

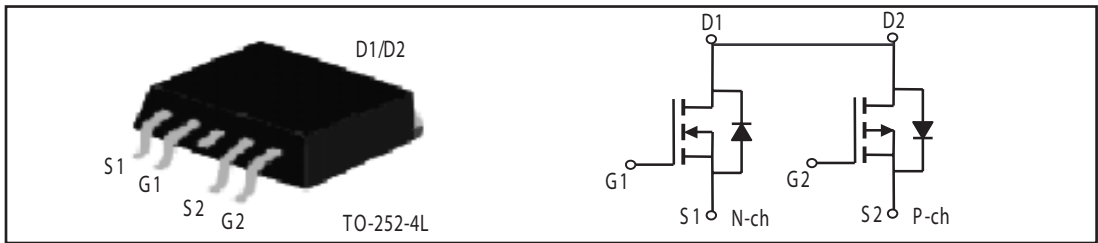


STU404D

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

PRODUCT SUMMARY (N-Channel)		
V _{DSS}	I _D	R _{DS(ON)} (mΩ) Max
40V	16A	30 @ V _{GS} = 10V
		40 @ V _{GS} = 4.5V

PRODUCT SUMMARY (P-Channel)		
V _{DSS}	I _D	R _{DS(ON)} (mΩ) Max
-40V	-12A	48 @ V _{GS} = -10V
		65 @ 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	16	-12	A
		13.8	-10	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 ($T_A = 25\text{ }^{\circ}\text{C}$ 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}	$V_{GS}=\pm 20V, V_{DS}=0V$			± 100	nA
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	$R_{DS(ON)}$	$V_{GS}=10V, I_D=8A$		22	30	m ohm
		$V_{GS}=4.5V, I_D=6A$		30	40	m ohm
On-State Drain Current	$I_{D(ON)}$	$V_{DS}=5V, V_{GS}=4.5V$	20			A
Forward Transconductance	g_{FS}	$V_{DS}=10V, I_D=8A$		20		S
DYNAMIC CHARACTERISTICS^b						
Input Capacitance	C_{ISS}	$V_{DS}=25V, V_{GS}=0V$ $f=1.0MHz$		885	1050	pF
Output Capacitance	C_{OSS}			105		pF
Reverse Transfer Capacitance	C_{RSS}			65		pF
Gate resistance	R_g	$V_{GS}=0V, V_{DS}=0V, f=1.0MHz$		0.32		ohm
SWITCHING CHARACTERISTICS^b						
Turn-On Delay Time	$t_{D(ON)}$	$V_{DD}=20V$ $I_D=1A$ $V_{GS}=10V$ $R_{GEN}=3.3\text{ ohm}$		16		ns
Rise Time	t_r			12		ns
Turn-Off Delay Time	$t_{D(OFF)}$			28		ns
Fall Time	t_f			7		ns
Total Gate Charge	Q_g	$V_{DS}=28V, I_D=8A, V_{GS}=10V$		17		nC
		$V_{DS}=28V, I_D=8A, V_{GS}=4.5V$		8.6		nC
Gate-Source Charge	Q_{gs}	$V_{DS}=28V, I_D=8A$		2.2		nC
Gate-Drain Charge	Q_{gd}	$V_{GS}=10V$		4.8		nC

