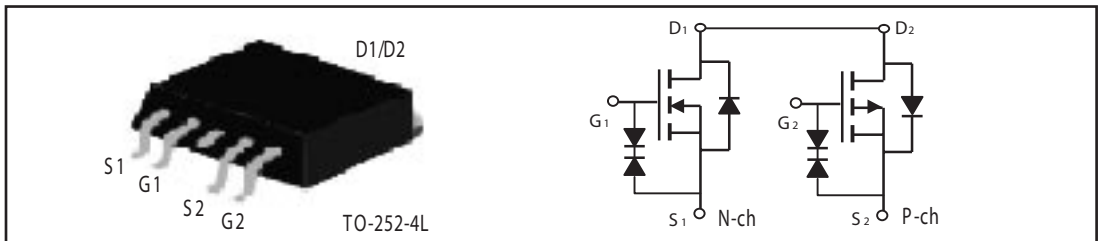




Dual Enhancement Mode Field Effect Transistor (N and P Channel)

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

PRODUCT SUMMARY (P-Channel)		
V _{DSS}	I _D	R _{DS(ON)} (m Ω) 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	25°C	I _D	18	-14	A
	70°C		15	-11	A
-Pulsed ^a		I _{DM}	50	-50	A
Drain-Source Diode Forward Current		I _S	8	-6	A
Maximum Power Dissipation	T _c = 25°C	P _D	11		W
	T _c = 70°C		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 ($T_A = 25^\circ\text{C}$ unless otherwise noted)

Parameter	Symbol	Condition	Min	Typ ^c	Max	Unit
OFF CHARACTERISTICS						
Drain-Source Breakdown Voltage	BV_{DSS}	$V_{GS} = 0V, I_D = 250\mu A$	40			V
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = 32V, V_{GS} = 0V$			1	μA
Gate-Body Leakage	I_{GSS}	$V_{GS} = \pm 20V, V_{DS} = 0V$			± 10	μA
ON CHARACTERISTICS^a						
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\mu A$	1	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	$t_{D(ON)}$	$V_{DD} = 20V$ $I_D = 3A$ $V_{GS} = 10V$ $R_{GEN} = 3\text{ ohm}$		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	
		$V_{DS} = 20V, I_D = 8A, V_{GS} = 4.5V$		7		nC
Gate-Source Charge	Q_{gs}	$V_{DS} = 20V, I_D = 8A$ $V_{GS} = 10V$		1.6		nC
Gate-Drain Charge	Q_{gd}			3.4		nC

STU409DH

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

Parameter	Symbol	Condition	Min	Typ ^c	Max	Unit
OFF CHARACTERISTICS						
Drain-Source Breakdown Voltage	BV_{DSS}	$V_{GS} = 0V, I_D = -250\mu A$	-40			V
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = -32V, V_{GS} = 0V$			-1	μA
Gate-Body Leakage	I_{GSS}	$V_{GS} = \pm 20V, V_{DS} = 0V$			± 10	μA
ON CHARACTERISTICS^a						
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = -250\mu A$	-1	-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	$t_{D(ON)}$	$V_{DD} = -20V$ $I_D = -3A$ $V_{GS} = -10V$ $R_{GEN} = 3\text{ ohm}$		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	
		$V_{DS} = -20V, I_D = -6A, V_{GS} = -4.5V$		8.5		nC
Gate-Source Charge	Q_{gs}	$V_{DS} = -20V, I_D = -6A$		2.3		nC
Gate-Drain Charge	Q_{gd}	$V_{GS} = -10V$		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

