



TM50G04GD

N+P-Channel Enhancement Mode Mosfet

General Description

- Low $R_{DS(ON)}$
- RoHS and Halogen-Free Compliant

Applications

- Load switch
- PWM

General Features

N Channel

$V_{DS} = 40V$ $I_D = 50A$

$R_{DS(ON)} = 6.5m\Omega$ (typ.) @ $V_{GS} = 10V$

P Channel

$V_{DS} = -40V$ $I_D = -48A$

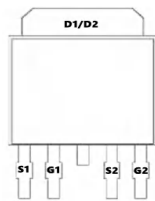
$R_{DS(ON)} = 13m\Omega$ (typ.) @ $V_{GS} = -10V$

100% UIS Tested

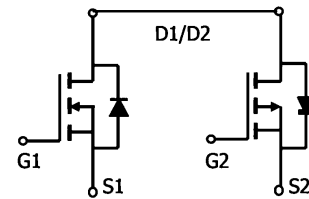
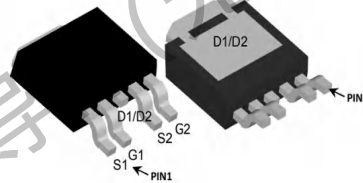
100% R_g Tested



GD:TO-252-4L



Marking: 50G04



Absolute Maximum Ratings ($T_C = 25^\circ C$ unless otherwise noted)

Symbol	Parameter	Rating		Units
		N-Ch	P-Ch	
V_{DS}	Drain-Source Voltage	40	-40	V
V_{GS}	Gate-Source Voltage	± 20	± 20	V
$I_D @ T_a = 25^\circ C$	Continuous Drain Current, $V_{GS} @ 10V$	50	-48	A
$I_D @ T_a = 100^\circ C$	Continuous Drain Current, $V_{GS} @ 10V$	35	-30	A
I_{DM}	Pulsed Drain Current	220	-180	A
$P_D @ T_C = 25^\circ C$	Total Power Dissipation	58	61.3	W
T_{STG}	Storage Temperature Range	-55 to 175	-55 to 175	$^\circ C$
T_J	Operating Junction Temperature Range	-55 to 175	-55 to 175	$^\circ C$

Thermal Data

Symbol	Parameter	Typ.	Max.	Unit
$R_{\theta JA}$	Thermal Resistance Junction-Ambient	---	62.5	$^\circ C/W$
$R_{\theta JC}$	Thermal Resistance Junction-Case	---	2.3	$^\circ C/W$

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N-CH Electrical Characteristics: ($T_C=25^{\circ}\text{C}$ unless otherwise noted)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
BVDSS	Drain-Source Breakdown Voltage	$V_{GS}=0V, I_D=250\mu A$	40	44	---	V
$\Delta BVDSS/\Delta T_J$	BVDSS Temperature Coefficient	Reference to 25°C , $I_D=1mA$	---	0.034	---	V/ $^{\circ}\text{C}$
RDS(ON)	Static Drain-Source On-Resistance	$V_{GS}=10V, I_D=10A$	---	6.5	9.0	m Ω
		$V_{GS}=4.5V, I_D=8A$	---	9.0	12	
VGS(th)	Gate Threshold Voltage	$V_{GS}=V_{DS}, I_D=250\mu A$	1.2	1.6	2.0	V
$\Delta V_{GS(th)}$	$V_{GS(th)}$ Temperature Coefficient		---	-4.96	---	mV/ $^{\circ}\text{C}$
IDSS	Drain-Source Leakage Current	$V_{DS}=32V, V_{GS}=0V, T_J=25^{\circ}\text{C}$	---	---	1	μA
		$V_{DS}=32V, V_{GS}=0V, T_J=55^{\circ}\text{C}$	---	---	5	
IGSS	Gate-Source Leakage Current	$V_{GS}=\pm 20V, V_{DS}=0V$	---	---	± 100	nA
gfs	Forward Transconductance	$V_{DS}=5V, I_D=10A$	---	40	---	S
R_g	Gate Resistance	$V_{DS}=0V, V_{GS}=0V, f=1MHz$	---	1.6	---	Ω
Q_g	Total Gate Charge (4.5V)	$V_{DS}=20V, V_{GS}=4.5V, I_D=10A$	---	18.8		nC
Q_{gs}	Gate-Source Charge		---	4.7		
Q_{gd}	Gate-Drain Charge		---	8.2		
Td(on)	Turn-On Delay Time	$V_{DD}=15V, V_{GS}=10V, R_G=3.3\Omega, I_D=1A$	---	14.3		ns
T_r	Rise Time		---	2.6		
Td(off)	Turn-Off Delay Time		---	77		
T_f	Fall Time		---	4.8		
Ciss	Input Capacitance	$V_{DS}=15V, V_{GS}=0V, f=1MHz$	---	2332		pF
Coss	Output Capacitance		---	193		
Crss	Reverse Transfer Capacitance		---	138		
IS	Continuous Source Current	$V_G=V_D=0V$, Force Current	---	---	50	A
ISM	Pulsed Source Current		---	---	42	A
VSD	Diode Forward Voltage	$V_{GS}=0V, I_S=1A, T_J=25^{\circ}\text{C}$	---	---	1	V

