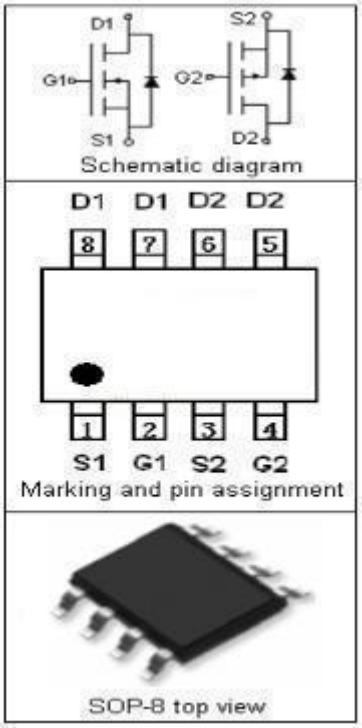
1 Description

It utilizes the lastest trench processing techniques to achieve the high cell density and reduces the on-resistance with high repetitive avalanche rating. These features combine to make this design an extremely efficient and reliable device for use in busk-boost curcuit, DSC, portable devices and a wide variety of others applications.



2 Main Product Characteristics

	NMOS	PMOS
V_{DSS}	60V	-60V
$R_{DS(on)}$	32mohm(typ.)	78mohm(typ.)
I_D	4.5A	-4.0A

3 Features and Benefits

- Advanced Trench mosfet process technology
- Special designed for buck-boost curcuit,DSC,portable devices and general purpose applications
- Ultra low on-resistance with low gate charge
- 150℃ operating temperature

4 Package Marking and Ordering Information

Device	Device Marking	Device Package	Reel Size	Tape width	Quantity
ZXMC4559DN8TA-CN	CS32RNP06M	SOP-8	Ø330mm	12mm	3000

5 Electrical Characteristics

5.1 Absolute Maximum Rating (Tc=25℃,unless otherwise noted)

Parameter		Symbol	Rating		Unit
			N-Channel	P-Channel	
Drain-Source Voltage		V_{DSS}	60	-60	V
Gate-Source Voltage		V_{GSS}	±20	±20	V
Continuous Drain Current,V_{GS}4.5V	T_C=25℃	I_D	4.5	-4.0	A
	T_C=100℃		3.6	-2.8	A
Pulsed Drain Current		I_{DM}	20	-20	A
Single Pulse Avalanche Energy		E_{AS}	25	25	mJ
Power Dissipation		$P_D$$T_C$=25℃	3	2.8	W
Maximum Junction Temperature		T_j	150	150	℃
Storage Temperature		T_{stg}	-55～150	-55～150	℃

5.2 Thermal Resistance (note4)

Characteristics	Symbol	Rating		Unit
		N-Channel	P-Channel	
Junction-to-ambient (PCB mounted,steady-state)		41.7	45	℃/W

5.3 N-Channel Electrical Characteristics (T_A=25℃ unless otherwise specified)

Parameter	Symbol	Test Condition	Value			Units
			Min	Typ	Max	
Off Characteristics						
Drain-source Breakdown Voltage	BV_{DSS}	I_D=250μA,V_{GS}=0V	60	--	--	V
Drain-to-Source Leakage Current	I_{DSS}	V_{DS}=60V,V_{GS}=0V,T_C=25℃	--	--	1	μA
		V_{DS}=48V,V_{GS}=0V,T_C=125℃	--	--	100	μA
Gate-to-Source Forward Leakage	I_{GSSF}	V_{GS}=+20V	--	--	100	nA
Gate-to-Source Reverse Leakage	I_{GSSR}	V_{GS}=-20V	--	--	-100	nA
On Characteristics						
Gate threshold Voltage	$V_{GS(th)}$	V_{DS}=V_{GS},I_D=250μA	1	2.1	3	V
Drain-source on-state Resistance	$R_{DS(on)}$	V_{GS}=10V,I_D=12A	--	32	40	mΩ
		V_{GS}=4.5V,I_D=6A	--	35	50	mΩ
Dynamic Characteristics						
Forward Transfer Conductance	g_{fs}	V_{DS}=10V,I_D=15A	--	11	--	S
Input Capacitance	C_{iss}	V_{GS}=0V,V_{DS}=30V,f=1.0MHz	--	814	--	pF
Output Capacitance	C_{oss}		--	110	--	
Reverse Transfer Capacitance	C_{rss}		--	49	--	
Switching Characteristics						
Turn-on Delay Time	$t_{d(on)}$	V_{DD}=30V, R_L=2.5Ω, V_{GS}=10V, R_{GEN}=3Ω	--	4.2	--	ns
Turn-on Rise Time	t_r		--	3.4	--	
Turn-off Delay Time	$t_{d(off)}$		--	16	--	
Turn-off Fall Time	t_f		--	2	--	
Total Gate Charge	Q_g	I_D=15A,V_{DS}=30V,V_{GS}=10V	--	13.5	--	nC
Gate-to-Source Charge	Q_{gs}		--	2.2	--	
Gate-to-Drain(“Miller”) Charge	Q_{gd}		--	3.4	--	
Drain-Source Diode Characteristics						
Diode Forward Voltage[3]	V_{FSD}	V_{GS}=0V,I_S=15A	--	--	1.3	V
Diode Forward Current[2]	I_S		--	--	4.5	A
Reverse Recovery Time	t_{rr}	T_J=25℃,I_F=15A, dI_F/dt=100A/μS,V_{GS}=0V	--	27	--	nS
Reverse Recovery Charge	Q_{rr}		--	30	--	nC

Notes：

1: Repetitive rating, pulse width limited by maximum junction temperature.

2: Surface mounted on FR4 Board, t≤10sec.

3: Pulse width ≤ 300μs, duty cycle ≤ 2%.

4: Guaranteed by design, not subject to production.

