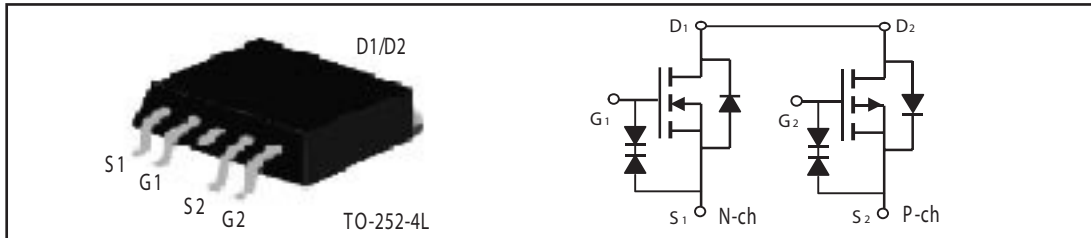




Dual Enhancement Mode Field Effect Transistor (N and P Channel)

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

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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}	$V_{DS}=20V, V_{GS}=0V$ $f=1.0\text{MHz}$		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

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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	-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

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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}	$V_{GS} = 0V, I_S = 8A$ $V_{GS} = 0V, I_S = -6A$	N-Ch P-Ch	0.94 -0.87	1.3 -1.3	V

Notes

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

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

N-Channel

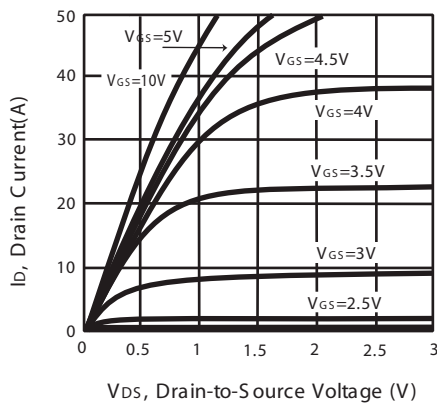


Figure 1. Output Characteristics

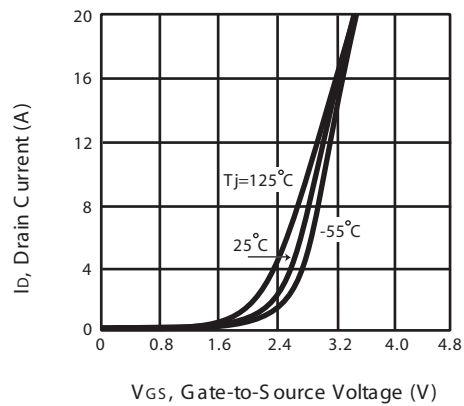


Figure 2. Transfer Characteristics

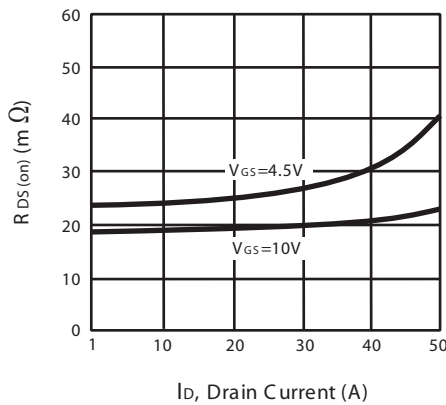


Figure 3. On-Resistance vs. Drain Current and Gate Voltage

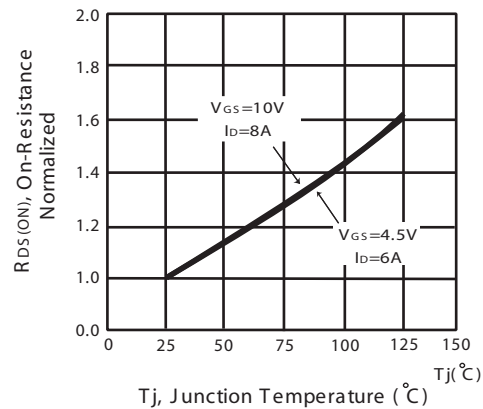


Figure 4. On-Resistance Variation with Drain Current and Temperature

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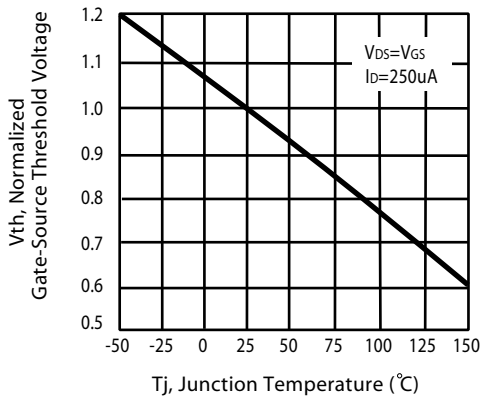


