



SamHop Microelectronics Corp.

**STU/D446S**

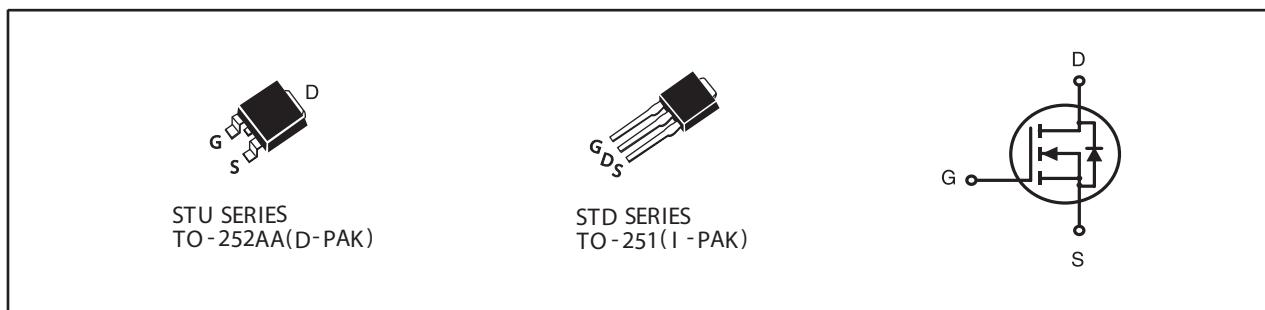
Ver 2.0

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

PRODUCT SUMMARY		
VDSS	ID	RDS(ON) (mΩ) Max
40V	38A	16.5 @ VGS=10V
		28 @ VGS=4.5V

### FEATURES

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



### ABSOLUTE MAXIMUM RATINGS ( $T_A=25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Limit	Units
$V_{DS}$	Drain-Source Voltage	40	V
$V_{GS}$	Gate-Source Voltage	$\pm 20$	V
$I_D$	Drain Current-Continuous <sup>a</sup>	38	A
	$T_C=25^\circ\text{C}$	38	A
	$T_C=70^\circ\text{C}$	30	A
$I_{DM}$	-Pulsed <sup>b</sup>	111	A
$E_{AS}$	Single Pulse Avalanche Energy <sup>d</sup>	64	mJ
$P_D$	Maximum Power Dissipation <sup>a</sup>	42	W
	$T_C=25^\circ\text{C}$	42	W
	$T_C=70^\circ\text{C}$	27	W
$T_J, T_{STG}$	Operating Junction and Storage Temperature Range	-55 to 150	$^\circ\text{C}$

### THERMAL CHARACTERISTICS

$R_{\theta JC}$	Thermal Resistance, Junction-to-Case <sup>a</sup>	3	$^\circ\text{C/W}$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient <sup>a</sup>	50	$^\circ\text{C/W}$

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## ELECTRICAL CHARACTERISTICS ( $T_A=25^\circ C$ 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	1.7	2.0	3	V
R <sub>DSON</sub>	Drain-Source On-State Resistance	V <sub>GS</sub> =10V , I <sub>D</sub> =19A		13	16.5	m ohm
		V <sub>GS</sub> =4.5V , I <sub>D</sub> =16A		20	28	m ohm
g <sub>FS</sub>	Forward Transconductance	V <sub>DS</sub> =5V , I <sub>D</sub> =19A		43		S
<b>DYNAMIC CHARACTERISTICS</b> <sup>c</sup>						
C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> =20V,V <sub>GS</sub> =0V f=1.0MHz		755		pF
C <sub>oss</sub>	Output Capacitance			121		pF
C <sub>rss</sub>	Reverse Transfer Capacitance			102		pF
<b>SWITCHING CHARACTERISTICS</b> <sup>c</sup>						
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		16		ns
t <sub>r</sub>	Rise Time			29		ns
t <sub>D(OFF)</sub>	Turn-Off Delay Time			42		ns
t <sub>f</sub>	Fall Time			10		ns
Q <sub>g</sub>	Total Gate Charge	V <sub>DS</sub> =20V,I <sub>D</sub> =19A,V <sub>GS</sub> =10V		16.5		nC
		V <sub>DS</sub> =20V,I <sub>D</sub> =19A,V <sub>GS</sub> =4.5V		8.7		nC
Q <sub>gs</sub>	Gate-Source Charge	V <sub>DS</sub> =20V,I <sub>D</sub> =19A, V <sub>GS</sub> =10V		2.1		nC
Q <sub>gd</sub>	Gate-Drain Charge			5		nC
<b>DRAIN-SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS</b>						
I <sub>s</sub>	Maximum Continuous Drain-Source Diode Forward Current			2		A
V <sub>SD</sub>	Diode Forward Voltage <sup>b</sup>	V <sub>GS</sub> =0V,I <sub>s</sub> =4A		0.79	1.3	V
<b>Notes</b>						
a.Surface Mounted on FR4 Board,t ≤ 10sec.						
b.Pulse Test:Pulse Width ≤ 300us, Duty Cycle ≤ 2%.						
c.Guaranteed by design, not subject to production testing.						
d.Starting T <sub>J</sub> =25°C,L=0.5mH,V <sub>DD</sub> = 20V.(See Figure13)						

