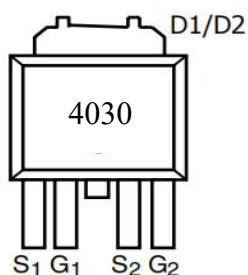


**Features**

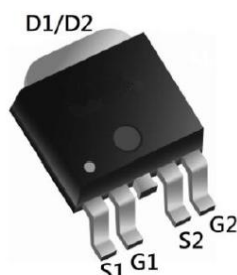
- Super Low Gate Charge
- Green Device Available
- Excellent Cdv/dt effect decline
- Advanced high cell density Trench technology
- 100% EAS Guaranteed

Bvdss**40V****-40V****Rdson****13.5mΩ****25mΩ****ID****30A****-30A****Application**

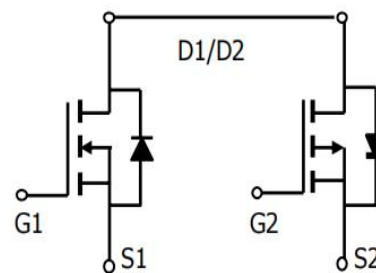
- Power management in half bridge and inverters
- Load Switch
- DC-DC Converter

RoHS**Package**

Marking and pin assignment



TO252-4L top view



Schematic diagram

Package Marking and Ordering Information

Device Marking	Device	Device Package	Quantity
4030	HL4030	TO252-4L	2500

Absolute Maximum Ratings ($T_C=25^{\circ}\text{C}$ unless otherwise specified)

Parameter	Symbol	Value		Unit
		N-Channel	P-Channel	
Drain-Source Voltage	V_{DS}	40	-40	V
Gate-Source Voltage	V_{GS}	± 20	± 20	V
Continuous Drain Current, $V_{GS}@10V^1$	$I_D@T_C=25^{\circ}\text{C}$	30	-30	A
	$I_D@T_C=100^{\circ}\text{C}$	18	-16	A
Pulsed Drain Current ²	I_{DM}	60	-60	A
Single Pulsed Avalanche Energy ³	EAS	28	41	mJ
Avalanche Current	I_{AS}	27	-27	
Total Power Dissipation ⁴	P_D	25	35	W
Junction Temperature Range	T_J	-55 ~ 150		$^{\circ}\text{C}$
Storage Temperature Range	T_{STG}	-55 ~ 150		$^{\circ}\text{C}$



Thermal Resistance Ratings

Parameter	Symbol	Value	Unit
Thermal Resistance Junction-Case ¹	$R_{\theta JC}$	3.6	°C/W
Thermal Resistance Junction-Ambient ¹	$R_{\theta JA}$	62	°C/W

Ordering Information

Ordering Number	Package	Pin Assignment			Packing
Halogen Free		G1/G2	D1/D2	S1/S2	
HL4030	TO252-4L	2,4	-	1,3	Tape Reel

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

Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Drain-Source Breakdown Voltage	BV_{DSS}	$V_{GS}=0V, I_D=250\mu A$	40	-	-	V
Drain-Source Leakage Current	I_{DSS}	$V_{DS}=32V, V_{GS}=0V$	-	-	1	μA
Gate-Source Leakage Current	I_{GSS}	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	± 100	nA
Gate Threshold Voltage	$V_{GS(th)}$	$V_{GS}=V_{DS}, I_D=250\mu A$	1.2	1.6	2.5	V
Static Drain-Source On-Resistance ²	$R_{DS(on)}$	$V_{GS}=10V, I_D=15A$	-	13.5	18	m Ω
		$V_{GS}=4.5V, I_D=10A$	-	18.4	24	
Forward Transconductance	g_{fs}	$V_{DS}=5V, I_D=15A$	-	34	-	S
Gate Resistance	R_g	$V_{DS}=0V, V_{GS}=0V, f=1MHz$	-	2.1	-	Ω
Total Gate Charge	Q_g	$V_{GS}=4.5V, V_{DS}=32V, I_D=15A$	-	10	-	nC
Gate-Source Charge	Q_{gs}		-	2.55	-	
Gate-Drain Charge	Q_{gd}		-	4.8	-	
Turn-On Delay Time	$T_{d(on)}$	$V_{GS}=10V, V_{DD}=20V$ $R_G=3.3\Omega, I_D=15A$	-	2.8	-	ns
Rise Time	T_r		-	12.8	-	
Turn-Off Delay Time	$T_{d(off)}$		-	21.2	-	
Fall Time	T_f		-	6.4	-	
Input Capacitance	C_{iss}	$V_{DS}=15V, V_{GS}=0V, f=1MHz$	-	1013	-	pF
Output Capacitance	C_{oss}		-	107	-	
Reverse Transfer Capacitance	C_{rss}		-	76	-	
Diode Forward Voltage ²	V_{SD}	$I_S=1A, V_{GS}=0V$	-	-	1.2	V
Continuous Source Current ¹	I_S	$V_G=V_D=0V$, Force Current	-	-	40	A
Pulsed Source Current ²	I_{SM}		-	-	85	A
Reverse Recovery Time	t_{rr}	$I_F=15A, di/dt=100A/\mu s$	-	10	-	nS
Reverse Recovery Charge	Q_{rr}		-	3.1	-	nC

