



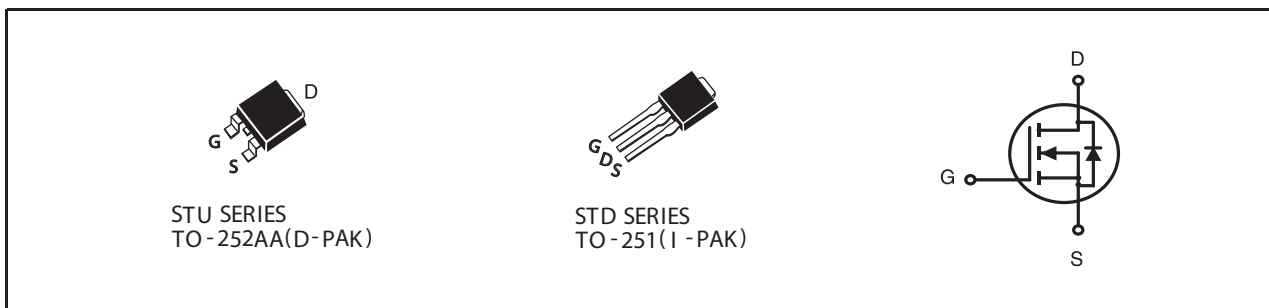
## N-Channel Logic Level Enhancement Mode Field Effect Transistor

### PRODUCT SUMMARY

VDSS	ID	RDS(ON) (mΩ) Max
40V	50A	10 @ VGS=10V
		12.5 @ VGS=4.5V

### FEATURES

- Super high dense cell design for low RDS(ON).
- Rugged and reliable.
- TO-252 and TO-251 Package.



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

Symbol	Parameter	Limit	Units
V <sub>DS</sub>	Drain-Source Voltage	40	V
V <sub>GS</sub>	Gate-Source Voltage	±20	V
I <sub>D</sub>	Drain Current-Continuous <sup>a</sup>	T <sub>C</sub> =25°C	50
		T <sub>C</sub> =70°C	40
I <sub>DM</sub>	-Pulsed <sup>b</sup>	146	A
E <sub>AS</sub>	Single Pulse Avalanche Energy <sup>d</sup>	14	mJ
P <sub>D</sub>	Maximum Power Dissipation <sup>a</sup>	T <sub>C</sub> =25°C	42
		T <sub>C</sub> =70°C	27
T <sub>J</sub> , T <sub>STG</sub>	Operating Junction and Storage Temperature Range	-55 to 150	°C

