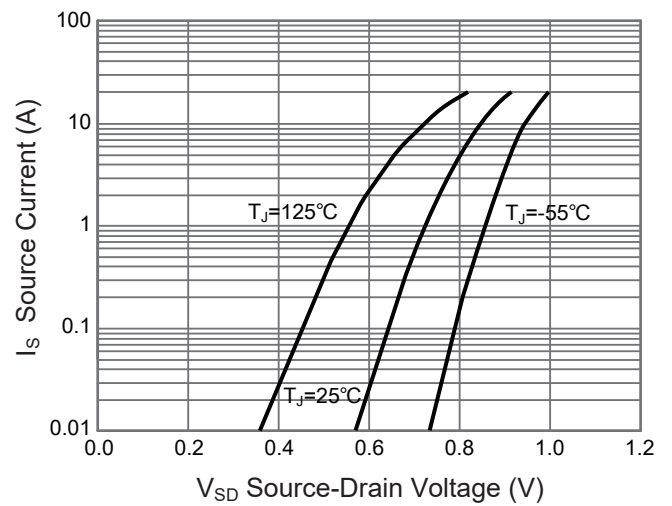
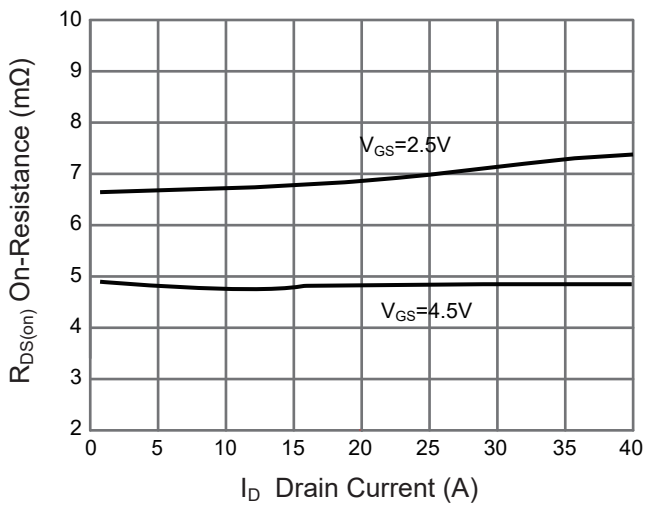
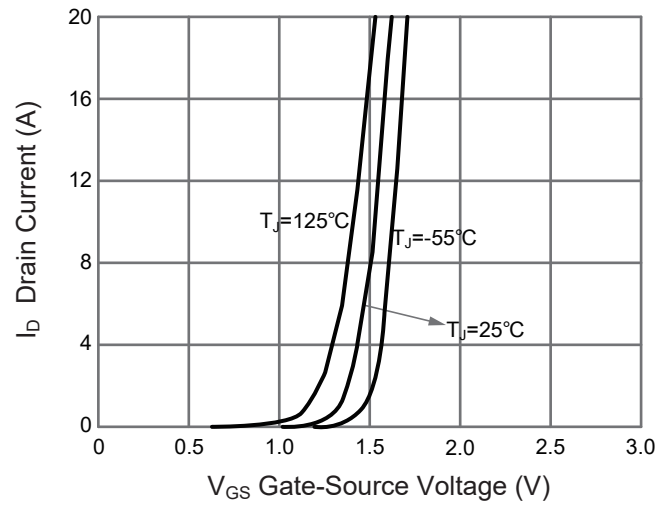
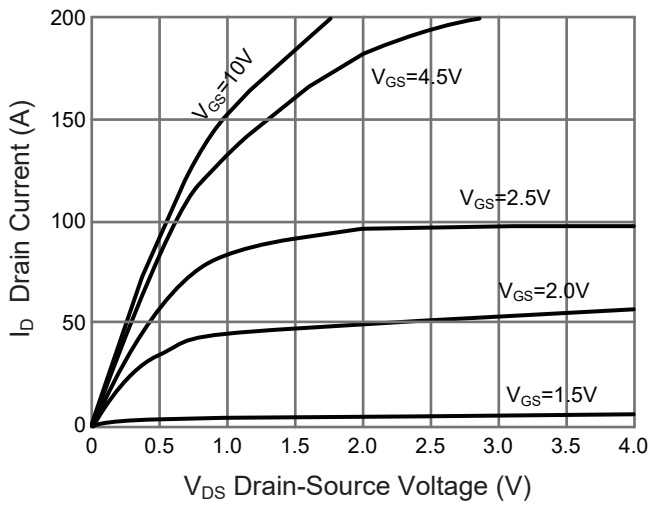
Note: 1. Repetitive Rating: Pulse width limited by maximum junction temperature  
2. EAS condition: T<sub>J</sub>=25°C, V<sub>DD</sub>=15V, V<sub>G</sub>=10V, R<sub>G</sub>=25Ω, L=0.5mH, I<sub>AS</sub>=15.5A  
3. Pulse Test: Pulse Width≤300μs, Duty Cycle≤0.5%



