

TM4614B

N+P-Channel Enhancement Mode Mosfet

General Description

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

Applications

- Load switch
- PWM

General Features

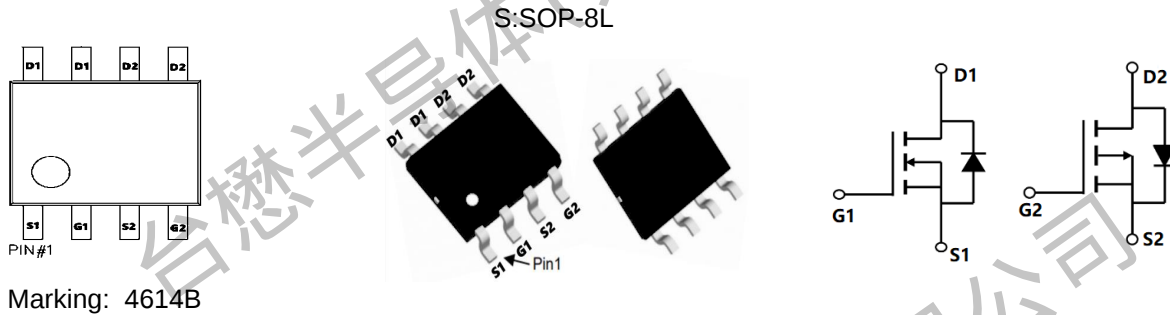
N Channel

$V_{DS} = 40V$, $I_D = 8A$
 $R_{DS(ON)} = 24m\Omega$ (typ.) @ $V_{GS} = 10V$

P Channel

$V_{DS} = -40V$, $I_D = -7A$
 $R_{DS(ON)} = 35m\Omega$ (typ.) @ $V_{GS} = -10V$

100% UIS Tested
100% R_g Tested



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, $V_{GS} @ 10V^1$	8	-7	A
$I_D @ T_A = 70^\circ C$	Continuous Drain Current, $V_{GS} @ 10V^1$	5.2	-4.5	A
I_{DM}	Pulsed Drain Current ²	29	-26	A
EAS	Single Pulse Avalanche Energy ³	16.2	39	mJ
$P_D @ T_A = 25^\circ C$	Total Power Dissipation ⁴	1.67	1.67	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	$^\circ C$
$R_{\theta JA}$	Thermal Resistance Junction-Ambient ¹	57		$^\circ C/W$
$R_{\theta JC}$	Thermal Resistance Junction-Case ¹	30		$^\circ C/W$



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N-Channel Electrical Characteristics ($T_J=25^\circ\text{C}$, 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 ²	$V_{GS}=10V$, $I_D=5A$	---	24	35	m Ω
		$V_{GS}=4.5V$, $I_D=4A$	---	36	42	
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		---	-4.56	---	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	$V_{DS}=5V$, $I_D=5A$	---	14	---	S
R _g	Gate Resistance	$V_{DS}=0V$, $V_{GS}=0V$, $f=1MHz$	---	2.6	---	Ω
Q _g	Total Gate Charge (4.5V)	$V_{DS}=20V$, $V_{GS}=4.5V$, $I_D=5A$	---	5.5	---	nC
Q _{gs}	Gate-Source Charge		---	1.25	---	
Q _{gd}	Gate-Drain Charge		---	2.5	---	
Td(on)	Turn-On Delay Time	$V_{DD}=20V$, $V_{GS}=10V$, $R_G=3.3\Omega$ $I_D=1A$	---	8.9	---	ns
T _r	Rise Time		---	2.2	---	
Td(off)	Turn-Off Delay Time		---	41	---	
T _f	Fall Time		---	2.7	---	
C _{iss}	Input Capacitance	$V_{DS}=15V$, $V_{GS}=0V$, $f=1MHz$	---	513	---	pF
C _{oss}	Output Capacitance		---	76	---	
C _{rss}	Reverse Transfer Capacitance		---	56	---	
I _s	Continuous Source Current ^{1,5}	$V_G=V_D=0V$, Force Current	---	---	8.0	A
ISM	Pulsed Source Current ^{2,5}		---	---	26	A
VSD	Diode Forward Voltage ²	$V_{GS}=0V$, $I_S=1A$, $T_J=25^\circ\text{C}$	---	---	1.2	V

Note :

- 1、The data tested by surface mounted on a 1 inch² FR-4 board with 2OZ copper.
- 2、The data tested by pulsed, pulse width $\leq 300\mu s$, duty cycle $\leq 2\%$
- 3、The EAS data shows Max. rating. The test condition is $V_{DD}=25V$, $V_{GS}=10V$, $L=0.1mH$, $I_{AS}=10A$
- 4、The power dissipation is limited by 150°C junction temperature
- 5、The data is theoretically the same as I_D and I_{DM} , in real applications, should be limited by total power dissipation.

