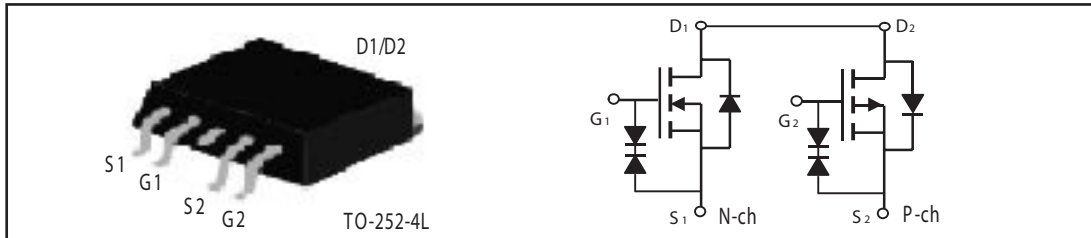




Dual Enhancement Mode Field Effect Transistor (N and P Channel)

PRODUCT SUMMARY (N-Channel)		
V _{DSS}	I _D	R _{DS(ON)} (mΩ) Max
40V	18A	24 @ V _{GS} = 10V
		30 @ V _{GS} = 4.5V

PRODUCT SUMMARY (P-Channel)		
V _{DSS}	I _D	R _{DS(ON)} (mΩ) Max
-40V	-14A	35 @ V _{GS} = -10V
		50 @ V _{GS} = -4.5V



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

Parameter	Symbol	N-Channel	P-Channel	Unit
Drain-Source Voltage	V _{DS}	40	-40	V
Gate-Source Voltage	V _{GS}	±20	±20	V
Drain Current-Continuous @ T _c	I _D	18	-14	A
		15	-11	A
-Pulsed ^a	I _{DM}	50	-50	A
Drain-Source Diode Forward Current	I _S	8	-6	A
Maximum Power Dissipation	P _D	11		W
		7.7		
Operating Junction and Storage Temperature Range	T _J , T _{STG}	-55 to 175		°C

THERMAL CHARACTERISTICS

Thermal Resistance, Junction-to-Case	R _{θJC}	13.6	°C/W
Thermal Resistance, Junction-to-Ambient	R _{θJA}	120	°C/W

STU409DH

N-Channel ELECTRICAL CHARACTERISTICS (T_A = 25°C unless otherwise noted)

Parameter	Symbol	Condition	Min	Typ ^c	Max	Unit
OFF CHARACTERISTICS						
Drain-Source Breakdown Voltage	BV _{DSS}	V _{GS} = 0V, I _D = 250uA	40			V
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} = 32V, V _{GS} = 0V			1	uA
Gate-Body Leakage	I _{GSS}	V _{GS} = ±20V, V _{DS} = 0V			±10	uA
ON CHARACTERISTICS^a						
Gate Threshold Voltage	V _{GS(th)}	V _{DS} = V _{GS} , I _D = 250uA	1.4	1.8	3	V
Drain-Source On-State Resistance	R _{DS(ON)}	V _{GS} = 10V, I _D = 8A		18	24	m ohm
		V _{GS} = 4.5V, I _D = 6A		23	30	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		17		S
DYNAMIC CHARACTERISTICS^b						
Input Capacitance	C _{ISS}	V _{DS} = 20V, V _{GS} = 0V f = 1.0MHz		700		pF
Output Capacitance	C _{OSS}			120		pF
Reverse Transfer Capacitance	C _{RSS}			75		pF
SWITCHING CHARACTERISTICS^b						
Turn-On Delay Time	t _{D(ON)}	V _{DD} = 20V I _D = 3 A V _{GS} = 10V R _{GEN} = 3 ohm		11		ns
Rise Time	t _r			12		ns
Turn-Off Delay Time	t _{D(OFF)}			45		ns
Fall Time	t _f			11		ns
Total Gate Charge	Q _g	V _{DS} = 20V, I _D = 8A, V _{GS} = 10V		14		nC
		V _{DS} = 20V, I _D = 8A, V _{GS} = 4.5V		7		nC
Gate-Source Charge	Q _{gs}	V _{DS} = 20V, I _D = 8 A V _{GS} = 10V		1.6		nC
Gate-Drain Charge	Q _{gd}			3.4		nC