Figure 5. Gate Threshold Variation with Temperature

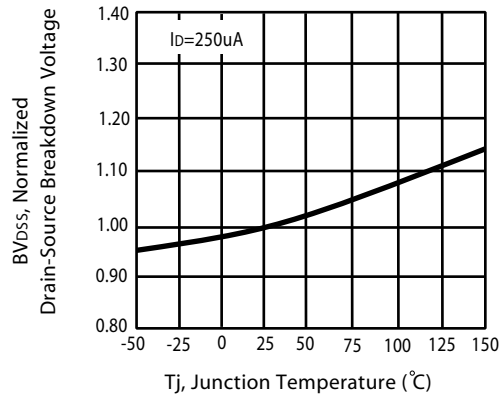


Figure 6. Breakdown Voltage Variation with Temperature

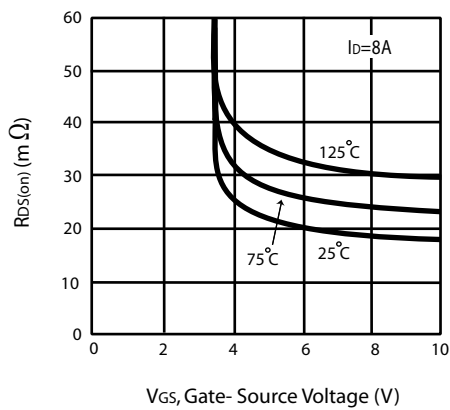


Figure 7. On-Resistance vs. Gate-Source Voltage

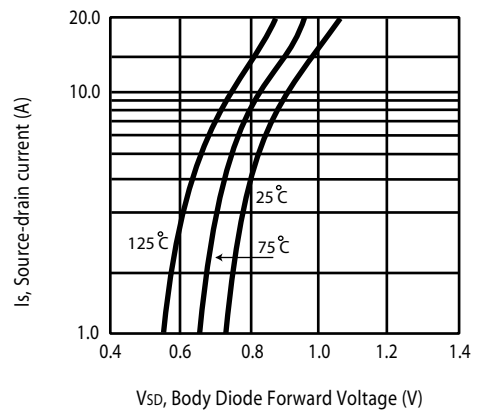


Figure 8. Body Diode Forward Voltage Variation with Source Current

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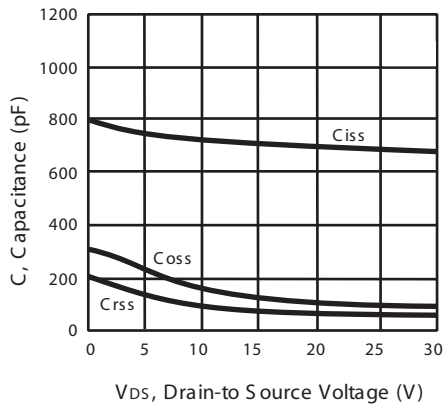