### THERMAL CHARACTERISTICS

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

# STU/D452S

Ver 1.0

## ELECTRICAL CHARACTERISTICS (TA=25°C unless otherwise noted)

Symbol	Parameter	Conditions	Min	Typ	Max	Units
<b>OFF CHARACTERISTICS</b>						
BV <sub>DSS</sub>	Drain-Source Breakdown Voltage	V <sub>GS</sub> =0V , I <sub>D</sub> =250uA	40			V
I <sub>DSS</sub>	Zero Gate Voltage Drain Current	V <sub>DS</sub> =32V , V <sub>GS</sub> =0V			1	uA
I <sub>GSS</sub>	Gate-Body Leakage Current	V <sub>GS</sub> = ±20V , V <sub>DS</sub> =0V			±100	nA
<b>ON CHARACTERISTICS</b>						
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250uA	1	1.6	3	V
R <sub>DS(ON)</sub>	Drain-Source On-State Resistance	V <sub>GS</sub> =10V , I <sub>D</sub> =25A		8	10	m ohm
		V <sub>GS</sub> =4.5V , I <sub>D</sub> =22A		9.5	13	m ohm
g <sub>FS</sub>	Forward Transconductance	V <sub>DS</sub> =10V , I <sub>D</sub> =25A		65		S
<b>DYNAMIC CHARACTERISTICS <sup>c</sup></b>						
C <sub>ISS</sub>	Input Capacitance	V <sub>DS</sub> =20V, V <sub>GS</sub> =0V f=1.0MHz		1370		pF
C <sub>OSS</sub>	Output Capacitance			220		pF
C <sub>RSS</sub>	Reverse Transfer Capacitance			162		pF
<b>SWITCHING CHARACTERISTICS <sup>c</sup></b>						
t <sub>D(ON)</sub>	Turn-On Delay Time	V <sub>DD</sub> =20V I <sub>D</sub> =1A V <sub>GS</sub> =10V R <sub>GEN</sub> = 6 ohm		24		ns
t <sub>r</sub>	Rise Time			30		ns
t <sub>D(OFF)</sub>	Turn-Off Delay Time			66		ns
t <sub>f</sub>	Fall Time			17		ns
Q <sub>g</sub>	Total Gate Charge	V <sub>DS</sub> =20V, I <sub>D</sub> =25A, V <sub>GS</sub> =10V		26		nC
		V <sub>DS</sub> =20V, I <sub>D</sub> =25A, V <sub>GS</sub> =4.5V		12.5		nC
Q <sub>gs</sub>	Gate-Source Charge	V <sub>DS</sub> =20V, I <sub>D</sub> =25A, V <sub>GS</sub> =10V		3		nC
Q <sub>gd</sub>	Gate-Drain Charge			6.8		nC
<b>DRAIN-SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS</b>						
I <sub>S</sub>	Maximum Continuous Drain-Source Diode Forward Current				3	A
V <sub>SD</sub>	Diode Forward Voltage <sup>b</sup>	V <sub>GS</sub> =0V, I <sub>S</sub> =3A		0.76	1.3	V

### Notes

- Surface Mounted on FR4 Board, t ≤ 10sec.
- Pulse Test: Pulse Width ≤ 300us, Duty Cycle ≤ 2%.
- Guaranteed by design, not subject to production testing.
- Starting T<sub>J</sub>=25°C, L=0.5mH, V<sub>DD</sub> = 30V. (See Figure13)