5. L=0.5mH,I_D=7.1A,V_{DD}=50V,V_{GATE}=60V,Start T_J=25℃.

5.3 P-Channel Electrical Characteristics (T_A=25℃ unless otherwise specified)

Parameter	Symbol	Test Condition	Value			Units
			Min	Typ	Max	
Off Characteristics						
Drain-source Breakdown Voltage	BV_{DSS}	I_D=250μA,V_{GS}=0V	-60	--	--	V
Drain-to-Source Leakage Current	I_{DSS}	V_{DS}=-60V,V_{GS}=0V,T_C=25℃	--	--	-1	μA
		V_{DS}=-48V,V_{GS}=0V,T_C=125℃	--	--	-100	μA
Gate-to-Source Forward Leakage	I_{GSSF}	V_{GS}=+20V	--	--	100	nA
Gate-to-Source Reverse Leakage	I_{GSSR}	V_{GS}=-20V	--	--	-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=-5A	--	78	100	mΩ
		V_{GS}=-4.5V,I_D=-5A		98	120	
Dynamic Characteristics(Note 4)						
Forward Transfer Conductance	g_{fs}	V_{DS}=-10V,I_D=-5A	--	9.5	--	S
Input Capacitance	C_{iss}	V_{GS}=0V,V_{DS}=-25V,f=1.0MHz	--	900	--	pF
Output Capacitance	C_{oss}		--	115	--	
Reverse Transfer Capacitance	C_{rss}		--	40	--	
Switching Characteristics(note4)						
Turn-on Delay Time	$t_{d(on)}$	V_{DD}=-30V, R_L=15Ω, V_{GS}=-10V, R_{GEN}=3Ω	--	8	--	nS
Turn-on Rise Time	t_r		--	6	--	
Turn-off Delay Time	$t_{d(off)}$		--	30	--	
Turn-off Fall Time	t_f		--	7	--	
Total Gate Charge	Q_g	I_D=-4A,V_{DD}=-20V,V_{GS}=-10V	--	18	--	nC
Gate-to-Source Charge	Q_{gs}		--	3.2	--	
Gate-to-Drain(“Miller”) Charge	Q_{gd}		--	3.8	--	
Drain-Source Diode Characteristics						
Diode Forward Voltage(3)	V_{FSD}	V_{GS}=0V,I_S=-10A	--	-0.92	-1.2	V
Diode Forward Current(2)	I_S		--	--	-4	A
Reverse Recovery Time	t_{rr}	T_J=25℃,I_F=-10A, dI_F/dt=100A/μS,V_{GS}=0V	--	22	--	nS
Reverse Recovery Charge	Q_{rr}		--	26	--	nC

Notes：

1: Repetitive rating, pulse width limited by maximum junction temperature.

2: Surface mounted on FR4 Board, t≤10sec.

3: Pulse width ≤ 300μs, duty cycle ≤ 2%.

4: Guaranteed by design, not subject to production.