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P-CH Electrical Characteristics: ($T_C=25^{\circ}\text{C}$ unless otherwise noted)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
BV_{DSS}	Drain-Source Breakdown Voltage	$V_{GS}=0V, I_D=-250\mu A$	-40	-44	---	V
$\Delta BV_{DSS}/\Delta T_J$	BV_{DSS} Temperature Coefficient	Reference to 25°C , $I_D=-1\text{mA}$	---	-0.023	---	V/ $^{\circ}\text{C}$
$R_{DS(ON)}$	Static Drain-Source On-Resistance	$V_{GS}=-10V, I_D=-30A$	---	13	17	m Ω
		$V_{GS}=-4.5V, I_D=-20A$	---	16	20	
$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS}=V_{DS}, I_D=-250\mu A$	-1.0	-1.75	-2.5	V
$\Delta V_{GS(th)}$	$V_{GS(th)}$ Temperature Coefficient		---	4.74	---	mV/ $^{\circ}\text{C}$
I_{DSS}	Drain-Source Leakage Current	$V_{DS}=-40V, V_{GS}=0V, T_J=25^{\circ}\text{C}$	---	---	1	uA
		$V_{DS}=-40V, V_{GS}=0V, T_J=55^{\circ}\text{C}$	---	---	5	
I_{GSS}	Gate-Source Leakage Current	$V_{GS}=\pm 20V, V_{DS}=0V$	---	---	± 100	nA
Q_g	Total Gate Charge (-4.5V)	$V_{DS}=-20V, V_{GS}=-4.5V, I_D=-12A$	---	25	---	nC
Q_{gs}	Gate-Source Charge		---	11	---	
Q_{gd}	Gate-Drain Charge		---	9.5	---	
$T_{d(on)}$	Turn-On Delay Time	$V_{DD}=-15V, R_L=15\Omega$ $I_D=-1A, V_{GEN}=-10V, R_G=6\Omega$	---	48	---	ns
T_r	Rise Time		---	24	---	
$T_{d(off)}$	Turn-Off Delay Time		---	88	---	
T_f	Fall Time		---	9.6	---	
C_{iss}	Input Capacitance	$V_{DS}=-20V, V_{GS}=0V, f=1\text{MHz}$	---	2760	---	pF
C_{oss}	Output Capacitance		---	260	---	
C_{rss}	Reverse Transfer Capacitance		---	85	---	
I_S	Continuous Source Current	$V_G=V_D=0V, \text{Force Current}$	---	---	-48	A
I_{SM}	Pulsed Source Current		---	---	-90	A
V_{SD}	Diode Forward Voltage	$V_{GS}=0V, I_S=-1A, T_J=25^{\circ}\text{C}$	---	---	-1.3	V

