



SamHop Microelectronics Corp.

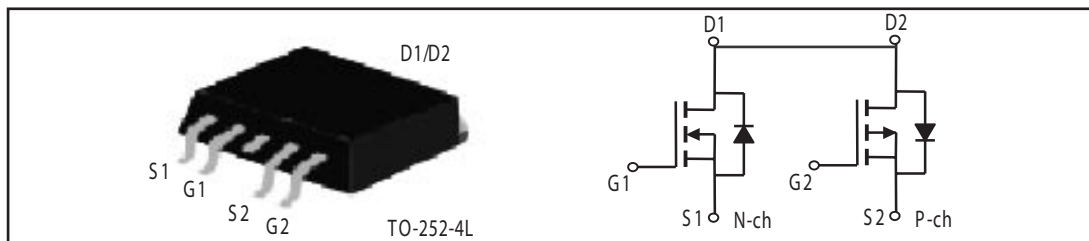
Nov,20 2007 ver1.0

# STU405DH

## Dual Enhancement Mode Field Effect Transistor ( N and P Channel)

PRODUCT SUMMARY (N-Channel)		
V <sub>DSS</sub>	I <sub>D</sub>	R <sub>DS(ON)</sub> ( mΩ ) Max
40V	11A	33 @ V <sub>GS</sub> = 10V
		45 @ V <sub>GS</sub> = 4.5V

PRODUCT SUMMARY (P-Channel)		
V <sub>DSS</sub>	I <sub>D</sub>	R <sub>DS(ON)</sub> ( mΩ ) Max
-40V	-9A	45 @ V <sub>GS</sub> = -10V
		65 @ V <sub>GS</sub> = -4.5V



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

Parameter	Symbol	N-Channel	P-Channel	Unit
Drain-Source Voltage	V <sub>DS</sub>	40	-40	V
Gate-Source Voltage	V <sub>GS</sub>	±20	±20	V
Drain Current-Continuous @ T <sub>c</sub>	I <sub>D</sub>	11	-9	A
		9	-7	A
-Pulsed <sup>a</sup>	I <sub>DM</sub>	45	-36	A
Drain-Source Diode Forward Current	I <sub>S</sub>	7	-6	A
Maximum Power Dissipation	P <sub>D</sub>	11		W
		7.7		
Operating Junction and Storage Temperature Range	T <sub>J</sub> , T <sub>STG</sub>	-55 to 175		°C

### THERMAL CHARACTERISTICS

Thermal Resistance, Junction-to-Case	R <sub>θJC</sub>	13.6	°C/W
Thermal Resistance, Junction-to-Ambient	R <sub>θJA</sub>	120	°C/W

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

Parameter	Symbol	Condition	Min	Typ <sup>c</sup>	Max	Unit
<b>OFF CHARACTERISTICS</b>						
Drain-Source Breakdown Voltage	$BV_{DSS}$	$V_{GS}=0V, I_D=250\mu A$	40			V
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS}=32V, V_{GS}=0V$			1	$\mu A$
Gate-Body Leakage	$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0V$			$\pm 100$	nA
<b>ON CHARACTERISTICS<sup>a</sup></b>						
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=250\mu A$	1	1.5	3	V
Drain-Source On-State Resistance	$R_{DS(on)}$	$V_{GS}=10V, I_D=8A$		24	33	m ohm
		$V_{GS}=4.5V, I_D=6A$		30	45	m ohm
On-State Drain Current	$I_{D(on)}$	$V_{DS}=5V, V_{GS}=4.5V$	20			A
Forward Transconductance	$g_{FS}$	$V_{DS}=10V, I_D=8A$		13.8		S
<b>DYNAMIC CHARACTERISTICS<sup>b</sup></b>						
Input Capacitance	$C_{ISS}$	$V_{DS}=25V, V_{GS}=0V$ $f=1.0MHz$		580		pF
Output Capacitance	$C_{OSS}$			82		pF
Reverse Transfer Capacitance	$C_{RSS}$			50		pF
<b>SWITCHING CHARACTERISTICS<sup>b</sup></b>						
Turn-On Delay Time	$t_{D(on)}$	$V_{DD}=20V$ $I_D=1A$ $V_{GS}=10V$ $R_{GEN}=3.3\text{ ohm}$		11		ns
Rise Time	$t_r$			10.2		ns
Turn-Off Delay Time	$t_{D(off)}$			17.3		ns
Fall Time	$t_f$			20		ns
Total Gate Charge	$Q_g$	$V_{DS}=28V, I_D=8A, V_{GS}=10V$		11.3		nC
		$V_{DS}=28V, I_D=8A, V_{GS}=4.5V$		5.8		nC
Gate-Source Charge	$Q_{gs}$	$V_{DS}=28V, I_D=8A$		1.2		nC
Gate-Drain Charge	$Q_{gd}$	$V_{GS}=10V$		2.9		nC