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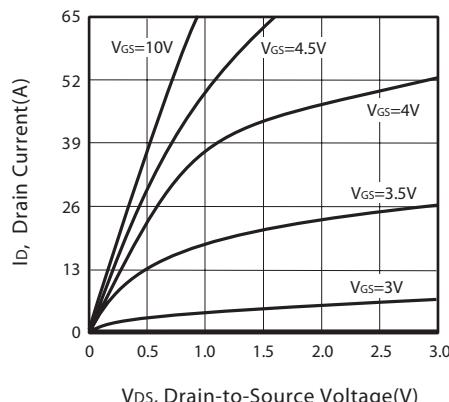


Figure 1. Output Characteristics

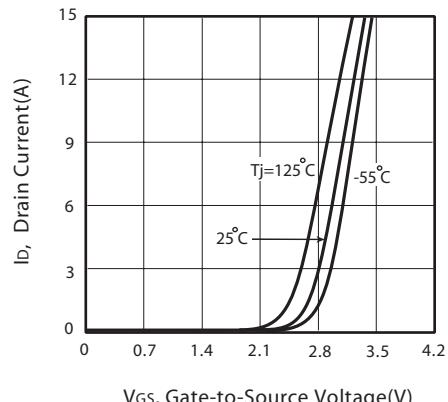


Figure 2. Transfer Characteristics

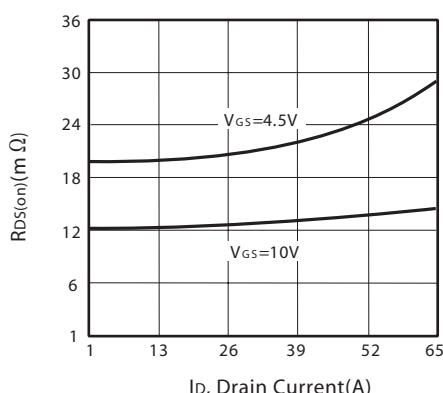


Figure 3. On-Resistance vs. Drain Current and Gate Voltage

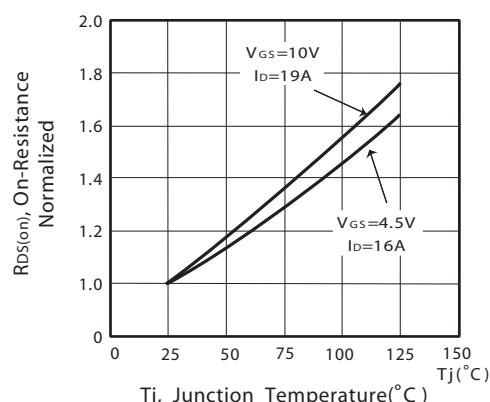


Figure 4. On-Resistance Variation with Drain Current and Temperature

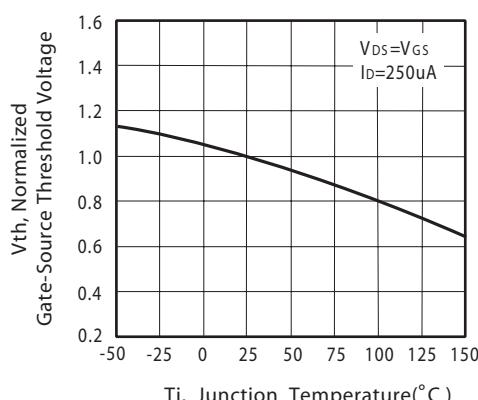


Figure 5. Gate Threshold Variation with Temperature

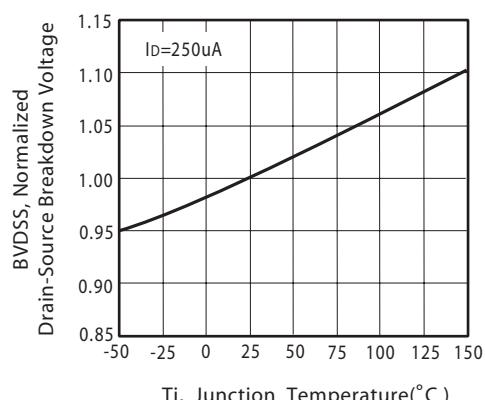