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N-Typical Characteristics

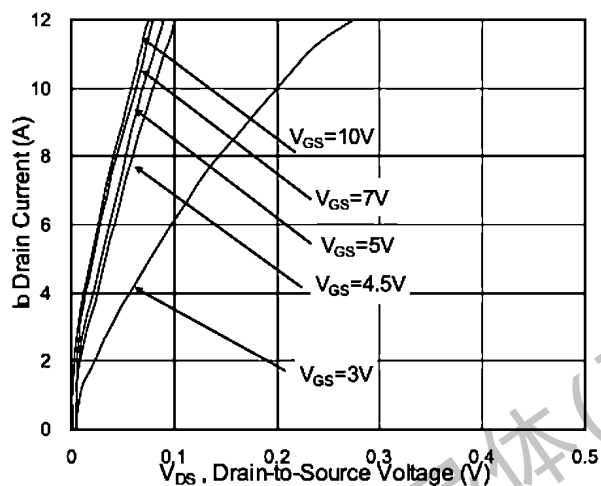


Fig.1 Typical Output Characteristics

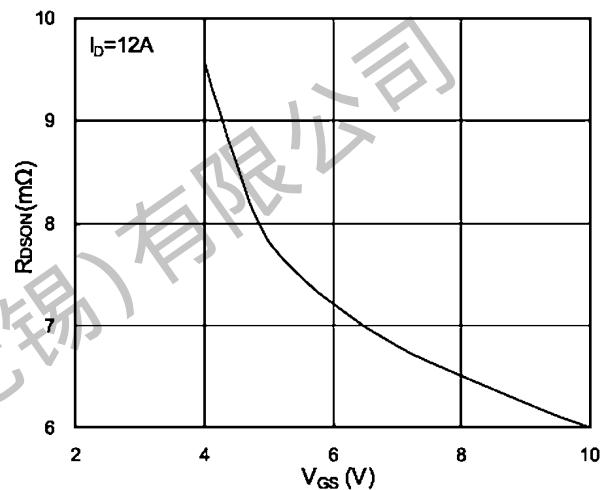


Fig.2 On-Resistance vs. G-S Voltage

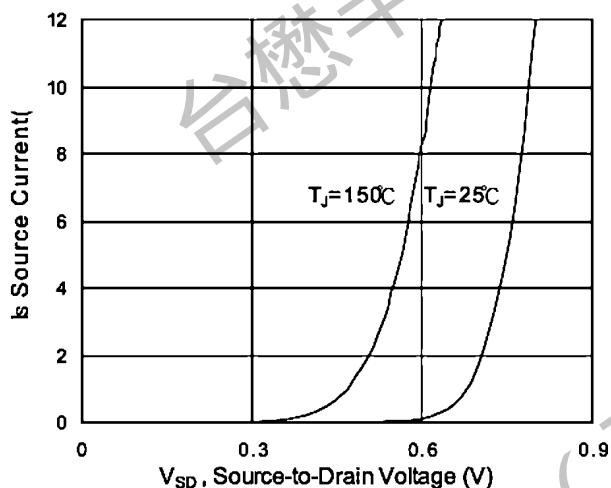


Fig.3 Forward Characteristics of Reverse

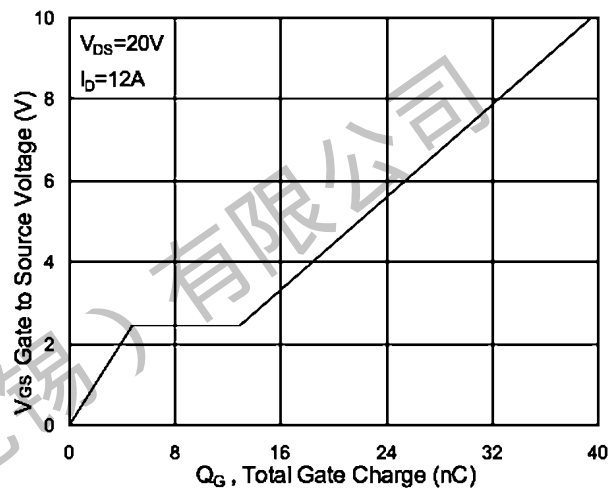


Fig.4 Gate-Charge Characteristics

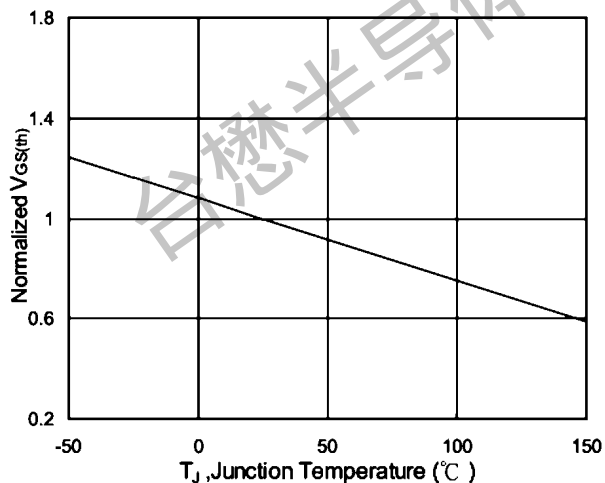


Fig.5 Normalized $V_{GS(th)}$ vs. T_J

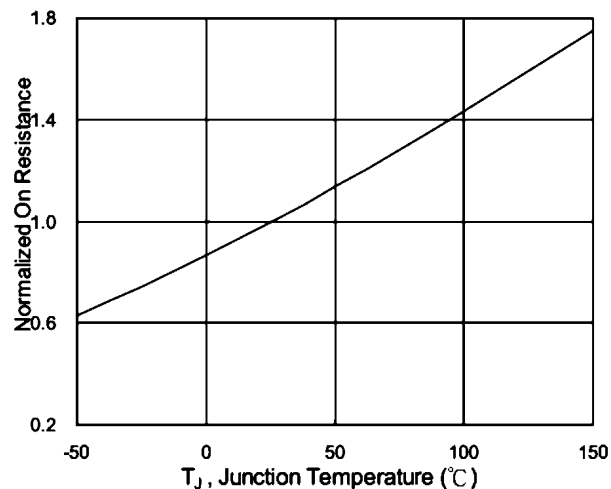


Fig.6 Normalized $R_{DS(on)}$ vs. T_J

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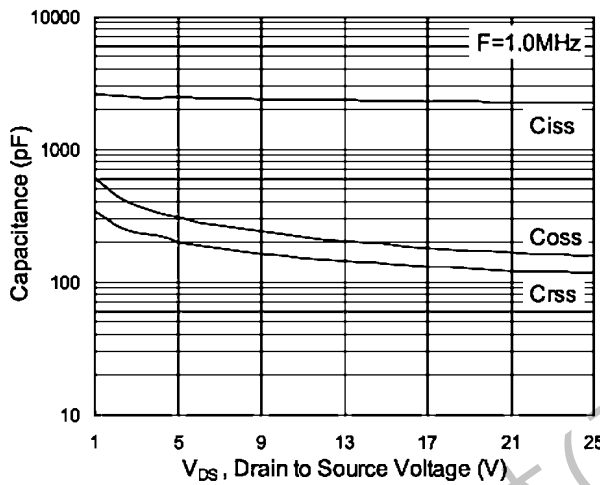