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P-Channel 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	-40			V
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>DS</sub> = -32V, 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>a</sup></b>						
Gate Threshold Voltage	V <sub>GS(th)</sub>	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = -250uA	-1	-1.7	-3	V
Drain-Source On-State Resistance	R <sub>DS(ON)</sub>	V <sub>GS</sub> = -10V, I <sub>D</sub> = -6A		35	45	m ohm
		V <sub>GS</sub> = -4.5V, I <sub>D</sub> = -4A		52	65	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> = -10V, I <sub>D</sub> = -6A		12		S
<b>DYNAMIC CHARACTERISTICS<sup>b</sup></b>						
Input Capacitance	C <sub>ISS</sub>	V <sub>DS</sub> = -25V, V <sub>GS</sub> = 0V f = 1.0MHz		980		pF
Output Capacitance	C <sub>OSS</sub>			135		pF
Reverse Transfer Capacitance	C <sub>RSS</sub>			90		pF
<b>SWITCHING CHARACTERISTICS<sup>b</sup></b>						
Turn-On Delay Time	t <sub>D(ON)</sub>	V <sub>DD</sub> = -20V I <sub>D</sub> = -1A V <sub>GS</sub> = -10V R <sub>GEN</sub> = 3.3 ohm		12		ns
Rise Time	t <sub>r</sub>			17		ns
Turn-Off Delay Time	t <sub>D(OFF)</sub>			82		ns
Fall Time	t <sub>f</sub>			35		ns
Total Gate Charge	Q <sub>g</sub>	V <sub>DS</sub> = -28V, I <sub>D</sub> = -6A, V <sub>GS</sub> = -10V		20.7		nC
		V <sub>DS</sub> = -28V, I <sub>D</sub> = -6A, V <sub>GS</sub> = -4.5V		11		nC
Gate-Source Charge	Q <sub>gs</sub>	V <sub>DS</sub> = -28V, I <sub>D</sub> = -6 A		1.5		nC
Gate-Drain Charge	Q <sub>gd</sub>	V <sub>GS</sub> = -10V		6.2		nC

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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>DRAIN-SOURCE DIODE CHARACTERISTICS<sup>b</sup></b>						
Diode Forward Voltage	V <sub>SD</sub>	V <sub>GS</sub> = 0V, I <sub>S</sub> = 7A	N-Ch	0.98	1.2	V
		V <sub>GS</sub> = 0V, I <sub>S</sub> = -6A	P-Ch	-0.9	-1.2	

Notes

- a. Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2%.
- b. Guaranteed by design, not subject to production testing.