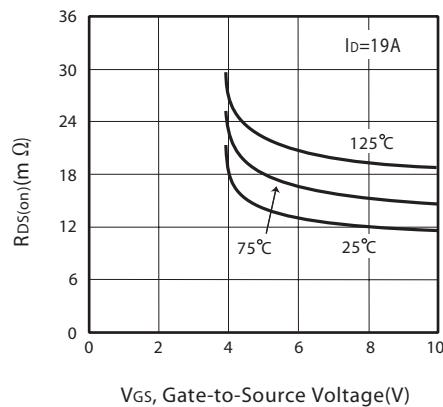


Figure 6. Breakdown Voltage Variation with Temperature

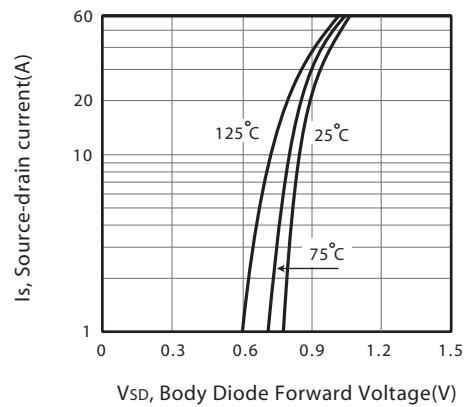
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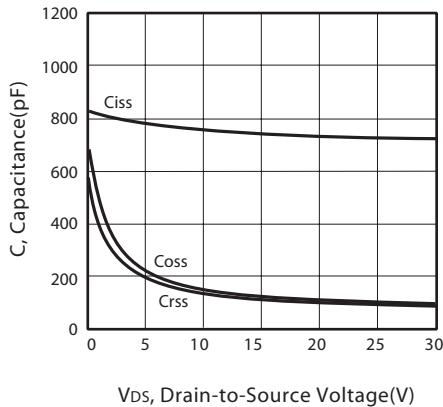
V<sub>GS</sub>, Gate-to-Source Voltage(V)

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



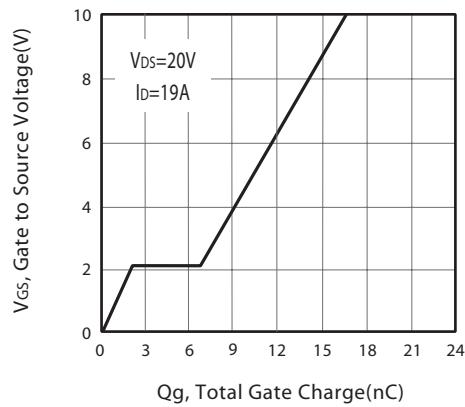
V<sub>SD</sub>, Body Diode Forward Voltage(V)

Figure 8. Body Diode Forward Voltage Variation with Source Current



V<sub>DS</sub>, Drain-to-Source Voltage(V)