Fig.7 Capacitance

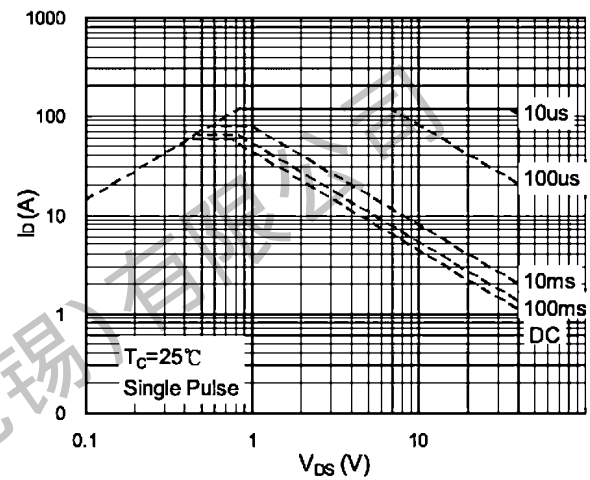


Fig.8 Safe Operating Area

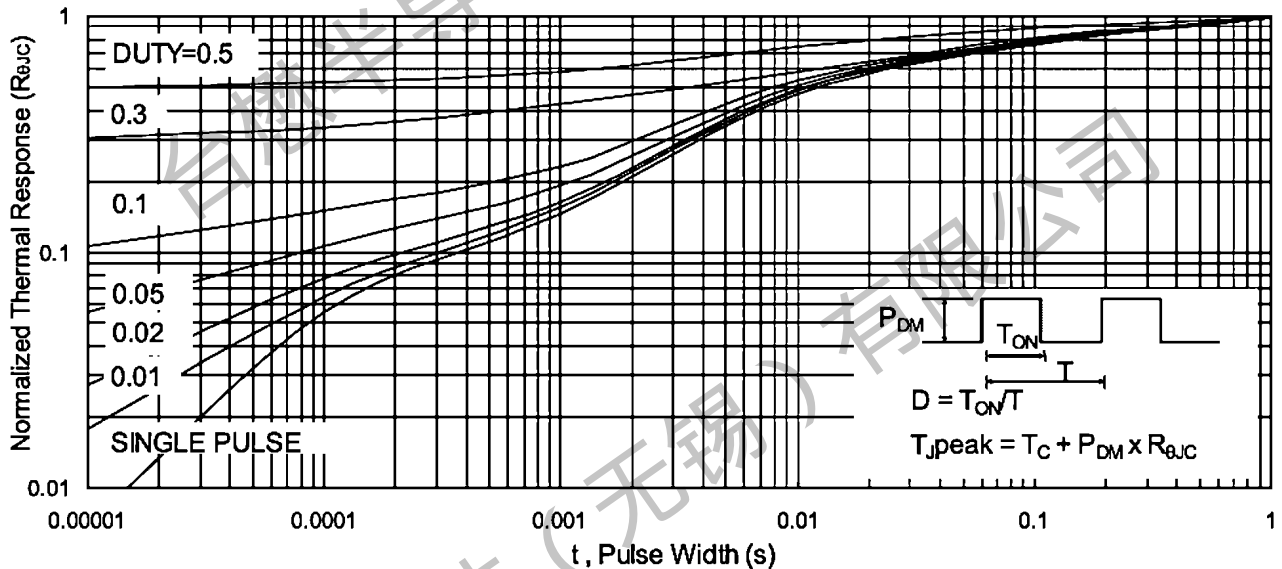


Fig.9 Normalized Maximum Transient Thermal Impedance

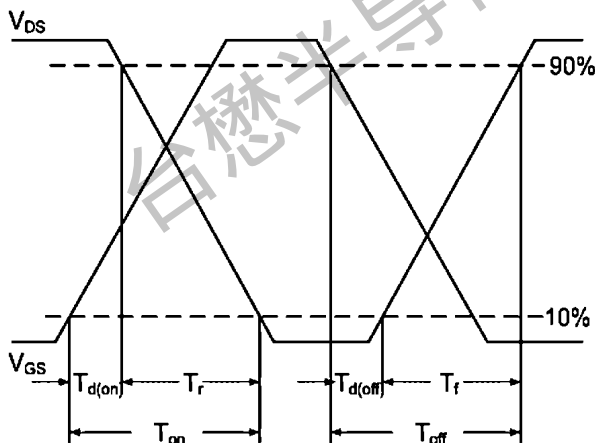


Fig.10 Switching Time Waveform

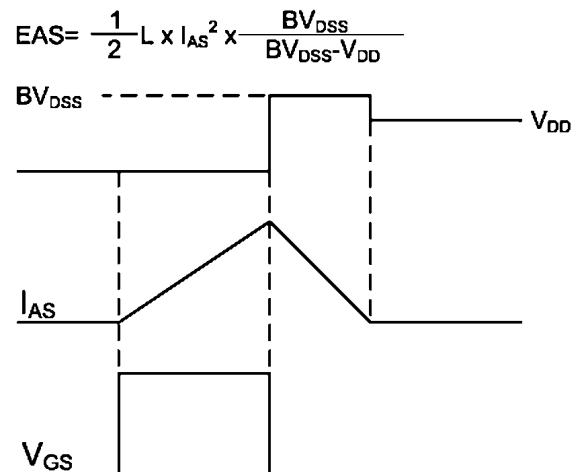


Fig.11 Unclamped Inductive Waveform