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P-Channel Electrical Characteristics ($T_J=25^\circ\text{C}$, unless otherwise noted)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
BVDSS	Drain-Source Breakdown Voltage	$V_{GS}=0V$, $I_D=-250\mu A$	-40	---	---	V
$\Delta BVDSS/\Delta T_J$	BV _{DSS} Temperature Coefficient	Reference to 25°C , $I_D=-1mA$	---	-0.02	---	V/ $^\circ\text{C}$
RDS(ON)	Static Drain-Source On-Resistance ²	$V_{GS}=-10V$, $I_D=-5A$	---	35	41	m Ω
		$V_{GS}=-4.5V$, $I_D=-3A$	---	40	68	
VGS(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		---	3.72	---	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
Q _g	Total Gate Charge (-4.5V)	$V_{DS}=-20V$, $V_{GS}=-4.5V$, $I_D=-6A$	---	15.8	---	nC
Q _{gs}	Gate-Source Charge		---	3.5	---	
Q _{gd}	Gate-Drain Charge		---	3.2	---	
Td(on)	Turn-On Delay Time	$V_{DD}=-15V$, $V_{GS}=-10V$, $R_G=3.3\Omega$, $I_D=-1A$	---	5.2	---	ns
T _r	Rise Time		---	7	---	
Td(off)	Turn-Off Delay Time		---	23	---	
T _f	Fall Time		---	8	---	
C _{iss}	Input Capacitance	$V_{DS}=-15V$, $V_{GS}=0V$, $f=1MHz$	---	1000	---	pF
C _{oss}	Output Capacitance		---	160	---	
C _{rss}	Reverse Transfer Capacitance		---	100	---	
I _s	Continuous Source Current ^{1,5}	$V_G=V_D=0V$, Force Current	---	---	-7.0	A
VSD	Diode Forward Voltage ²	$V_{GS}=0V$, $I_S=-1A$, $T_J=25^\circ\text{C}$	---	---	-1.2	V

Note :

- 1、The data tested by surface mounted on a 1 inch² FR-4 board with 2OZ copper.
- 2、The data tested by pulsed, pulse width $\leq 300\mu s$, duty cycle $\leq 2\%$
- 3、The EAS data shows Max. rating. The test condition is $V_{DD}=-25V$, $V_{GS}=-10V$, $L=0.1mH$, $I_{AS}=-7A$
- 4、The power dissipation is limited by 150°C junction temperature
- 5、The data is theoretically the same as I_D and I_{DM} , in real applications, should be limited by total power dissipation.



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N-Channel Typical Characteristics