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P-Channel ELECTRICAL CHARACTERISTICS ($T_A = 25\text{ }^{\circ}\text{C}$ 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}	$V_{GS}=\pm 20V, V_{DS}=0V$			± 100	nA
ON CHARACTERISTICS^a						
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=-250\mu A$	-1	-1.6	-3	V
Drain-Source On-State Resistance	$R_{DS(ON)}$	$V_{GS}=-10V, I_D=-6A$		40	48	m ohm
		$V_{GS}=-4.5V, I_D=-4A$		50	65	m ohm
On-State Drain Current	$I_{D(ON)}$	$V_{DS}=-5V, V_{GS}=-10V$	-20			A
Forward Transconductance	g_{FS}	$V_{DS}=-10V, I_D=-6A$		12		S
DYNAMIC CHARACTERISTICS^b						
Input Capacitance	C_{ISS}	$V_{DS}=-25V, V_{GS}=0V$ $f=1.0MHz$		980	1150	pF
Output Capacitance	C_{OSS}			135		pF
Reverse Transfer Capacitance	C_{RSS}			90		pF
Gate resistance	R_g	$V_{GS}=0V, V_{DS}=0V, f=1.0MHz$		2.2		ohm
SWITCHING CHARACTERISTICS^b						
Turn-On Delay Time	$t_{D(ON)}$	$V_{DD}=-20V$ $I_D=-1A$ $V_{GS}=-10V$ $R_{GEN}=3.3\text{ ohm}$		12		ns
Rise Time	t_r			17		ns
Turn-Off Delay Time	$t_{D(OFF)}$			82		ns
Fall Time	t_f			35		ns
Total Gate Charge	Q_g	$V_{DS}=-28V, I_D=-6A, V_{GS}=-10V$		20.7		nC
		$V_{DS}=-28V, I_D=-6A, V_{GS}=-4.5V$		11		nC
Gate-Source Charge	Q_{gs}	$V_{DS}=-28V, I_D=-6A$		1.5		nC
Gate-Drain Charge	Q_{gd}	$V_{GS}=-10V$		6.2		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}	$V_{GS} = 0\text{V}, I_S = 8\text{A}$	N-Ch	0.98	1.2	V
		$V_{GS} = 0\text{V}, I_S = -6\text{A}$	P-Ch	-0.9	-1.2	

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

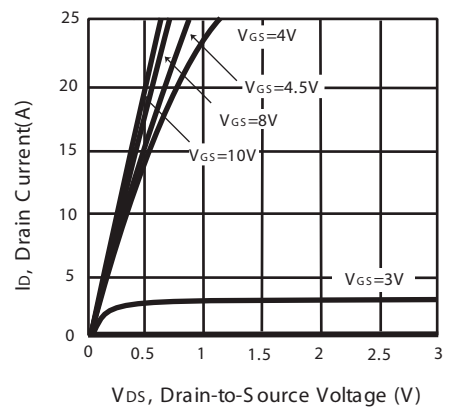


Figure 1. Output Characteristics

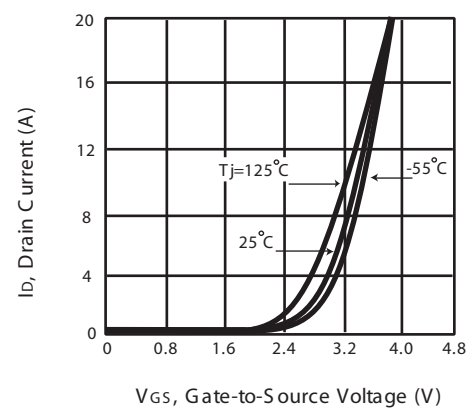


Figure 2. Transfer Characteristics

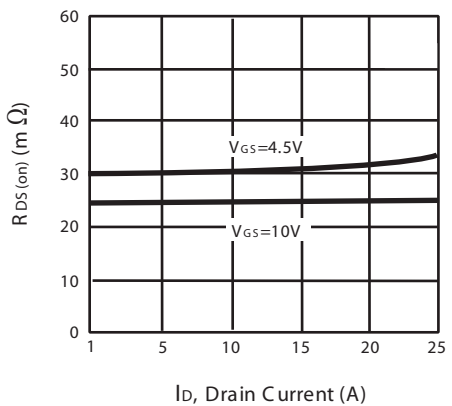


Figure 3. On-Resistance vs. Drain Current and Gate Voltage

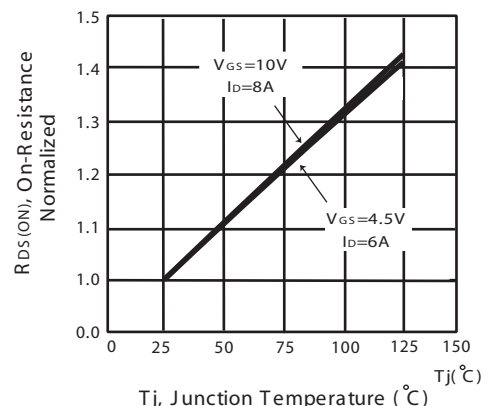


Figure 4. On-Resistance Variation with Drain Current and Temperature

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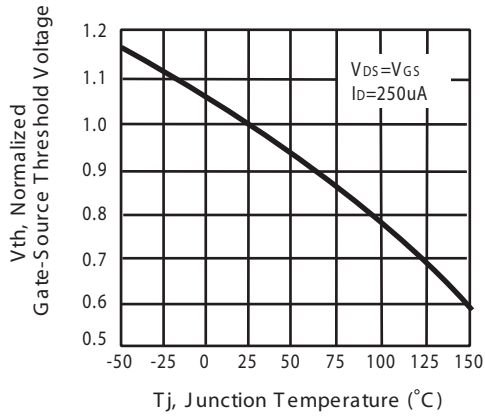


