

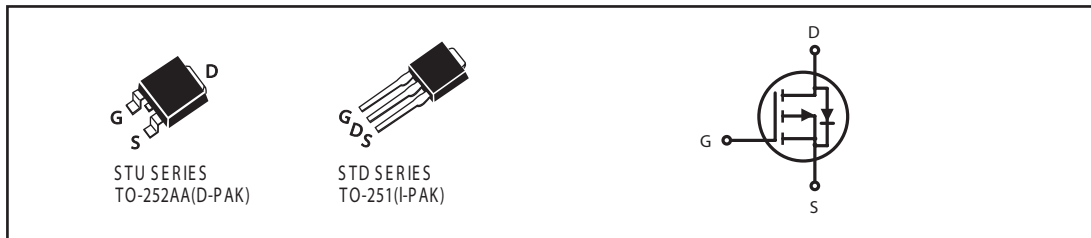


## P-Channel Enhancement Mode Field Effect Transistor

PRODUCT SUMMARY		
V <sub>DSS</sub>	I <sub>D</sub>	R <sub>DS(ON)</sub> (mΩ) Max
-55V	-15A	68 @ V <sub>GS</sub> = -10V
		85 @ V <sub>GS</sub> = -4.5V

### FEATURES

- Super high dense cell design for low R<sub>DS(ON)</sub>.
- Rugged and reliable.
- TO-252 and TO-251 Package.



### ABSOLUTE MAXIMUM RATINGS (T<sub>A</sub>=25°C unless otherwise noted)

Parameter	Symbol	Limit	Unit	
Drain-Source Voltage Rating	V <sub>spike</sub> <sup>d</sup>	60	V	
Drain-Source Voltage	V <sub>DS</sub>	-55	V	
Gate-Source Voltage	V <sub>GS</sub>	±20	V	
Drain Current-Continuous <sup>a</sup> @ T <sub>a</sub>	I <sub>D</sub>	25°C	-15	A
		70°C	-12	A
-Pulsed <sup>b</sup>	I <sub>DM</sub>	-30	A	
Drain-Source Diode Forward Current <sup>a</sup>	I <sub>S</sub>	-10	A	
Maximum Power Dissipation <sup>a</sup>	P <sub>D</sub>	T <sub>a</sub> =25°C	42	W
		T <sub>a</sub> =70°C	28	
Operating Junction and Storage Temperature Range	T <sub>J</sub> , T <sub>STG</sub>	-55 to 150	°C	

### THERMAL CHARACTERISTICS

Thermal Resistance, Junction-to-Case	R <sub>θJC</sub>	3	°C/W
Thermal Resistance, Junction-to-Ambient	R <sub>θJA</sub>	50	°C/W

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ELECTRICAL CHARACTERISTICS (T<sub>A</sub> = 25°C unless otherwise noted)

Parameter	Symbol	Condition	Min	Typ <sup>c</sup>	Max	Unit
<b>OFF CHARACTERISTICS</b>						
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	V <sub>GS</sub> = 0V, I <sub>D</sub> = -250uA	-55			V
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>DS</sub> = -44V, V <sub>GS</sub> = 0V			-1	uA
Gate-Body Leakage	I <sub>GSS</sub>	V <sub>GS</sub> = ±20V, V <sub>DS</sub> = 0V			±100	nA
<b>ON CHARACTERISTICS<sup>b</sup></b>						
Gate Threshold Voltage	V <sub>GS(th)</sub>	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = -250uA	-1.3	-1.8	-2.5	V
Drain-Source On-State Resistance	R <sub>DS(ON)</sub>	V <sub>GS</sub> = -10V, I <sub>D</sub> = -10A		50	68	m-ohm
		V <sub>GS</sub> = -4.5V, I <sub>D</sub> = -6A		65	85	m-ohm
On-State Drain Current	I <sub>D(ON)</sub>	V <sub>DS</sub> = -5V, V <sub>GS</sub> = -10V	20			A
Forward Transconductance	g <sub>FS</sub>	V <sub>DS</sub> = -15V, I <sub>D</sub> = -10A		12		S
<b>DYNAMIC CHARACTERISTICS<sup>c</sup></b>						
Input Capacitance	C <sub>ISS</sub>	V <sub>DS</sub> = -30V, V <sub>GS</sub> = 0V f = 1.0MHz		830	985	pF
Output Capacitance	C <sub>OSS</sub>			110	125	pF
Reverse Transfer Capacitance	C <sub>RSS</sub>			65	75	pF
<b>SWITCHING CHARACTERISTICS<sup>c</sup></b>						
Turn-On Delay Time	t <sub>D(ON)</sub>	V <sub>D</sub> = -30V, I <sub>D</sub> = -1A, V <sub>GEN</sub> = -10V, R <sub>GEN</sub> = 6 ohm		7.1	8	ns
Rise Time	t <sub>r</sub>			22.7	26	ns
Turn-Off Delay Time	t <sub>D(OFF)</sub>			59.3	68	ns
Fall Time	t <sub>f</sub>			24.9	28	ns
Total Gate Charge	Q <sub>g</sub>	V <sub>DS</sub> = -30V, I <sub>D</sub> = -5A, V <sub>GS</sub> = -10V		16.7	19	nC
		V <sub>DS</sub> = -30V, I <sub>D</sub> = -5A, V <sub>GS</sub> = -4.5V		8.1	9.5	nC
Gate-Source Charge	Q <sub>gs</sub>	V <sub>DS</sub> = -30V, I <sub>D</sub> = -5A, V <sub>GS</sub> = -10V		1.9	2.6	nC
Gate-Drain Charge	Q <sub>gd</sub>			4.1	4.7	nC

