TM40G06GD

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} = 60V I_D =40A

$R_{DS(ON)}$ =12mΩ (typ.) @ V_{GS}=10V

P Channel

V_{DS} = -60V I_D =-35A

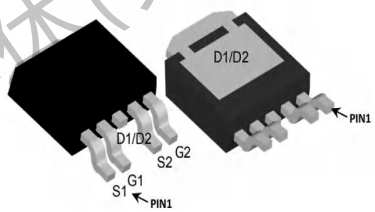
$R_{DS(ON)}$ =28mΩ (typ.) @ V_{GS}=-10V

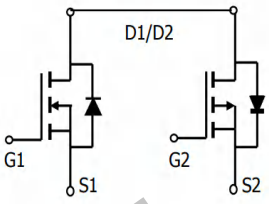
100% UIS Tested

100% R_g Tested

Green Product

GD:TO-252-4L





Marking: 40G06

Absolute Maximum Ratings (T_C = 25°C unless otherwise noted)

Symbol	Parameter	Rating		Units
		N-Ch	P-Ch	
V_{DS}	Drain-Source Voltage	60	-60	V
V_{GS}	Gate-Source Voltage	±20	±20	V
I_D@Ta=25°C	Continuous Drain Current, V_{GS} @ 10V	40	-35	A
I_D@Ta=100°C	Continuous Drain Current, V_{GS} @ 10V	28	-24.5	A
I_{DM}	Pulsed Drain Current	160	-140	A
P_D@T_C=25°C	Total Power Dissipation	80	80	W
T_{STG}	Storage Temperature Range	-55 to 175	-55 to 175	°C
T_J	Operating Junction Temperature Range	-55 to 175	-55 to 175	°C

Thermal Data

Symbol	Parameter	Typ.	Max.	Unit
$R_{\theta JA}$	Thermal Resistance Junction-Ambient	---	48	°C/W
$R_{\theta JC}$	Thermal Resistance Junction-Case	---	5	°C/W

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N-Channel Electrical Characteristics (T_C=25℃unless otherwise noted)

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	BV_{DSS}	V_{GS}=0V I_D=250μA	60	-	-	V
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS}=60V,V_{GS}=0V	-	-	1	μA
Gate-Body Leakage Current	I_{GSS}	V_{GS}=±20V,V_{DS}=0V	-	-	±100	nA
On Characteristics (Note 3)						
Gate Threshold Voltage	$V_{GS(th)}$	V_{DS}=V_{GS},I_D=250μA	1	2	3	V
Drain-Source On-State Resistance	$R_{DS(ON)}$	V_{GS}=10V, I_D=20A	-	12	17	mΩ
		V_{GS}=4.5V, I_D=10A	-	18	24	
Forward Transconductance	g_{FS}	V_{DS}=5V,I_D=20A	18	-	-	S
Dynamic Characteristics (Note4)						
Input Capacitance	C_{lss}	V_{DS}=30V,V_{GS}=0V, F=1.0MHz	-	1620	-	PF
Output Capacitance	C_{oss}		-	112	-	PF
Reverse Transfer Capacitance	C_{rss}		-	96	-	PF
Switching Characteristics (Note 4)						
Turn-on Delay Time	$t_{d(on)}$	V_{DD}=30V,R_L=6.7Ω V_{GS}=10V,R_G=3Ω	-	7.4	-	nS
Turn-on Rise Time	t_r		-	5.1	-	nS
Turn-Off Delay Time	$t_{d(off)}$		-	28.2	-	nS
Turn-Off Fall Time	t_f		-	5.5	-	nS
Total Gate Charge	Q_g	V_{DS}=30V,I_D=20A, V_{GS}=10V	-	38.5	-	nC
Gate-Source Charge	Q_{gs}		-	7	-	nC
Gate-Drain Charge	Q_{gd}		-	8.5	-	nC
Drain-Source Diode Characteristics						
Diode Forward Voltage (Note 3)	V_{SD}	V_{GS}=0V,I_S=20A	-		1.2	V
Diode Forward Current (Note 2)	I_S		-	-	40	A
Reverse Recovery Time	t_{rr}	TJ = 25°C, IF =20A di/dt = 100A/μs (Note3)	-	28	-	nS
Reverse Recovery Charge	Qrr		-	40	-	nC
Forward Turn-On Time	t_{on}	Intrinsic turn-on time is negligible (turn-on is dominated by LS+LD)				

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N-Channel Typical Electrical and Thermal Characteristics (Curves)