Dec, 10, 2009

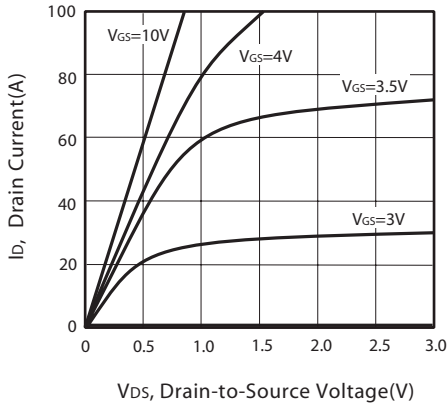


Figure 1. Output Characteristics

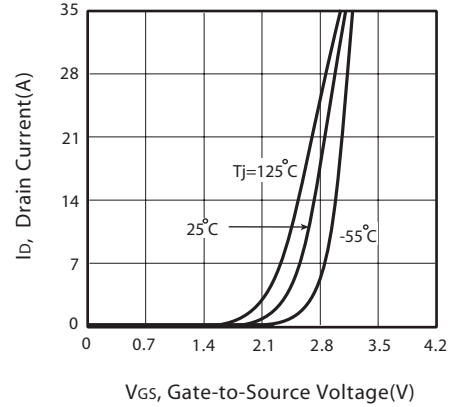


Figure 2. Transfer Characteristics

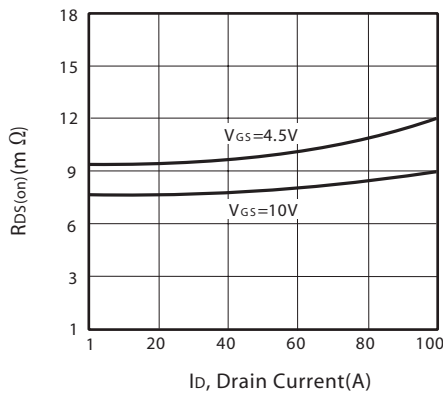


Figure 3. On-Resistance vs. Drain Current and Gate Voltage

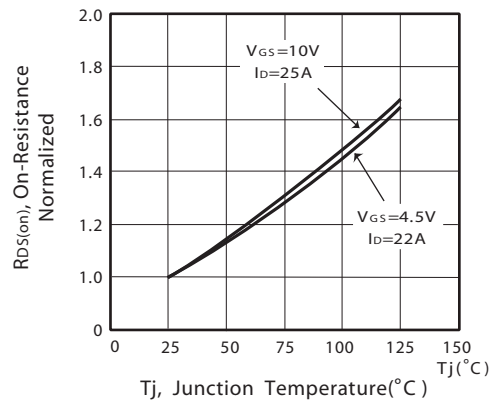


Figure 4. On-Resistance Variation with Drain Current and Temperature

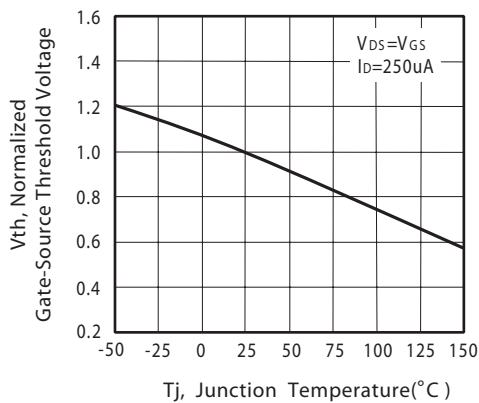


Figure 5. Gate Threshold Variation with Temperature

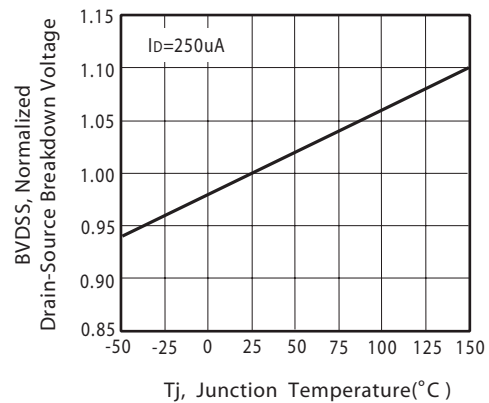


Figure 6. Breakdown Voltage Variation with Temperature

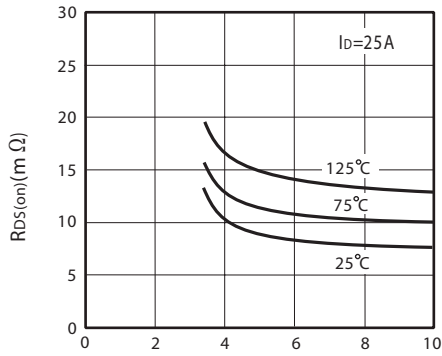