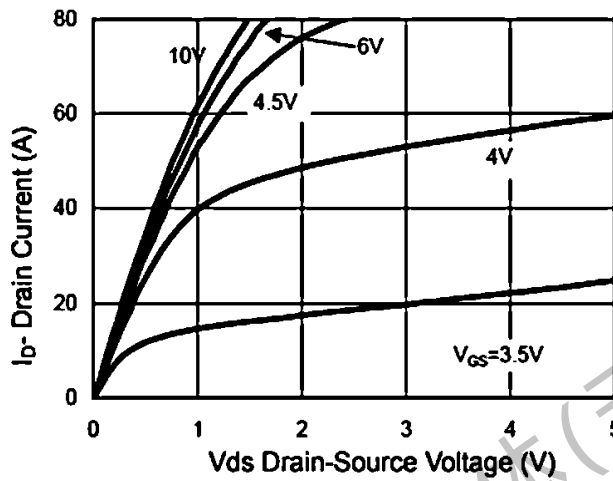


Figure 1 Output Characteristics

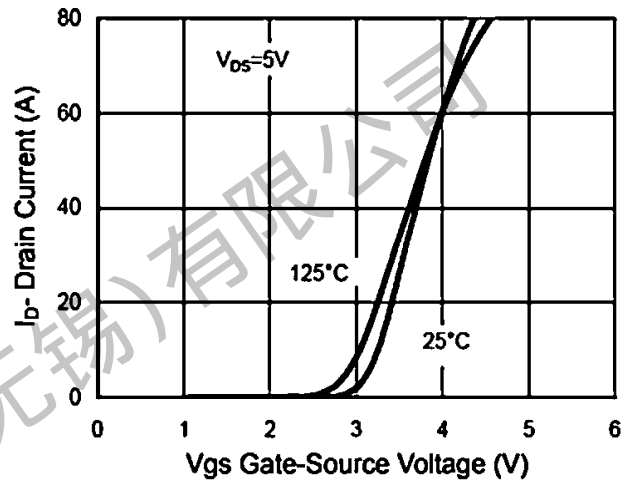


Figure 2 Transfer Characteristics

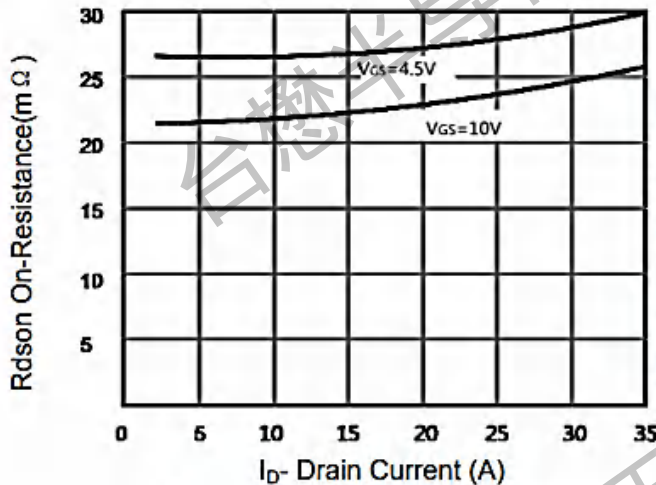


Figure 3 Rdson- Drain Current

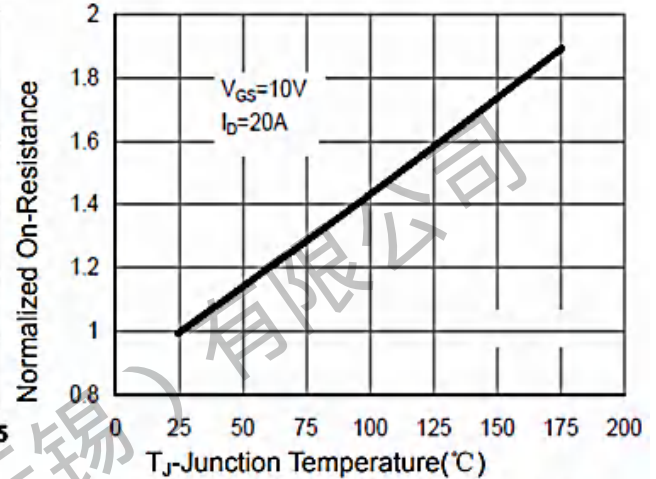


Figure 4 Rdson-Junction Temperature

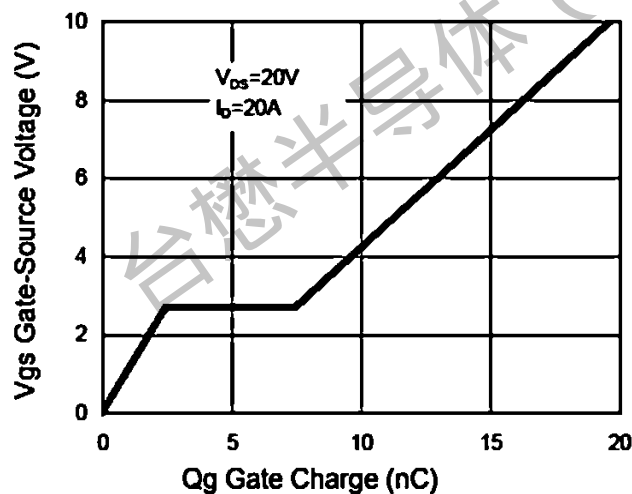


Figure 5 Gate Charge

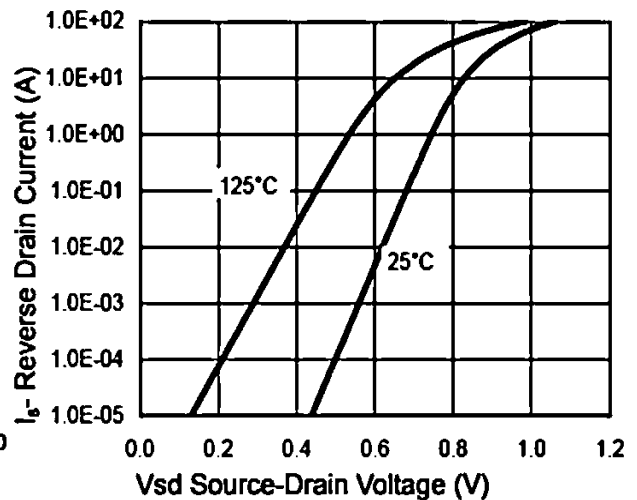


Figure 6 Source- Drain Diode Forward



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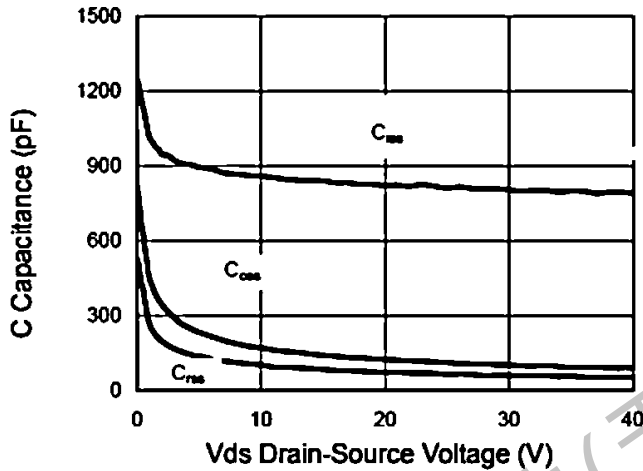