Notes:

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 $V_{DD}=25V, V_{GS}=10V, L=0.1mH, I_{AS}=25A$
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.

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

Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Drain-Source Breakdown Voltage	BV_{DSS}	$V_{GS}=0V, I_D=-250\mu A$	-40	-	-	V
Drain-Source Leakage Current	I_{DSS}	$V_{DS}=-32V, V_{GS}=0V$	-	-	-1	μA
Gate-Source Leakage Current	I_{GSS}	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	± 100	nA
Gate Threshold Voltage	$V_{GS(th)}$	$V_{GS}=V_{DS}, I_D=-250\mu A$	-1	-	-2.5	V
Static Drain-Source On-Resistance ²	$R_{DS(on)}$	$V_{GS}=-10V, I_D=-8A$	-	25	32	m Ω
		$V_{GS}=-4.5V, I_D=-4A$	-	32	46	
Forward Transconductance	g_{fs}	$V_{DS}=-5V, I_D=-8A$	-	10.7	-	S
Total Gate Charge	Q_g	$V_{GS}=-4.5V, V_{DS}=-15V, I_D=-1A$	-	11.5	-	nC
Gate-Source Charge	Q_{gs}		-	3.5	-	
Gate-Drain Charge	Q_{gd}		-	3.3	-	
Turn-On Delay Time	$T_{d(on)}$	$V_{GS}=-10V, V_{DD}=-15V,$ $R_G=3.3\Omega, I_D=-1A$	-	22	-	ns
Rise Time	T_r		-	15.7	-	
Turn-Off Delay Time	$T_{d(off)}$		-	59	-	
Fall Time	T_f		-	5.5	-	
Input Capacitance	C_{iss}	$V_{DS}=-15V, V_{GS}=0V, f=1\text{MHz}$	-	1415	-	pF
Output Capacitance	C_{oss}		-	134	-	
Reverse Transfer Capacitance	C_{rss}		-	102	-	
Diode Forward Voltage ²	V_{SD}	$I_S=-1A, V_{GS}=0V$	-	-	-1.2	V
Continuous Source Current ^{1,5}	I_S	$V_G=V_D=0V, \text{Force Current}$	-	-	-30	A
Pulsed Source Current ^{2,5}	I_{SM}		-	-	-60	A

Notes:

- 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 $V_{DD}=-25V, V_{GS}=-10V, L=0.1\text{mH}, I_{AS}=-28.6A$.
- 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.