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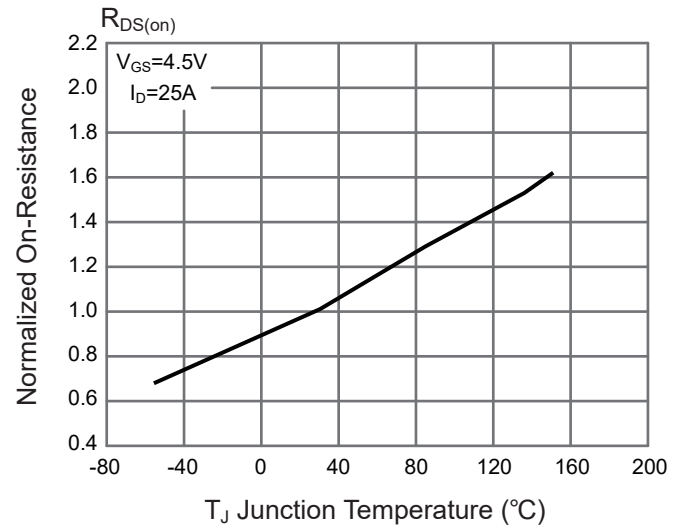
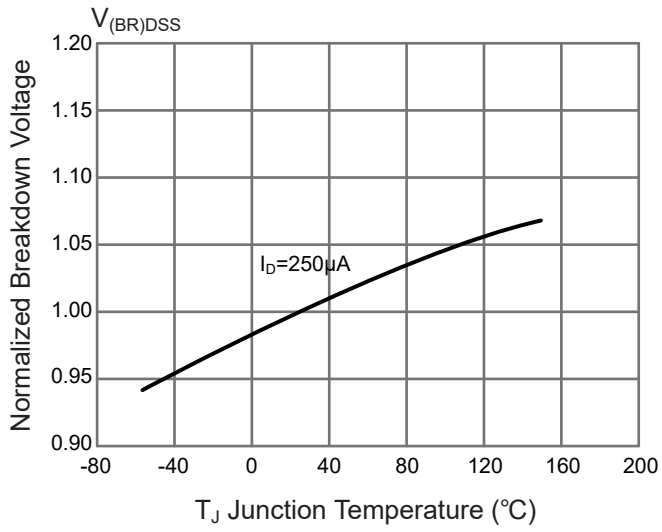
### Typical Characteristic Curves





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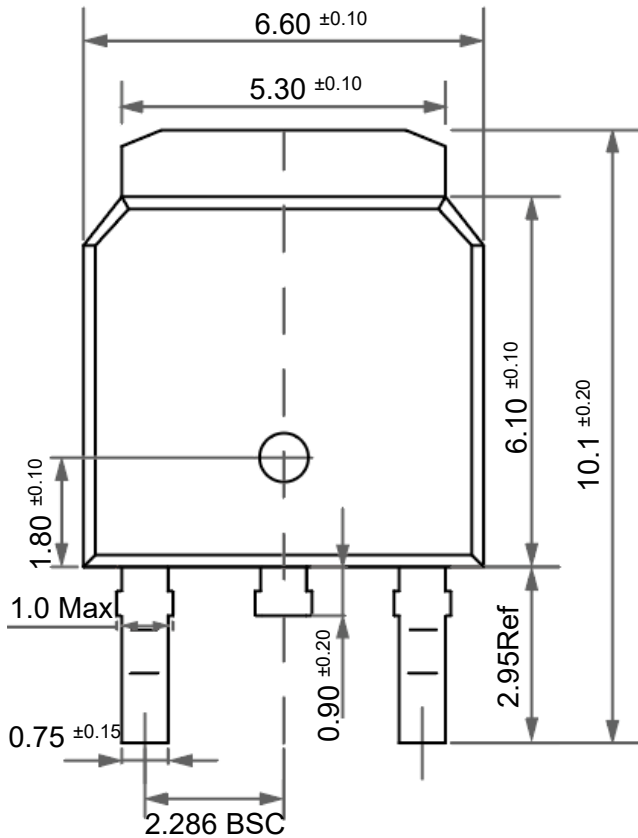
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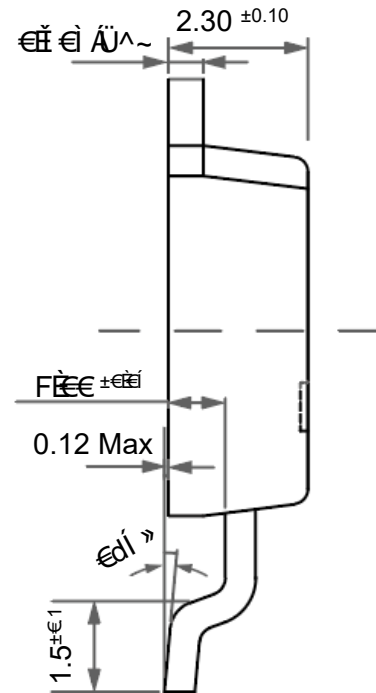
### Package Outline

