



## N-Channel Field Effect Transistor

### PRODUCT SUMMARY

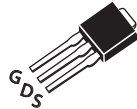
V <sub>DSS</sub>	I <sub>D</sub>	R <sub>DS(ON)</sub> (Ω) Typ
400V	2A	3.2 @ V <sub>GS</sub> =10V

### FEATURES

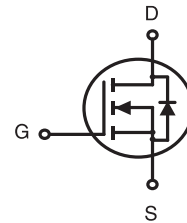
- Super high dense cell design for low R<sub>DS(ON)</sub>.
- Rugged and reliable.
- Surface Mount Package.



STU SERIES  
TO-252AA(D-PAK)



STD SERIES  
TO-251(I-PAK)



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

Symbol	Parameter	Limit	Units
V <sub>DS</sub>	Drain-Source Voltage	400	V
V <sub>GS</sub>	Gate-Source Voltage	±20	V
I <sub>D</sub>	Drain Current-Continuous <sup>a</sup>	T <sub>A</sub> =25°C	2
		T <sub>A</sub> =70°C	1.5
I <sub>DM</sub>	-Pulsed <sup>b</sup>	6	A
E <sub>AS</sub>	Single Pulse Avalanche Energy <sup>d</sup>	10.4	mJ
P <sub>D</sub>	Maximum Power Dissipation	T <sub>A</sub> =25°C	42
		T <sub>A</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

# SDU/D03N04

Ver 1.0

## ELECTRICAL CHARACTERISTICS (T<sub>A</sub>=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> =250μA	400			V
I <sub>DSS</sub>	Zero Gate Voltage Drain Current	V <sub>DS</sub> =320V, V <sub>GS</sub> =0V			1	μA
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> =250μA	2	3	4	V
R <sub>DS(ON)</sub>	Drain-Source On-State Resistance	V <sub>GS</sub> =10V, I <sub>D</sub> =1A		3.2	3.8	m ohm
g <sub>FS</sub>	Forward Transconductance	V <sub>DS</sub> =10V, I <sub>D</sub> =1A		0.9		S
<b>DYNAMIC CHARACTERISTICS <sup>°</sup></b>						
C <sub>ISS</sub>	Input Capacitance	V <sub>DS</sub> =25V, V <sub>GS</sub> =0V f=1.0MHz		185		pF
C <sub>OSS</sub>	Output Capacitance			31		pF
C <sub>RSS</sub>	Reverse Transfer Capacitance			6.1		pF
<b>SWITCHING CHARACTERISTICS <sup>°</sup></b>						
t <sub>D(ON)</sub>	Turn-On Delay Time	V <sub>DD</sub> =200V I <sub>D</sub> =1A V <sub>GS</sub> =10V R <sub>GEN</sub> =25 ohm		13.4		ns
t <sub>r</sub>	Rise Time			12.2		ns
t <sub>D(OFF)</sub>	Turn-Off Delay Time			21.5		ns
t <sub>f</sub>	Fall Time			5.6		ns
Q <sub>g</sub>	Total Gate Charge	V <sub>DS</sub> =200V, I <sub>D</sub> =1A, V <sub>GS</sub> =10V		4.36		nC
Q <sub>gs</sub>	Gate-Source Charge	V <sub>DS</sub> =200V, I <sub>D</sub> =1A, V <sub>GS</sub> =10V		1.28		nC
Q <sub>gd</sub>	Gate-Drain Charge			1.48		nC
<b>DRAIN-SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS</b>						
I <sub>S</sub>	Maximum Continuous Drain-Source Diode Forward Current				1	A
V <sub>SD</sub>	Diode Forward Voltage	V <sub>GS</sub> =0V, I <sub>S</sub> =1A		0.81	1.4	V

### Notes

- Surface Mounted on FR4 Board, t ≤ 10sec.
- Pulse Test: Pulse Width ≤ 300μs, Duty Cycle ≤ 2%.
- Guaranteed by design, not subject to production testing.
- Starting T<sub>J</sub>=25°C, L=1mH, R<sub>G</sub>=25Ω, V<sub>DD</sub> = 50V. (See Figure 12)