Figure 7. On-Resistance vs. Gate-Source Voltage

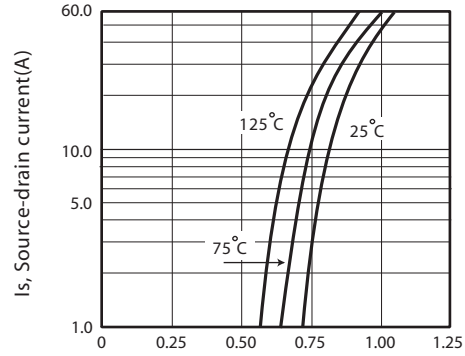


Figure 8. Body Diode Forward Voltage Variation with Source Current

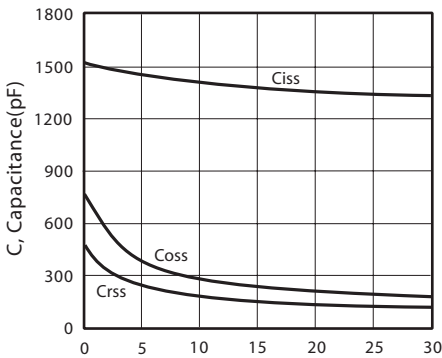


Figure 9. Capacitance

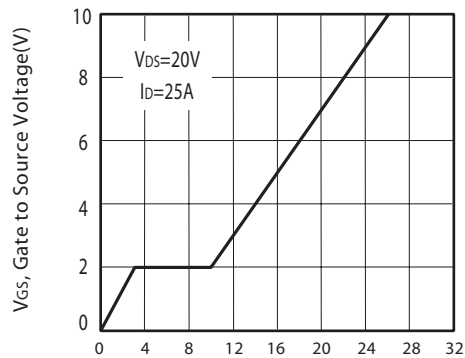


Figure 10. Gate Charge

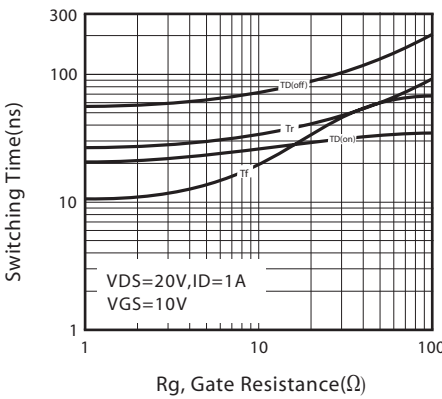


Figure 11. switching characteristics

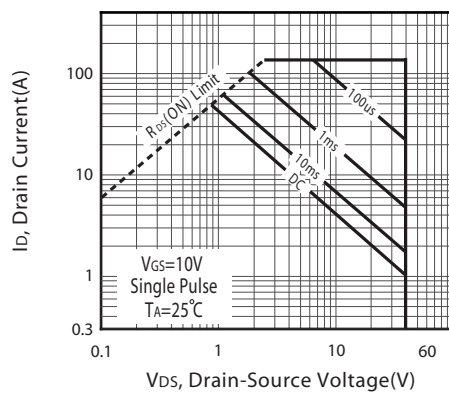
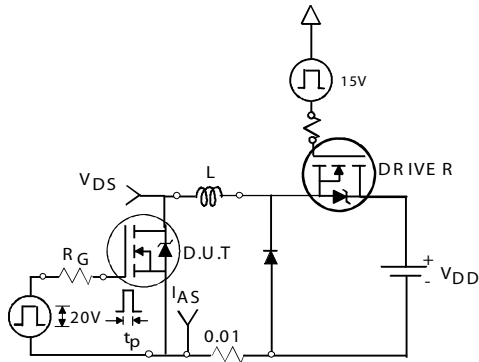
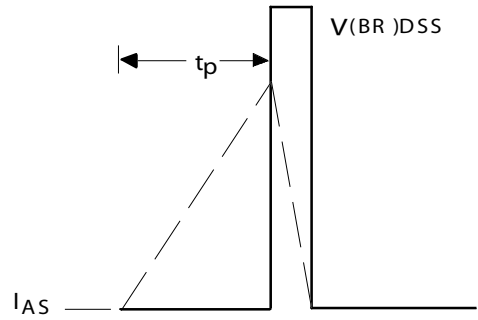


Figure 12. Maximum Safe Operating Area



Unclamped Inductive Test Circuit

Figure 13a.



Unclamped Inductive Waveforms

Figure 13b.