N-Channel Typical Characteristics

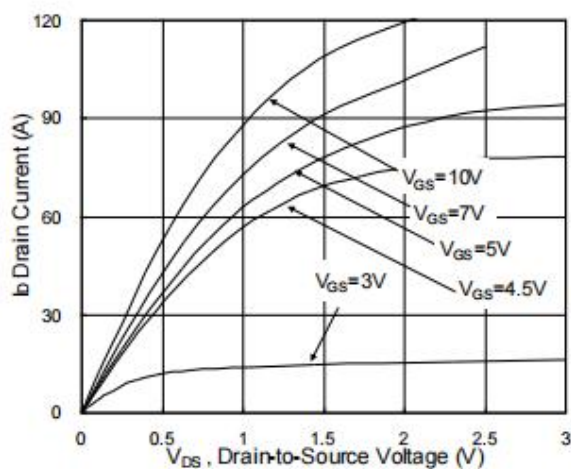


Fig.1 Typical Output Characteristics

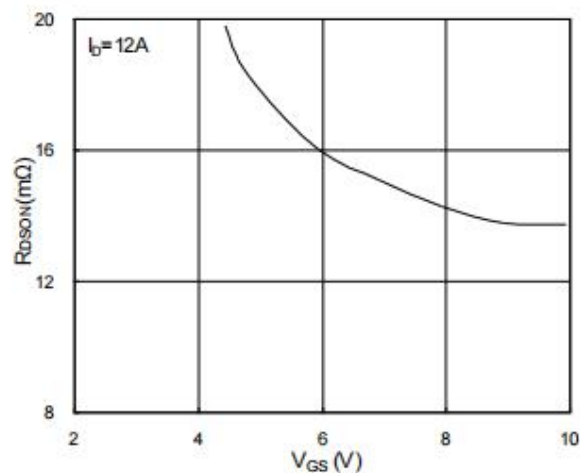


Fig.2 On-Resistance vs. G-S Voltage

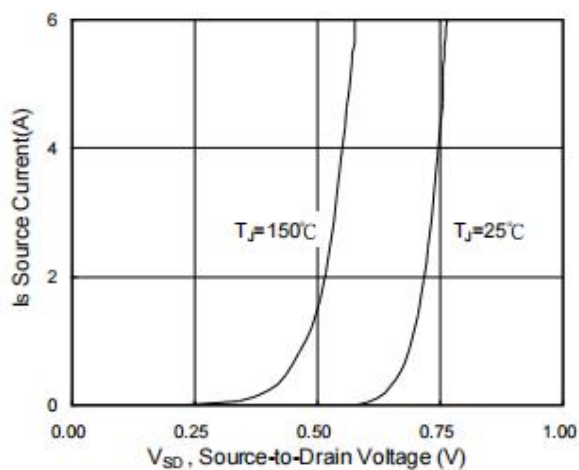


Fig.3 Forward Characteristics of Reverse

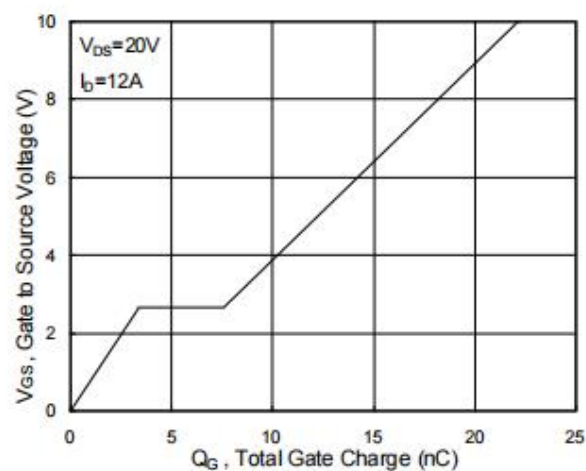
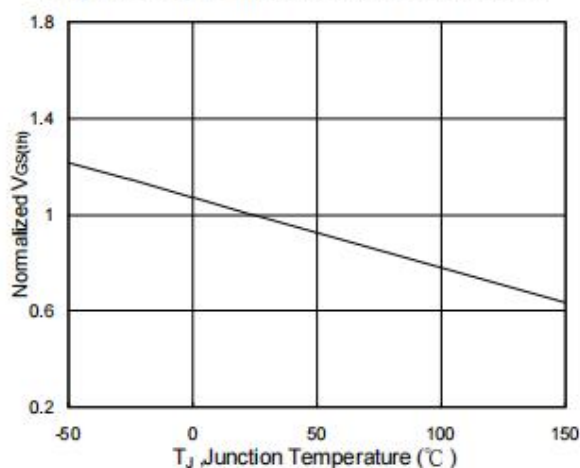
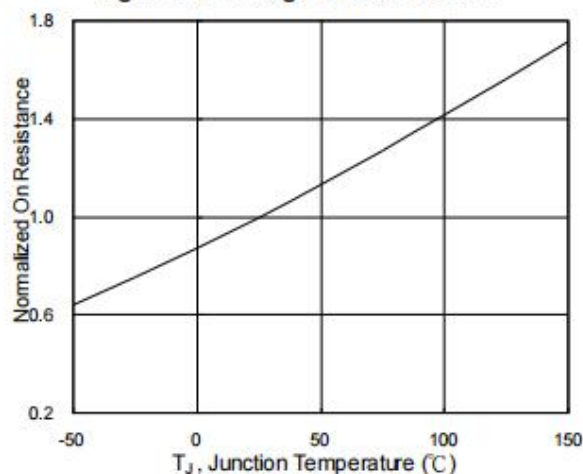