May, 22, 2009

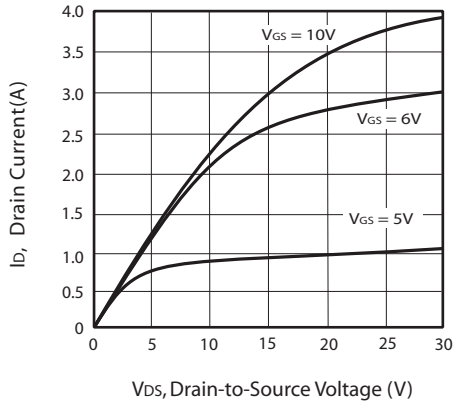


Figure 1. Output Characteristics

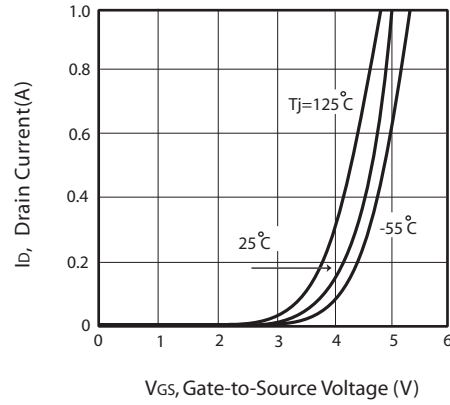


Figure 2. Transfer Characteristics

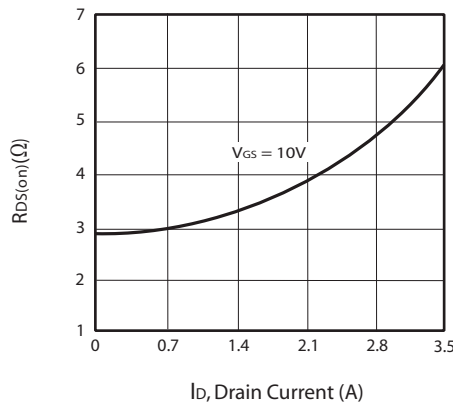


Figure 3. On-Resistance vs. Drain Current and Gate Voltage

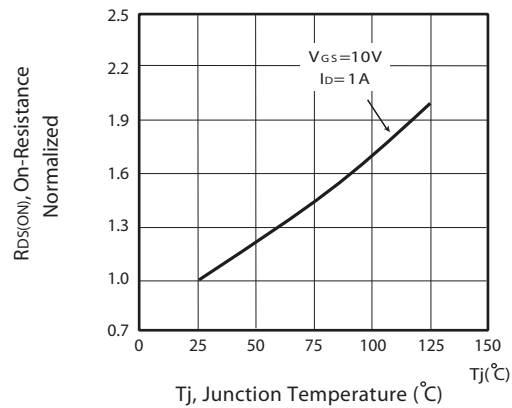


Figure 4. On-Resistance Variation with Drain Current and Temperature

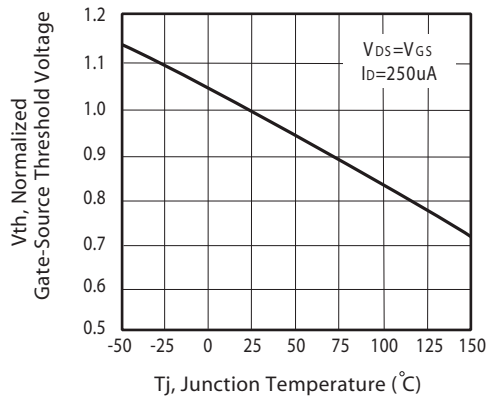


Figure 5. Gate Threshold Variation with Temperature

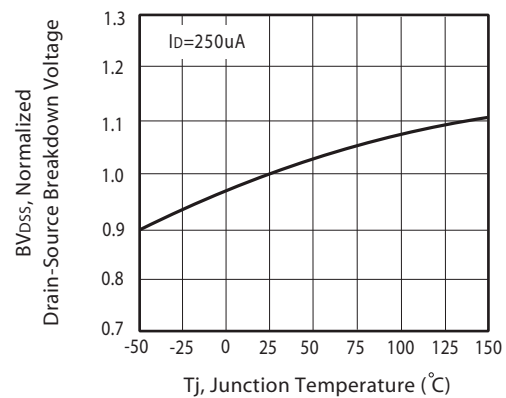


Figure 6. Breakdown Voltage Variation with Temperature