Figure 5. Gate Threshold Variation with Temperature

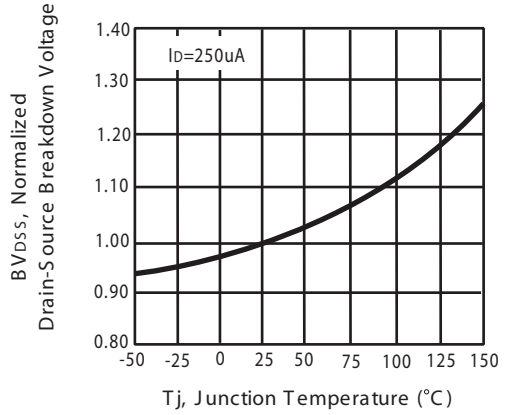


Figure 6. Breakdown Voltage Variation with Temperature

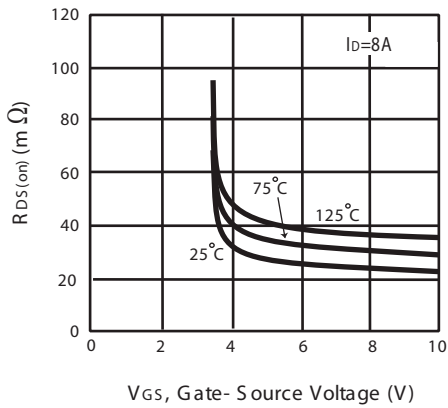


Figure 7. On-Resistance vs. Gate-Source Voltage

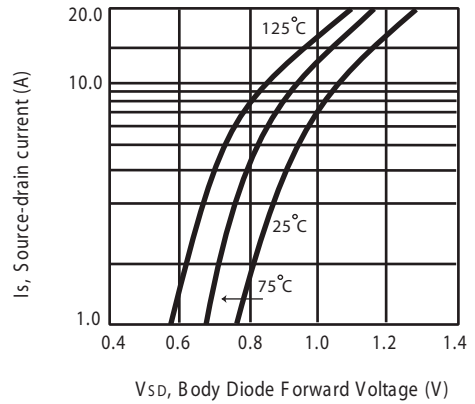


Figure 8. Body Diode Forward Voltage Variation with Source Current

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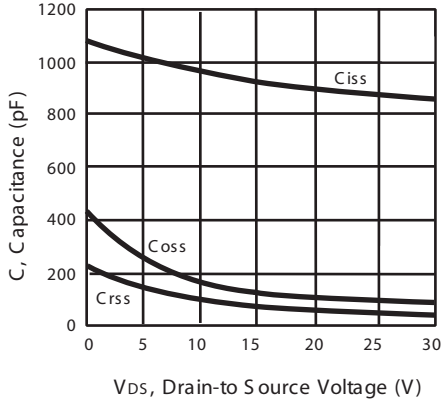