Fig.4 Gate-Charge Characteristics

Fig.5 $V_{GS(th)}$ vs. T_J Fig.6 Normalized $R_{DS(on)}$ vs. T_J

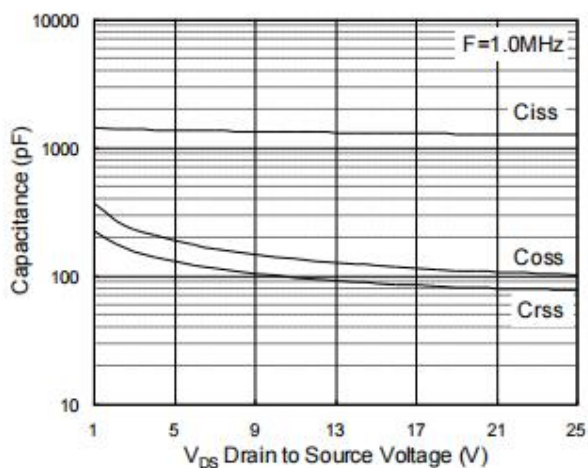


Fig.7 Capacitance

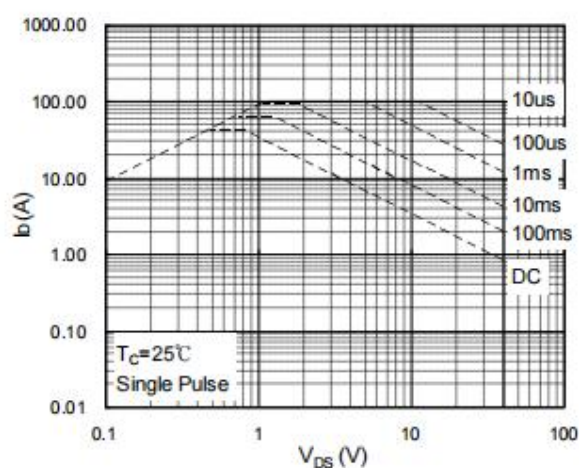


Fig.8 Safe Operating Area