5. L=0.5mH,I_D=-7.1A,V_{DD}=-50V,V_{GATE}=-60V,Start T_J=25℃.

6 N-Channel Typical characteristics diagrams

Figure1. On-Region Characteristics

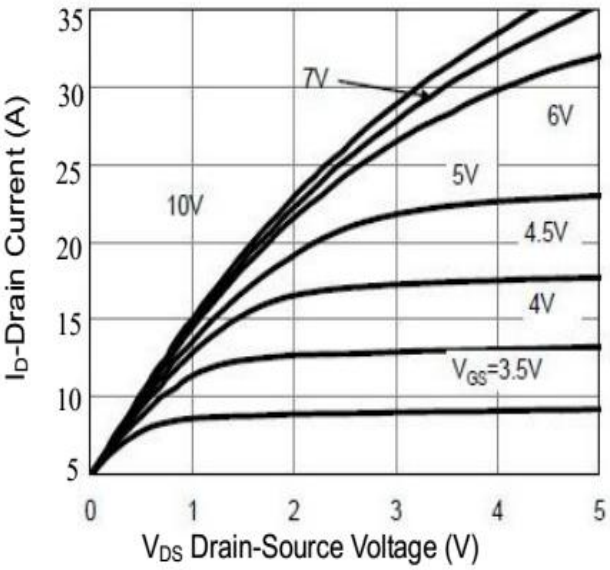


Figure 2: Transfer Characteristics

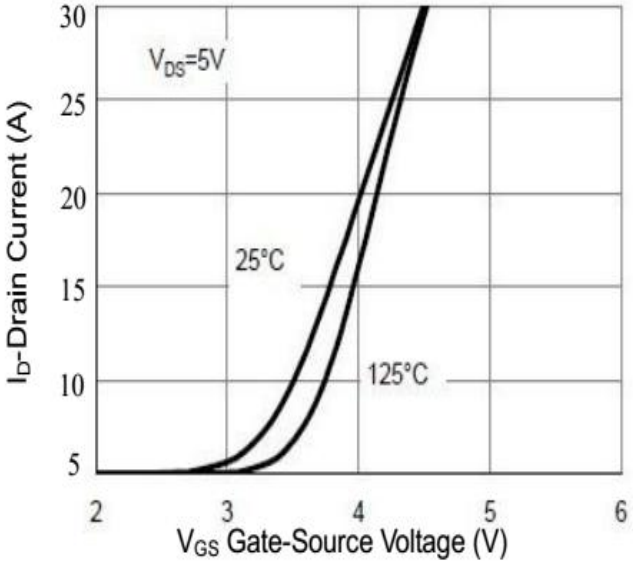


Figure3. On-Resistance vs. Drain Current and Gate Voltage

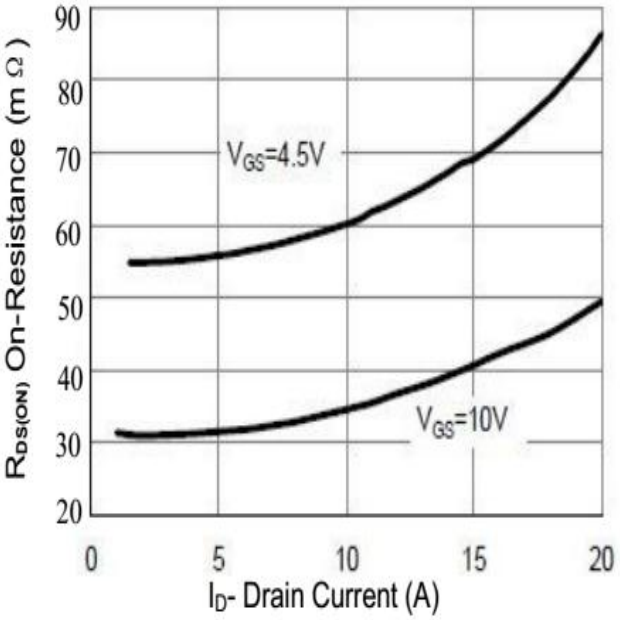
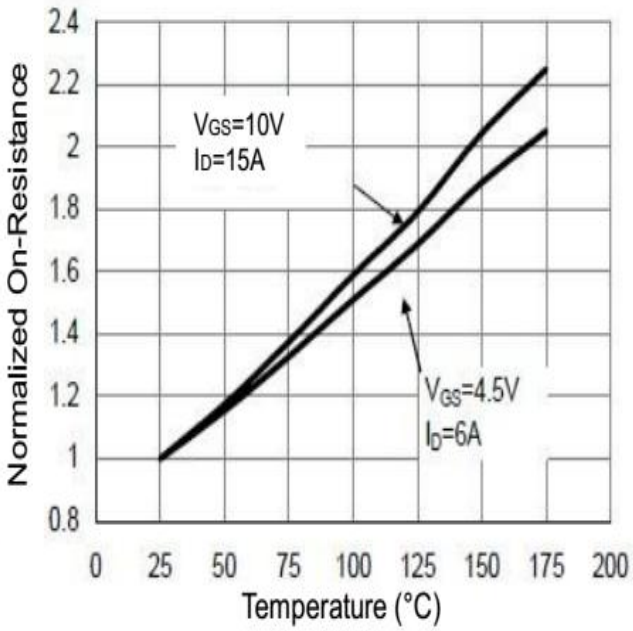