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P-Typical Characteristics

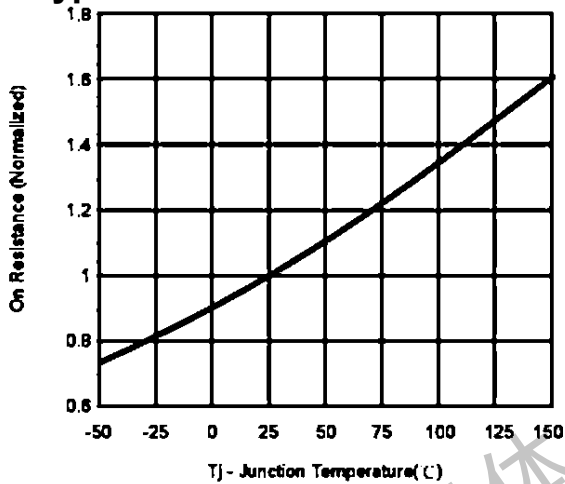


Fig.1 On Resistance Vs Junction Temperature

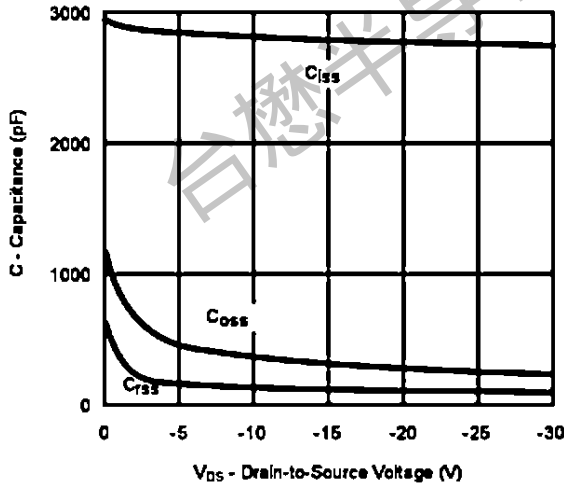


Fig.3 Capacitance

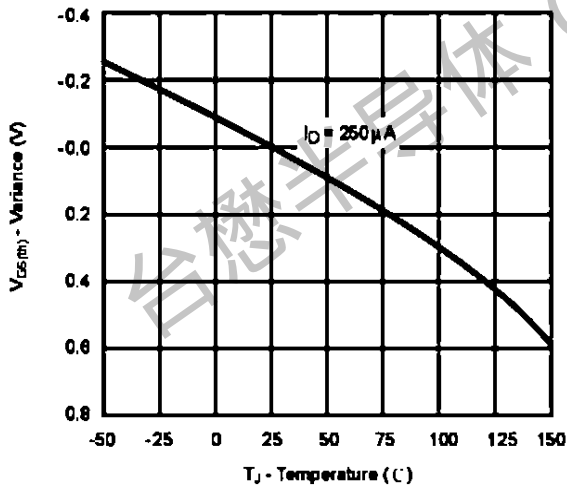


Fig.5 Threshold Voltage

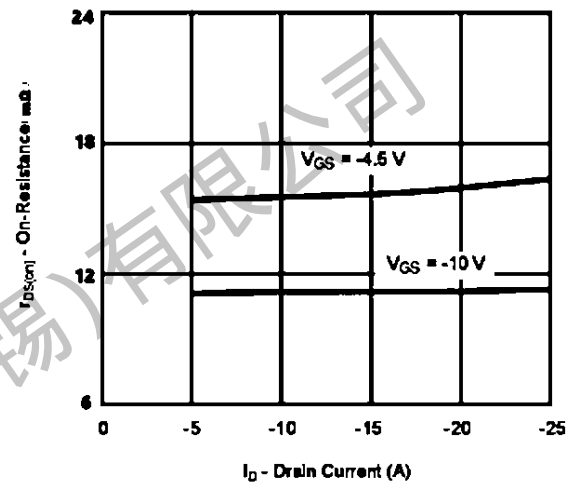


Fig.2 On-Resistance Vs. Drain Current