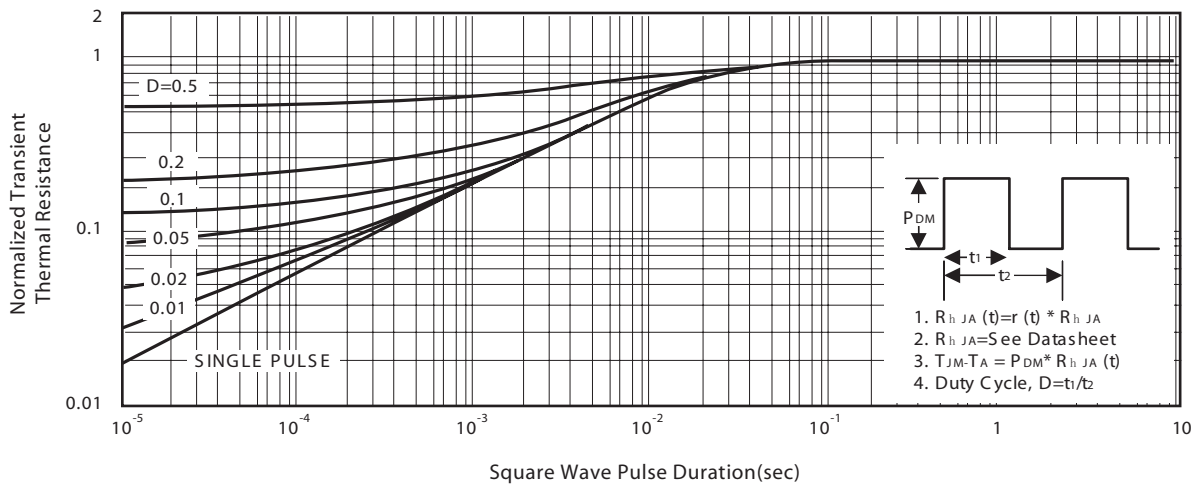
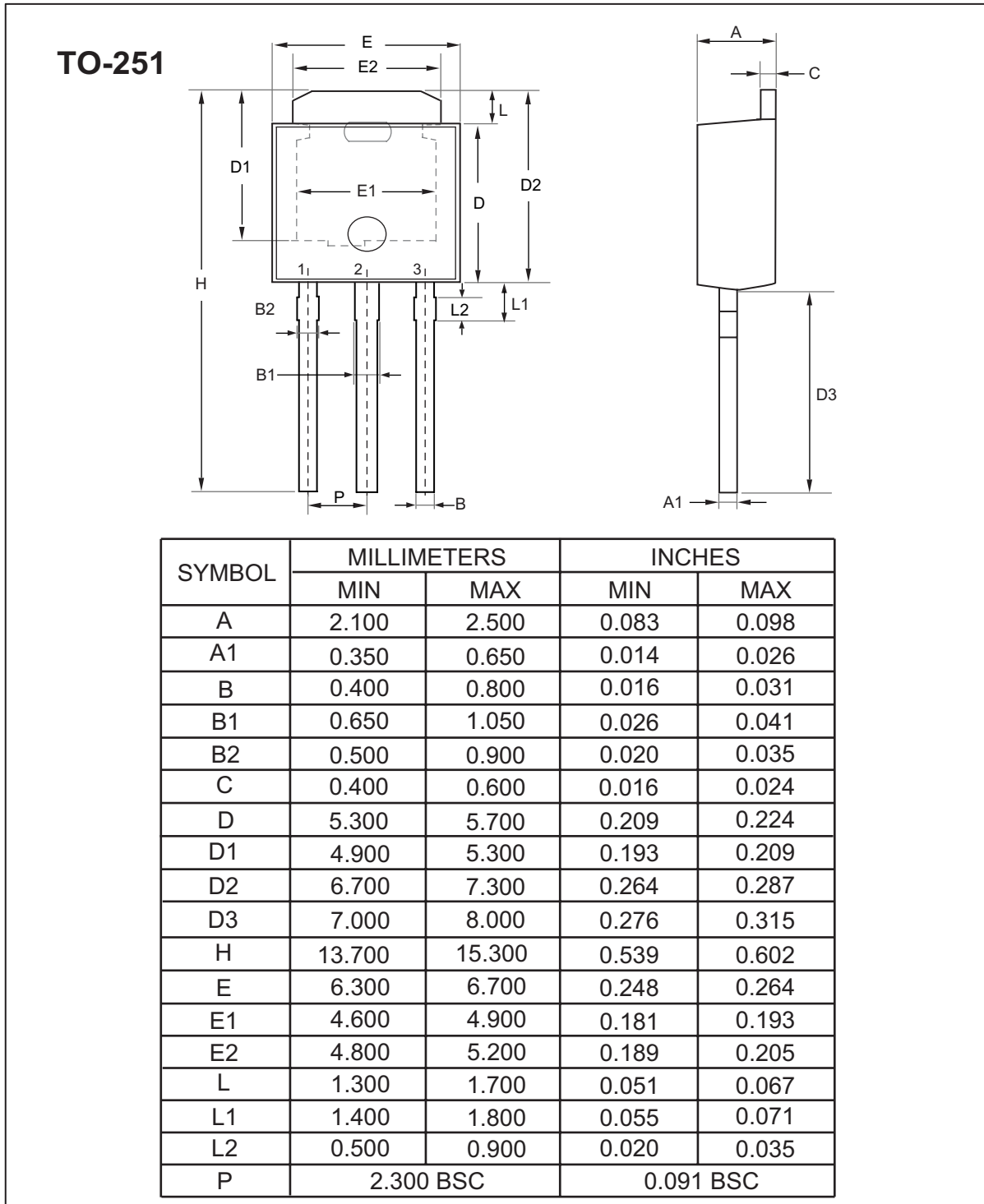