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## ELECTRICAL CHARACTERISTICS ( $T_A=25^\circ\text{C}$ unless otherwise noted)

Parameter	Symbol	Condition	Min	Typ <sup>c</sup>	Max	Unit
<b>DRAIN-SOURCE DIODE CHARACTERISTICS<sup>b</sup></b>						
Diode Forward Voltage	$V_{SD}$	$V_{GS} = 0V, I_s = -10A$		-0.9	-1.3	V

### Notes

- a. Surface Mounted on FR4 Board,  $t \leq 10\text{sec}$ .
- b. Pulse Test: Pulse Width  $\leq 300\mu\text{s}$ , Duty Cycle  $\leq 2\%$ .
- c. Guaranteed by design, not subject to production testing.
- d. Guaranteed when external  $R_g=6\ \text{ohm}$  and  $t_f < t_f\ \text{max}$

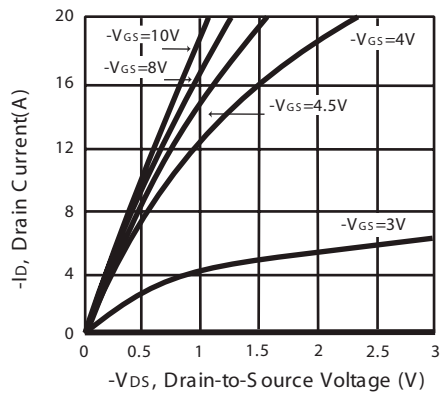


Figure 1. Output Characteristics

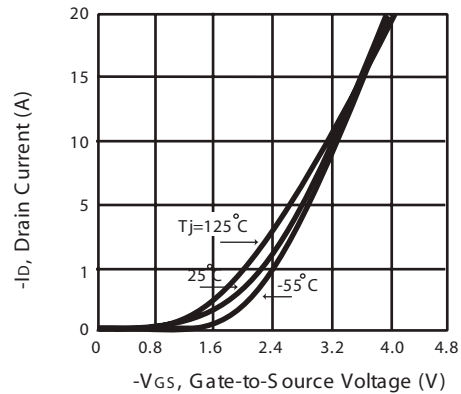


Figure 2. Transfer Characteristics

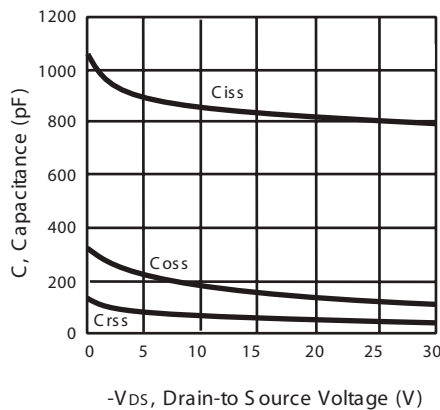


Figure 3. Capacitance

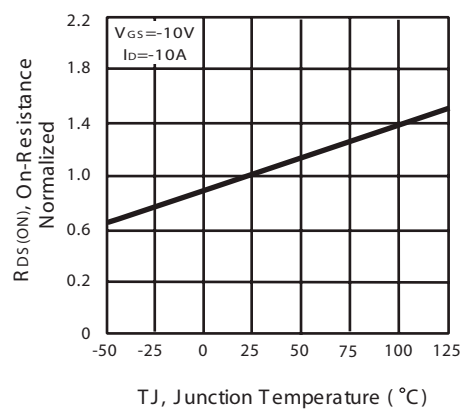


Figure 4. On-Resistance Variation with Temperature

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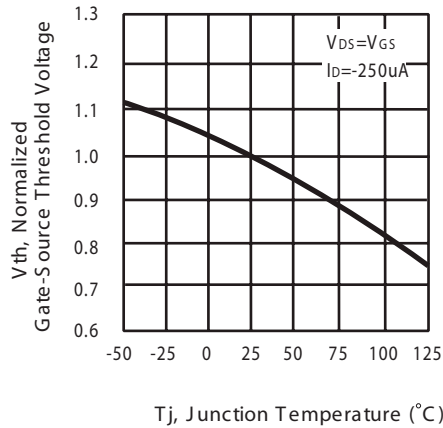