N-Channel

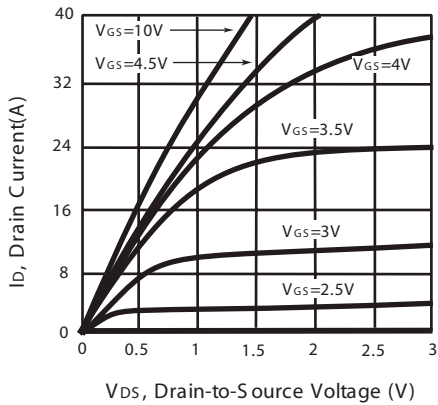


Figure 1. Output Characteristics

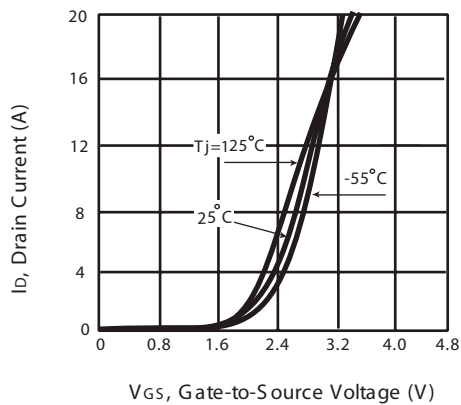


Figure 2. Transfer Characteristics

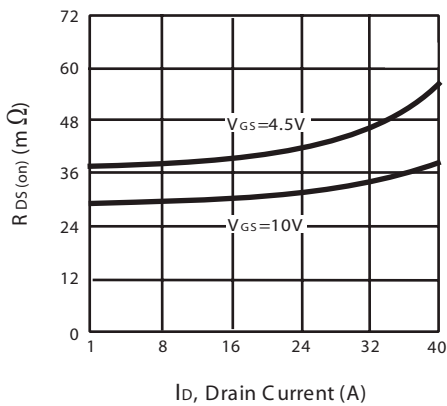


Figure 3. On-Resistance vs. Drain Current and Gate Voltage

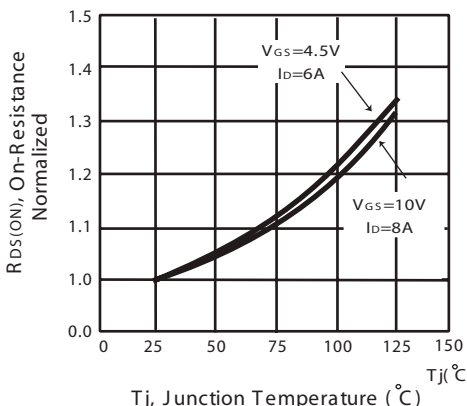


Figure 4. On-Resistance Variation with Drain Current and Temperature

# STU405DH

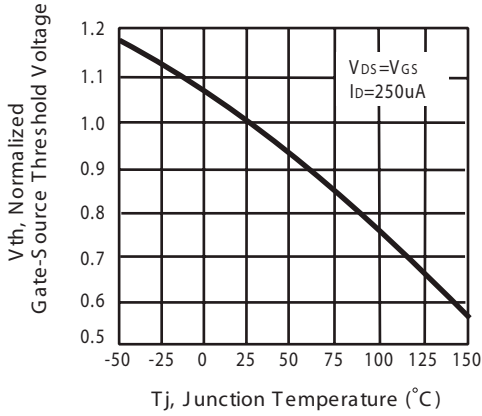


Figure 5. Gate Threshold Variation with Temperature

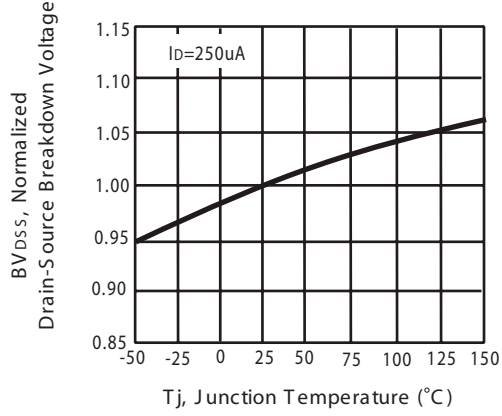


Figure 6. Breakdown Voltage Variation with Temperature