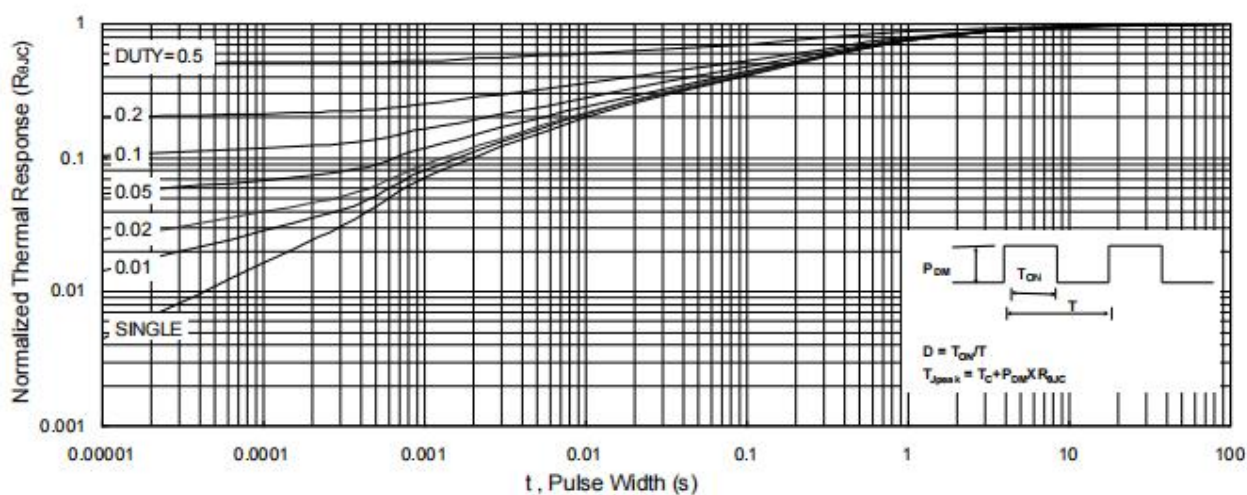


Fig.9 Normalized Maximum Transient Thermal Impedance

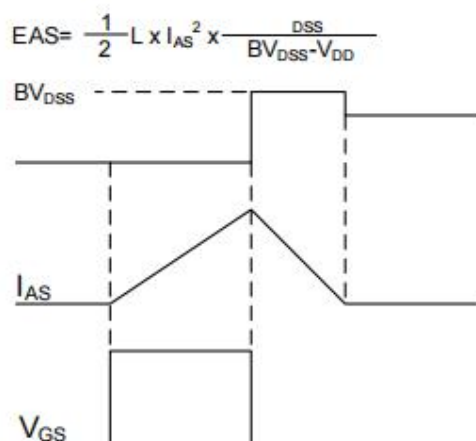
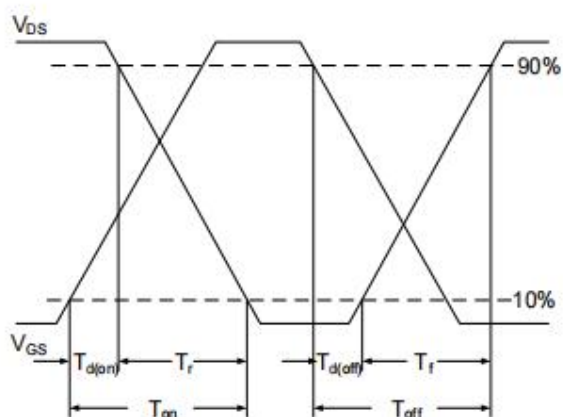
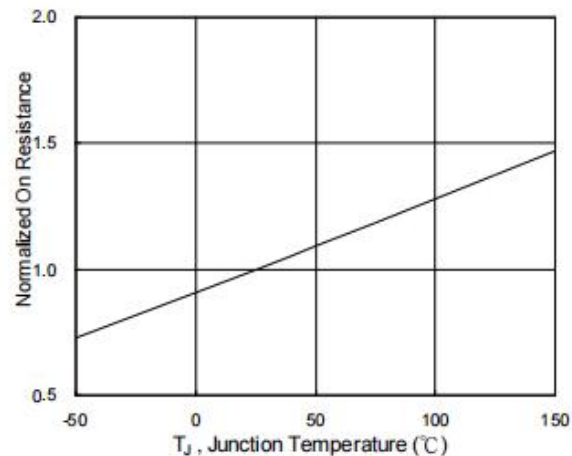