Figure 9. Capacitance

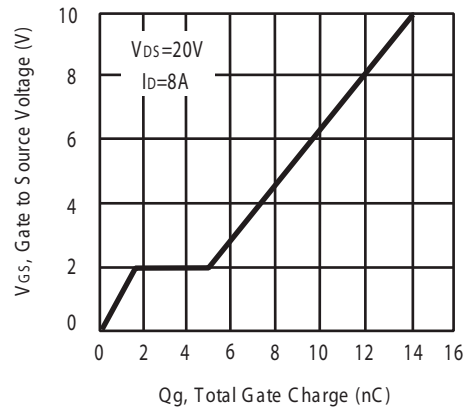


Figure 10. Gate Charge

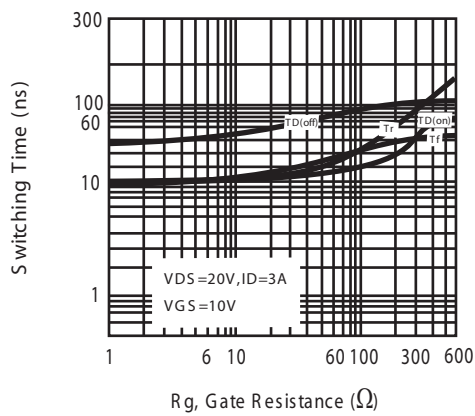


Figure 11. switching characteristics

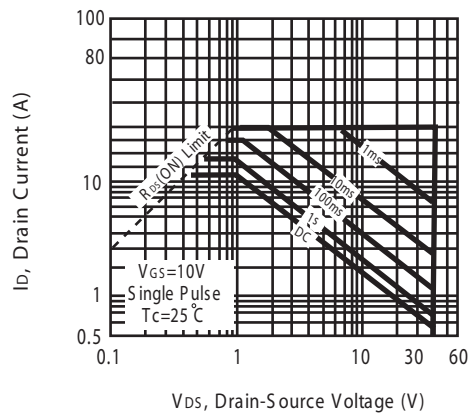


Figure 12. Maximum Safe Operating Area

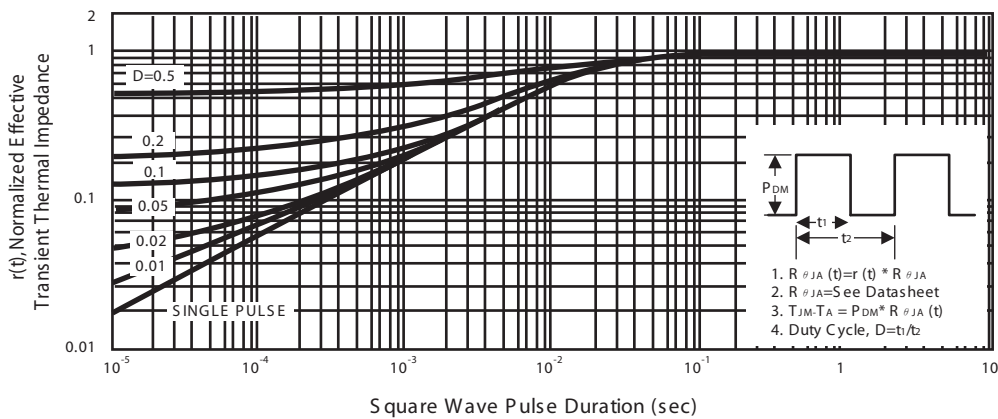


Figure 13. Normalized Thermal Transient Impedance Curve

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P-Channel

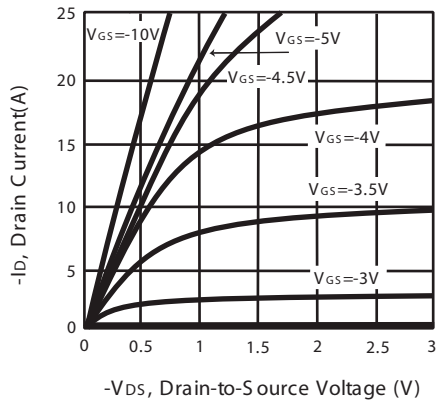


Figure 1. Output Characteristics

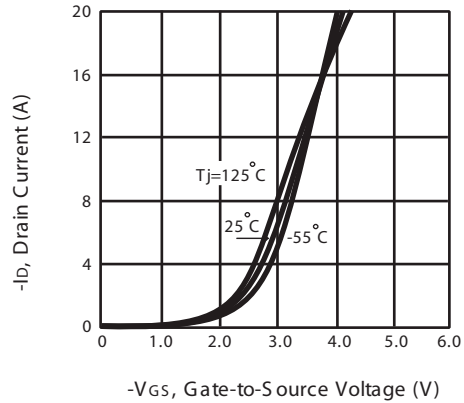


Figure 2. Transfer Characteristics

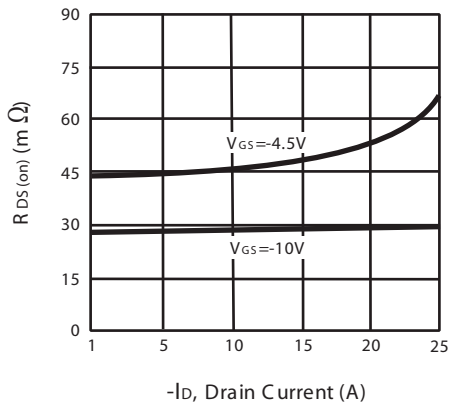