Figure 14. Normalized Thermal Transient Impedance Curve

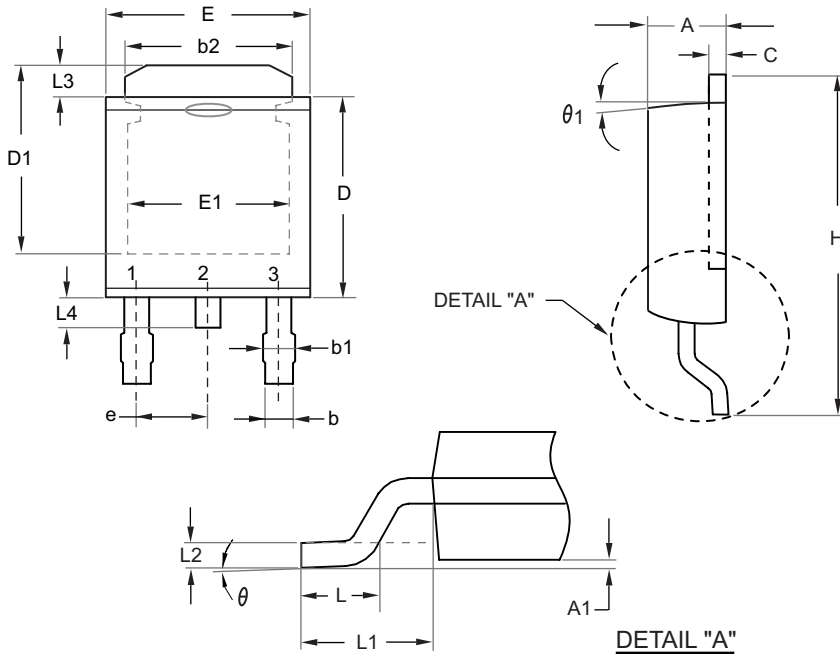
## PACKAGE OUTLINE DIMENSIONS



# STU/D452S

Ver 1.0

TO-252

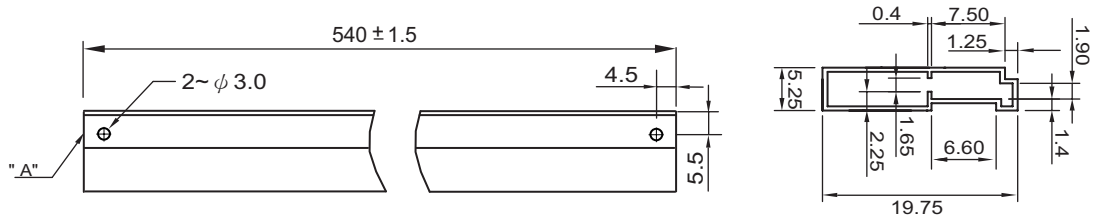


SYMBOLS	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	2.100	2.500	0.083	0.098
A1	0.000	0.200	0.000	0.008
b	0.400	0.889	0.016	0.035
b1	0.770	1.140	0.030	0.045
b2	4.800	5.460	0.189	0.215
C	0.400	0.600	0.016	0.024
D	5.300	6.223	0.209	0.245
D1	4.900	5.515	0.193	0.217