Figure 9. Capacitance

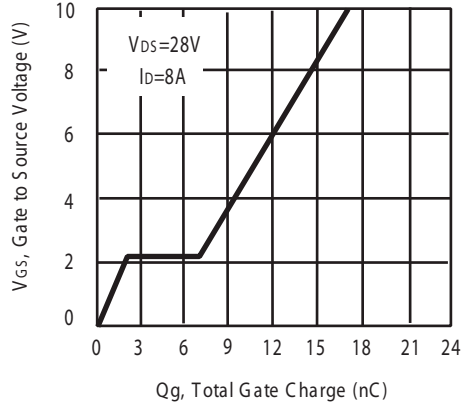


Figure 10. Gate Charge

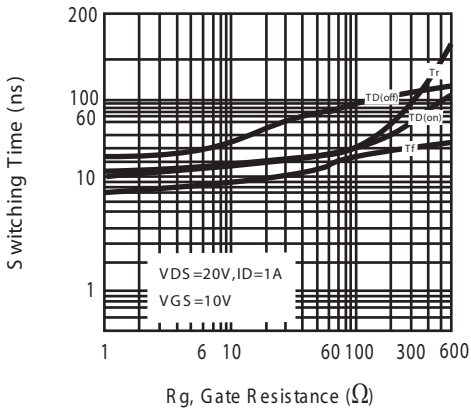


Figure 11. switching characteristics

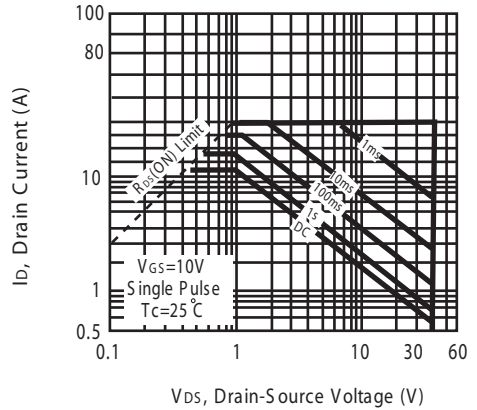


Figure 12. Maximum Safe Operating Area

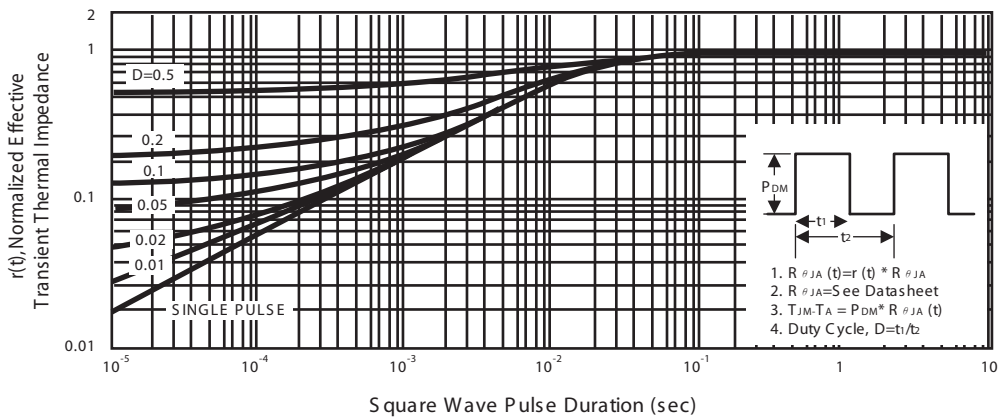


Figure 13. Normalized Thermal Transient Impedance Curve

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P-Channel

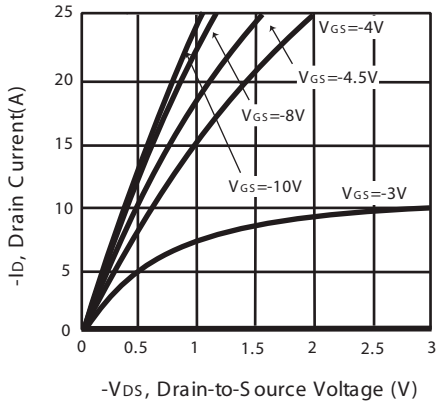


Figure 1. Output Characteristics

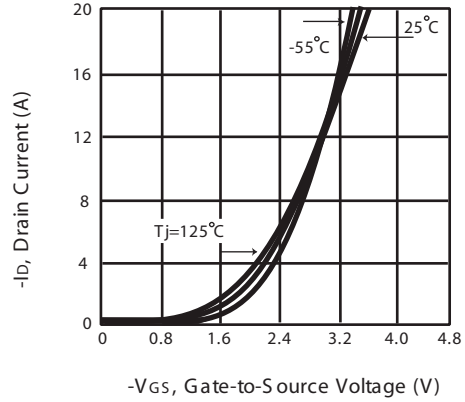


Figure 2. Transfer Characteristics

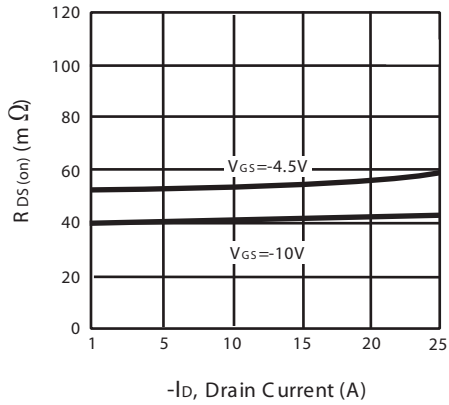


Figure 3. On-Resistance vs. Drain Current and Gate Voltage