Figure 3. On-Resistance vs. Drain Current and Gate Voltage

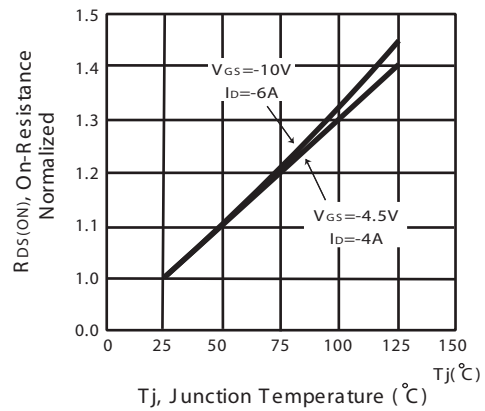


Figure 4. On-Resistance Variation with Drain Current and Temperature

STU409DH

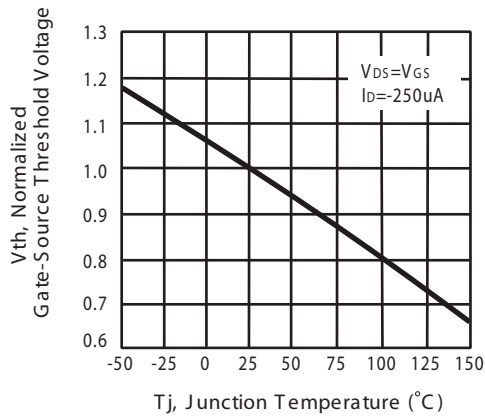


Figure 5. Gate Threshold Variation with Temperature

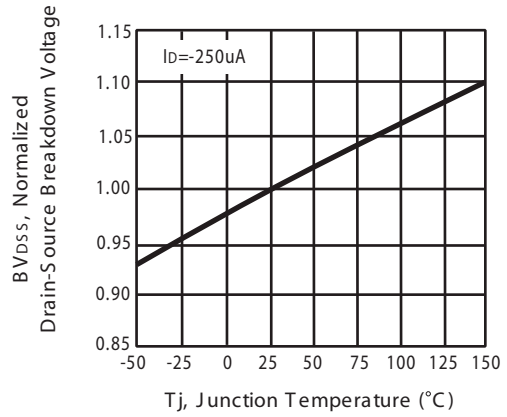


Figure 6. Breakdown Voltage Variation with Temperature

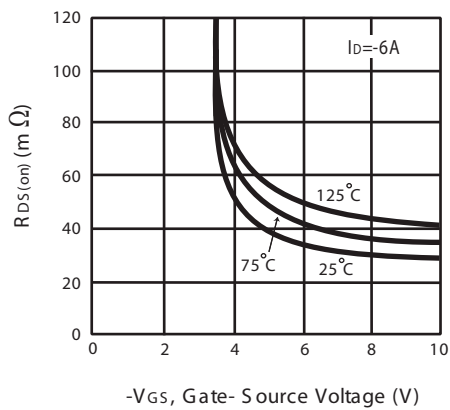


Figure 7. On-Resistance vs. Gate-Source Voltage

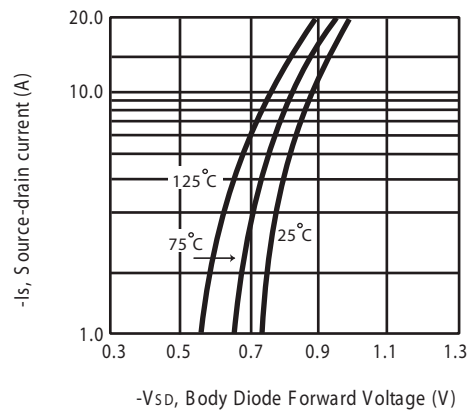


Figure 8. Body Diode Forward Voltage Variation with Source Current

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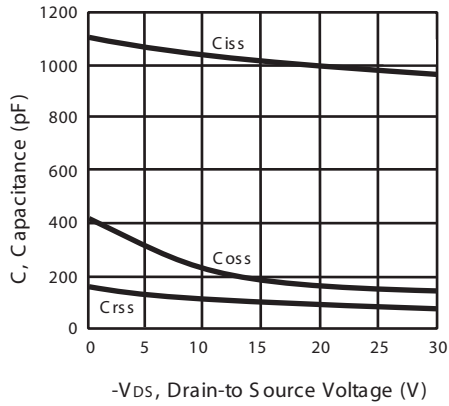