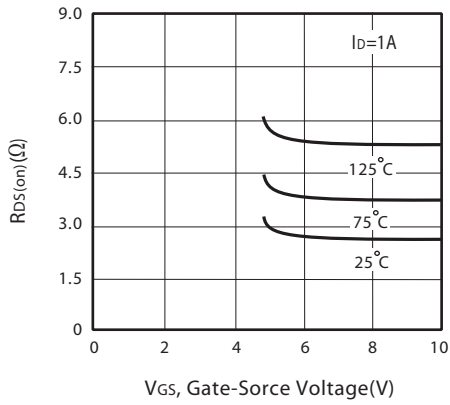


Figure 7. On-Resistance vs. Gate-Source Voltage

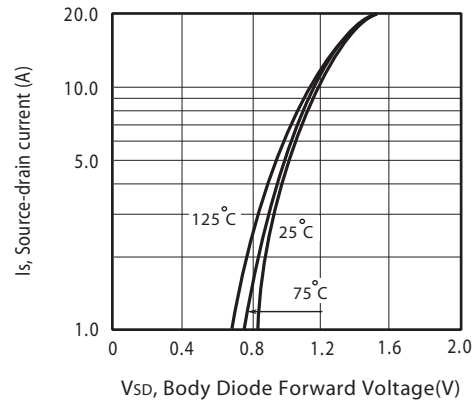


Figure 8. Body Diode Forward Voltage Variation with Source Current

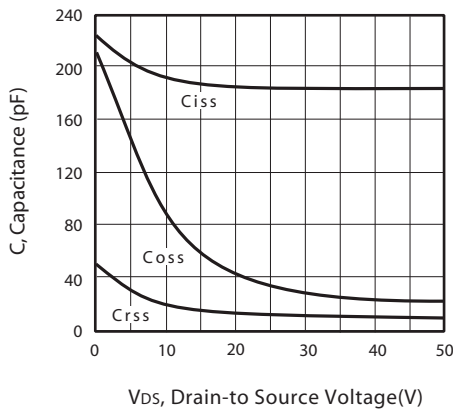


Figure 9. Capacitance

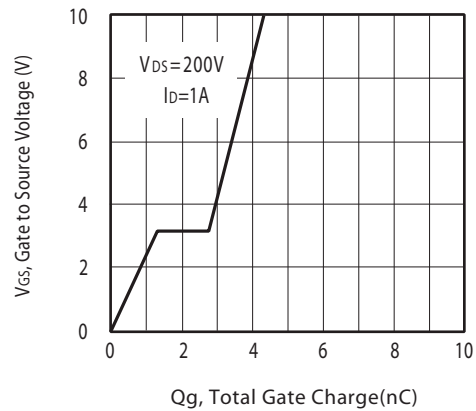


Figure 10. Gate Charge

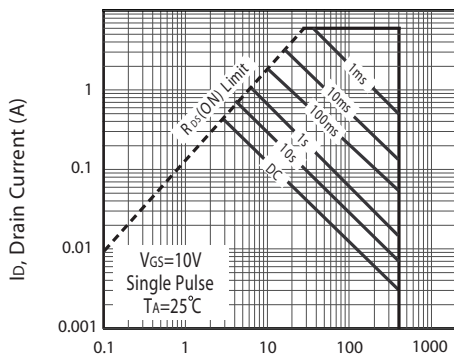
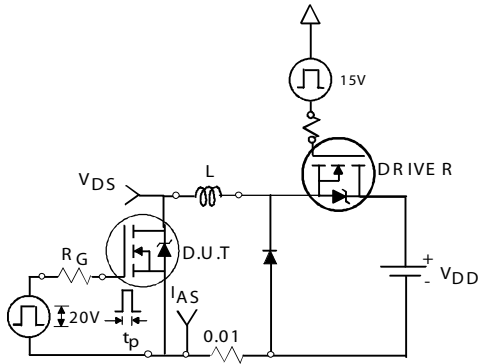
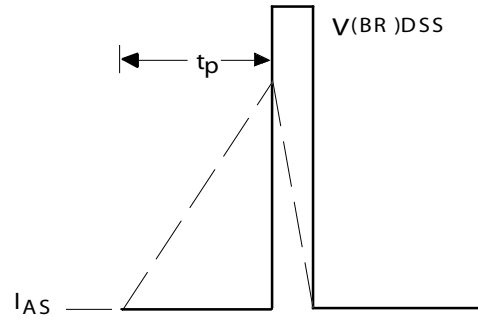


Figure 11. Maximum Safe Operating Area



Unclamped Inductive Test Circuit

Figure 13a.