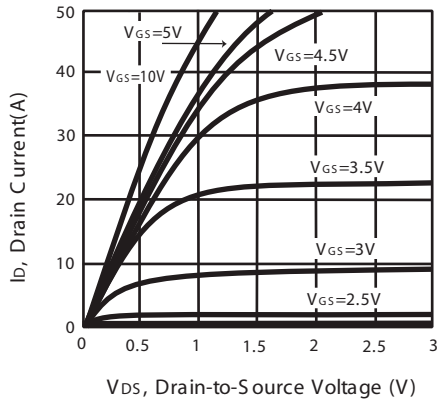


Figure 1. Output Characteristics

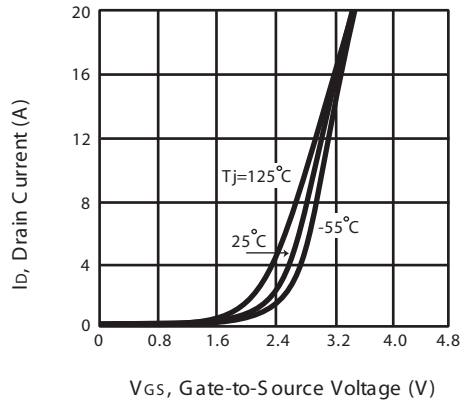


Figure 2. Transfer Characteristics

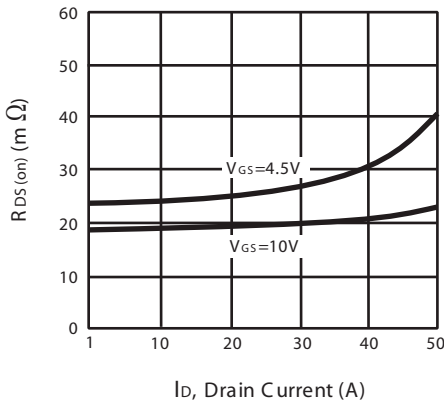


Figure 3. On-Resistance vs. Drain Current and Gate Voltage

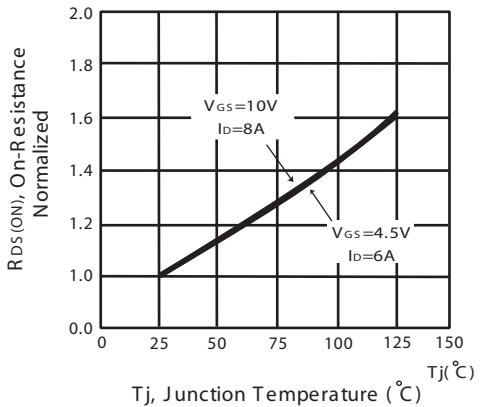


Figure 4. On-Resistance Variation with Drain Current and Temperature

STU409DH

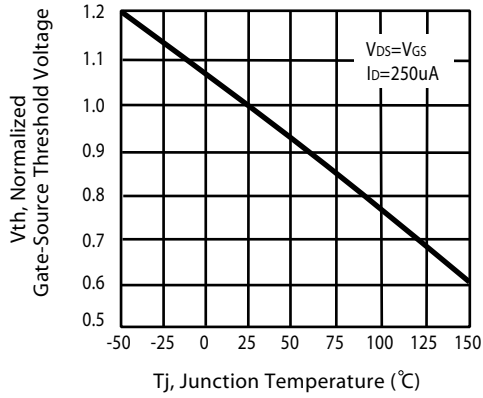


Figure 5. Gate Threshold Variation with Temperature