Figure 9. Capacitance

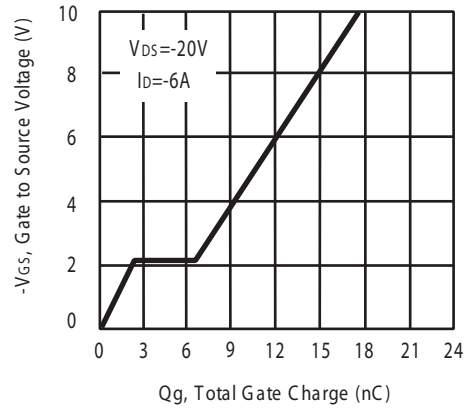


Figure 10. Gate Charge

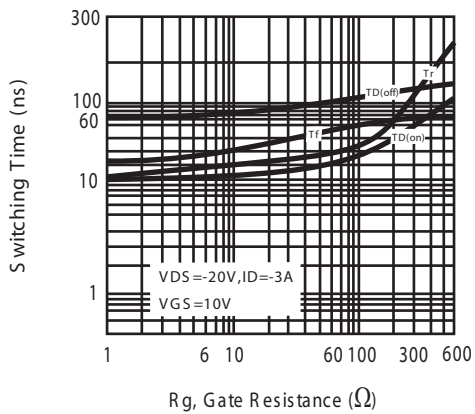


Figure 11. switching characteristics

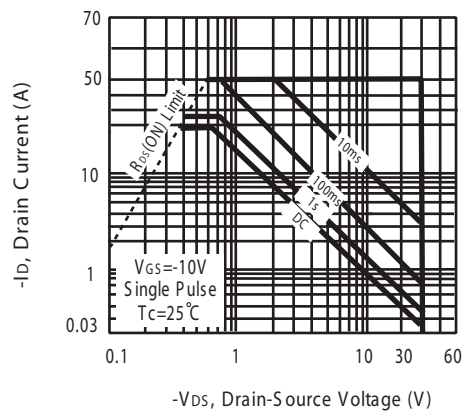


Figure 12. Maximum Safe Operating Area

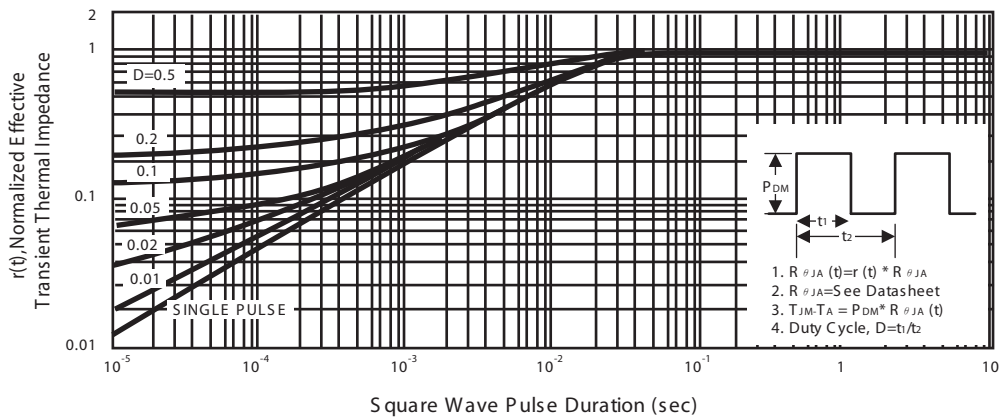
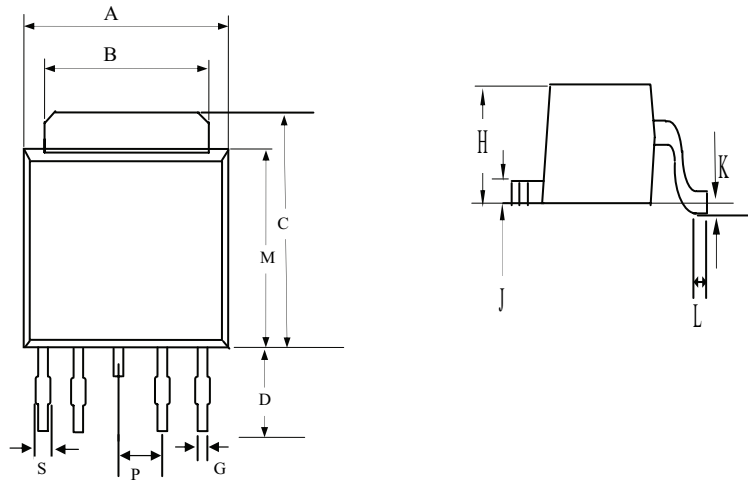