Unclamped Inductive Waveforms

Figure 13b.

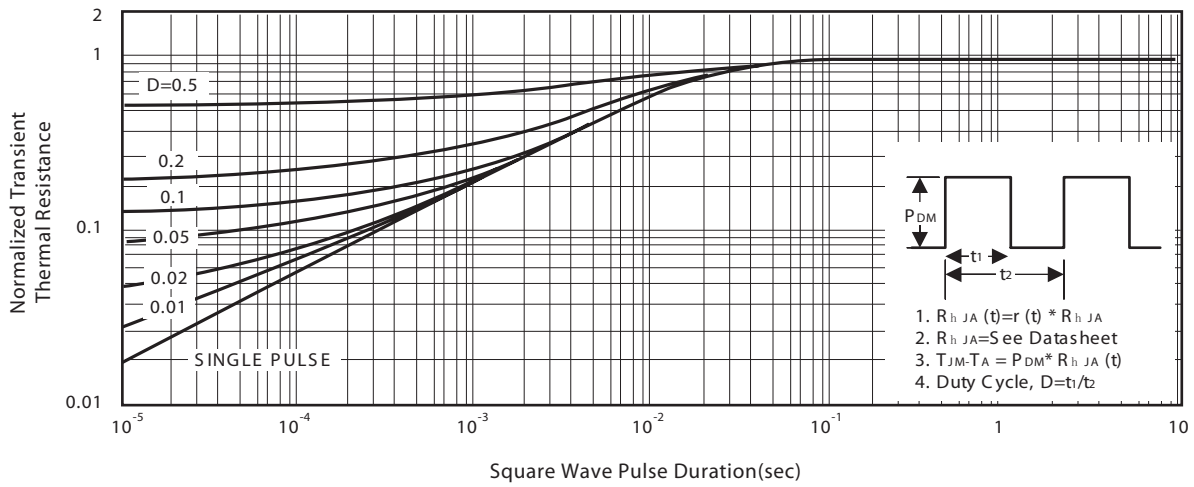
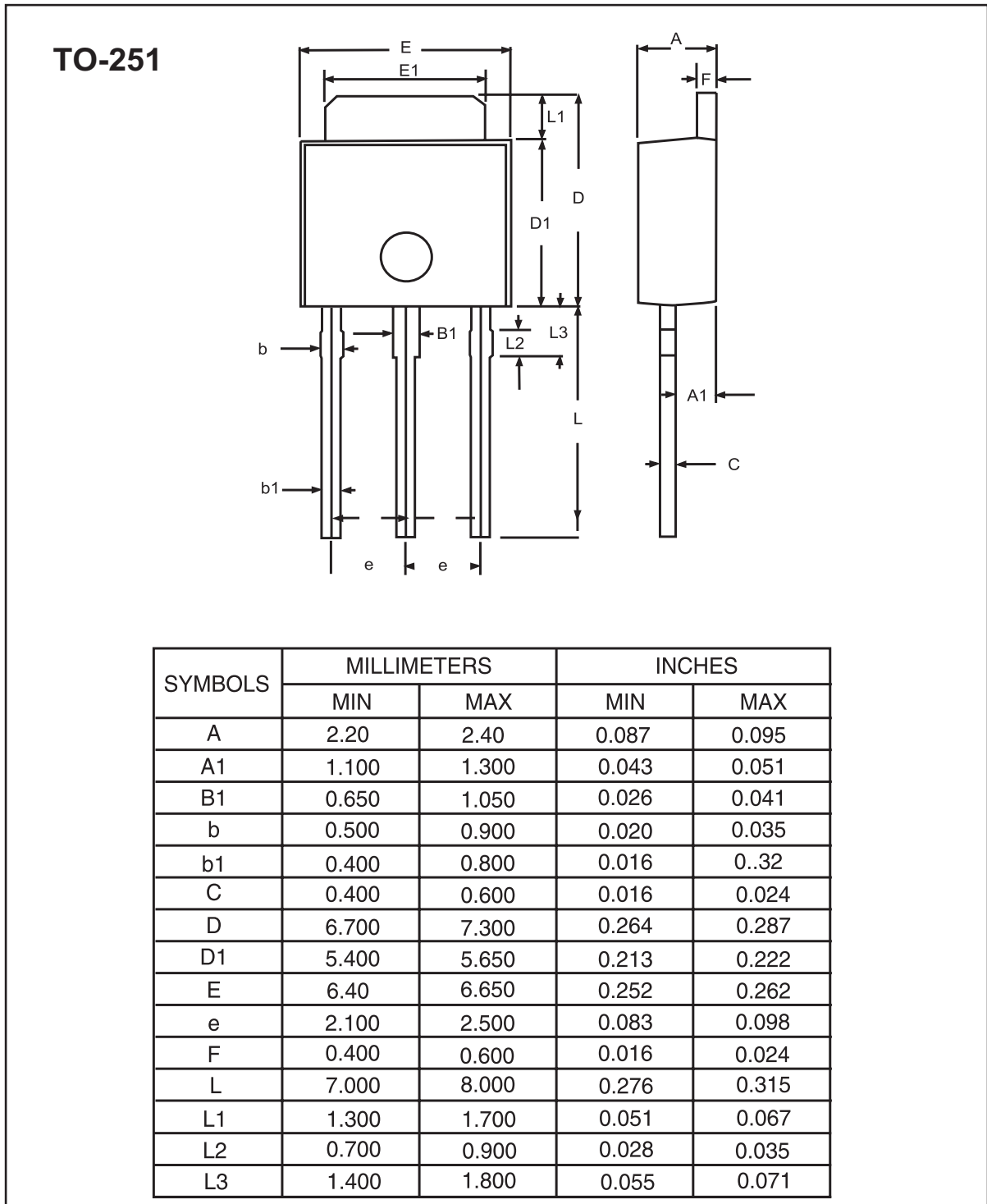