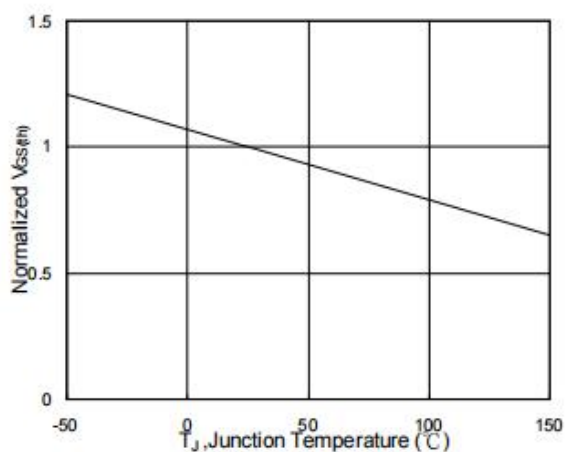
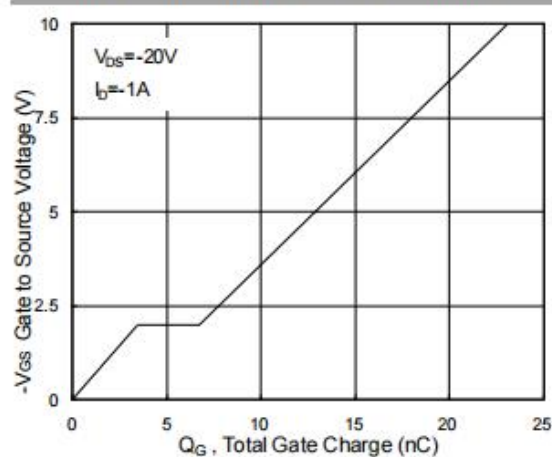
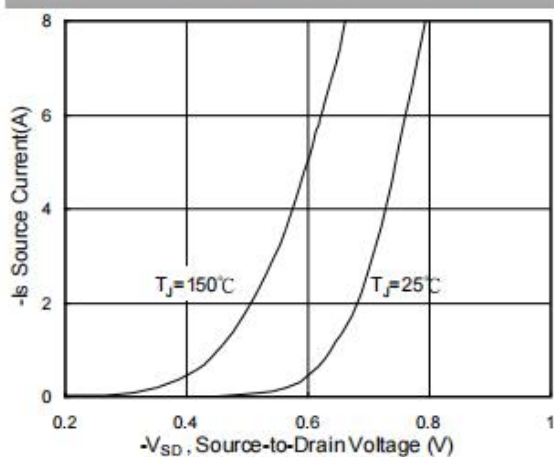
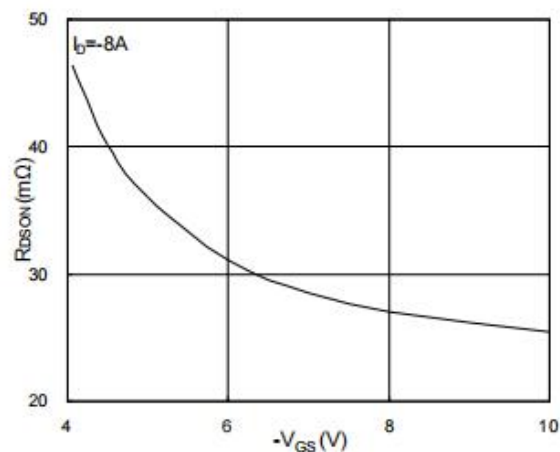
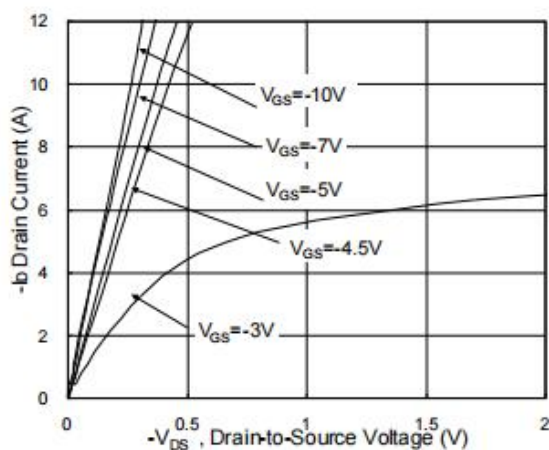