STU409DH

P-Channel ELECTRICAL CHARACTERISTICS (TA = 25°C unless otherwise noted)

Parameter	Symbol	Condition	Min	Typ ^c	Max	Unit
OFF CHARACTERISTICS						
Drain-Source Breakdown Voltage	BV _{DSS}	V _{GS} = 0V, I _D = -250uA	-40			V
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} = -32V, V _{GS} = 0V			-1	uA
Gate-Body Leakage	I _{GSS}	V _{GS} = ±20V, V _{DS} = 0V			±10	uA
ON CHARACTERISTICS^a						
Gate Threshold Voltage	V _{GS(th)}	V _{DS} = V _{GS} , I _D = -250uA	-1.4	-1.8	-3	V
Drain-Source On-State Resistance	R _{DS(ON)}	V _{GS} = -10V, I _D = -6A		28	35	m ohm
		V _{GS} = -4.5V, I _D = -4A		42	50	m ohm
On-State Drain Current	I _{D(ON)}	V _{DS} = -5V, V _{GS} = -10V	-20			A
Forward Transconductance	g _{FS}	V _{DS} = -10V, I _D = -6A		11		S
DYNAMIC CHARACTERISTICS^b						
Input Capacitance	C _{ISS}	V _{DS} = -20V, V _{GS} = 0V f = 1.0MHz		1000		pF
Output Capacitance	C _{OSS}			175		pF
Reverse Transfer Capacitance	C _{RSS}			95		pF
SWITCHING CHARACTERISTICS^b						
Turn-On Delay Time	t _{D(ON)}	V _{DD} = -20V I _D = -3A V _{GS} = -10V R _{GEN} = 3 ohm		11		ns
Rise Time	t _r			15		ns
Turn-Off Delay Time	t _{D(OFF)}			72		ns
Fall Time	t _f			30		ns
Total Gate Charge	Q _g	V _{DS} = -20V, I _D = -6A, V _{GS} = -10V		17.5		nC
		V _{DS} = -20V, I _D = -6A, V _{GS} = -4.5V		8.5		nC
Gate-Source Charge	Q _{gs}	V _{DS} = -20V, I _D = -6 A V _{GS} = -10V		2.3		nC
Gate-Drain Charge	Q _{gd}			4.5		nC

STU409DH

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

Parameter	Symbol	Condition	Min	Typ ^c	Max	Unit
DRAIN-SOURCE DIODE CHARACTERISTICS ^b						
Diode Forward Voltage	V_{SD}	$V_{GS} = 0\text{V}, I_S = 8\text{A}$ $V_{GS} = 0\text{V}, I_S = -6\text{A}$	N-Ch P-Ch	0.94 -0.87	1.3 -1.3	V

Notes

a. Pulse Test: Pulse Width $\leq 300 \mu\text{s}$, Duty Cycle $\leq 2\%$.

b. Guaranteed by design, not subject to production testing.