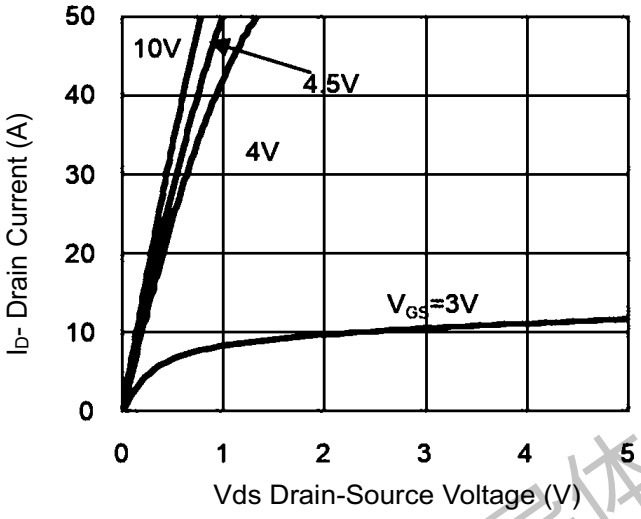

Figure 1 Output Characteristics

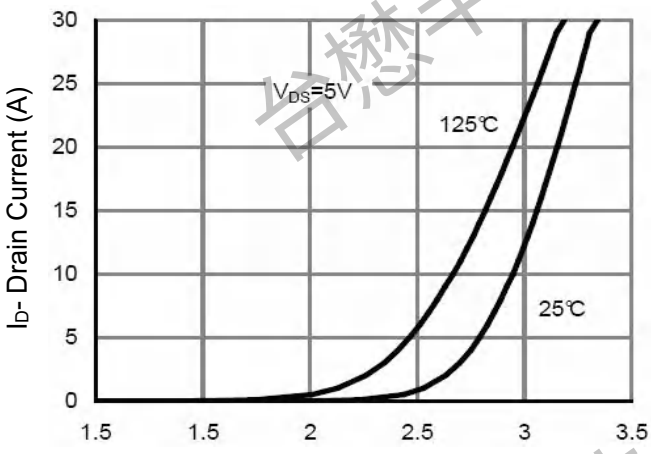

Figure 2 Transfer Characteristics

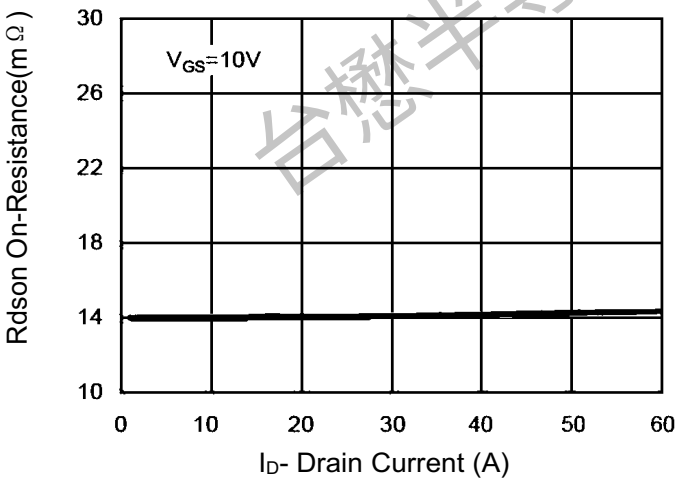

Figure 3 Rdson- Drain Current

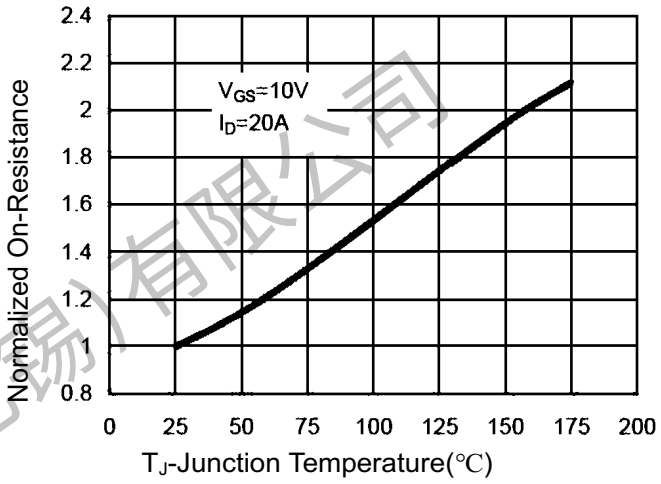

Figure 4 Rdson-Junction Temperature

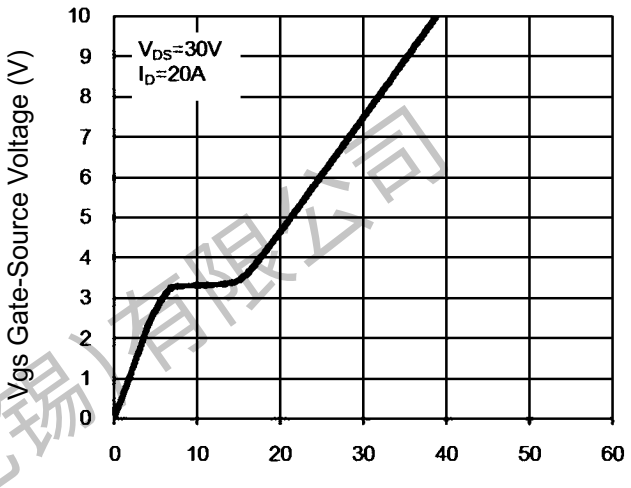

Figure 5 Gate Charge

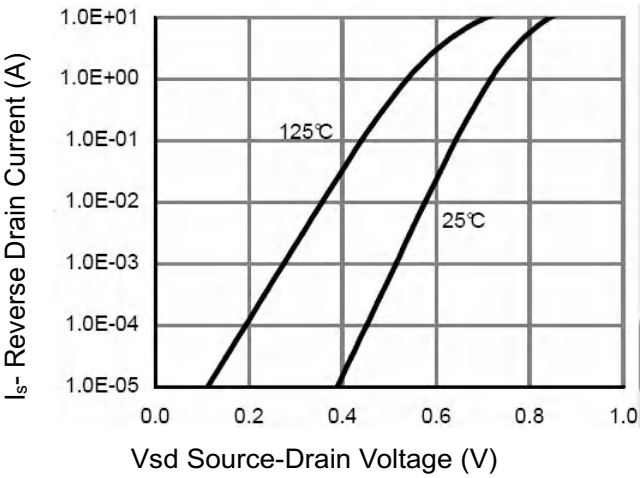

Figure 6 Source- Drain Diode Forward

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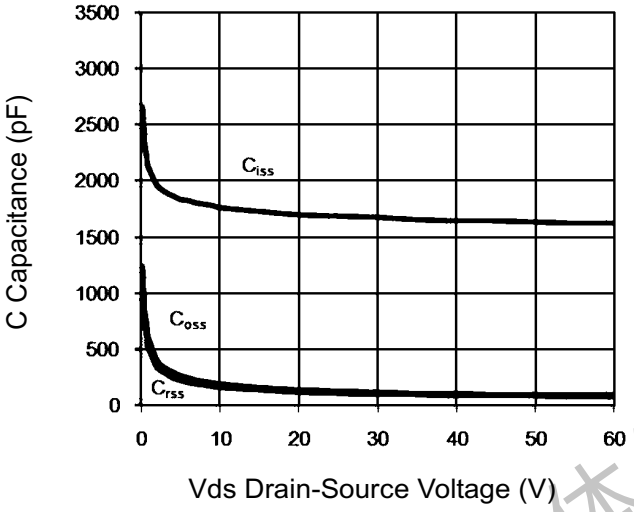