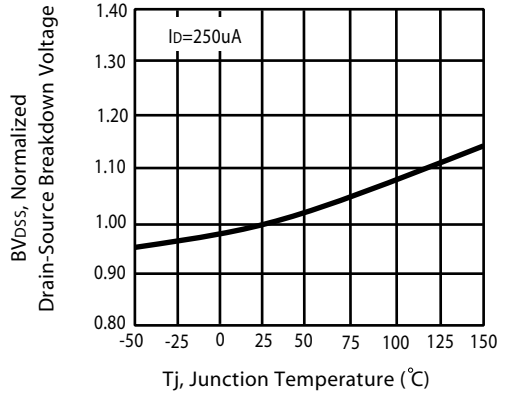


Figure 6. Breakdown Voltage Variation with Temperature

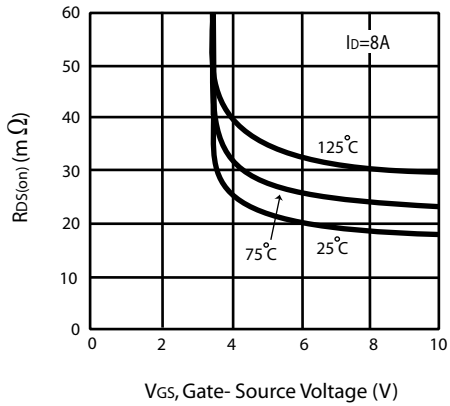


Figure 7. On-Resistance vs. Gate-Source Voltage

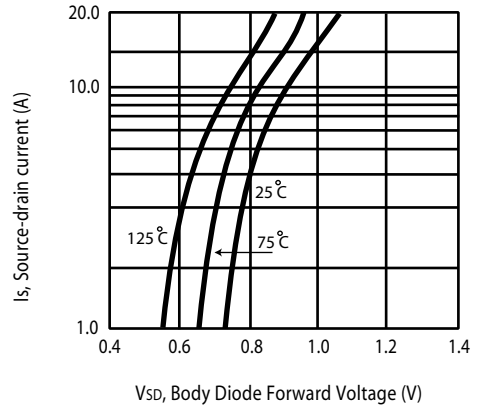


Figure 8. Body Diode Forward Voltage Variation with Source Current

STU409DH

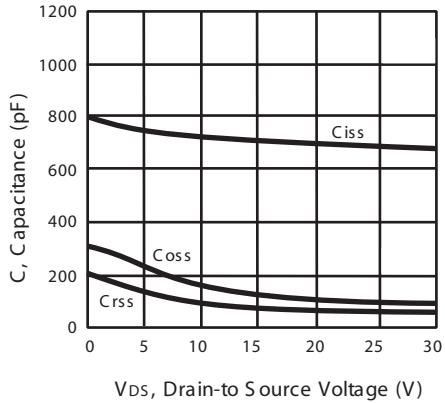


Figure 9. Capacitance

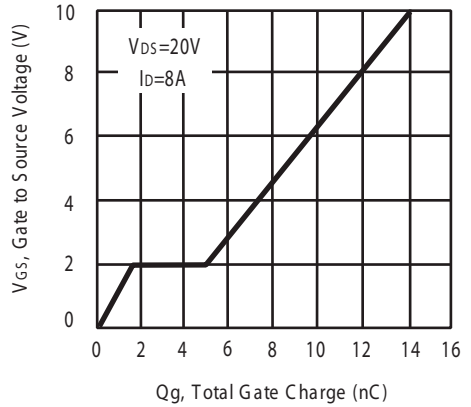


Figure 10. Gate Charge

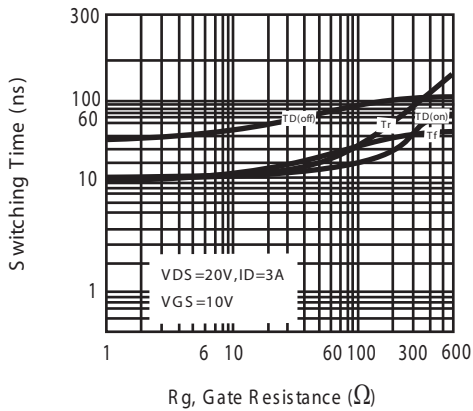