N-Channel

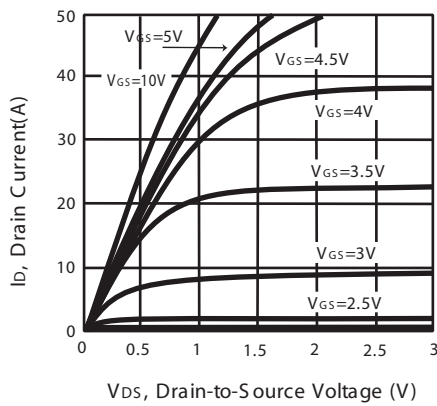


Figure 1. Output Characteristics

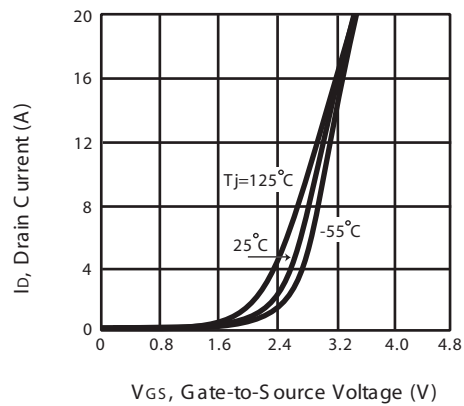


Figure 2. Transfer Characteristics

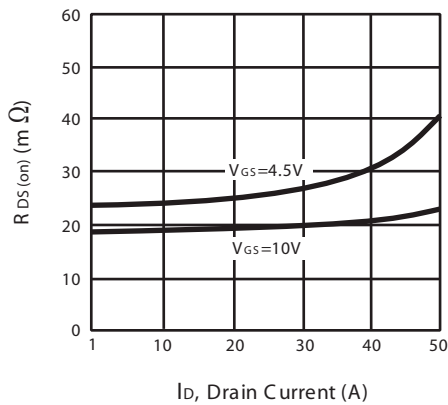


Figure 3. On-Resistance vs. Drain Current and Gate Voltage

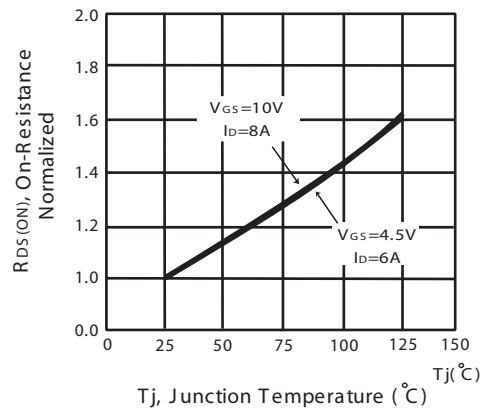


Figure 4. On-Resistance Variation with Drain Current and Temperature

STU409DH

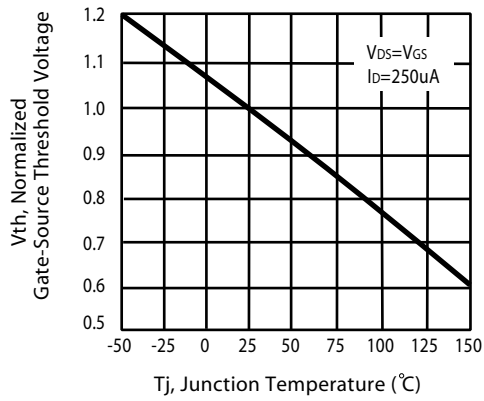


Figure 5. Gate Threshold Variation with Temperature