Figure 7 Capacitance vs Vds

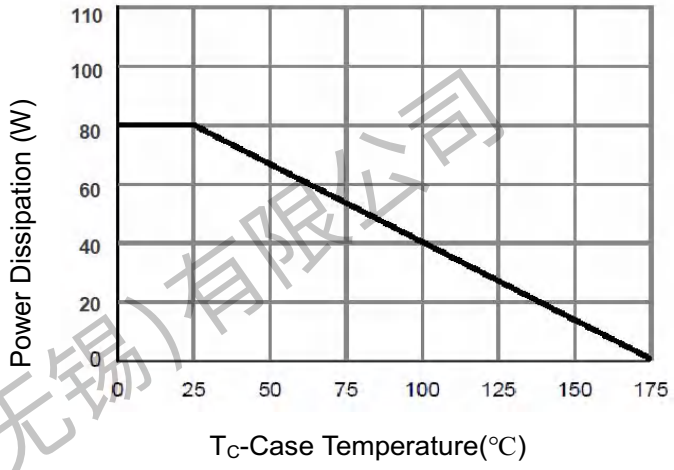

Figure 9 Power De-rating

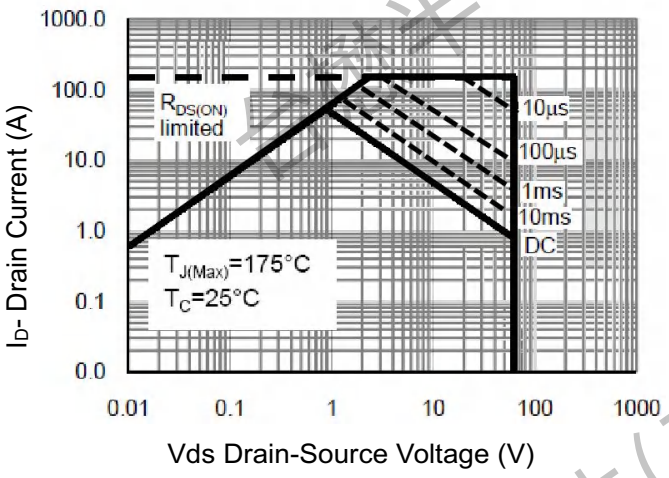

Figure 8 Safe Operation Area

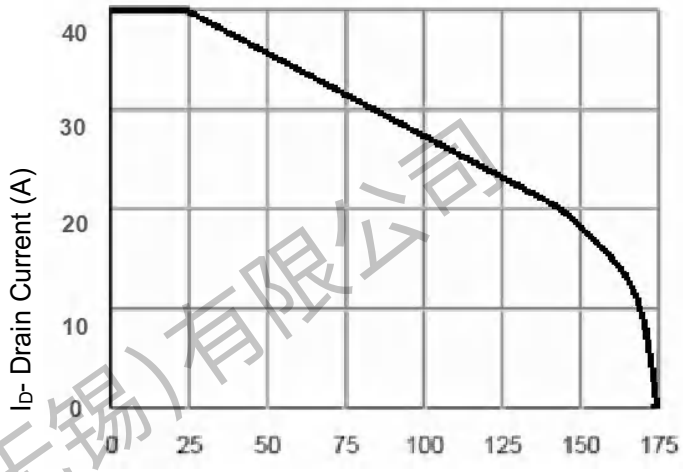

Figure 10 ID Current De-rating

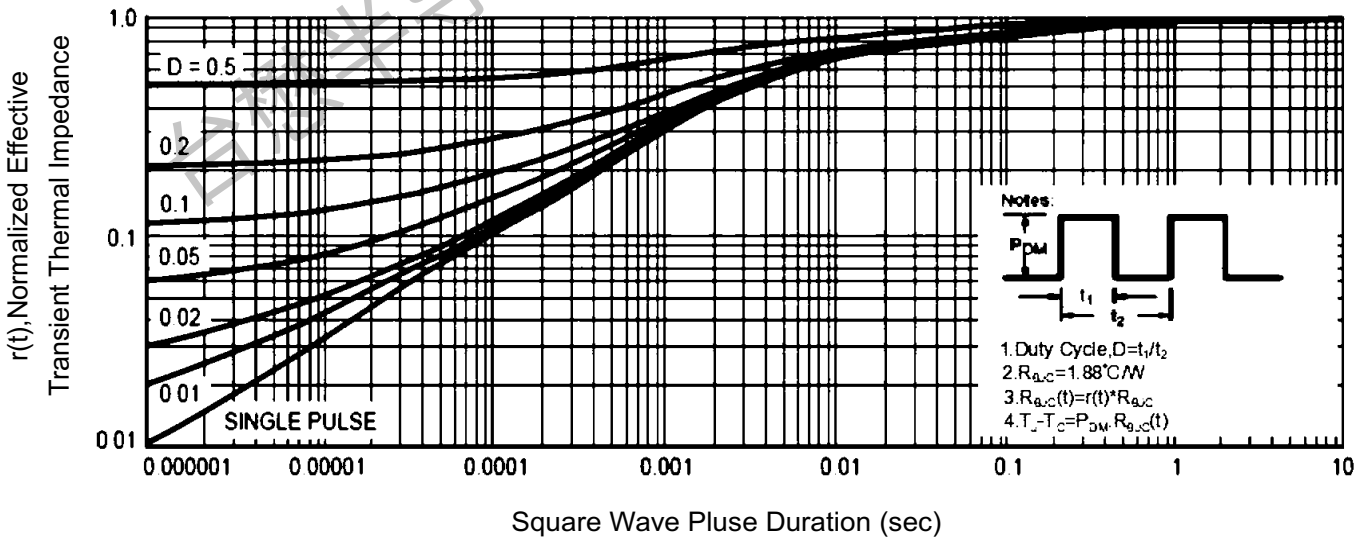

Figure 11 Normalized Maximum Transient Thermal Impedance

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N+P-Channel Enhancement Mode Mosfet

P-Channel Electrical Characteristics (T_C=25℃unless otherwise noted)

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	BV_{DSS}	V_{GS}=0V I_D=-250μA	-60	-	-	V
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS}=-60V,V_{GS}=0V	-	-	-1	μA
Gate-Body Leakage Current	I_{GSS}	V_{GS}=±20V,V_{DS}=0V	-	-	±100	nA
On Characteristics (Note 3)						
Gate Threshold Voltage	$V_{GS(th)}$	V_{DS}=V_{GS},I_D=-250μA	-1	-2	-3	V
Drain-Source On-State Resistance	$R_{DS(ON)}$	V_{GS}=-10V, I_D=-20A	-	28	36	mΩ
		V_{GS}=-4.5V, I_D=-10A	-	36	45	
Forward Transconductance	g_{FS}	V_{DS}=-5V,I_D=-20A	-	20	-	S