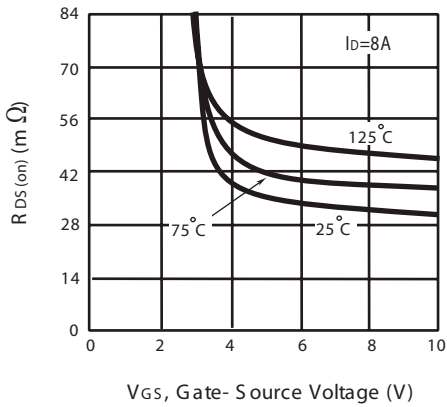


Figure 7. On-Resistance vs. Gate-Source Voltage

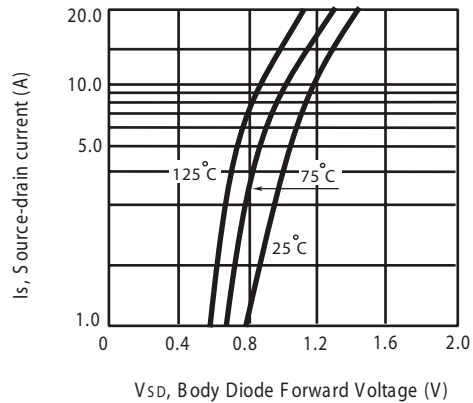


Figure 8. Body Diode Forward Voltage Variation with Source Current

# STU405DH

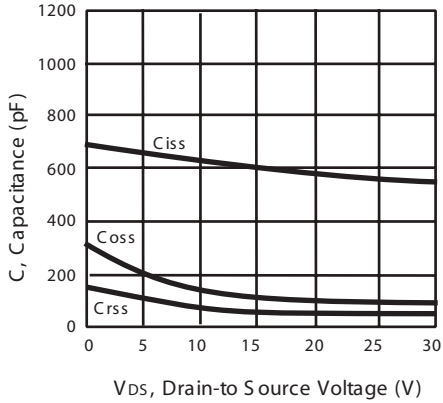


Figure 10. Capacitance

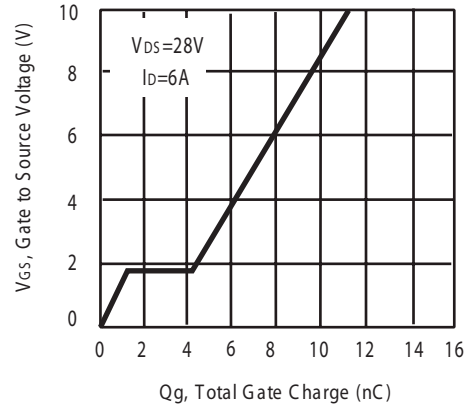


Figure 11. Gate Charge

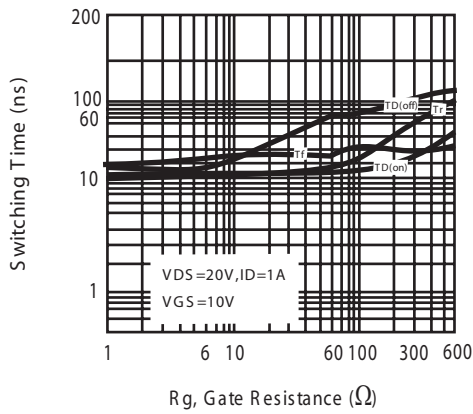


Figure 12. switching characteristics

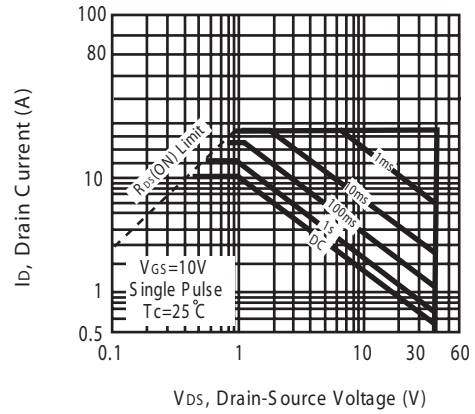


Figure 13. Maximum Safe Operating Area

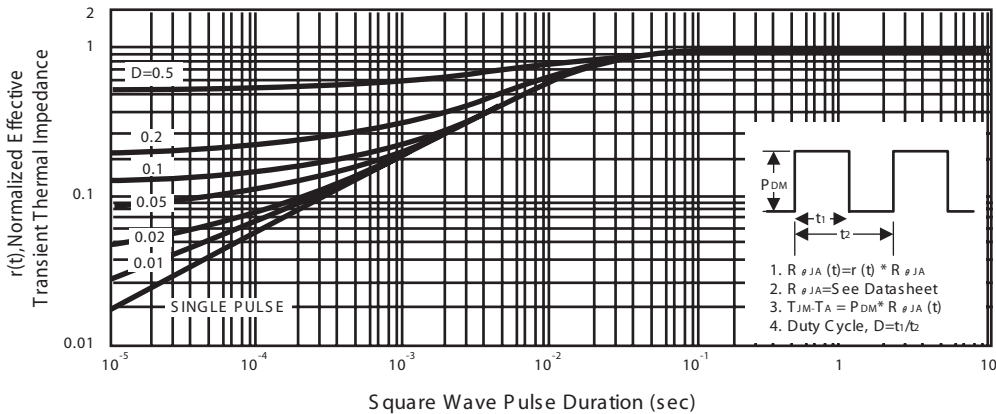