TO-252

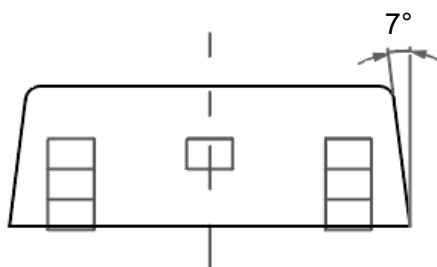
Dimensions in mm



Front View



Side View



Bottom View

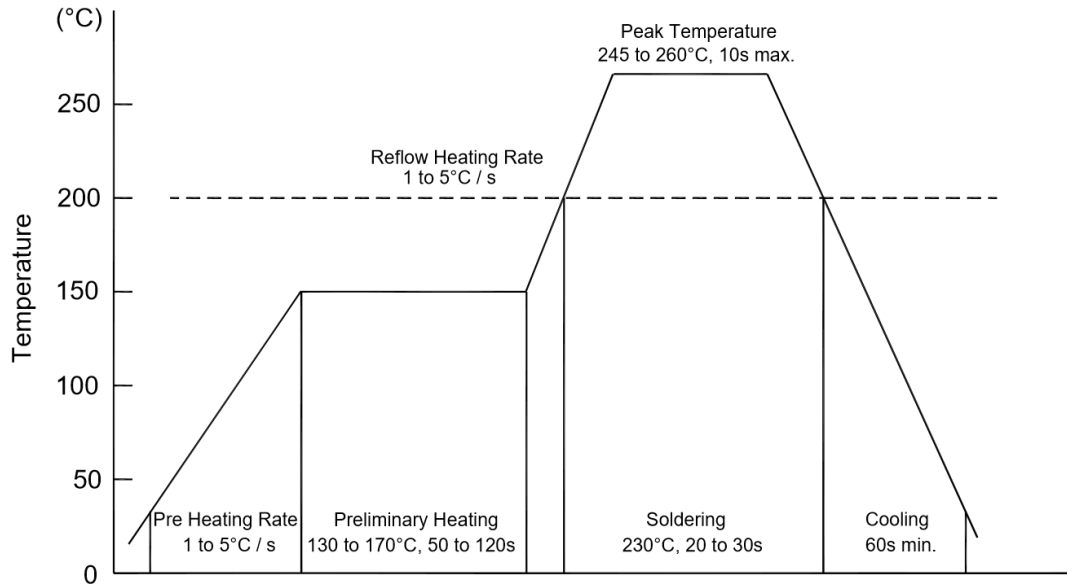
### Ordering Information

Device	Package	Shipping
TN60N20TE	TO-252	2,500PCS/Reel&13inches



### Conditions of Soldering and Storage

#### ◆ Recommended condition of reflow soldering



Recommended peak temperature is over 245°C. If peak temperature is below 245°C, you may adjust the following parameters:

- Time length of peak temperature (longer)
- Time length of soldering (longer)
- Thickness of solder paste (thicker)

#### ◆ Conditions of hand soldering

- Temperature: 300°C
- Time: 3s max.
- Times: one time

#### ◆ Storage conditions

- **Temperature**  
5 to 40°C
- **Humidity**  
30 to 80% RH
- **Recommended period**  
One year after manufacturing