Figure 11. switching characteristics

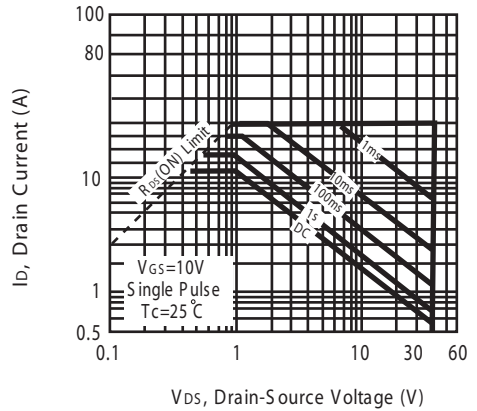


Figure 12. Maximum Safe Operating Area

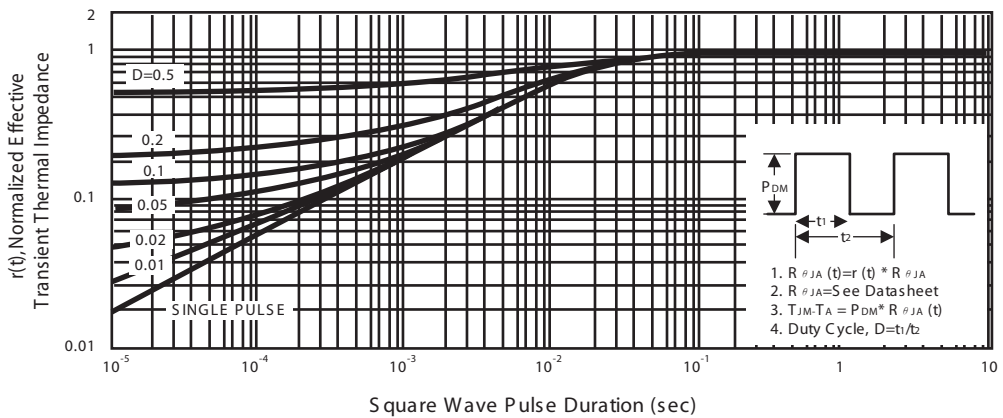


Figure 13. Normalized Thermal Transient Impedance Curve

STU409DH

P-Channel

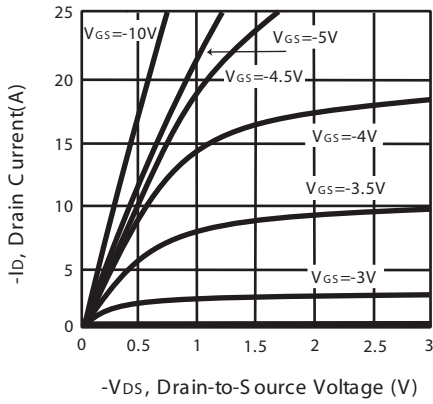


Figure 1. Output Characteristics

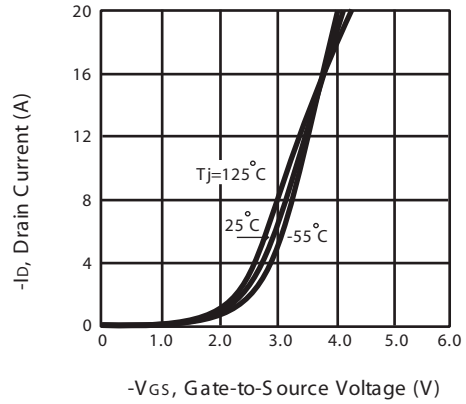


Figure 2. Transfer Characteristics

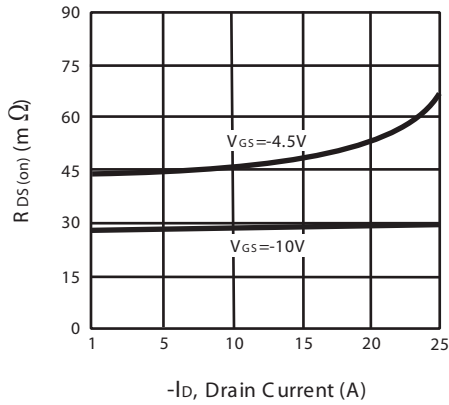