Figure 5. Gate Threshold Variation with Temperature

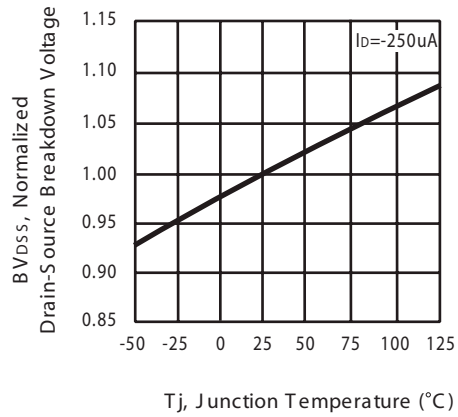


Figure 6. Breakdown Voltage Variation with Temperature

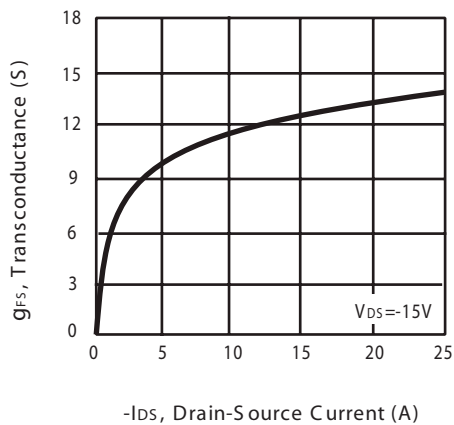


Figure 7. Transconductance Variation with Drain Current

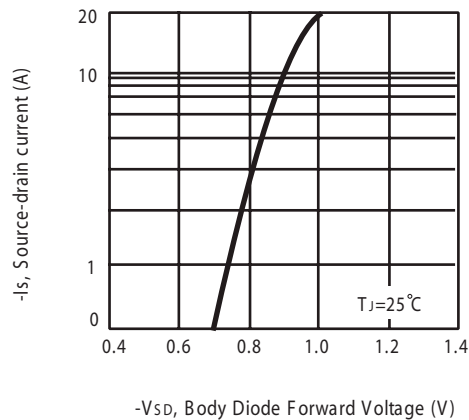


Figure 8. Body Diode Forward Voltage Variation with Source Current