Fig.11 Unclamped Inductive Switching Waveform



P-Channel Typical Characteristics



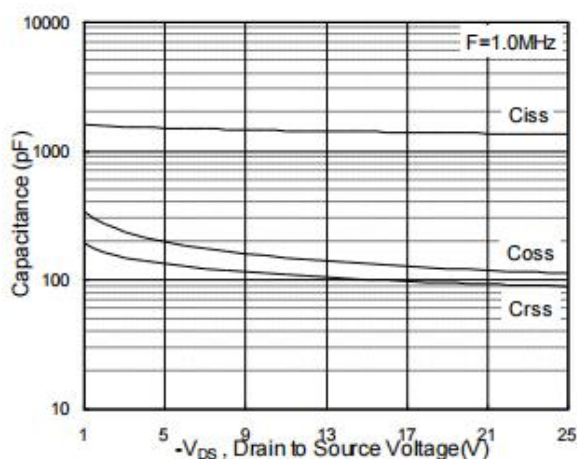


Fig.7 Capacitance

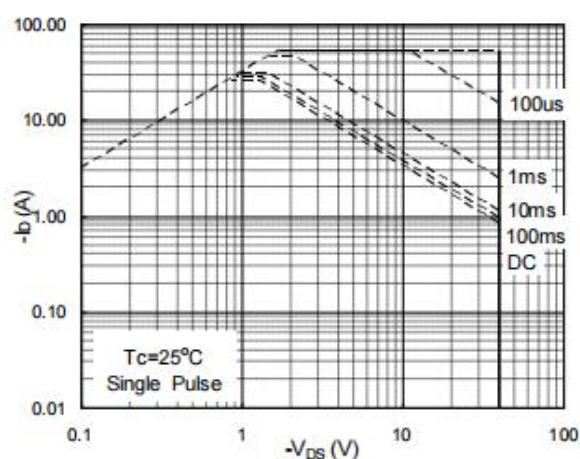


Fig.8 Safe Operating Area

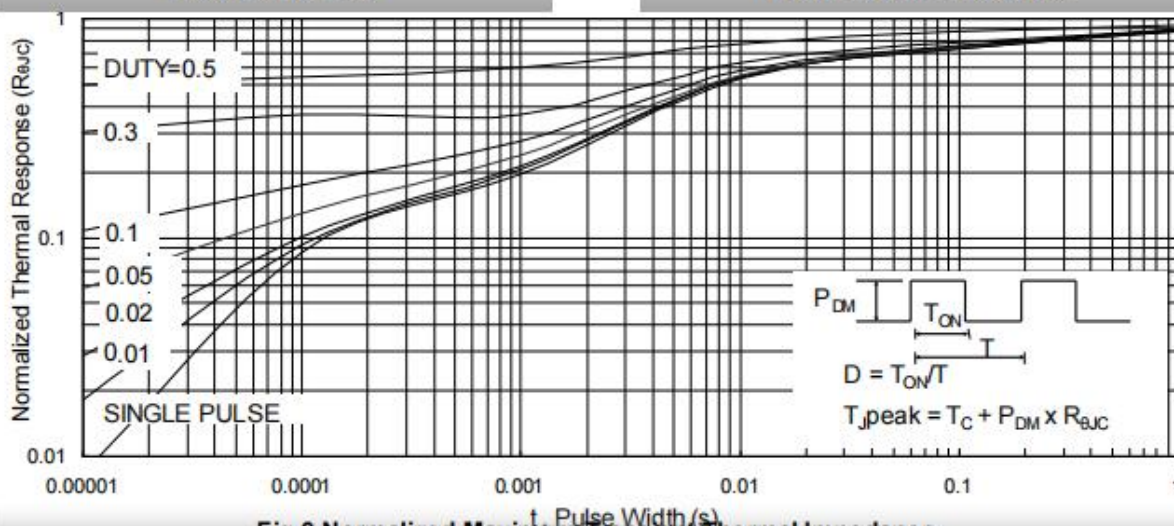


Fig.9 Normalized Maximum Transient Thermal Impedance

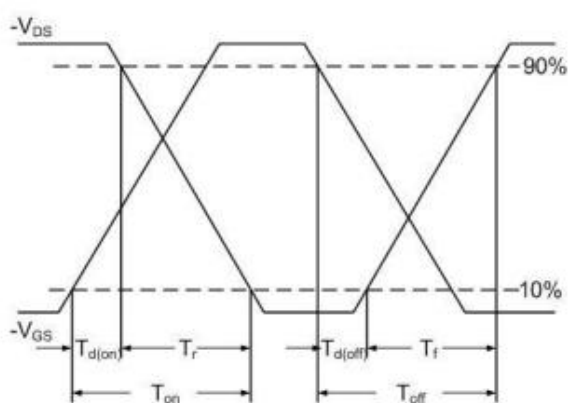


Fig.10 Switching Time Waveform

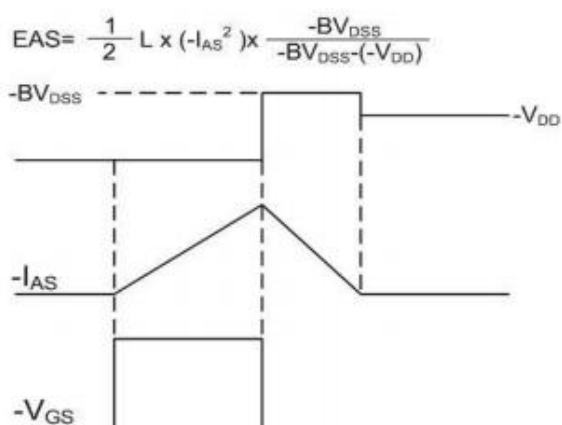
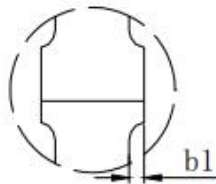
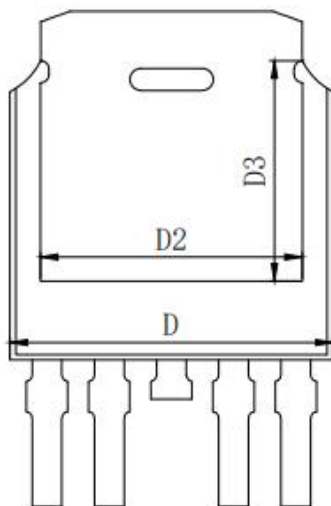
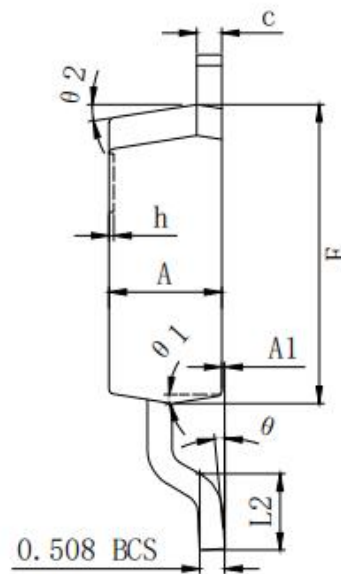