Figure 3. On-Resistance vs. Drain Current and Gate Voltage

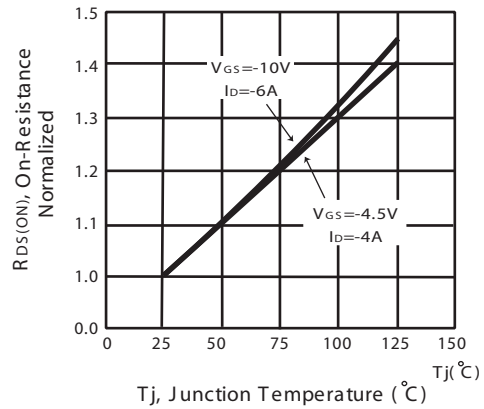


Figure 4. On-Resistance Variation with Drain Current and Temperature

STU409DH

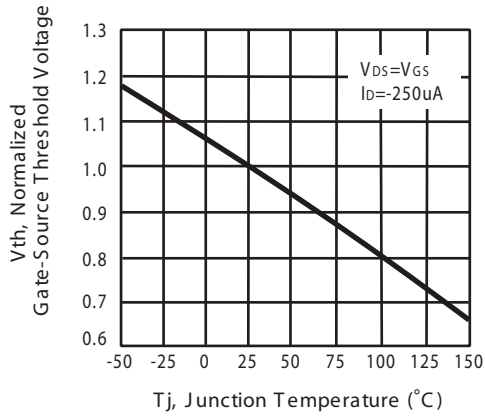


Figure 5. Gate Threshold Variation with Temperature

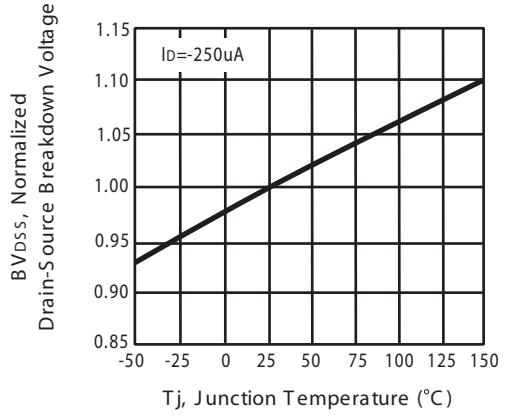


Figure 6. Breakdown Voltage Variation with Temperature

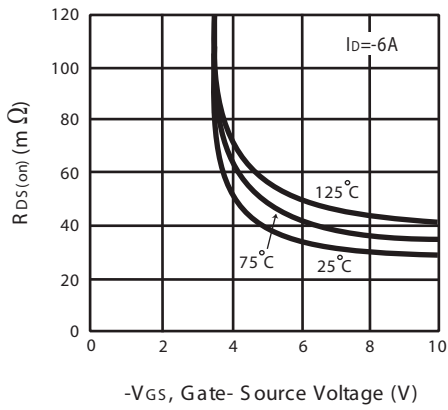


Figure 7. On-Resistance vs. Gate-Source Voltage

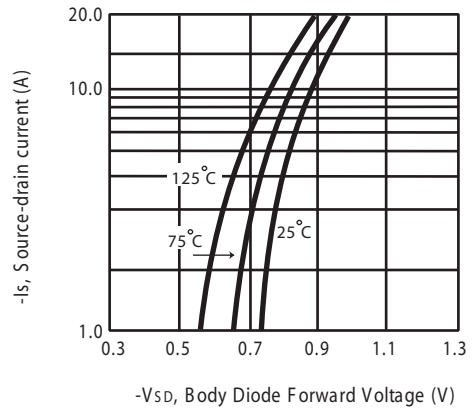