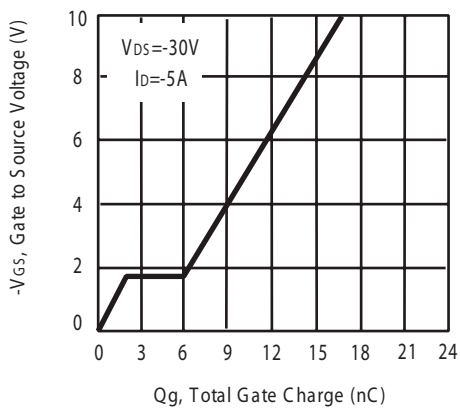


Figure 9. Gate Charge

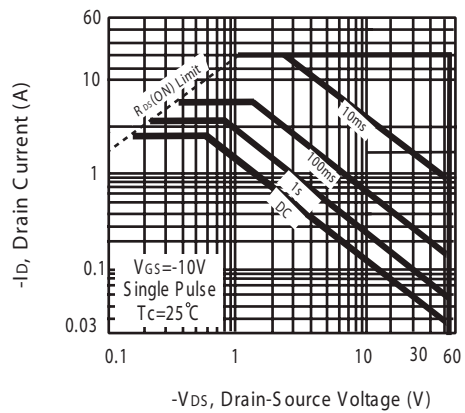


Figure 10. Maximum Safe Operating Area

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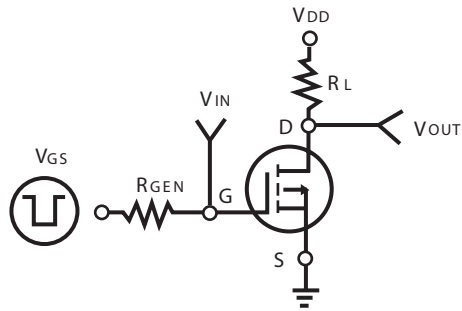


Figure 11. S switching Test Circuit

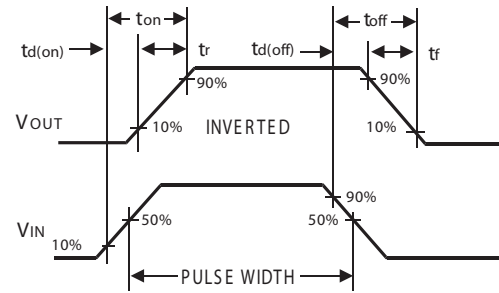
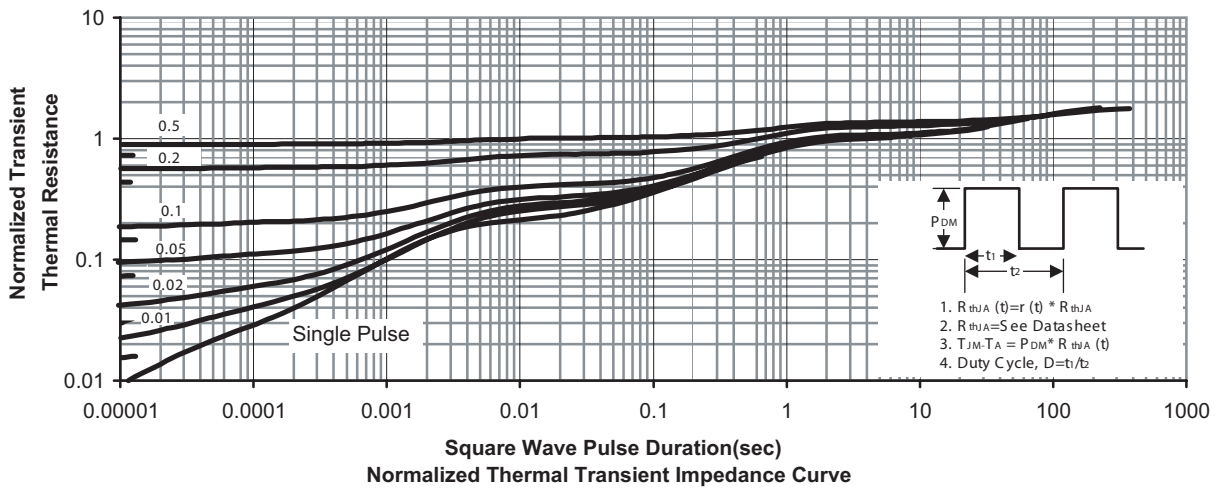