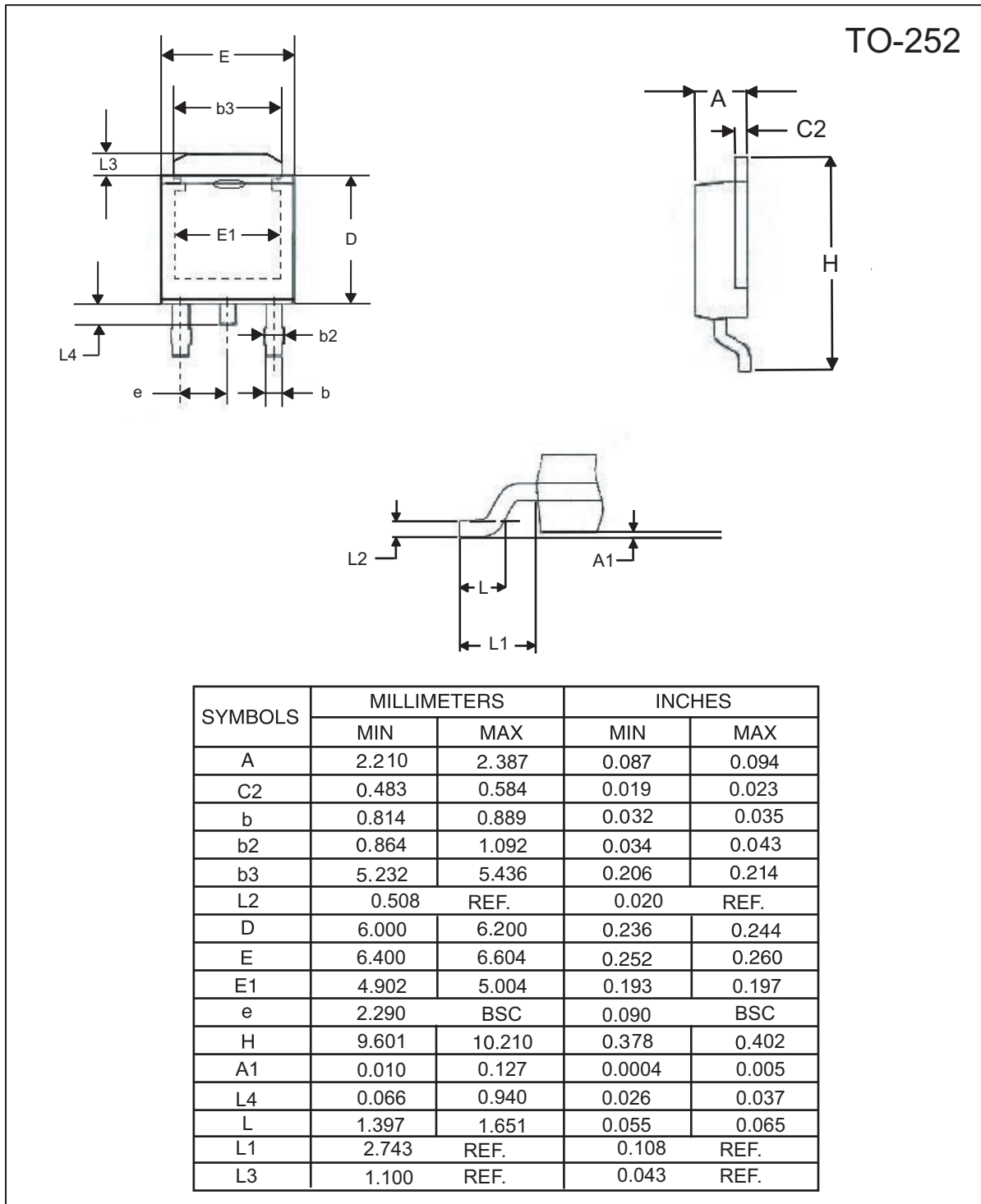
Figure 14. Normalized Thermal Transient Impedance Curve