Figure4. On-Resistance vs. Junction Temperature



6 N-Channel Typical characteristics diagrams(continues)

Figure5. On-Resistance vs. Gate-Source Voltage

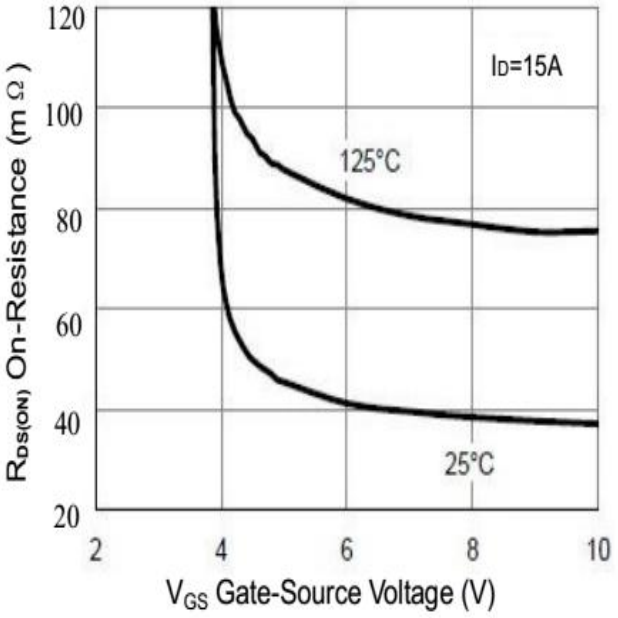


Figure6. Body-Diode Characteristics

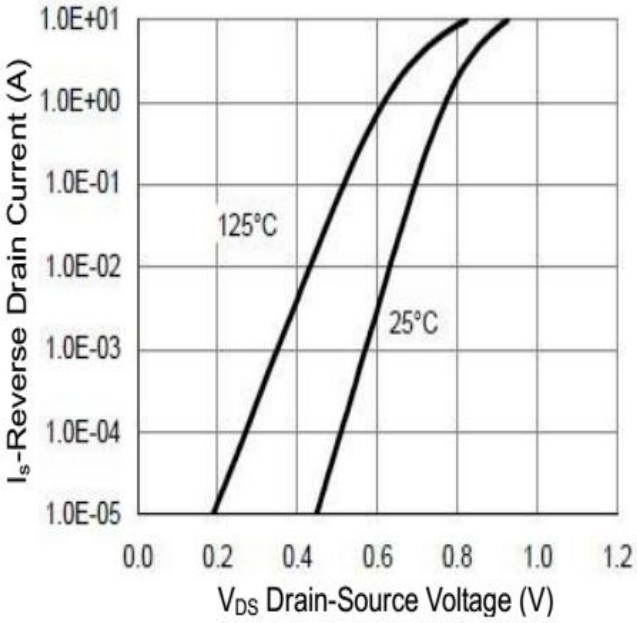


Figure7. Gate-Charge Characteristics

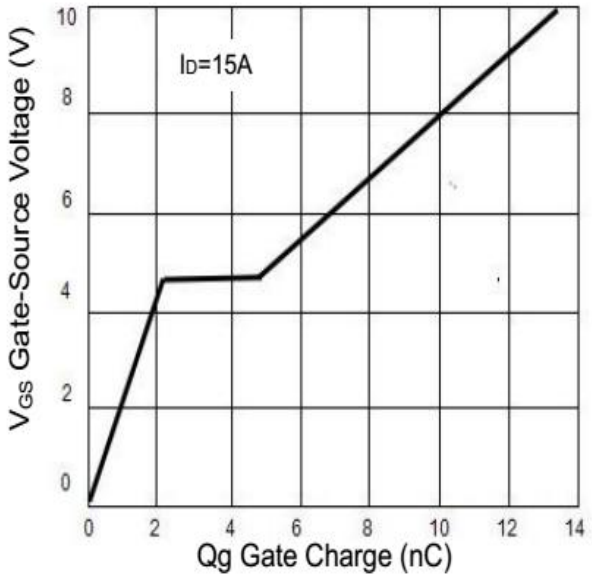
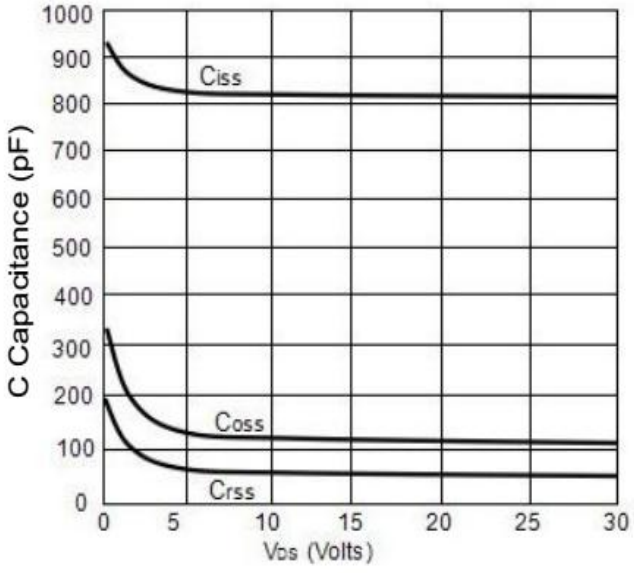
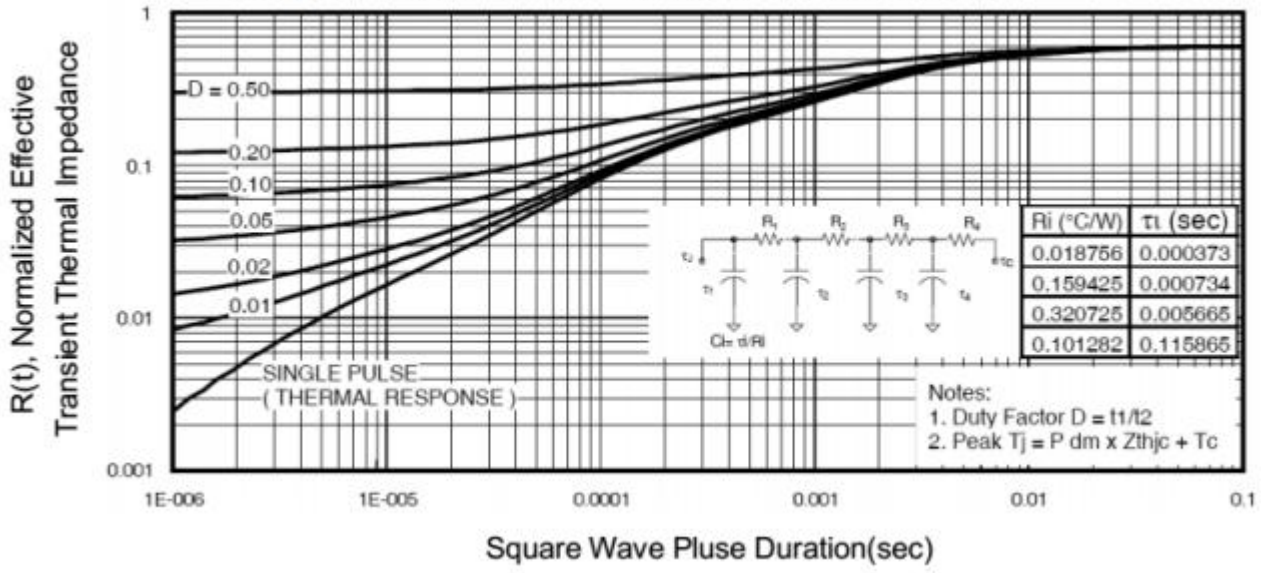


Figure 8. Capacitance Characteristics

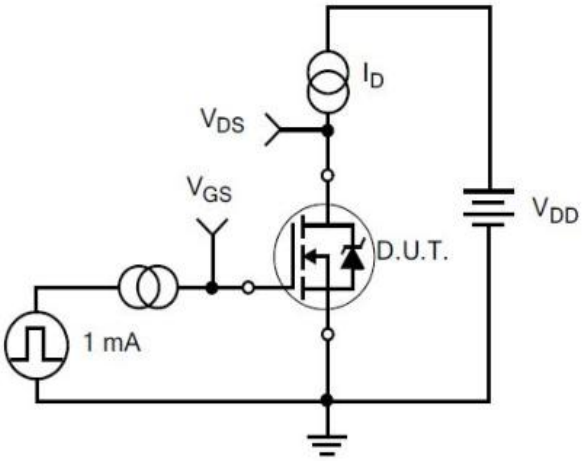


6 N-Channel Typical characteristics diagrams(continues)

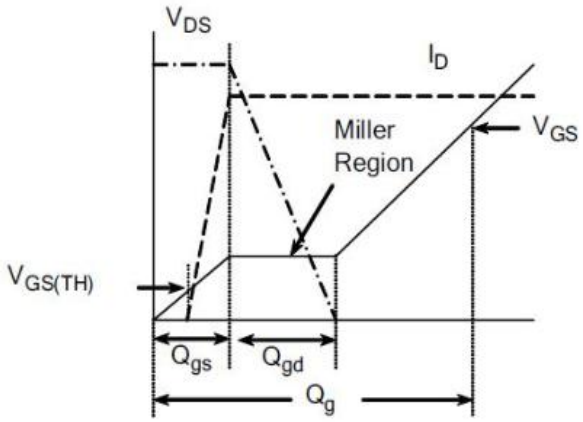
Figure 9. Normalized Maximum Transient Thermal Impedance