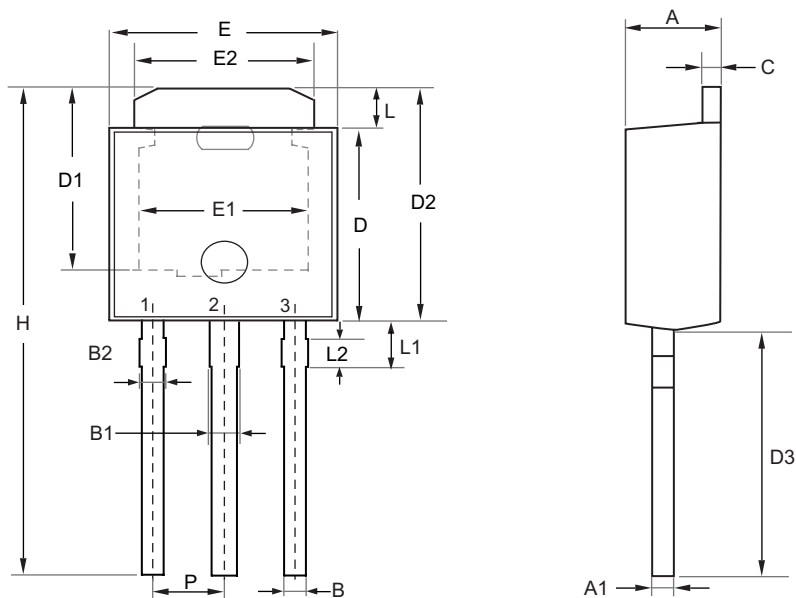
Figure 12. S switching Waveforms



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## PACKAGE OUTLINE DIMENSIONS

TO-251

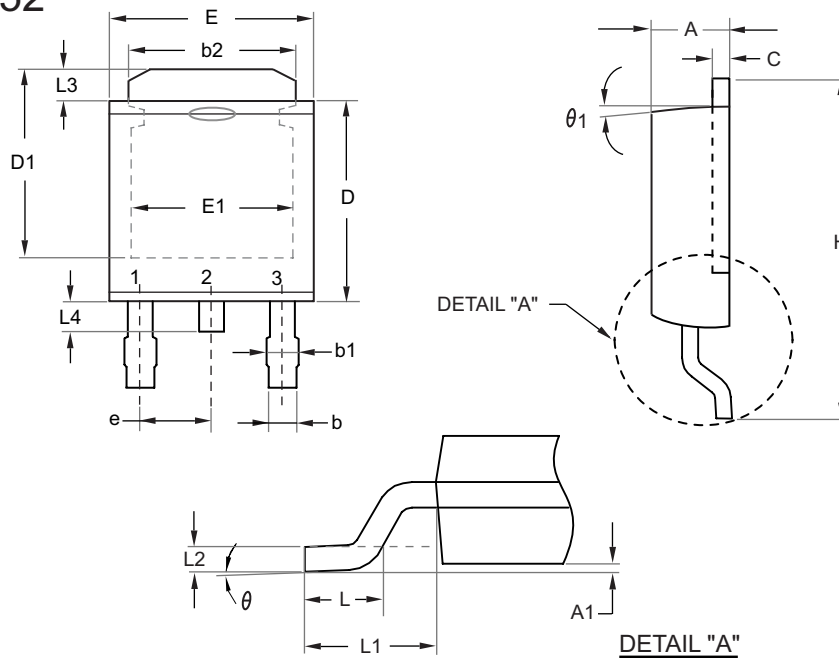


SYMBOL	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	2.100	2.500	0.083	0.098
A1	0.350	0.650	0.014	0.026
B	0.400	0.800	0.016	0.031
B1	0.650	1.050	0.026	0.041
B2	0.500	0.900	0.020	0.035
C	0.400	0.600	0.016	0.024
D	5.300	5.700	0.209	0.224
D1	4.900	5.300	0.193	0.209
D2	6.700	7.300	0.264	0.287
D3	7.000	8.000	0.276	0.315
H	13.700	15.300	0.539	0.602
E	6.300	6.700	0.248	0.264
E1	4.600	4.900	0.181	0.193
E2	4.800	5.200	0.189	0.205
L	1.300	1.700	0.051	0.067
L1	1.400	1.800	0.055	0.071
L2	0.500	0.900	0.020	0.035
P	2.300 BSC		0.091 BSC	

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## PACKAGE OUTLINE DIMENSIONS