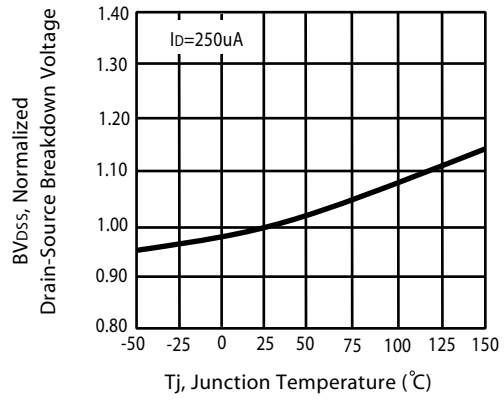


Figure 6. Breakdown Voltage Variation with Temperature

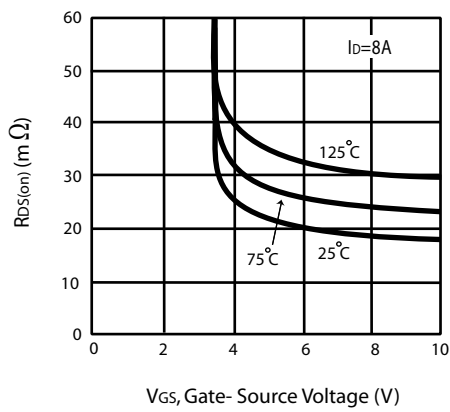


Figure 7. On-Resistance vs. Gate-Source Voltage

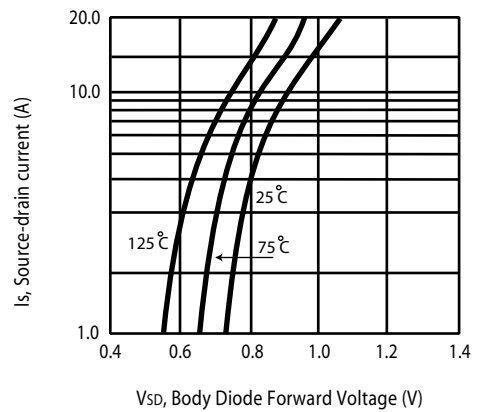


Figure 8. Body Diode Forward Voltage Variation with Source Current

STU409DH

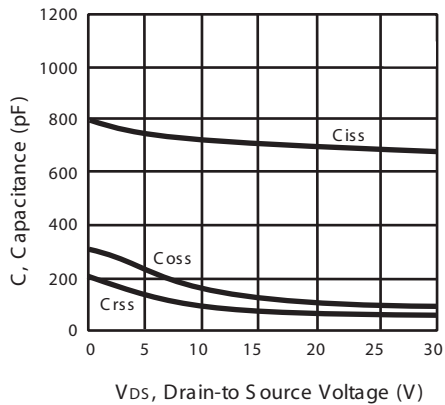


Figure 9. Capacitance

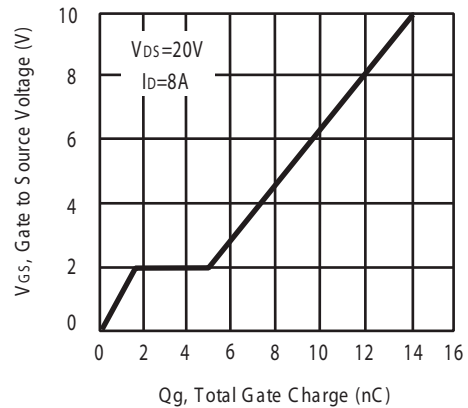


Figure 10. Gate Charge

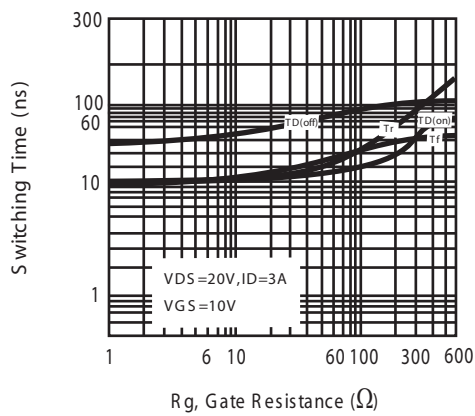