Figure 7 Capacitance vs Vds

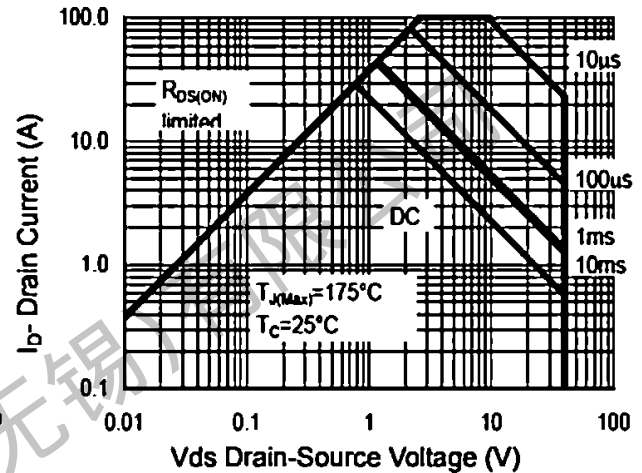


Figure 8 Safe Operation Area

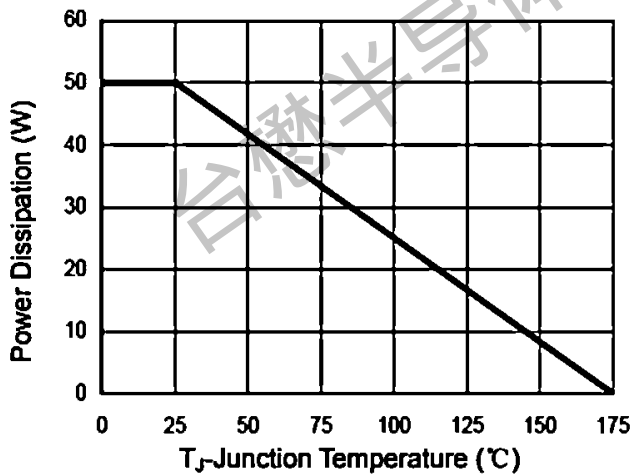


Figure 9 Power De-rating

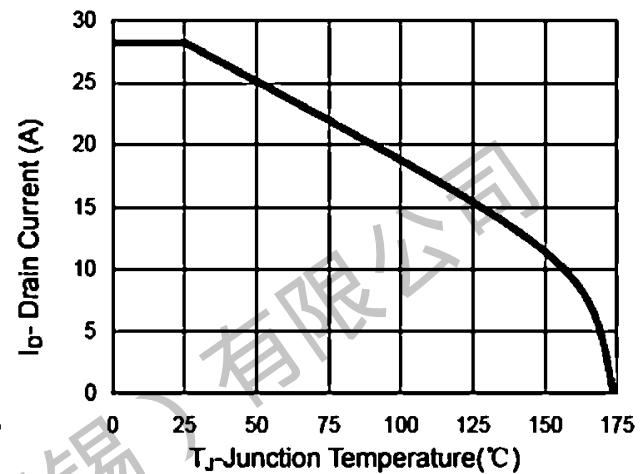


Figure 10 Ids Current De-rating

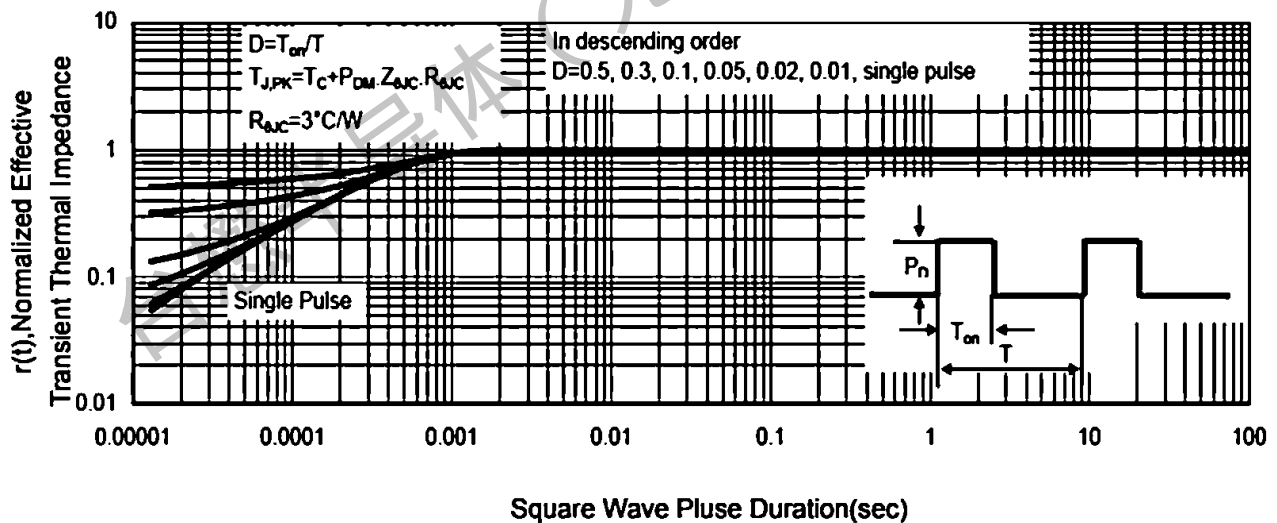


Figure 11 Normalized Maximum Transient Thermal Impedance



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P-Channel Typical Characteristics