Dynamic Characteristics (Note4)						
Input Capacitance	C_{lss}	V_{DS}=-30V,V_{GS}=0V, F=1.0MHz	-	2220	-	PF
Output Capacitance	C_{oss}		-	119	-	PF
Reverse Transfer Capacitance	C_{rss}		-	97.5	-	PF
Switching Characteristics (Note 4)						
Turn-on Delay Time	$t_{d(on)}$	V_{DD}=-30V, I_D=-20A, V_{GS}=-10V,R_G=3Ω	-	13	-	nS
Turn-on Rise Time	t_r		-	14	-	nS
Turn-Off Delay Time	$t_{d(off)}$		-	39	-	nS
Turn-Off Fall Time	t_f		-	15	-	nS
Total Gate Charge	Q_g	V_{DS}=-30,I_D=-20A, V_{GS}=-10V	-	40.5	-	nC
Gate-Source Charge	Q_{gs}		-	9	-	nC
Gate-Drain Charge	Q_{gd}		-	9.5	-	nC
Drain-Source Diode Characteristics						
Diode Forward Voltage (Note 3)	V_{SD}	V_{GS}=0V,I_S=-20A	-		1.2	V
Diode Forward Current (Note 2)	I_S		-	-	-35	A
Reverse Recovery Time	t_{rr}	T_J = 25°C, I_F =-20A di/dt = -100A/μs(Note3)	-	-	40	nS
Reverse Recovery Charge	Qrr		-	-	70	nC

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N+P-Channel Enhancement Mode Mosfet

P-Channel Typical Electrical and Thermal Characteristics (Curves)