Figure 9. Capacitance



Q<sub>g</sub>, Total Gate Charge(nC)

Figure 10. Gate Charge

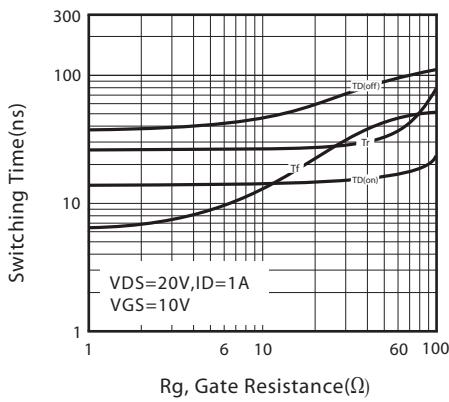


Figure 11. switching characteristics

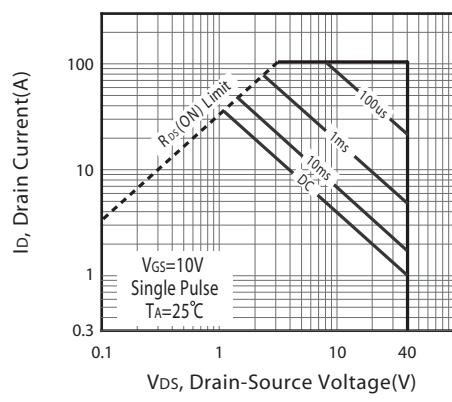
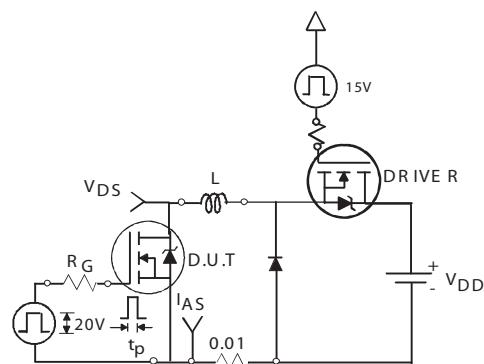


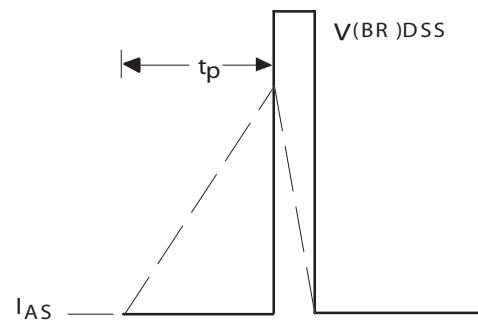
Figure 12. Maximum Safe Operating Area

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Unclamped Inductive Test Circuit

Figure 13a.



Unclamped Inductive Waveforms

Figure 13b.