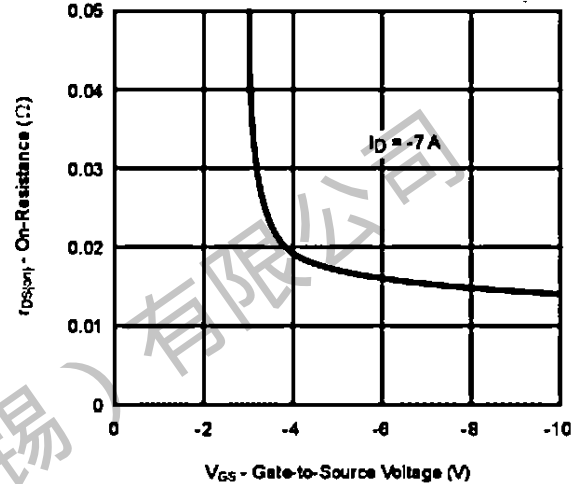


Fig.4 On-Resistance Vs. Gate-to-Source Voltage

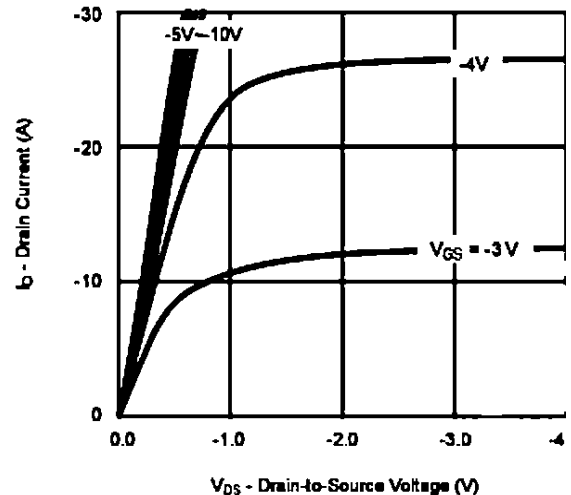
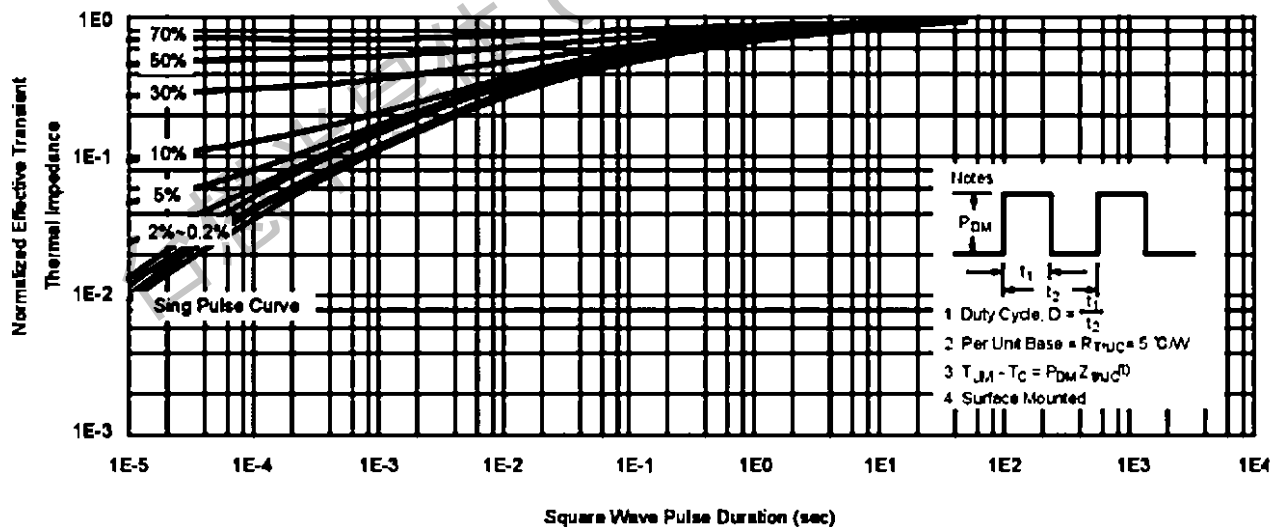
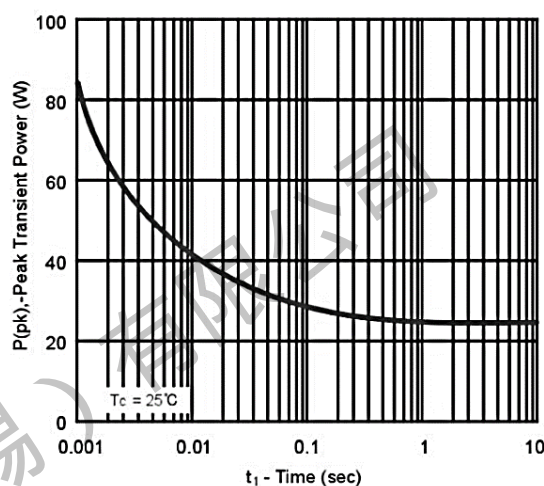
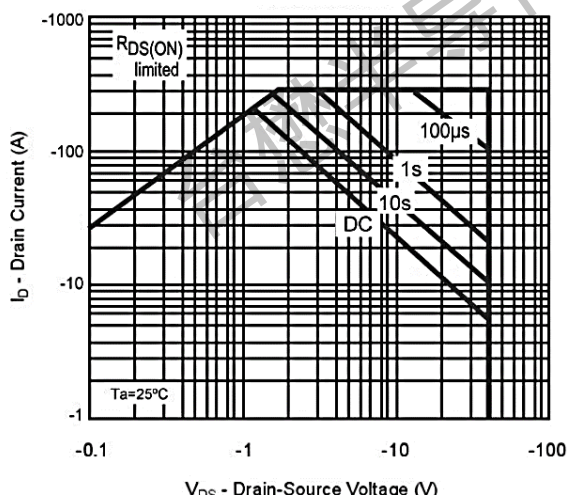
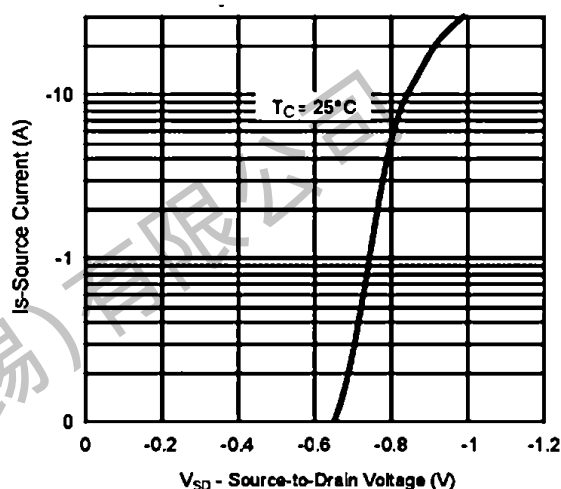
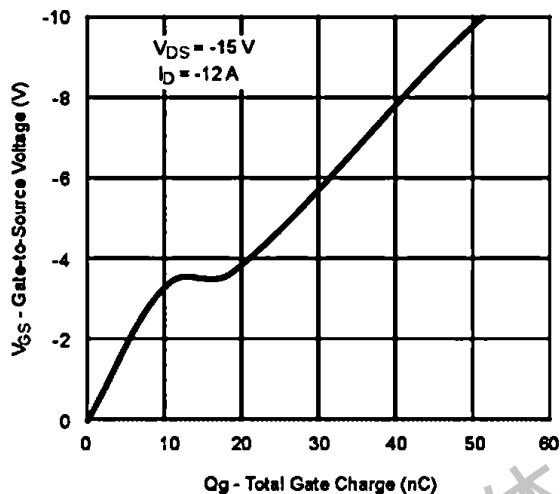