Figure 14. Normalized Thermal Transient Impedance Curve

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## P-Channel

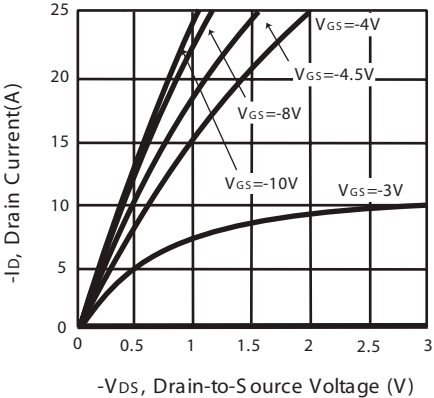


Figure 1. Output Characteristics

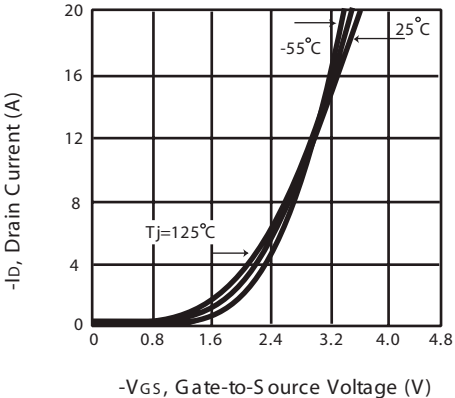


Figure 2. Transfer Characteristics

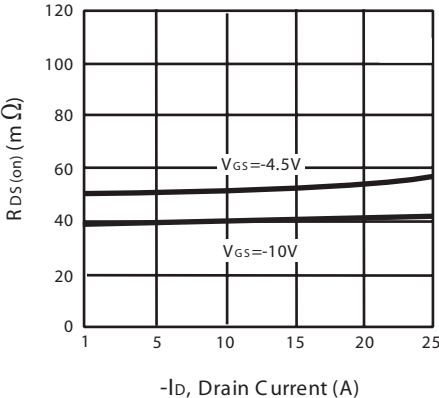


Figure 3. On-Resistance vs. Drain Current and Gate Voltage

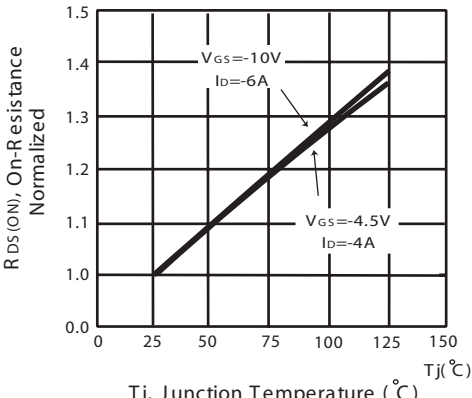


Figure 4. On-Resistance Variation with Drain Current and Temperature

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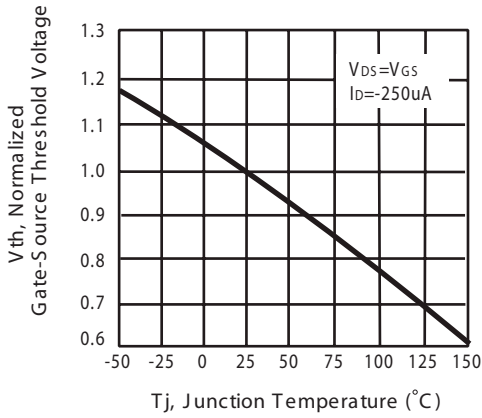