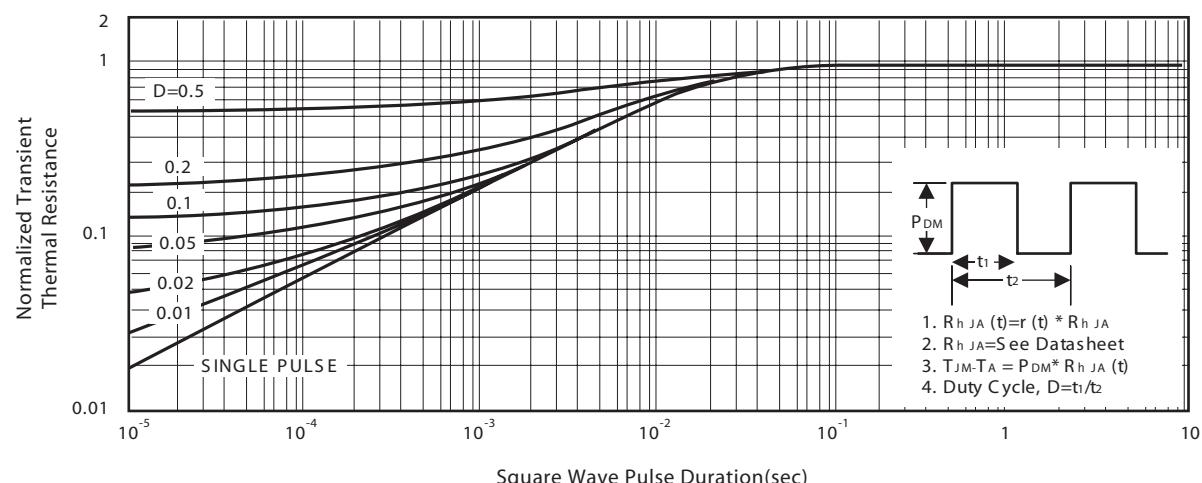


Figure 14. Normalized Thermal Transient Impedance Curve

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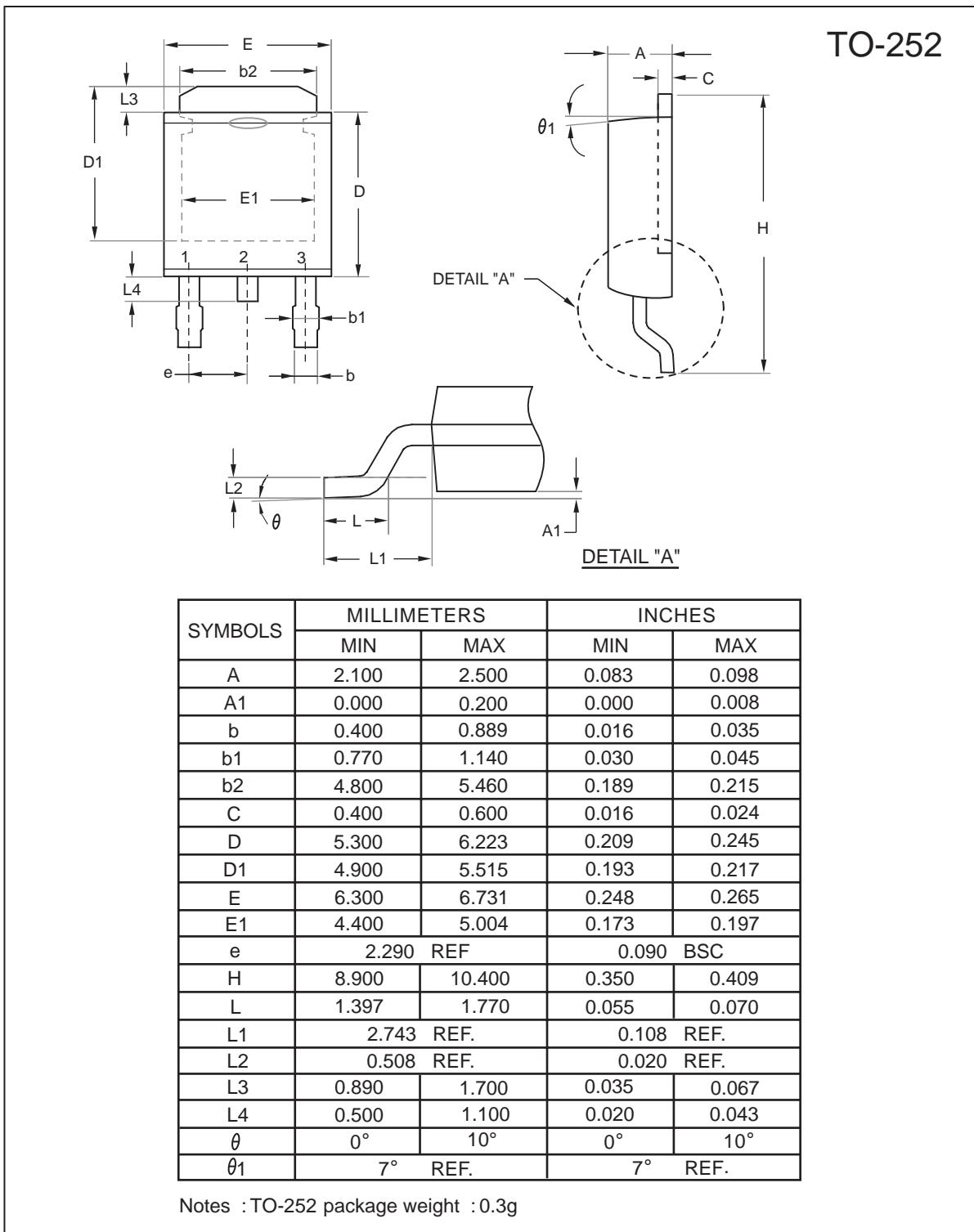
## PACKAGE OUTLINE DIMENSIONS