Figure 8. Body Diode Forward Voltage Variation with Source Current

STU409DH

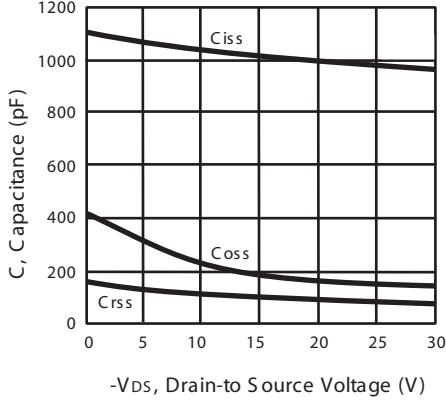


Figure 9. Capacitance

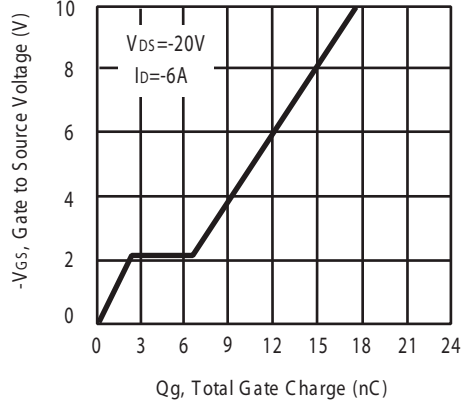


Figure 10. Gate Charge

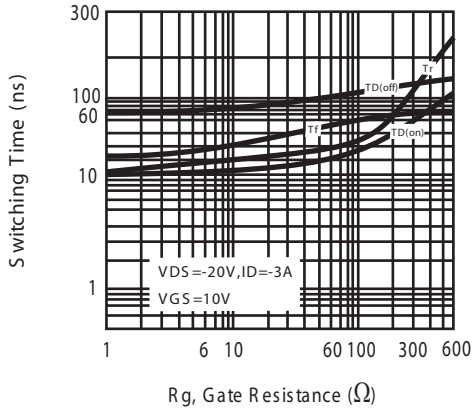


Figure 11. switching characteristics

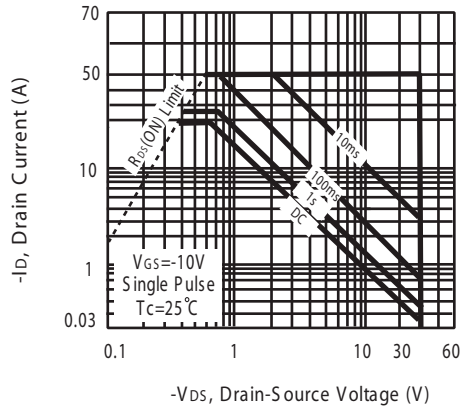


Figure 12. Maximum Safe Operating Area

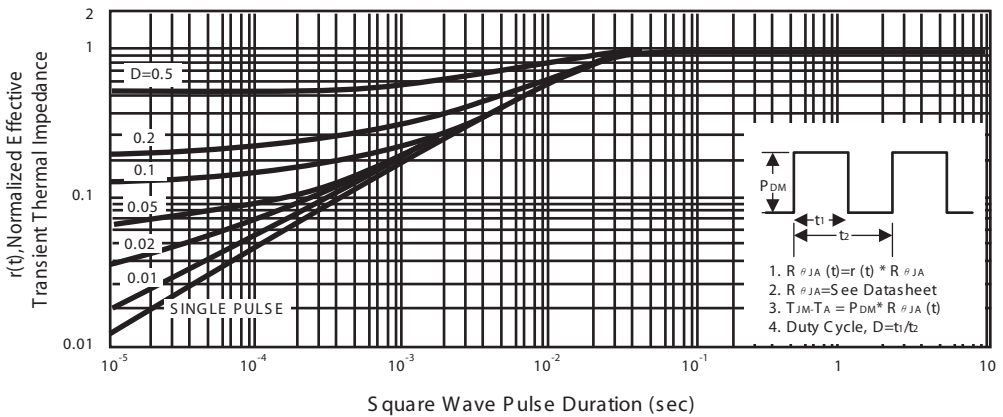
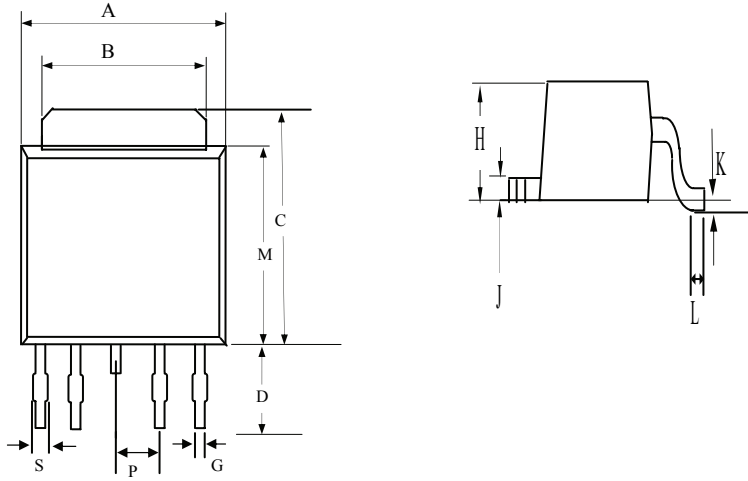