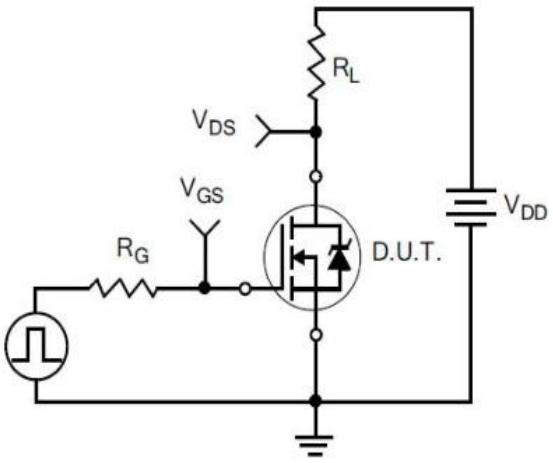
7 Typical Test Circuit and Waveform



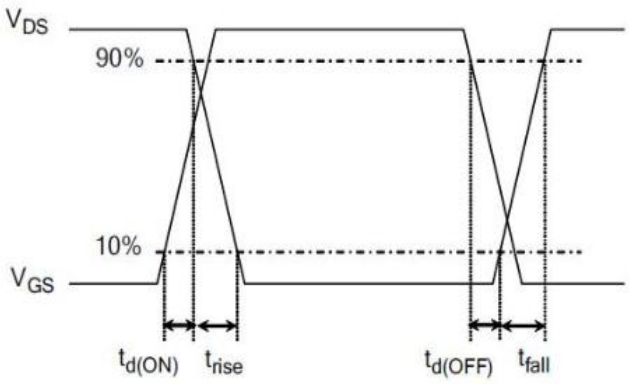
1) Gate Charge Test Circuit



2) . Gate Charge Waveform

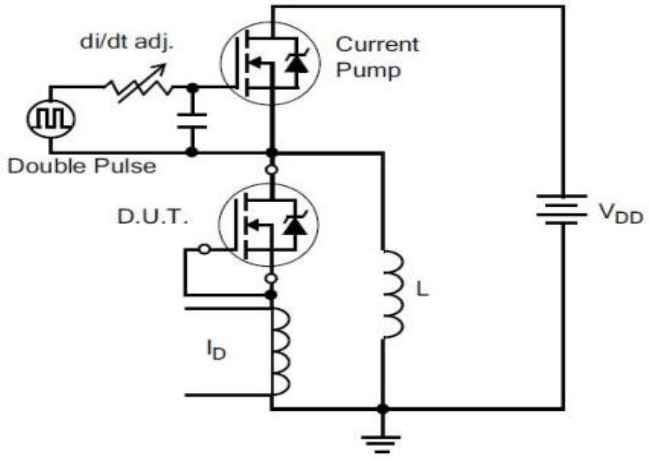


3) Resistive Switching Test Circuit

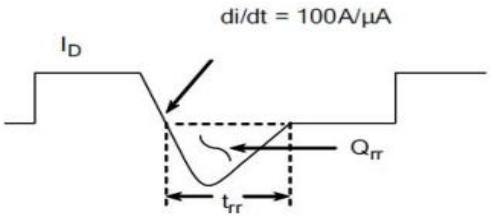


4) Resistive Switching Waveforms

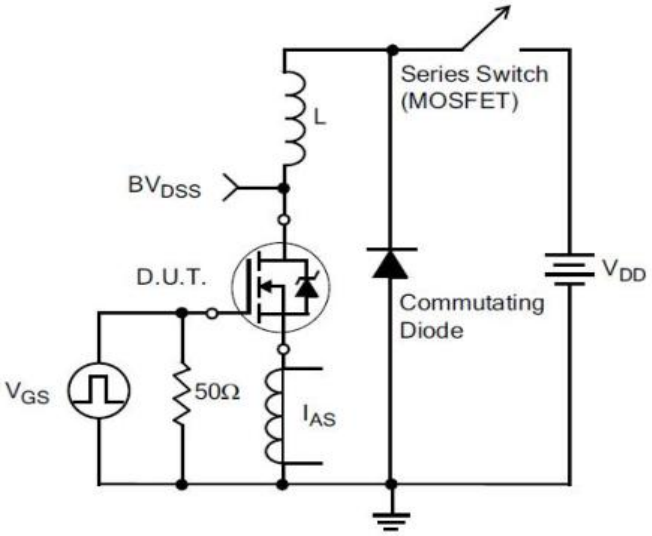
7 Typical Test Circuit and Waveform(continues)