Fig.6 On-Region Characteristics

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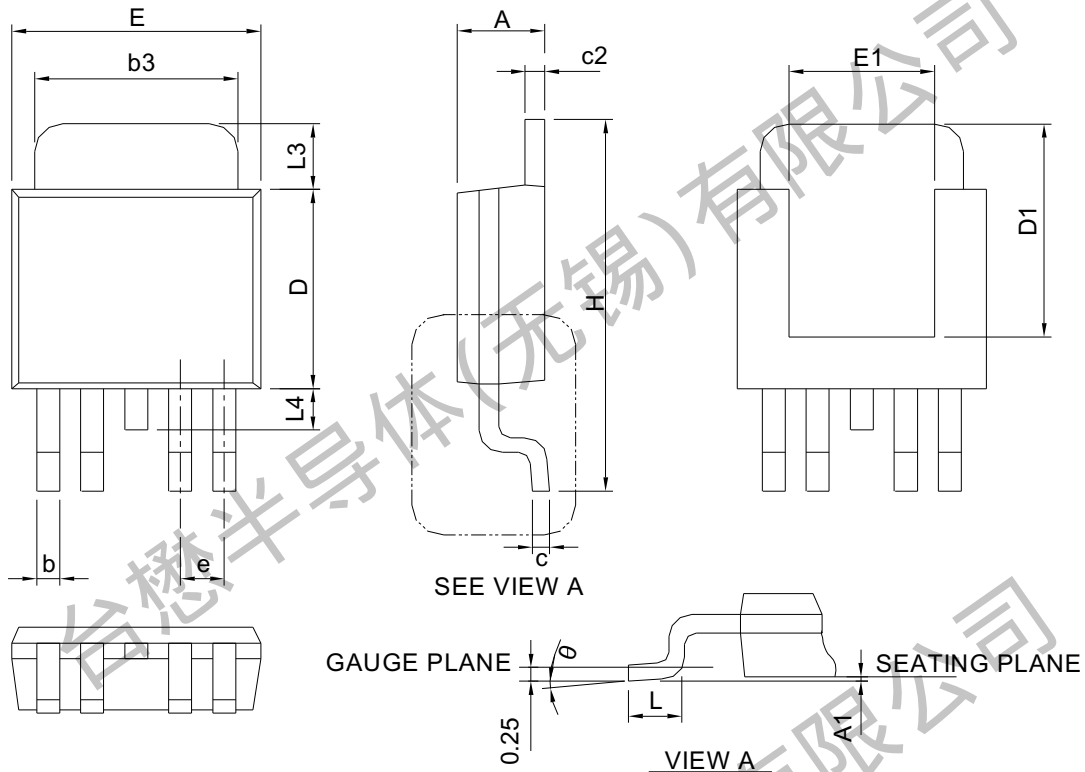
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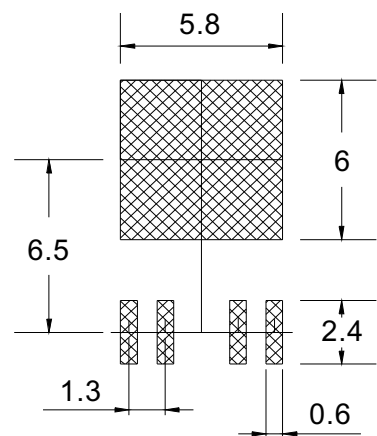
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Package Mechanical Data:TO-252-4L



SYMBOL	TO-252-4			
	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
A	2.18	2.39	0.086	0.094
A1	-	0.2	-	0.008
b	0.50	0.71	0.020	0.028
b3	4.32	5.46	0.170	0.215
c	0.46	0.61	0.018	0.024
c2	0.46	0.89	0.018	0.035
D	5.33	6.22	0.210	0.245
D1	4.57	6.00	0.180	0.236
E	6.35	6.73	0.250	0.265
E1	3.81	6.00	0.150	0.236
e	1.30 BSC		0.051 BSC	
H	9.40	10.41	0.370	0.410
L	1.40	1.78	0.055	0.070
L3	0.89	2.03	0.035	0.080
L4	-	1.02	-	0.040
θ	0°	8°	0°	8°