Figure 11. switching characteristics

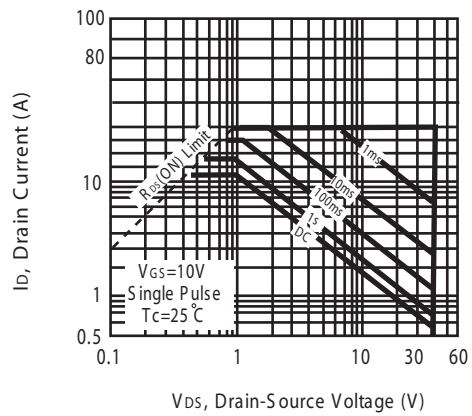


Figure 12. Maximum Safe Operating Area

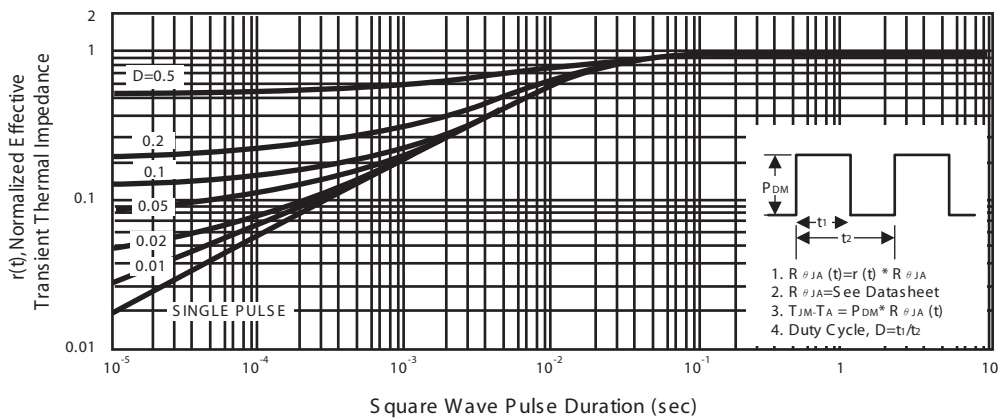


Figure 13. Normalized Thermal Transient Impedance Curve

STU409DH

P-Channel

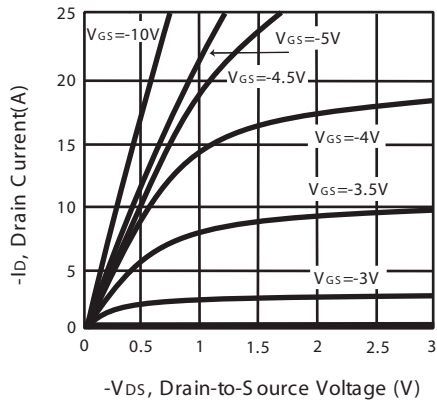


Figure 1. Output Characteristics

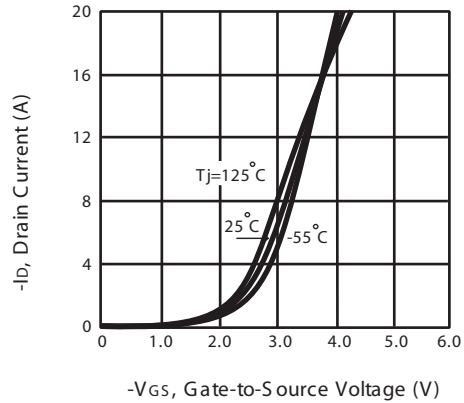


Figure 2. Transfer Characteristics

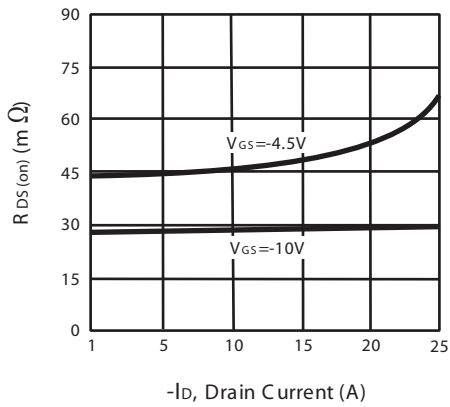