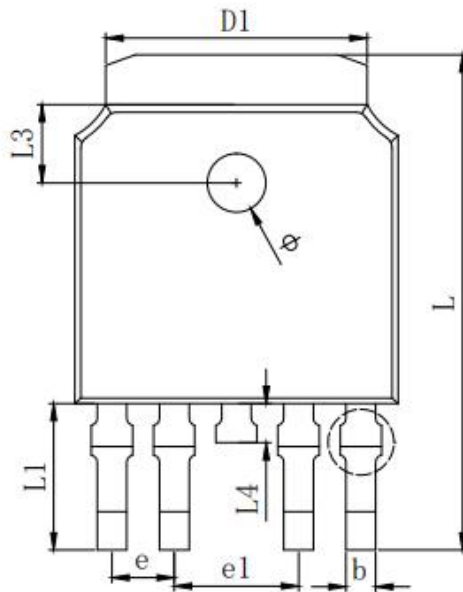


Fig.11 Unclamped Inductive Waveform



Package Dimensions TO252-4L



SYMBOL	MILLIMETER		
	MIN	Typ.	MAX
A	2.200	2.300	2.400
A1	0.000		0.127
b	0.550	0.600	0.650
b1	0.000		0.120
c (电镀后)	0.460	0.520	0.580
D	6.500	6.600	6.700
D1		5.334 REF	
D2		5.346 REF	
D3		4.490 REF	
E	6.000	6.100	6.200
e		1.270 TYP	
e1		2.540 TYP	
h	0.000	0.100	0.200
L	9.900	10.100	10.300
L1		2.988 REF	
L2	1.400	1.550	1.700
L3		1.600 REF	
L4	0.700	0.800	0.900
Φ	1.100	1.200	1.300
θ	0°		8°
θ1		9° TYP	
θ2		9° TYP	



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