Figure 13. Normalized Thermal Transient Impedance Curve

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PACKAGE OUTLINE DIMENSIONS

TO-252-4L

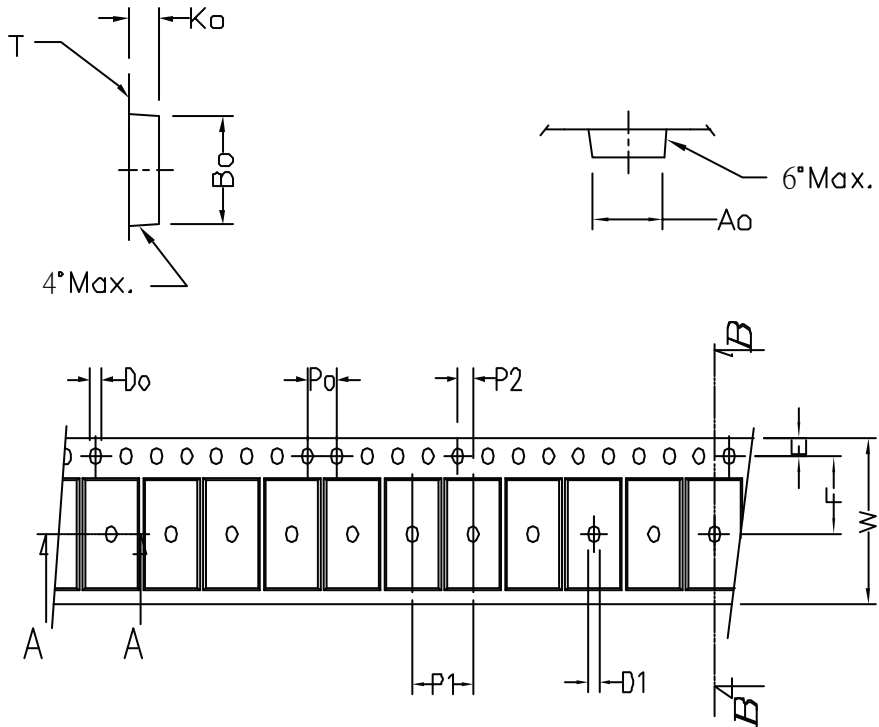


REF .	Millimeters	
	MIN	MAX
A	6.40	6.80
B	5.2	5.50
C	6.80	10.20
D	2.20	3.00
P	1.27 REF.	
S	0.50	0.80
G	0.40	0.60
H	2.20	2.40
J	0.45	0.60
K	0	0.15
L	0.90	1.50
M	5.40	5.80

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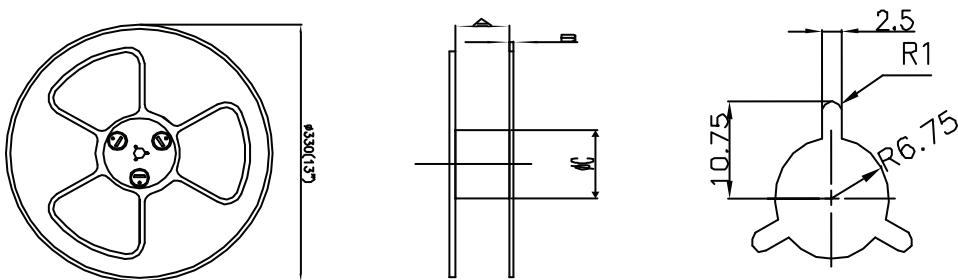
TO-252-4L Tape and Reel Data

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
$A \pm 0.1$	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
ϕC	100	100	100	100	100	100	100