Figure 3. On-Resistance vs. Drain Current and Gate Voltage

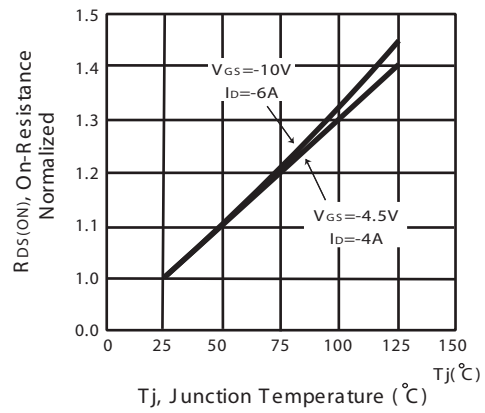


Figure 4. On-Resistance Variation with Drain Current and Temperature

STU409DH

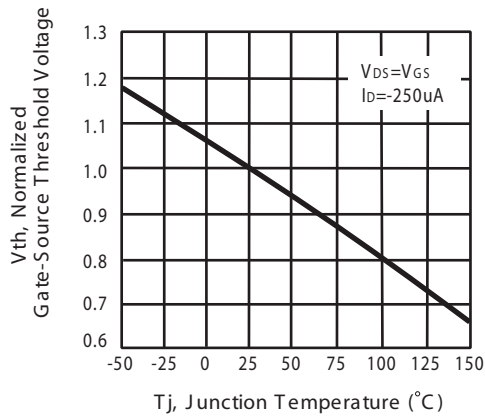


Figure 5. Gate Threshold Variation with Temperature

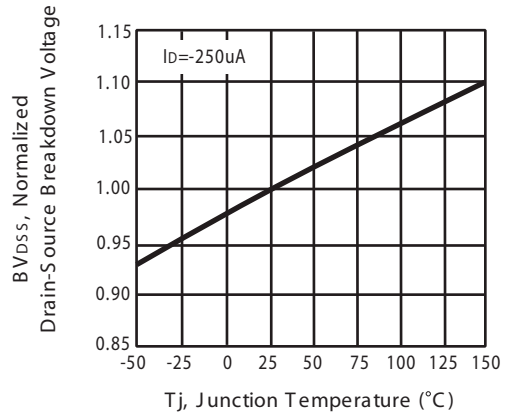


Figure 6. Breakdown Voltage Variation with Temperature

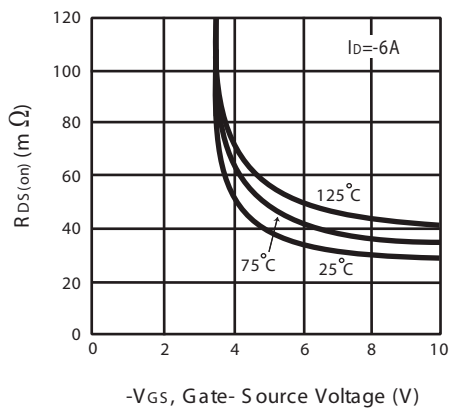


Figure 7. On-Resistance vs. Gate-Source Voltage

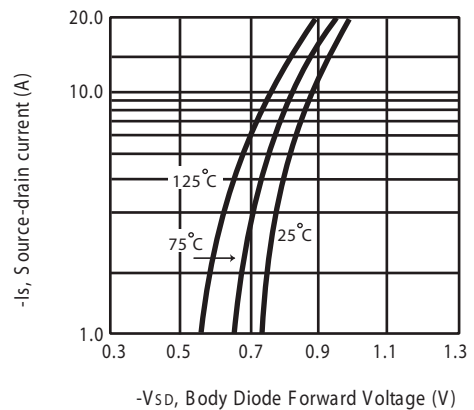