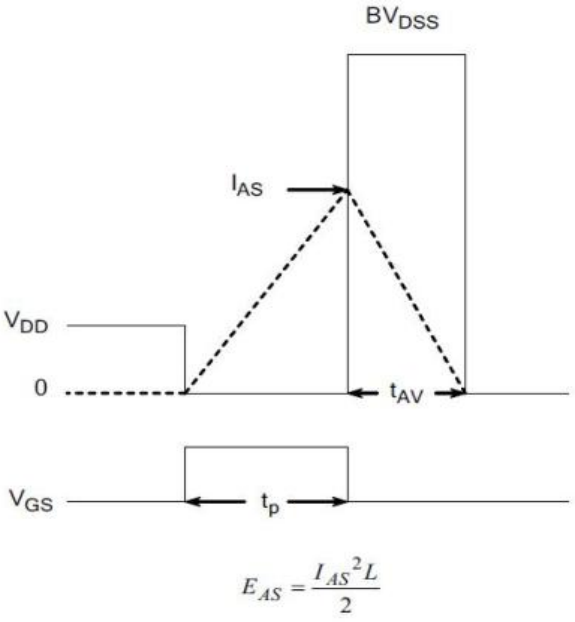
5) Diode Reverse Recovery Test Circuit



6) Diode Reverse Recovery Waveform



7) . Unclamped Inductive Switching Test Circuit



$$E_{AS} = \frac{I_{AS}^2 L}{2}$$

8) Unclamped Inductive Switching Waveforms

8 P-Channel Typical characteristics diagrams

Figure1. Power Dissipation

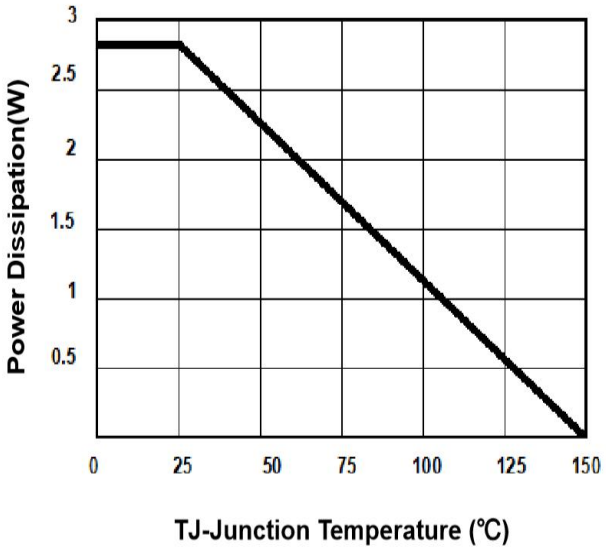


Figure2. Drain Current

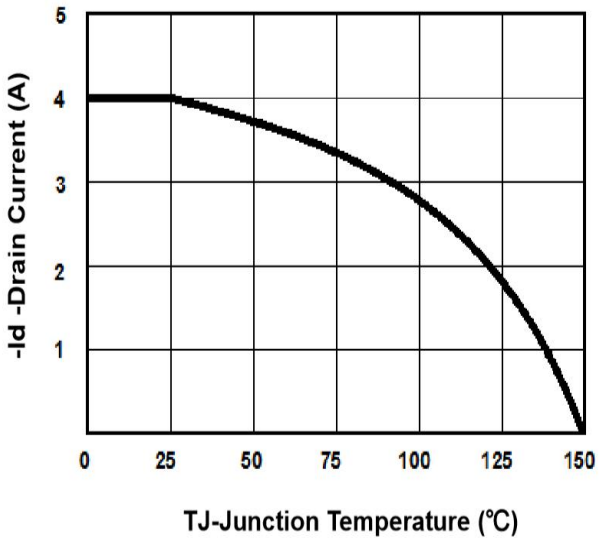


Figure3. Output Characteristics

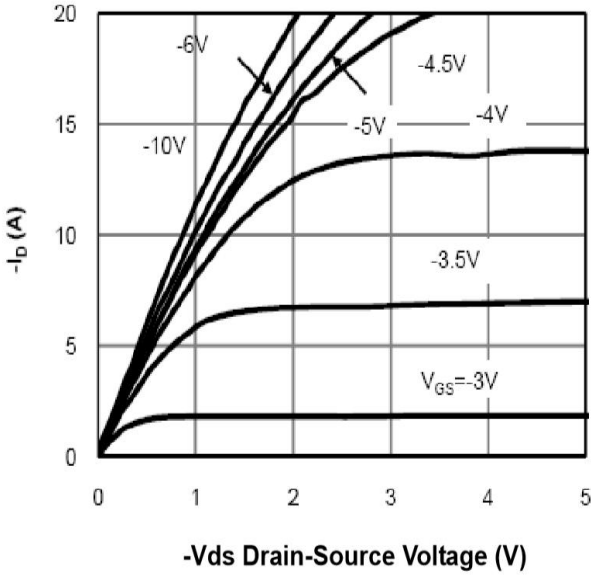
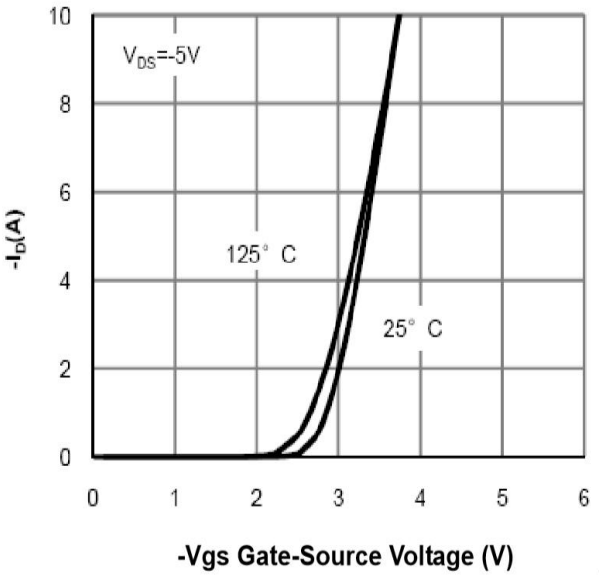