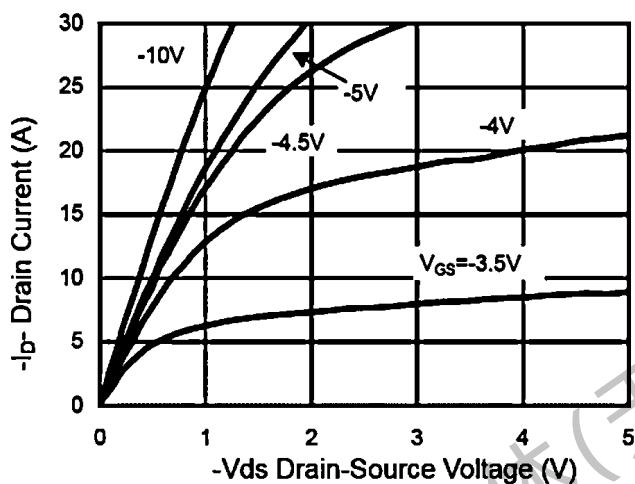


Figure 1 Output Characteristics

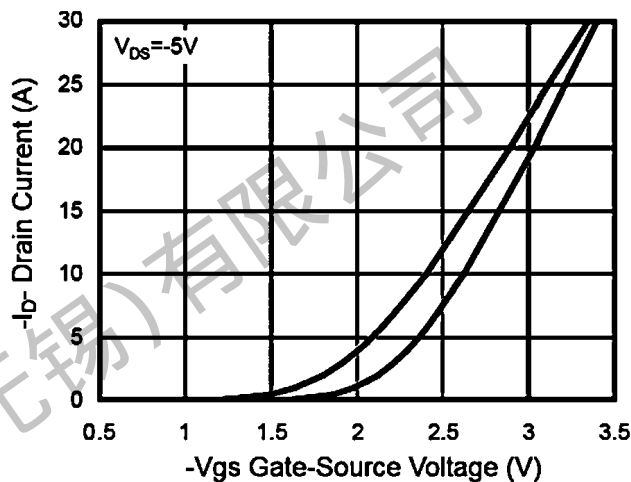


Figure 2 Transfer Characteristics

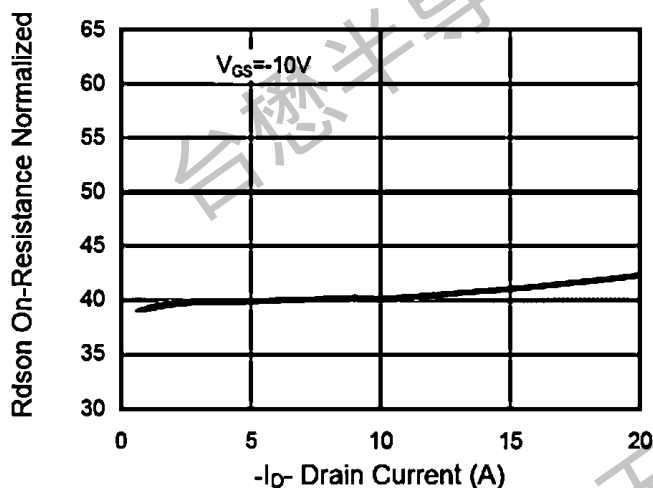


Figure 3 Rdson- Drain Current

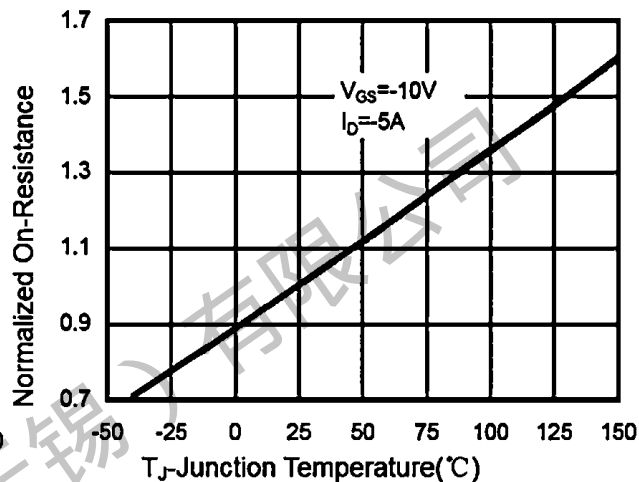


Figure 4 Rdson-Junction Temperature

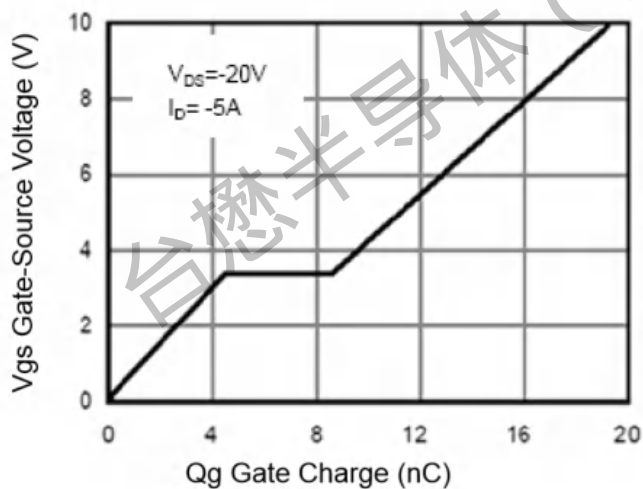


Figure 5 Gate Charge

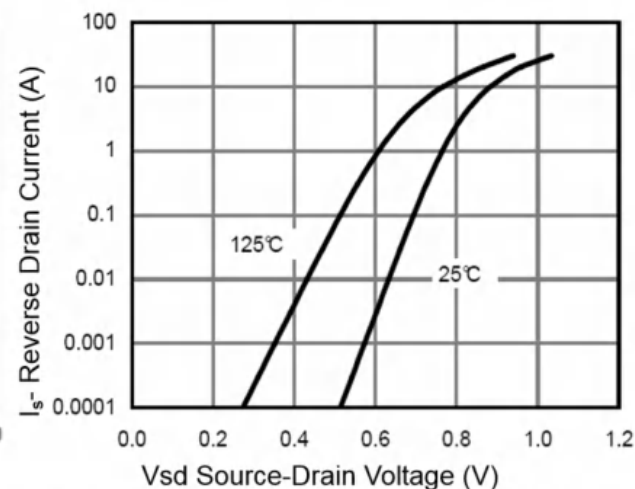


Figure 6 Source- Drain Diode Forward



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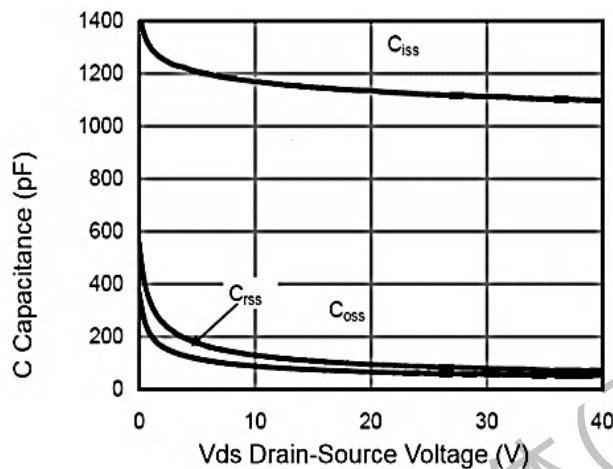