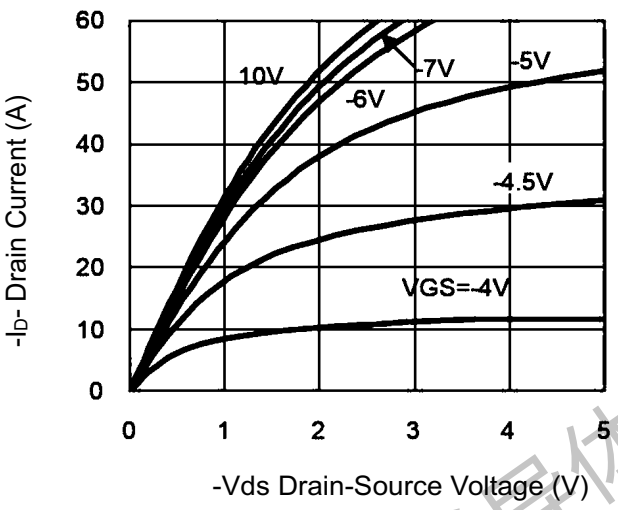

Figure 1 Output Characteristics

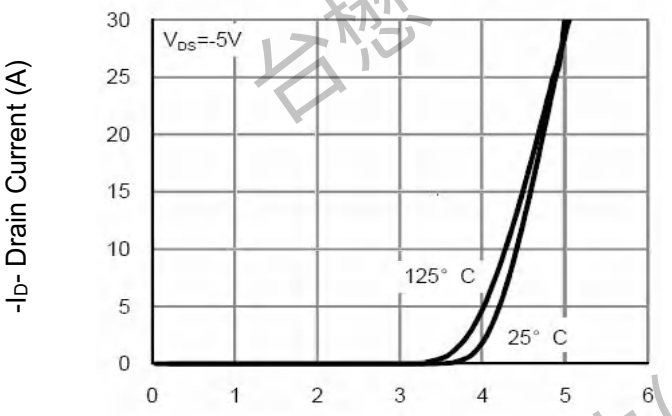

Figure 2 Transfer Characteristics

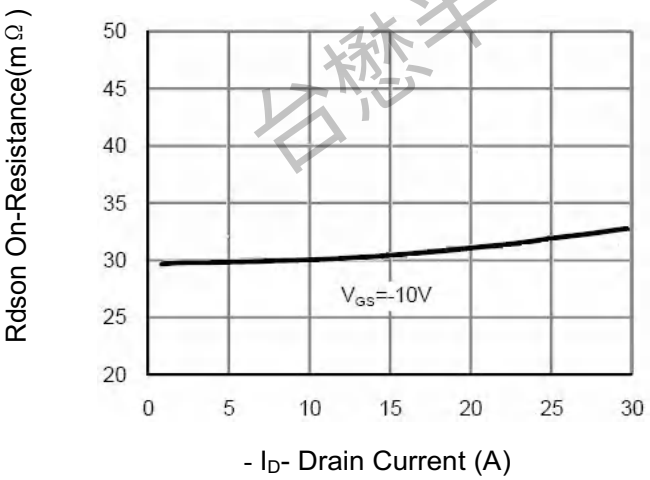

Figure 3 Rdson- Drain Current

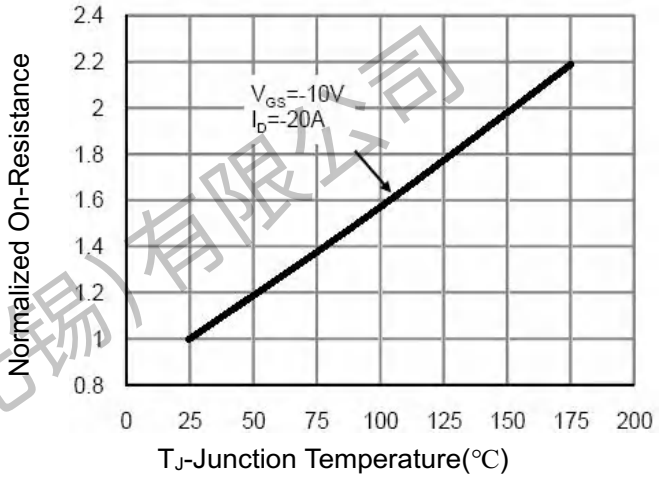

Figure 4 Rdson-Junction Temperature

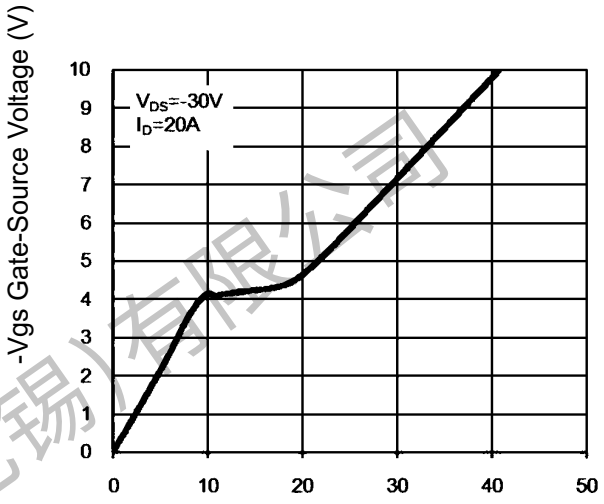

Figure 5 Gate Charge

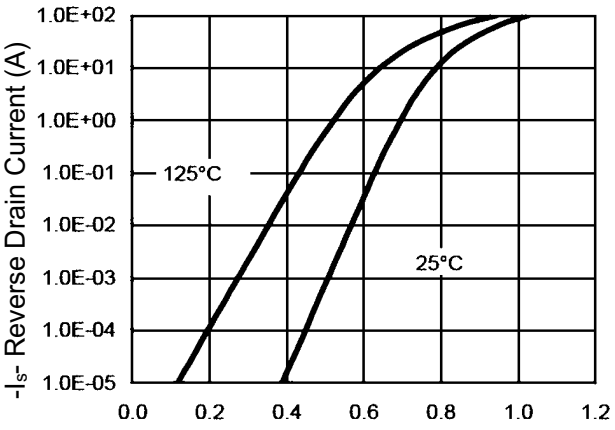

Figure 6 Source- Drain Diode Forward

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N+P-Channel Enhancement Mode Mosfet