Figure4. Transfer Characteristics



8 Typical characteristics diagrams(continues)

Figure5. Capacitance

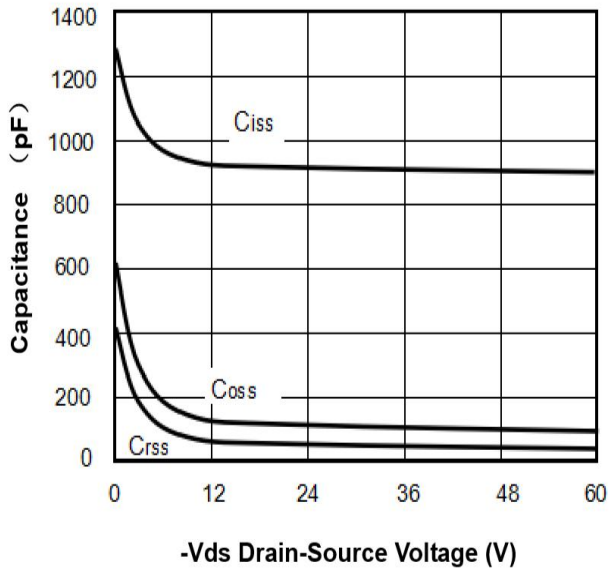


Figure6. $R_{DS(ON)}$ vs Junction Temperature

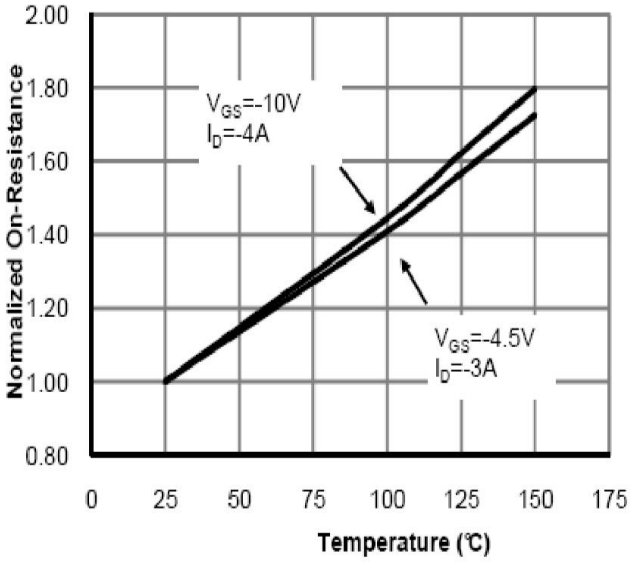


Figure7. Max BV_{DSS} vs Junction Temperature

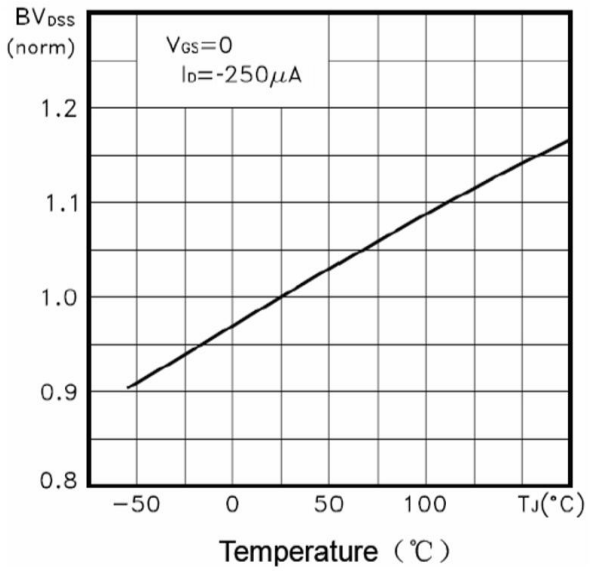
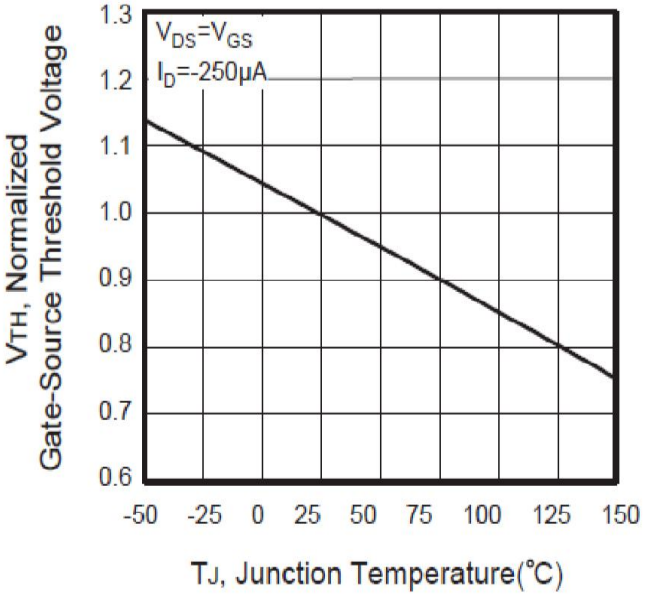