TO-251		MILLIMETERS		INCHES	
SYMBOL		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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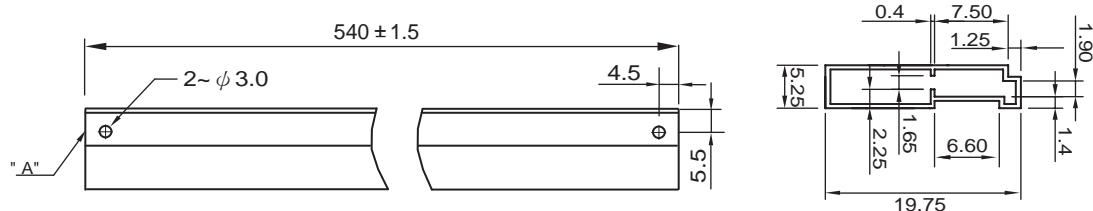
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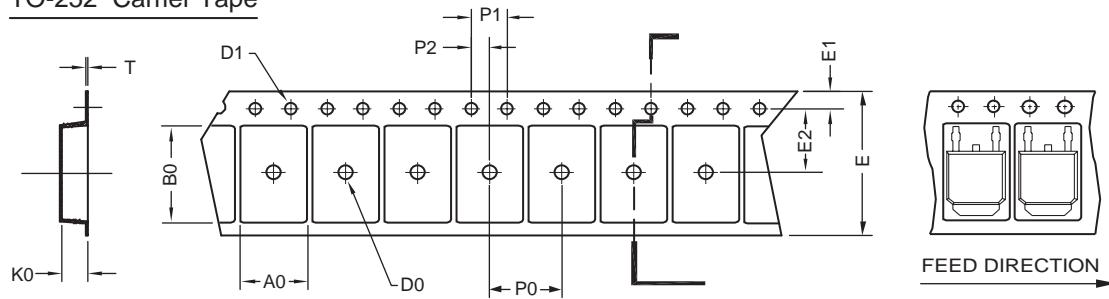
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## TO-251 Tube/TO-252 Tape and Reel Data

### TO-251 Tube



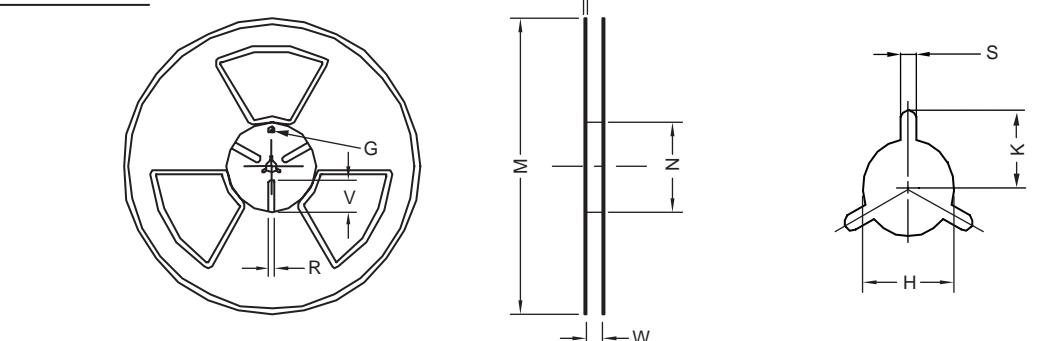
### TO-252 Carrier Tape



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	ψ 2	ψ 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	ψ 330	ψ 330 ± 0.5	ψ 97 ± 1.0	17.0 + 1.5 - 0	2.2	ψ 13.0 + 0.5 - 0.2	10.6	2.0 ± 0.5	---	---	---