TO-252

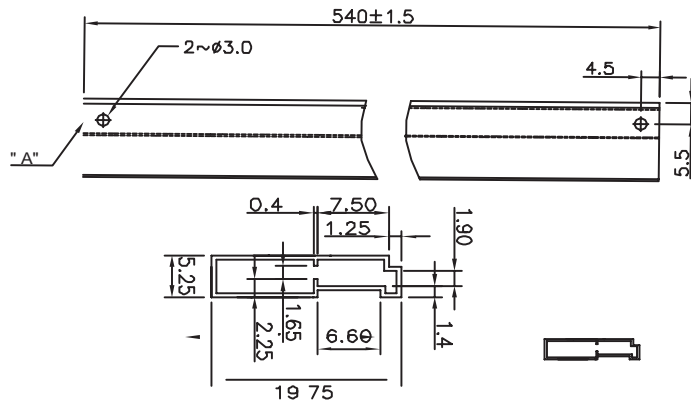


SYMBOLS	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	2.100	2.500	0.083	0.098
A1	0.000	0.200	0.000	0.008
b	0.400	0.889	0.016	0.035
b1	0.770	1.140	0.030	0.045
b2	4.800	5.460	0.189	0.215
C	0.400	0.600	0.016	0.024
D	5.300	6.223	0.209	0.245
D1	4.900	5.515	0.193	0.217
E	6.300	6.731	0.248	0.265
E1	4.400	5.004	0.173	0.197
e	2.290 REF		0.090 BSC	
H	8.900	10.400	0.350	0.409
L	1.397	1.770	0.055	0.070
L1	2.743 REF.		0.108 REF.	
L2	0.508 REF.		0.020 REF.	
L3	0.890	1.700	0.035	0.067
L4	0.500	1.100	0.020	0.043
$\theta$	0°	10°	0°	10°
$\theta_1$	7° REF.		7° REF.	

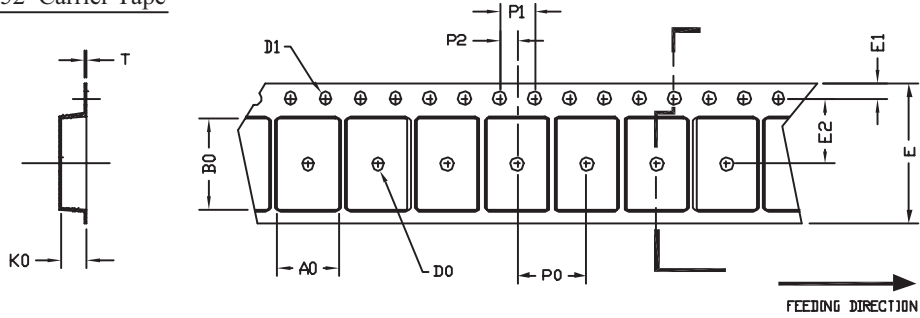
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## TO251 Tube/TO-252 Tape and Reel Data

### TO-251 Tube



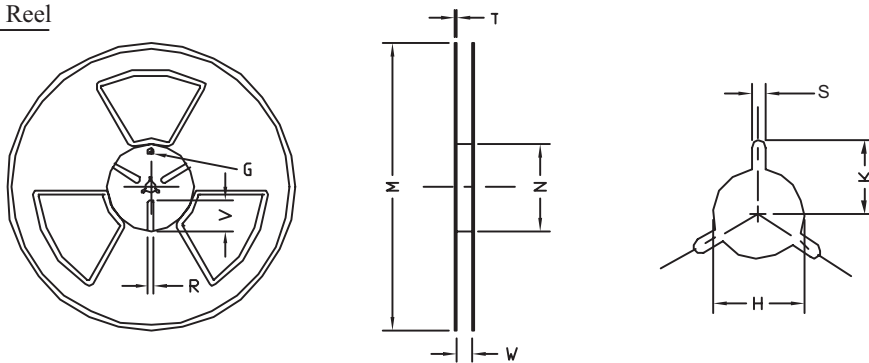
### TO-252 Carrier Tape



UNIT:mm

PACKAGE	A0	B0	K0	D0	D1	E	E1	E2	P0	P1	P2	T
TO-252 (16 mm)	6.80 ±0.1	10.3 ±0.1	2.50 ±0.1	φ2	φ1.5 +0.1 -0	16.0 0.3±	1.75 0.1±	7.5 ±0.15	8.0 ±0.1	4.0 ±0.1	2.0 ±0.15	0.3 ±0.05

### TO-252 Reel



UNIT:mm

TAPE SIZE	REEL SIZE	M	N	W	T	H	K	S	G	R	V
16 mm	φ 330	φ 330 ± 0.5	φ 97 ± 1.0	17.0 + 1.5 - 0	2.2	φ 13.0 + 0.5 - 0.2	10.6	2.0 ±0.5	---	---	---