Figure 7 Capacitance vs Vds

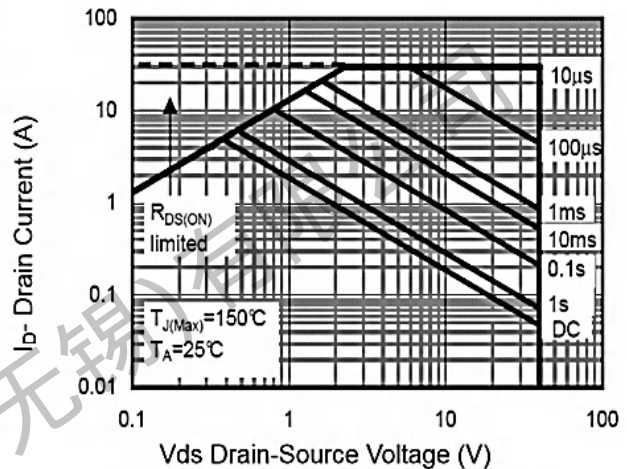


Figure 8 Safe Operation Area

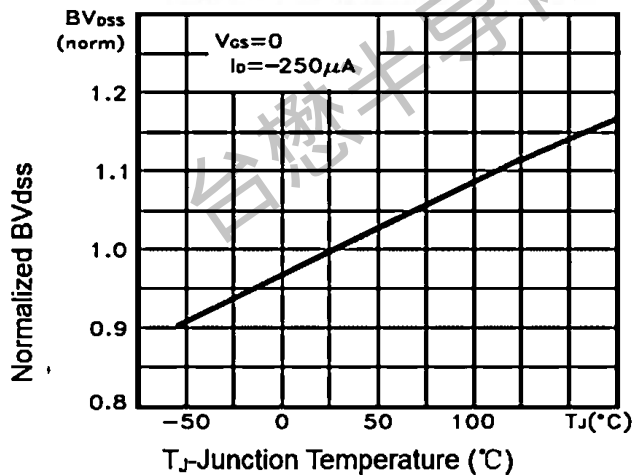


Figure 9 BV_{DSS} vs Junction Temperature

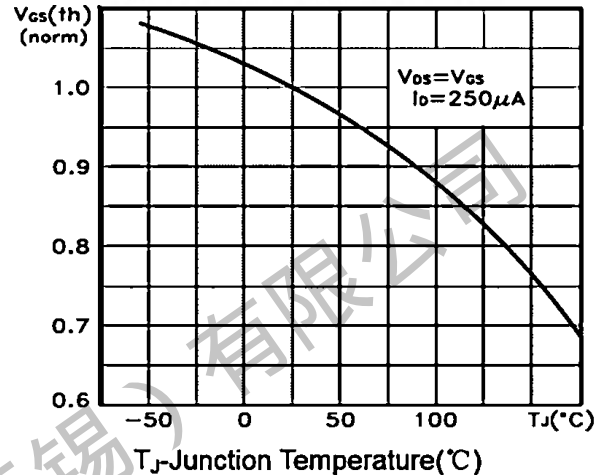


Figure 10 $V_{GS(th)}$ vs Junction Temperature

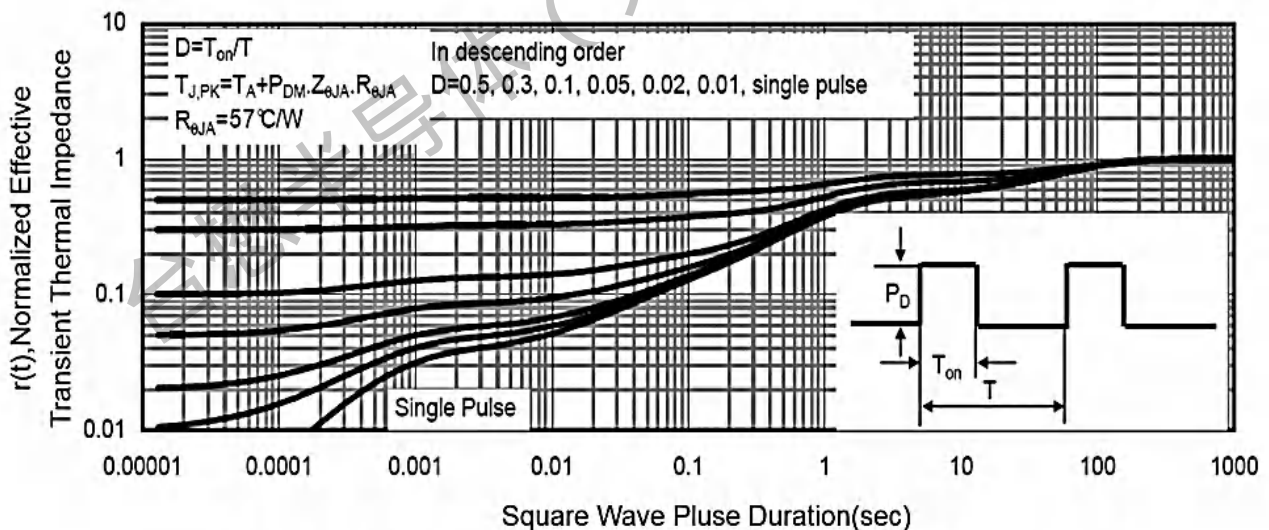
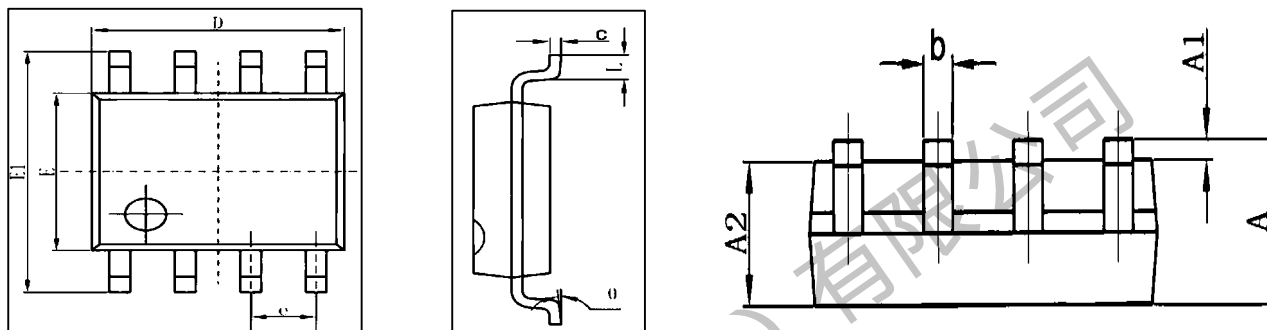


Figure 11 Normalized Maximum Transient Thermal Impedance