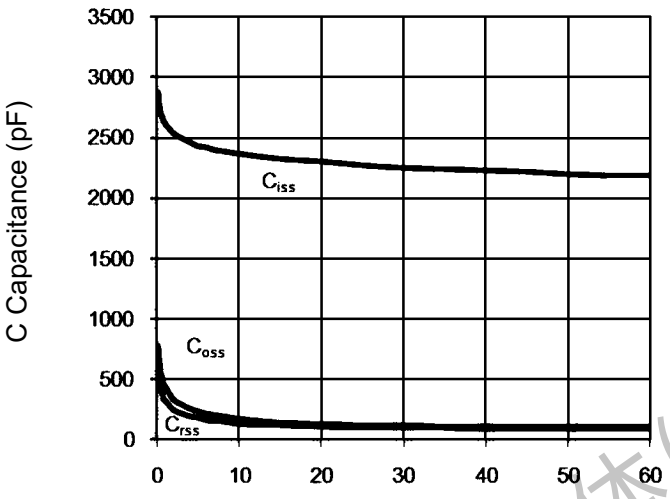


Figure 7 Capacitance vs Vds

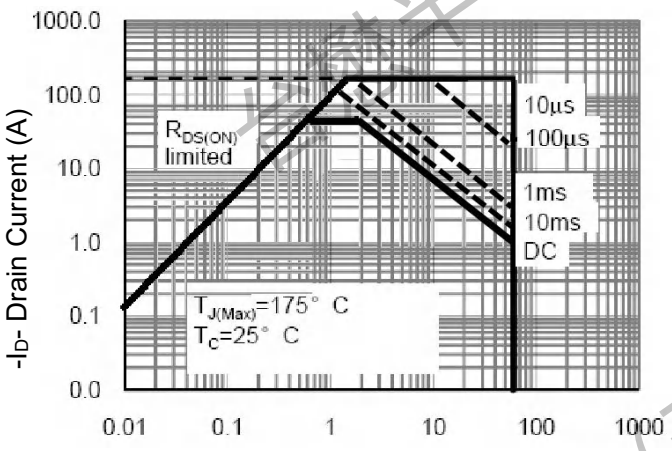


Figure 8 Safe Operation Area

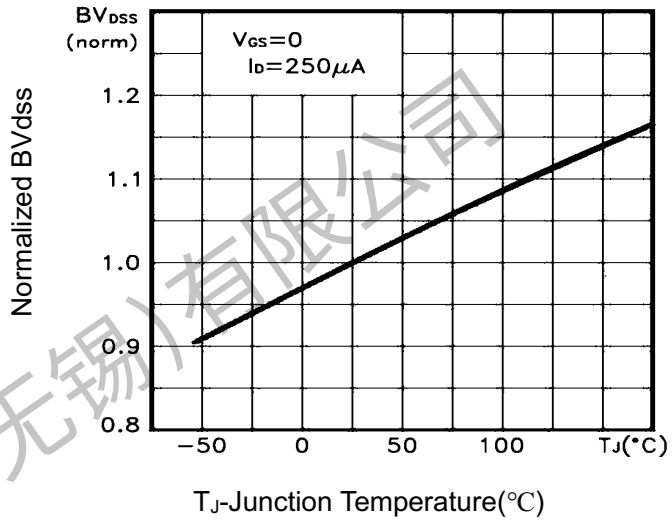


Figure 9 BV_{DSS} vs Junction Temperature

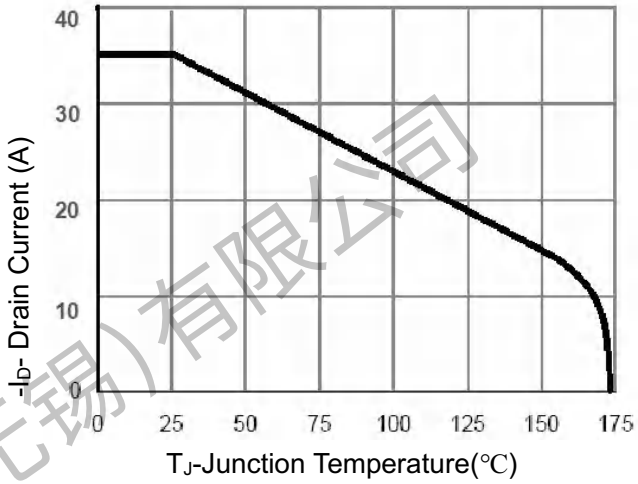