Figure 5. Gate Threshold Variation with Temperature

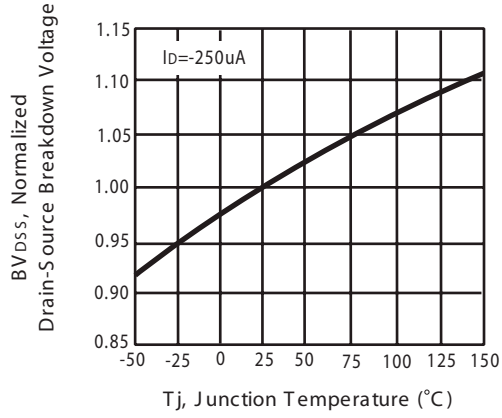


Figure 6. Breakdown Voltage Variation with Temperature

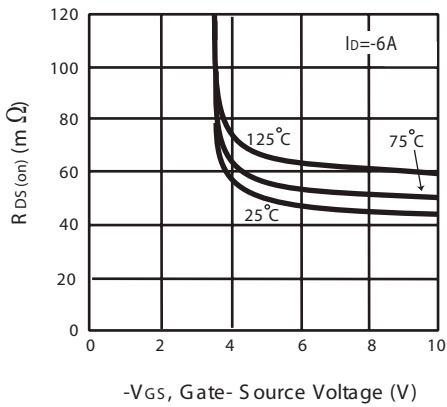


Figure 7. On-Resistance vs. Gate-Source Voltage

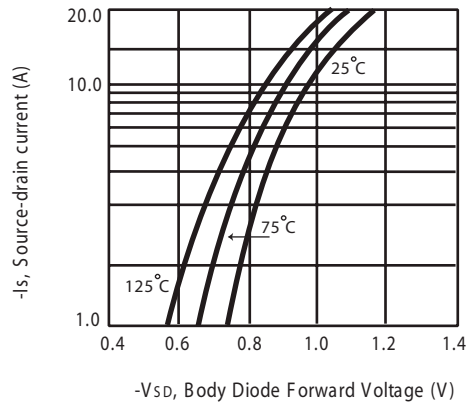


Figure 8. Body Diode Forward Voltage Variation with Source Current