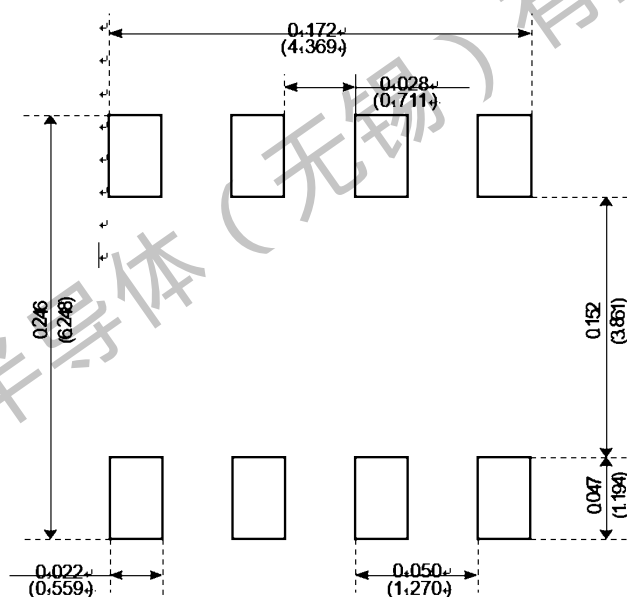
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Package Mechanical Data:SOP-8L



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.350	1.750	0.053	0.069
A1	0.100	0.250	0.004	0.010
A2	1.350	1.550	0.053	0.061
b	0.330	0.510	0.013	0.020
c	0.170	0.250	0.006	0.010
D	4.700	5.100	0.185	0.200
E	3.800	4.000	0.150	0.157
E1	5.800	6.200	0.228	0.244
e	1.270 (BSC)		0.050 (BSC)	
L	0.400	1.270	0.016	0.050
θ	0°	8°	0°	8°