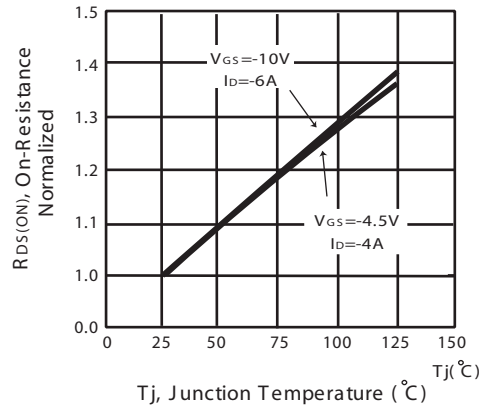


Figure 4. On-Resistance Variation with Drain Current and Temperature

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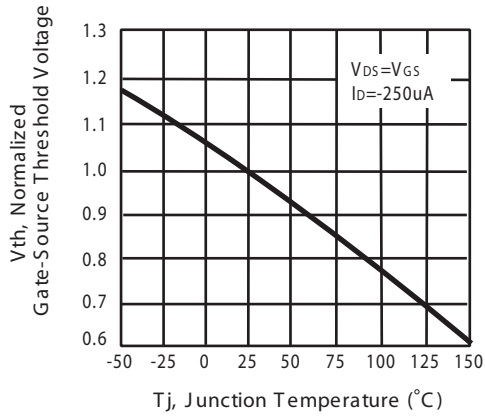


Figure 5. Gate Threshold Variation with Temperature

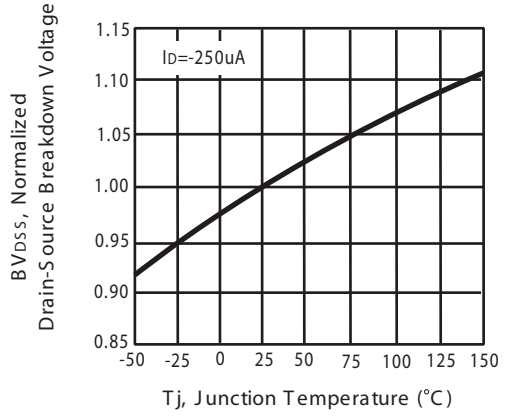


Figure 6. Breakdown Voltage Variation with Temperature

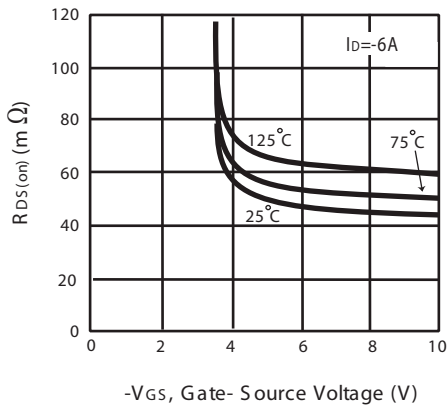


Figure 7. On-Resistance vs. Gate-Source Voltage

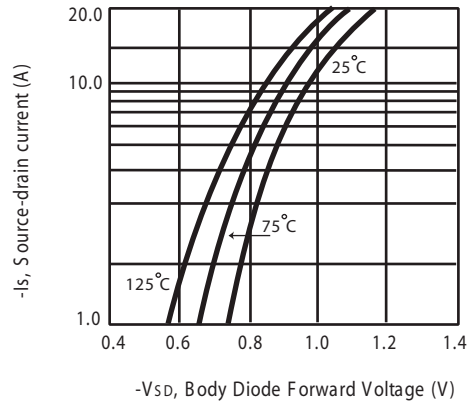


Figure 8. Body Diode Forward Voltage Variation with Source Current

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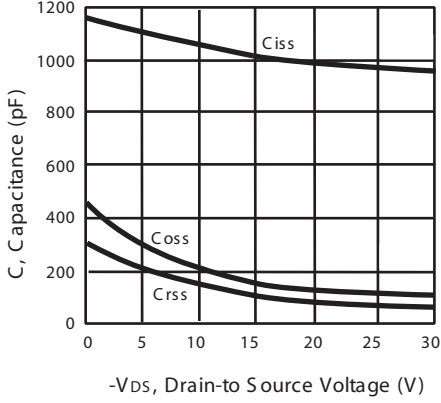