# STU405DH

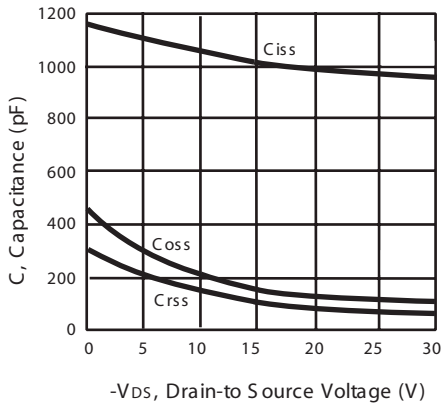


Figure 9. Capacitance

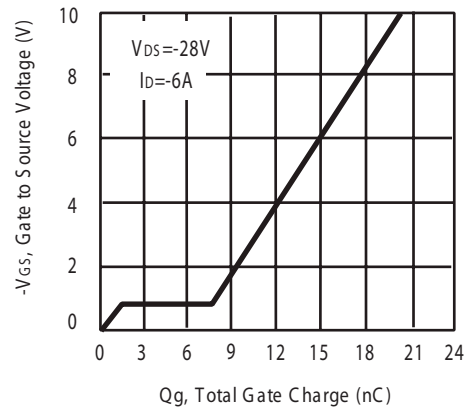


Figure 10. Gate Charge

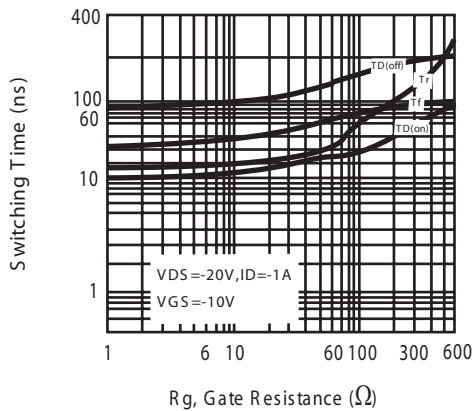


Figure 11. switching characteristics

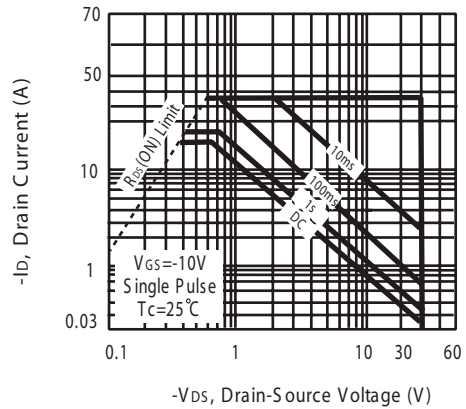


Figure 12. Maximum Safe Operating Area

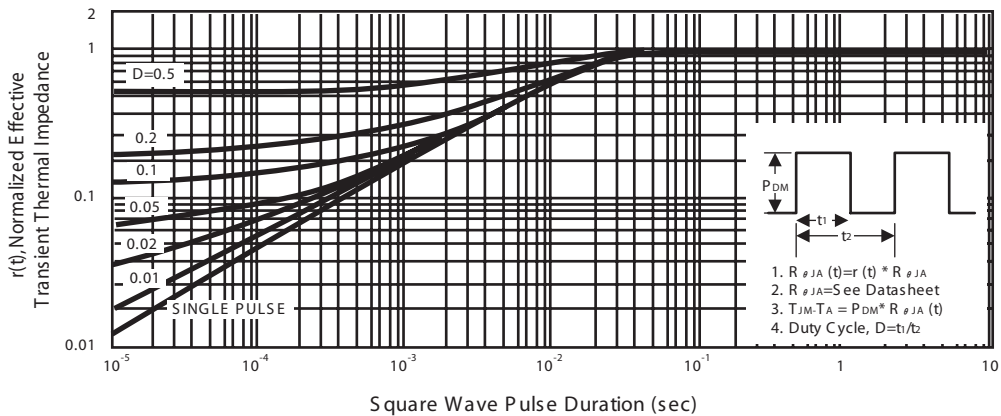
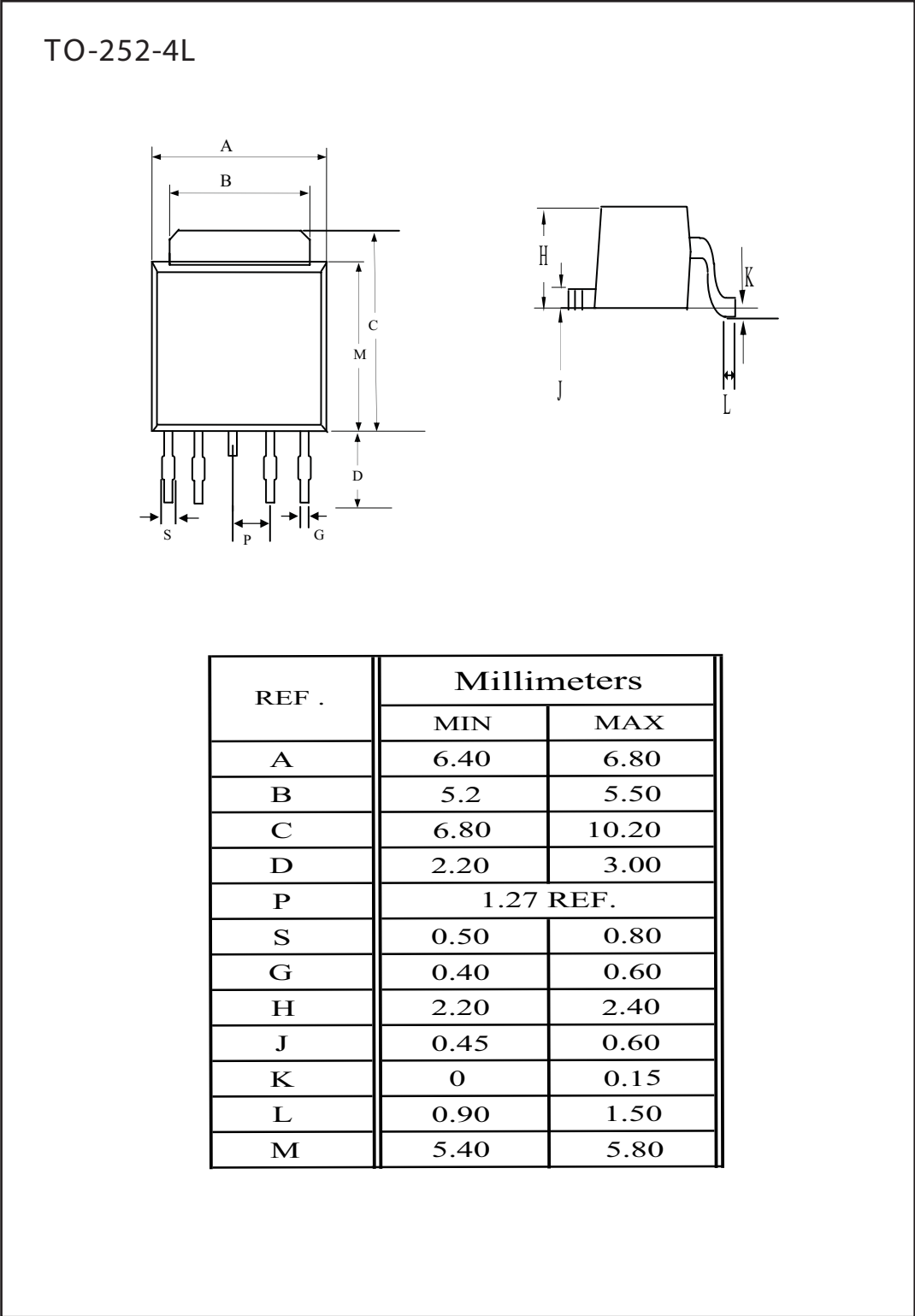