## PACKAGE OUTLINE DIMENSIONS



# SDU/D03N04

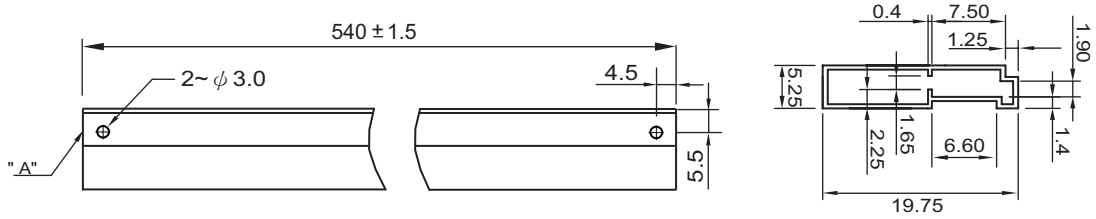
Ver 1.0



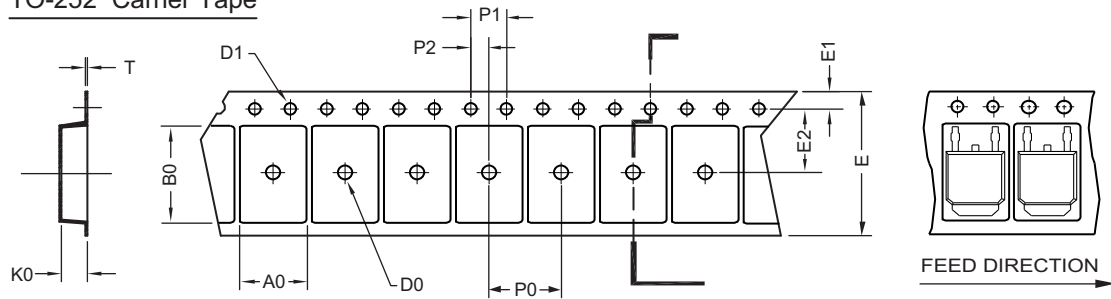
May,22,2009

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

### TO-251 Tube



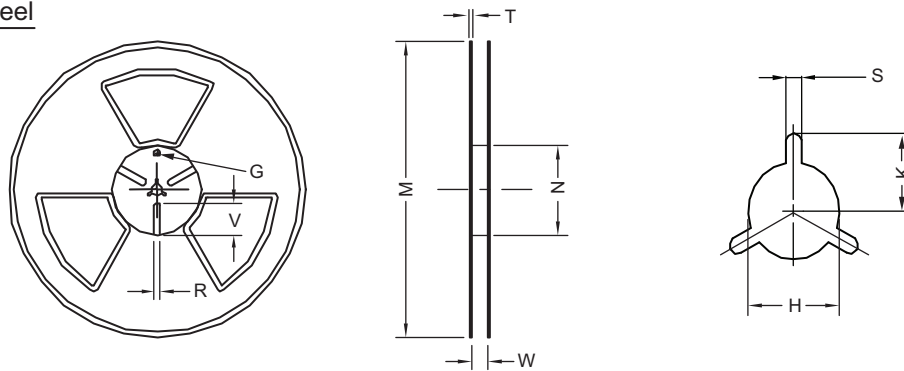
### TO-252 Carrier Tape



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	---	---	---