Figure 9. Capacitance

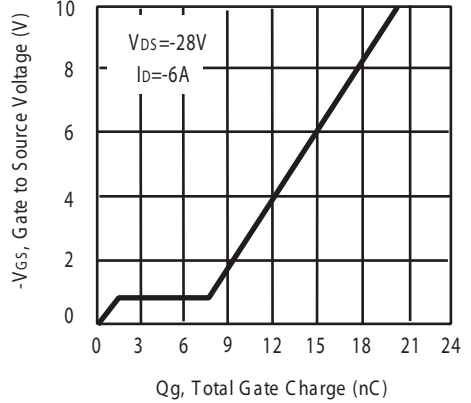


Figure 10. Gate Charge

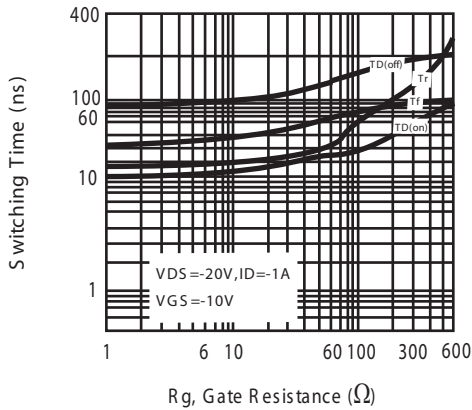


Figure 11. switching characteristics

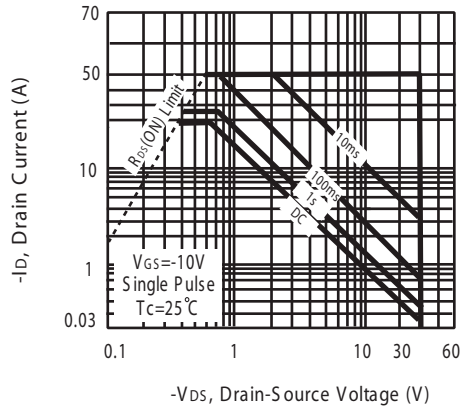


Figure 12. Maximum Safe Operating Area

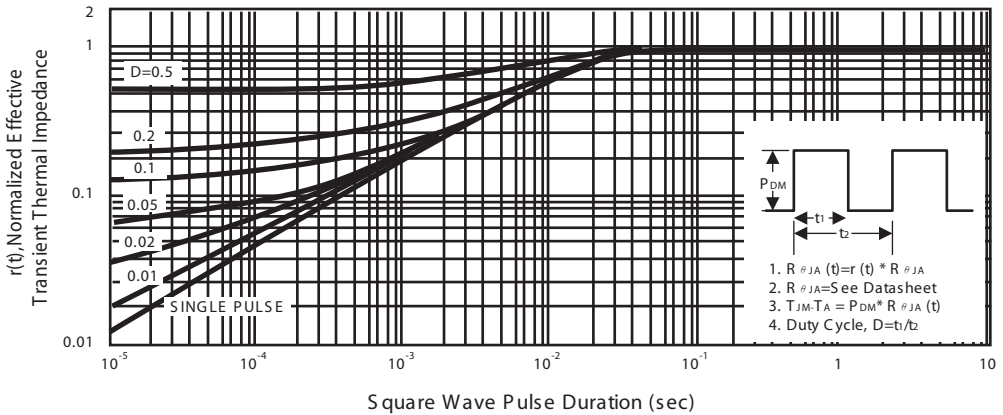
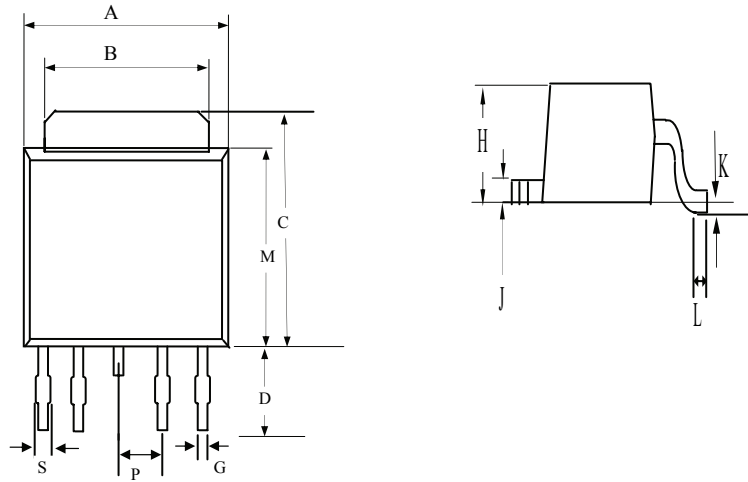