Figure 10 ID Current De-rating

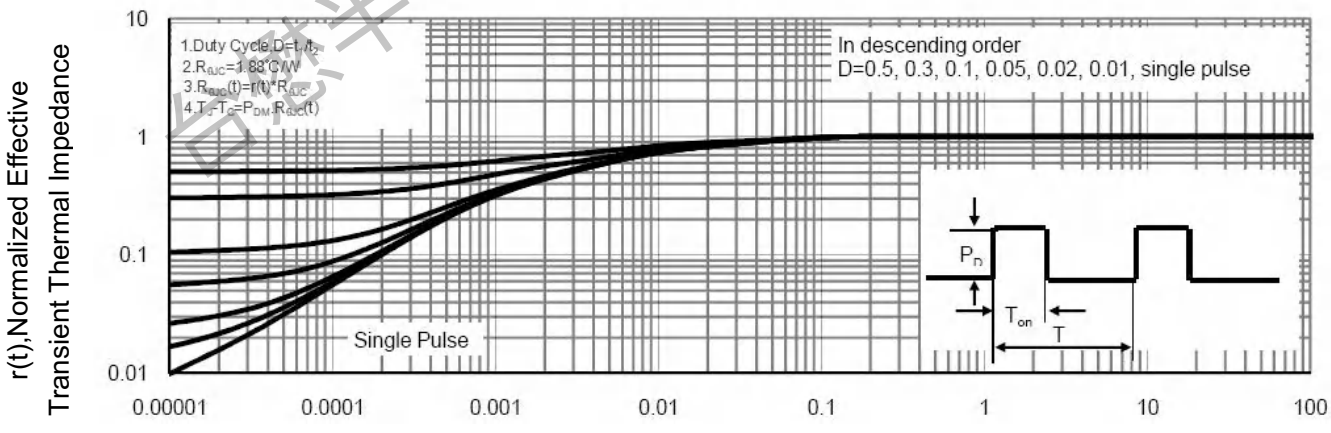
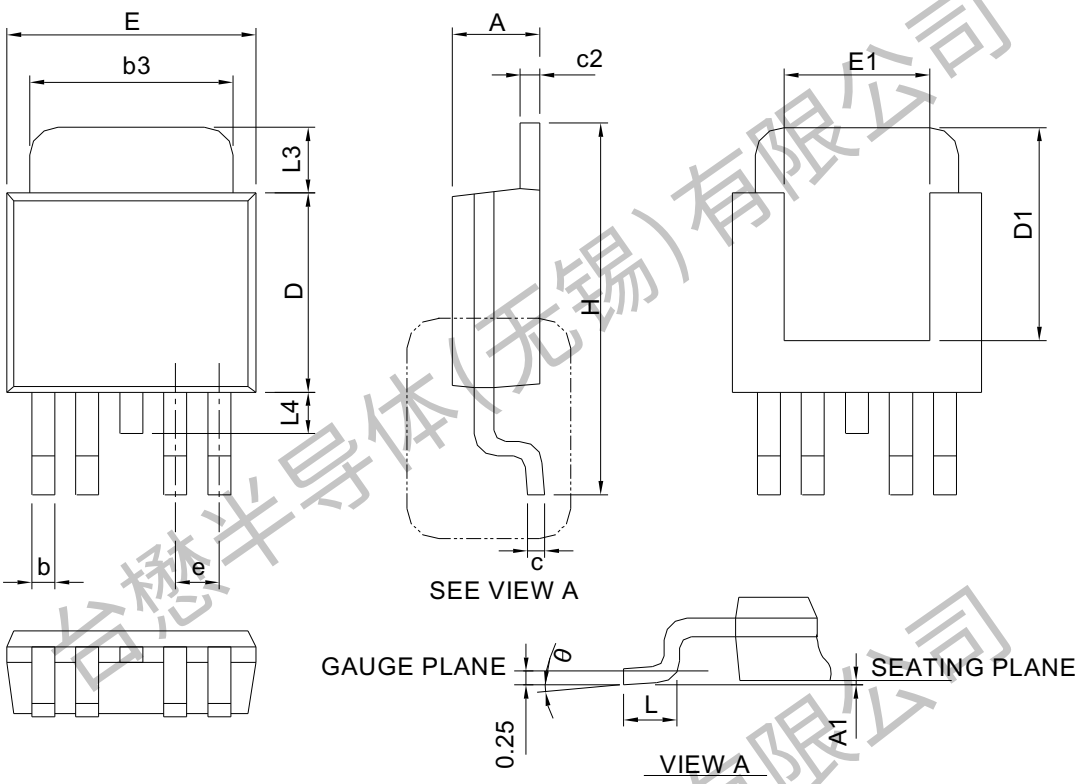


Figure 11 Normalized Maximum Transient Thermal Impedance

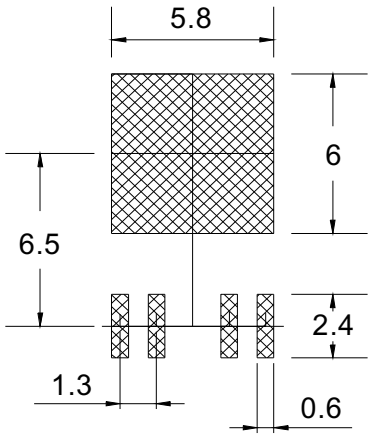
TM40G06GD N+P-Channel Enhancement Mode Mosfet