Figure 13. Normalized Thermal Transient Impedance Curve

STU409DH

PACKAGE OUTLINE DIMENSIONS

TO-252-4L

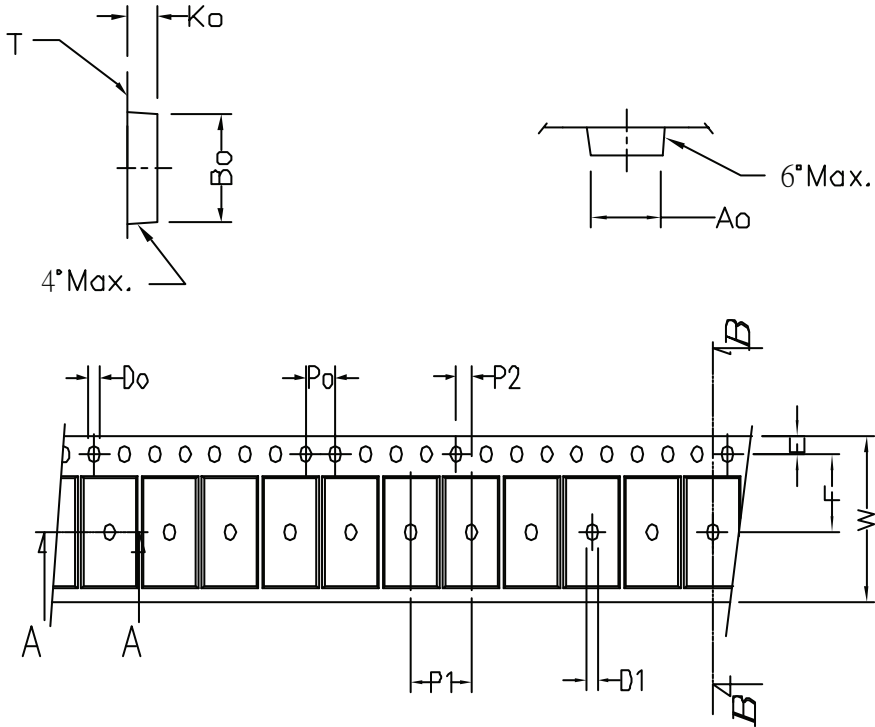


REF .	Millimeters	
	MIN	MAX
A	6.40	6.80
B	5.2	5.50
C	6.80	10.20
D	2.20	3.00
P	1.27 REF.	
S	0.50	0.80
G	0.40	0.60
H	2.20	2.40
J	0.45	0.60
K	0	0.15
L	0.90	1.50
M	5.40	5.80

STU409DH

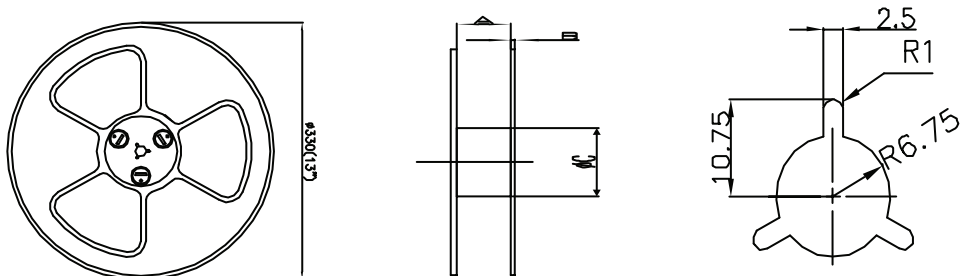
TO-252-4L Tape and Reel Data

TO-252-4L Carrier Tape



symbol	A ₀	B ₀	K ₀	P ₀	P ₁	P ₂	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	D ₀	D ₁	W	10P ₀	
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
∅C	100	100	100	100	100	100	100