RECOMMENDED LAND PATTERN



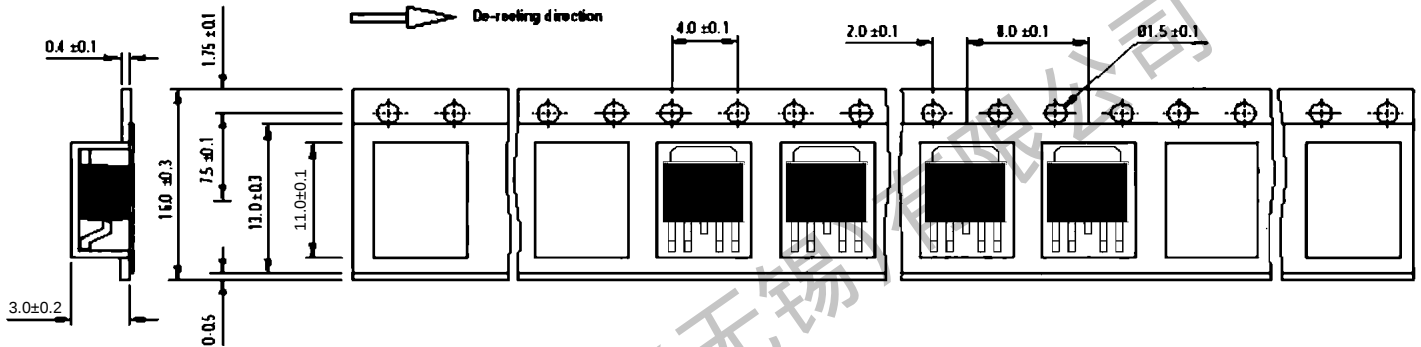
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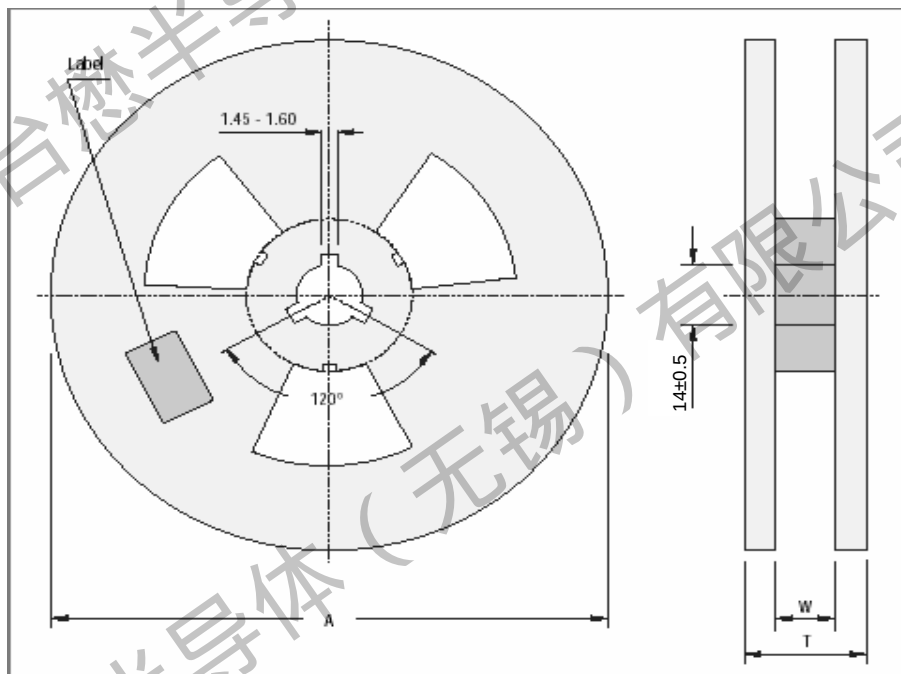
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TO-252-4L Embossed Carrier Tape



TO-252-4L Reel



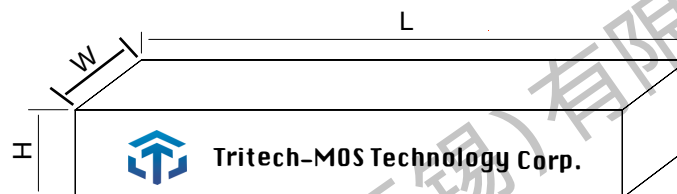
1.TO-252-4L Packaging

Package	Packing Form	Quantity		
		Reel	Inner Box	Outbox
TO-252-4L	Reel	2500	5	1

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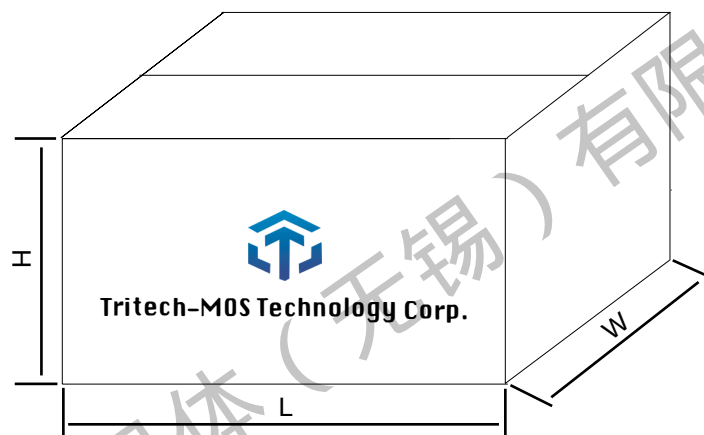
Inner Box



Dimension : 370 (L)×355(W) ×50(H) mm

Quantity : 2500 × 2Ea = 5000pcs

Outer Box



Dimension : 380(L)×380(W) ×275(H) mm

Quantity : 5000 × 5Ea = 25000pcs

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Revision history:

Date	Rev	Description	Page
2023.09.21	23.09	Original	