Package Mechanical Data:TO-252-4L



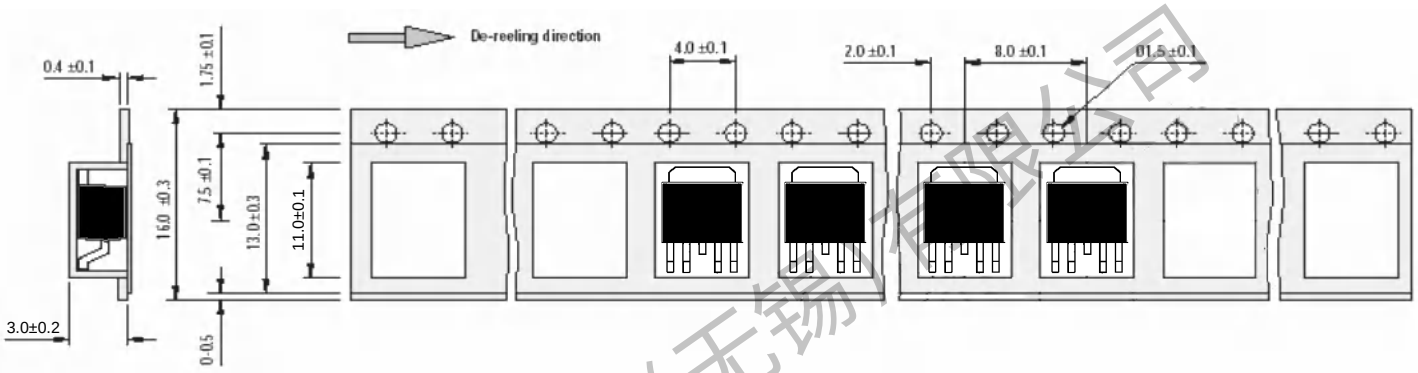
SYMBOL	TO-252-4			
	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
A	2.18	2.39	0.086	0.094
A1	-	0.2	-	0.008
b	0.50	0.71	0.020	0.028
b3	4.32	5.46	0.170	0.215
c	0.46	0.61	0.018	0.024
c2	0.46	0.89	0.018	0.035
D	5.33	6.22	0.210	0.245
D1	4.57	6.00	0.180	0.236
E	6.35	6.73	0.250	0.265
E1	3.81	6.00	0.150	0.236
e	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

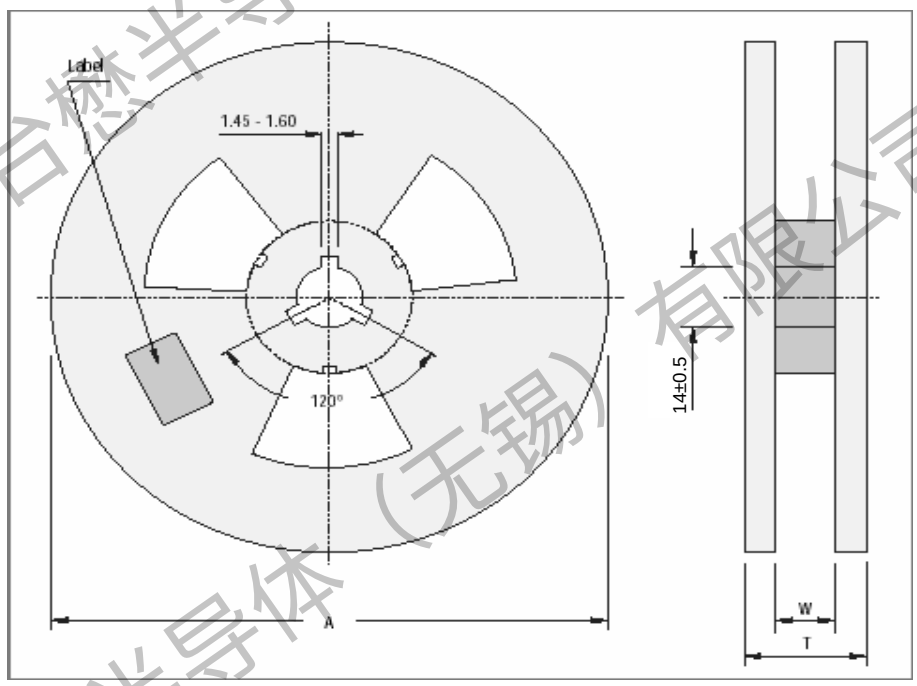


UNIT: mm

TO-252-4L Embossed Carrier Tape



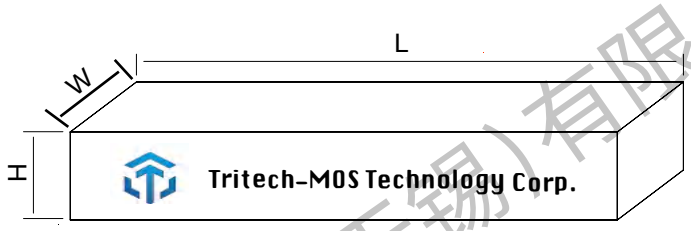
TO-252-4L ReeL



1.TO-252-4L Packaging

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

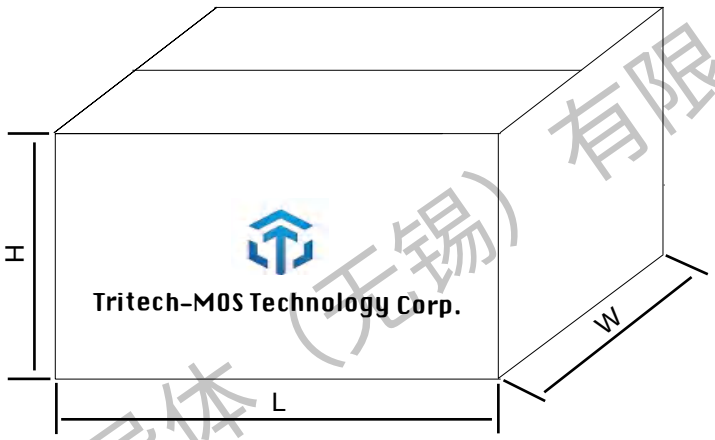
Inner Box



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

Important Notices and Disclaimers

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Revision history:

Date	Rev	Description	Page
2023.07.06	23.07	Original	