Figure 8. Body Diode Forward Voltage Variation with Source Current

STU409DH

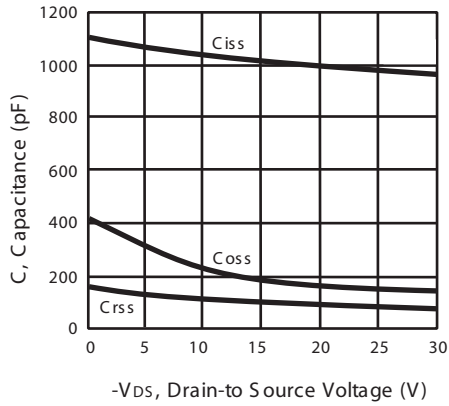


Figure 9. Capacitance

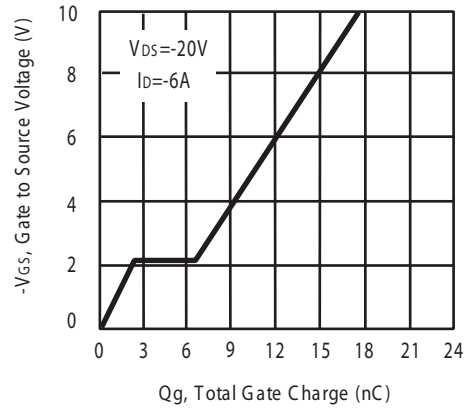


Figure 10. Gate Charge

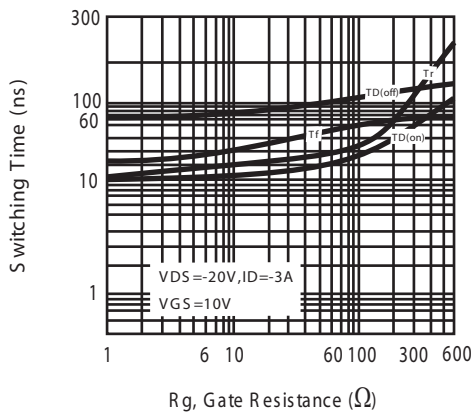


Figure 11. switching characteristics

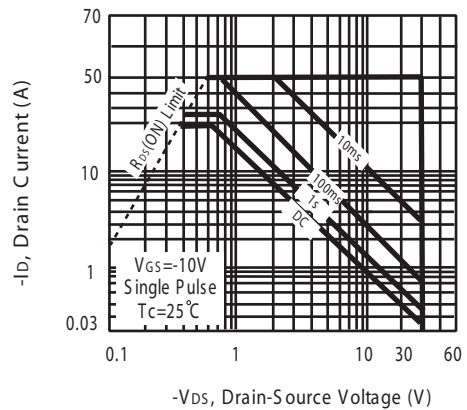


Figure 12. Maximum Safe Operating Area

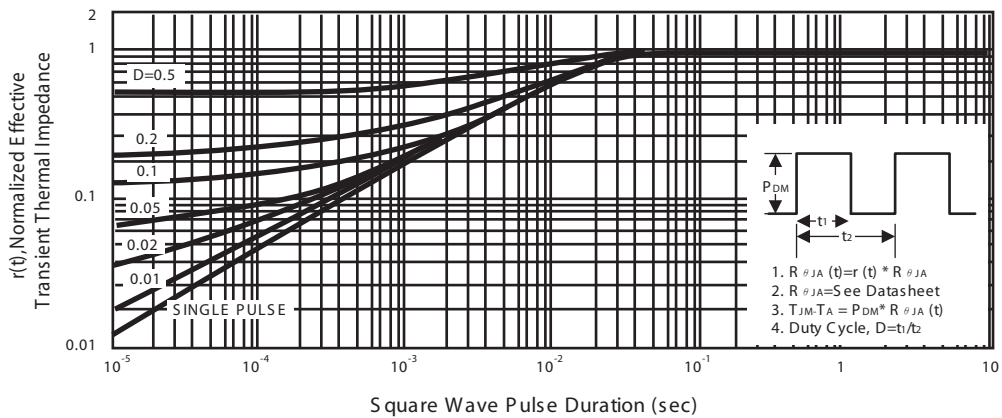
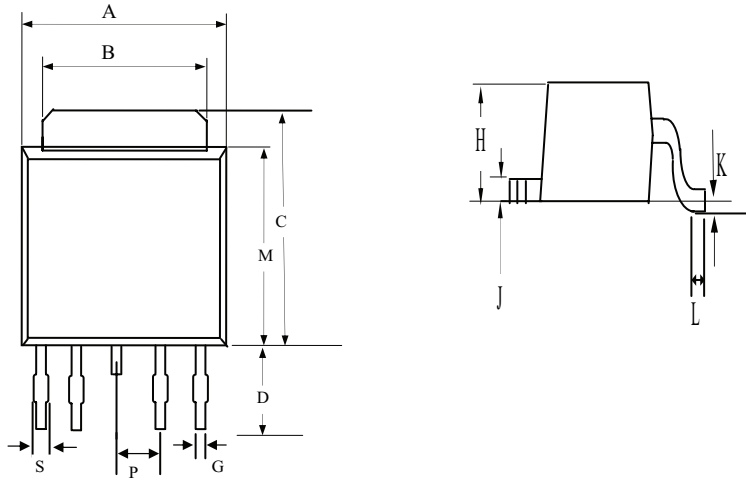