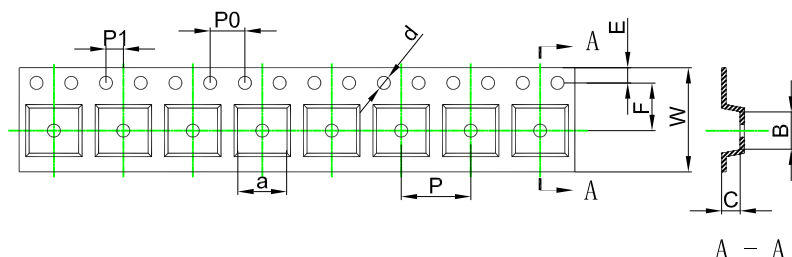


Recommended Minimum Pads

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SOP-8L Embossed Carrier Tape



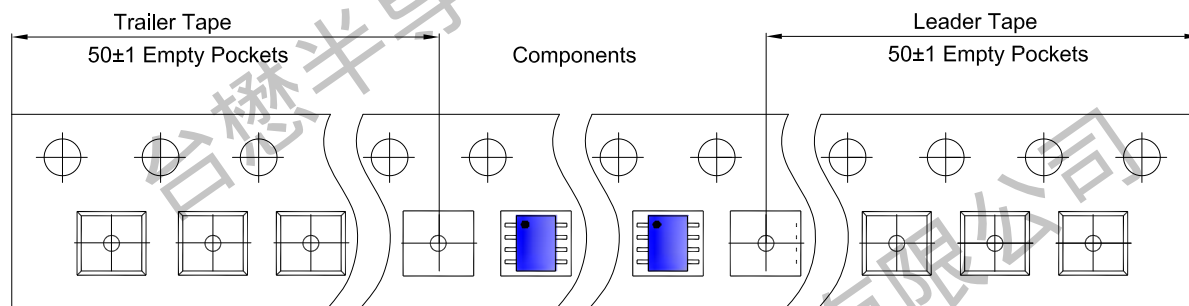
Packaging Description:

SOP-8L parts are shipped in tape. The carrier tape is made from a dissipative (carbon filled) polycarbonate resin. The cover tape is a multilayer film (Heat Activated Adhesive in nature) primarily composed of polyester film, adhesive layer, sealant, and anti-static sprayed agent. These reeled parts in standard option are shipped with 2,500 units per 13" or 33cm diameter reel. The reels are clear in color and is made of polystyrene plastic (anti-static coated).

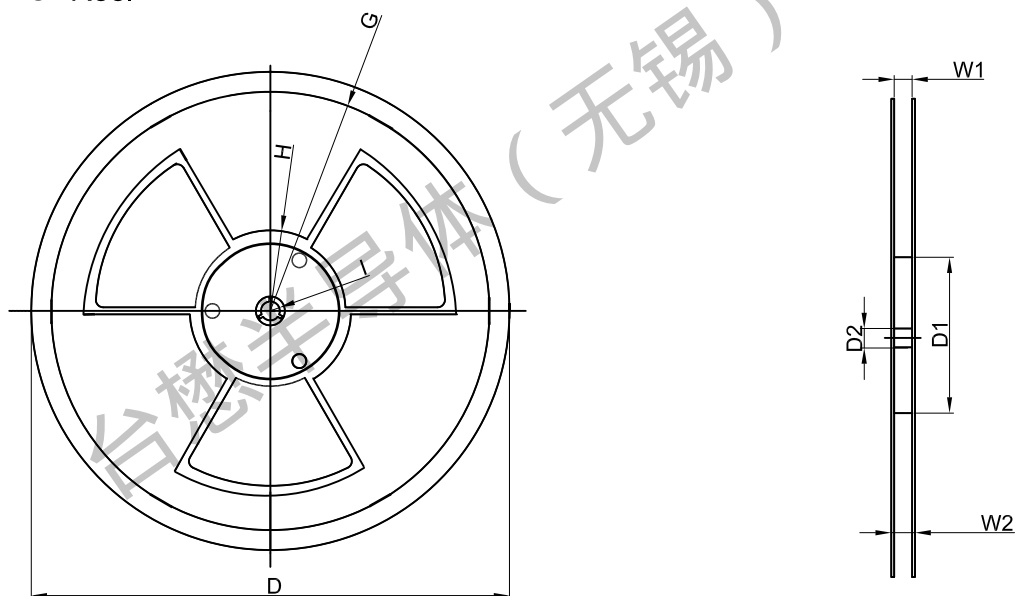
ALL DIM IN mm

Dimensions are in millimeter										
Pkg type	a	B	C	d	E	F	P0	P	P1	W
SOP-8L	6.40	5.40	2.10	Ø1.50	1.75	5.50	4.00	8.00	2.00	12.00

SOP-8L Tape Leader and Trailer



SOP-8L Reel



Dimensions are in millimeter								
Reel Option	D	D1	D2	G	H	I	W1	W2
13"Dia	Ø330.00	100.00	13.00	R135.00	R55.00	R6.50	12.00	14.00

REEL	Reel Size	Box	Box Size(mm)	Carton	Carton Size(mm)	G.W.(kg)
3,000 pcs	13 inch	6,000 pcs	370×355×52	48,000 pcs	400×360×368	

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Revision history:

Date	Rev	Description	Page
2024.05.14	24.05	Original	