Figure 13. Normalized Thermal Transient Impedance Curve

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PACKAGE OUTLINE DIMENSIONS

TO-252-4L

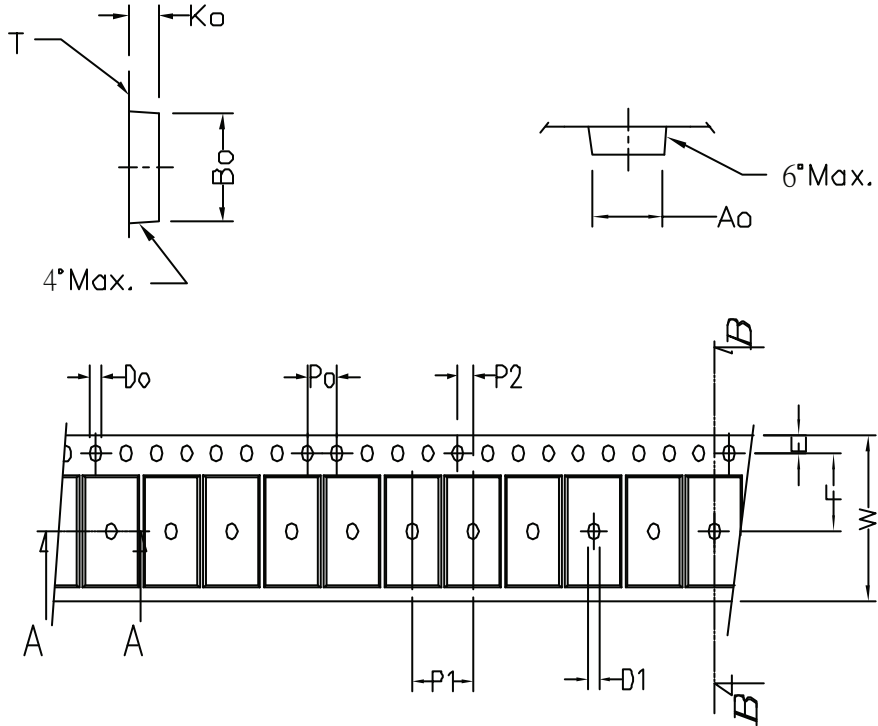


REF .	Millimeters	
	MIN	MAX
A	6.40	6.80
B	5.2	5.50
C	6.80	10.20
D	2.20	3.00
P	1.27 REF.	
S	0.50	0.80
G	0.40	0.60
H	2.20	2.40
J	0.45	0.60
K	0	0.15
L	0.90	1.50
M	5.40	5.80

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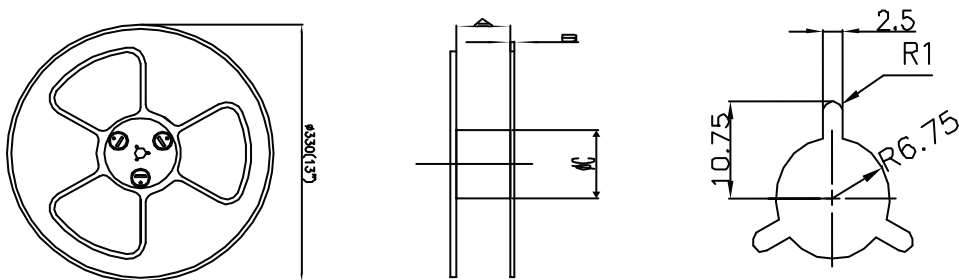
TO-252-4L Tape and Reel Data

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	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