Figure 13. Normalized Thermal Transient Impedance Curve

STU409DH

PACKAGE OUTLINE DIMENSIONS

TO-252-4L

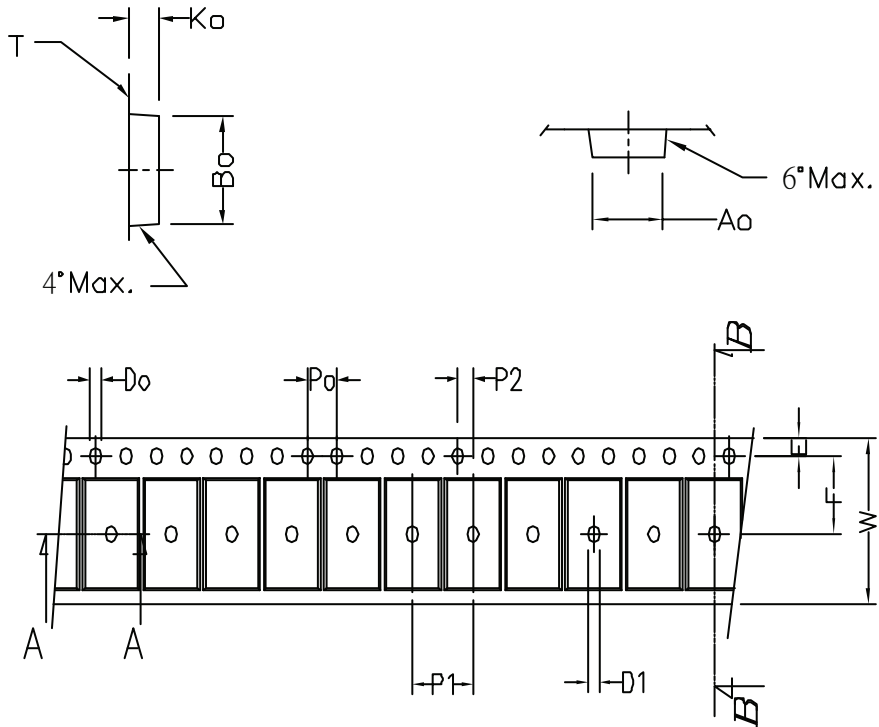


REF .	Millimeters	
	MIN	MAX
A	6.40	6.80
B	5.2	5.50
C	6.80	10.20
D	2.20	3.00
P	1.27 REF.	
S	0.50	0.80
G	0.40	0.60
H	2.20	2.40
J	0.45	0.60
K	0	0.15
L	0.90	1.50
M	5.40	5.80

STU409DH

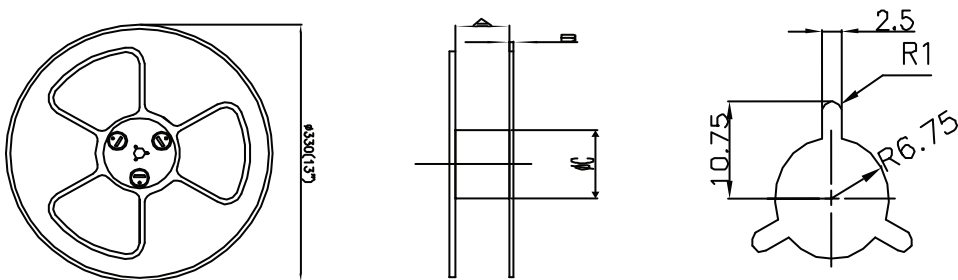
TO-252-4L Tape and Reel Data

TO-252-4L 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 ^{+0.3} _{-0.1}	40.0±0.2	

TO-252-4L 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
øC	100	100	100	100	100	100	100