E	6.300	6.731	0.248	0.265
E1	4.400	5.004	0.173	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.	

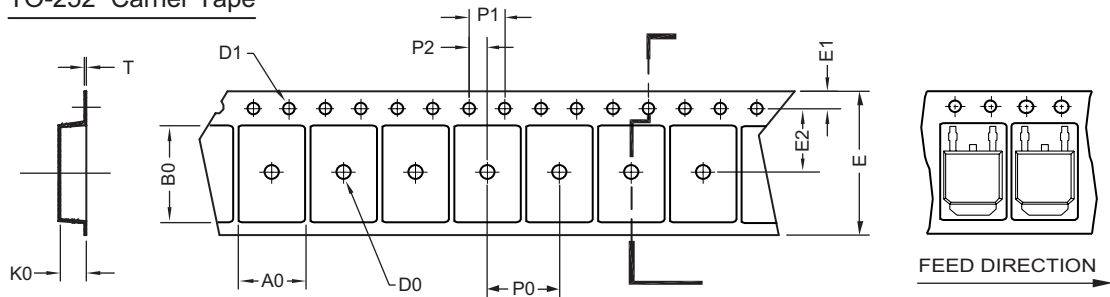
Dec,10,2009

## TO-251 Tube/TO-252 Tape and Reel Data

### TO-251 Tube



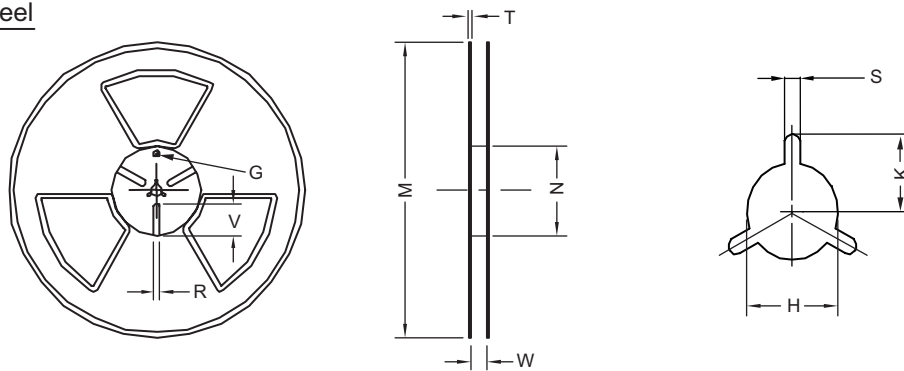
### TO-252 Carrier Tape



UNIT:mm

PACKAGE	A0	B0	K0	D0	D1	E	E1	E2	P0	P1	P2	T
TO-252 (16 mm)	6.96 ±0.1	10.49 ±0.1	2.79 ±0.1	φ 2	φ 1.5 + 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	---	---	---