Figure 13. Normalized Thermal Transient Impedance Curve

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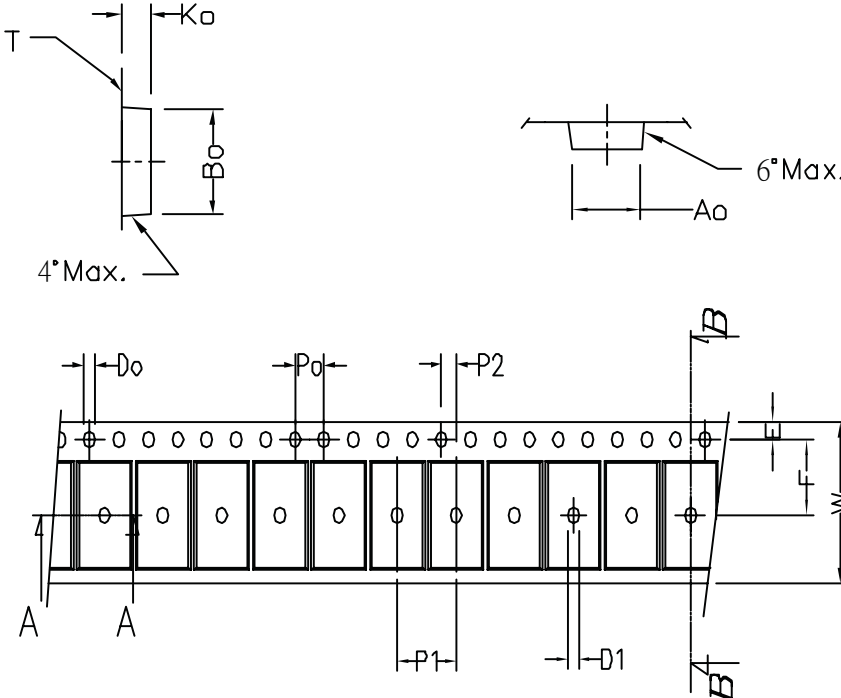
## PACKAGE OUTLINE DIMENSIONS



# STU405DH

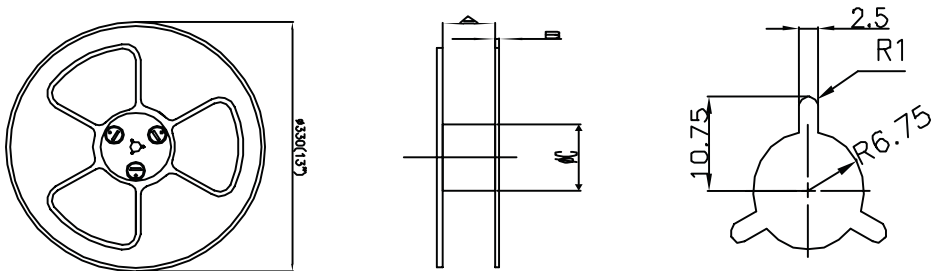
## TO-252-5L Tape and Reel Data

TO-252-5L Carrier Tape



symbol	Ao	Bo	Ko	Po	P1	P2	T
Spec	6.96±0.1	10.49±0.1	2.79±0.1	4.0±0.1	8.0±0.10	2.0±0.05	0.33±0.013
symbol	E	F	Do	D1	W	10Po	
Spec	1.75±0.1	7.5±0.05	1.55±0.05	1.5±0.25	16.0 <sup>+0.3</sup> <sub>-0.1</sub>	40.0±0.2	

TO-252-5L Reel



UNIT:mm

Width of carrier tape	8	12	16	24	32	44	56
A±0.1	9.4	13.4	17.4	25.4	33.4	45.4	57.4
B	2.3	2.3	2.3	2.3	2.3	2.3	2.3
∅C	100	100	100	100	100	100	100