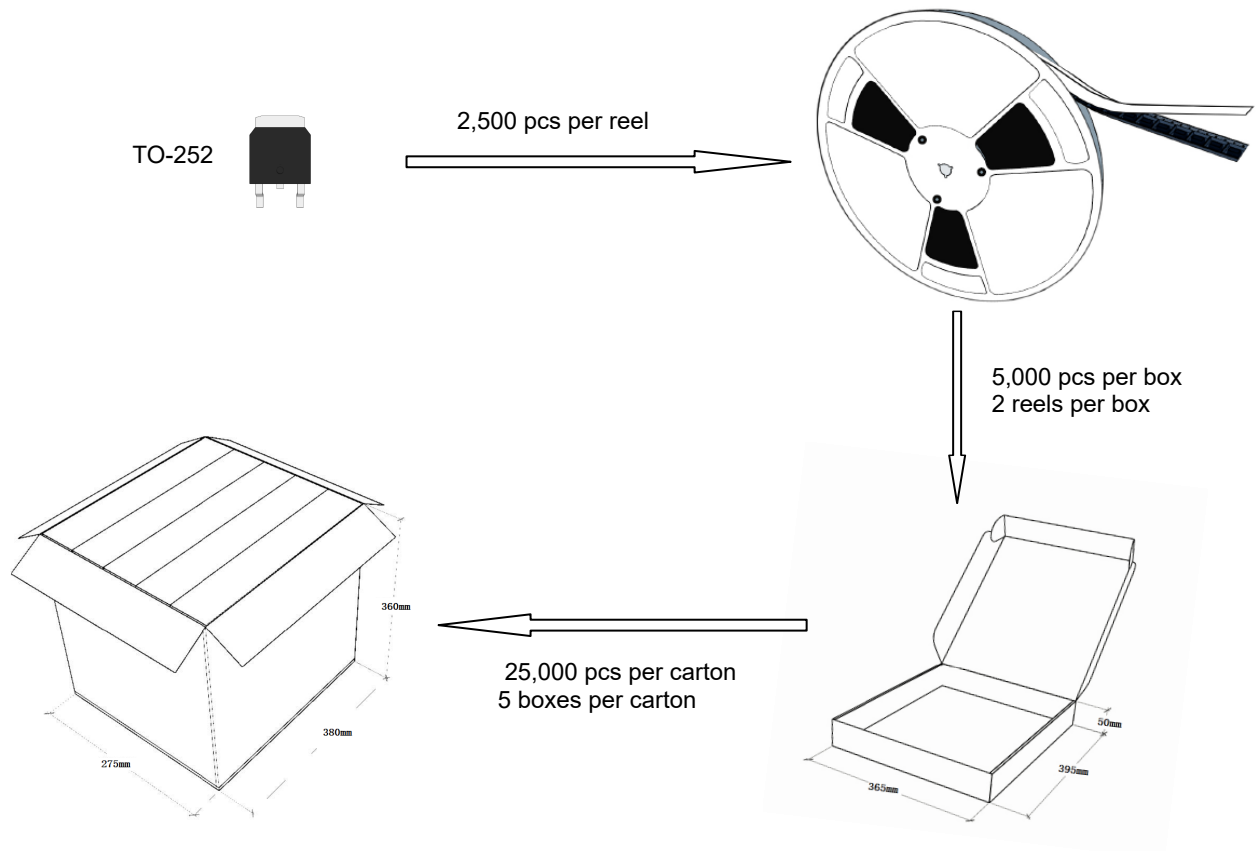


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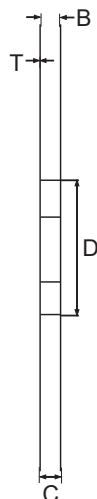
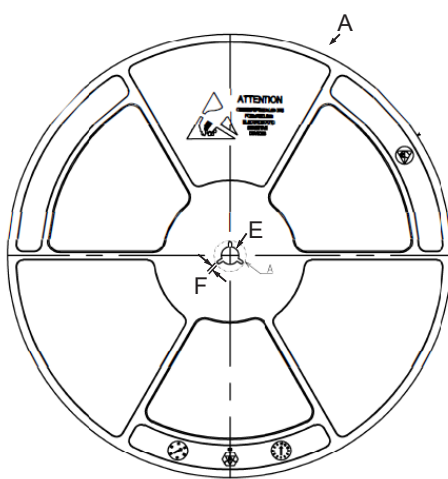
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### Package Specifications

- The method of packaging



### ◆ reel data



Symbol	Value(unit:mm)
A	$\Phi 330.2 \pm 1$
B	$17 \pm 0.5$
C	$21.2 \pm 2$
D	$\Phi 100 \pm 0.5$
E	$\Phi 13.4 \pm 0.2$
F	$2.3 \pm 0.2$
T	$2.1 \pm 0.2$



## 3






### Contact Information

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For additional information, please contact your local Sales Representative.

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