Figure8. $V_{GS(th)}$ vs Junction Temperature



8 Typical characteristics diagrams(continues)

Figure9. Gate Charge Waveforms

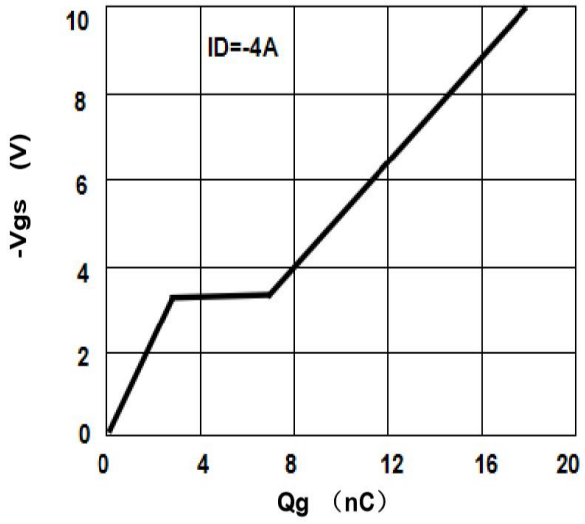


Figure10. Maximum Safe Operating Area

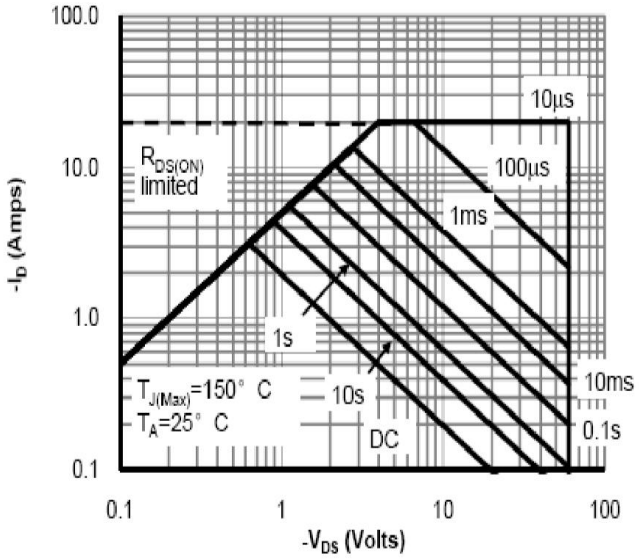
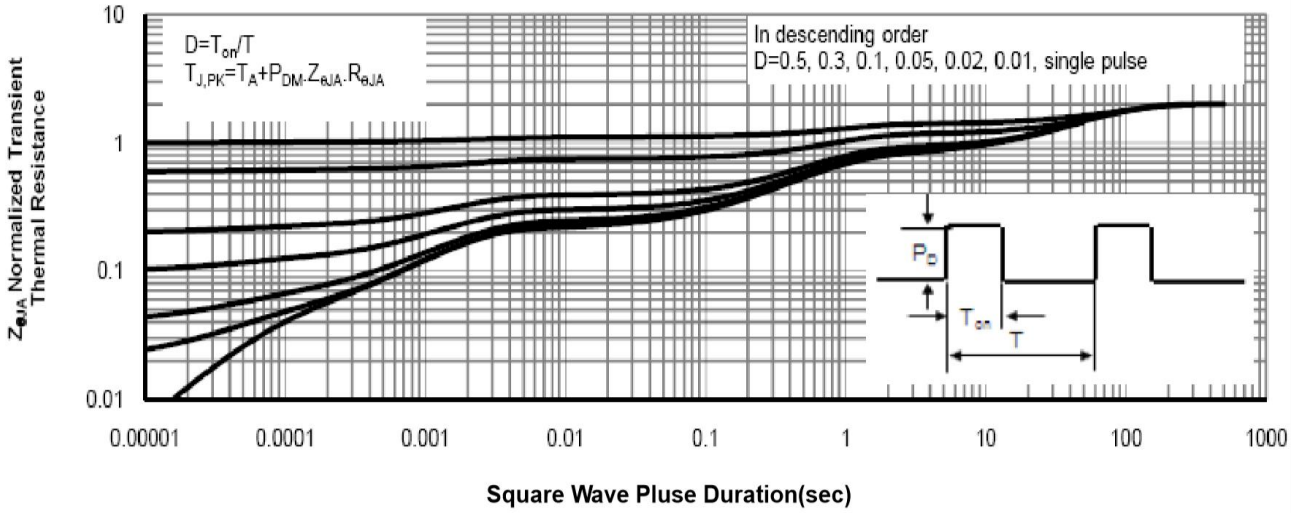
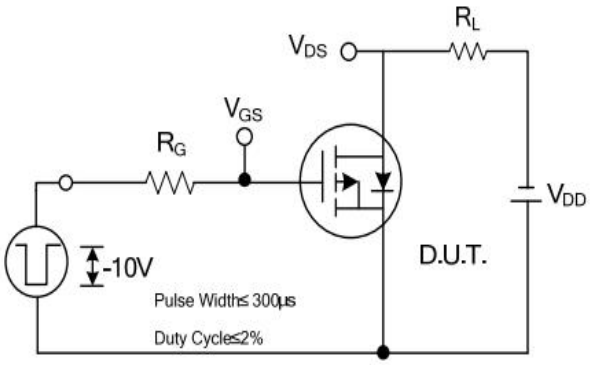


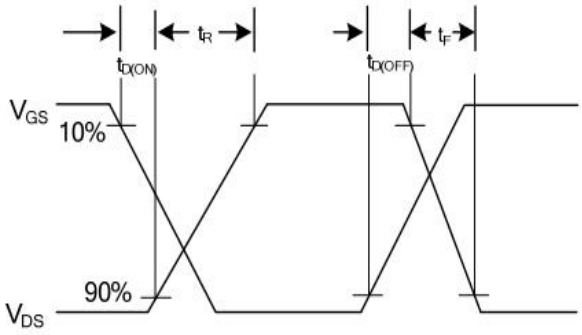
Figure11. Normalized Maximum Transient Thermal Impedance



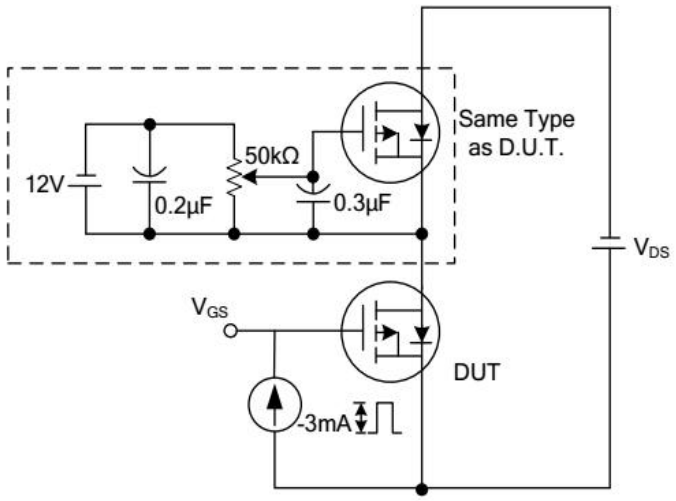
9 Typical Test Circuit and Waveform



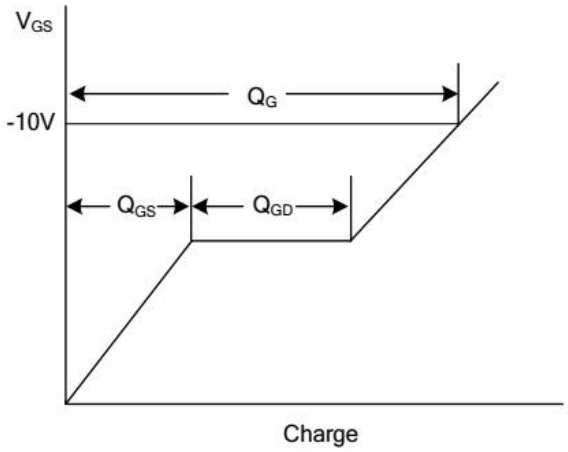
Switching Test Circuit



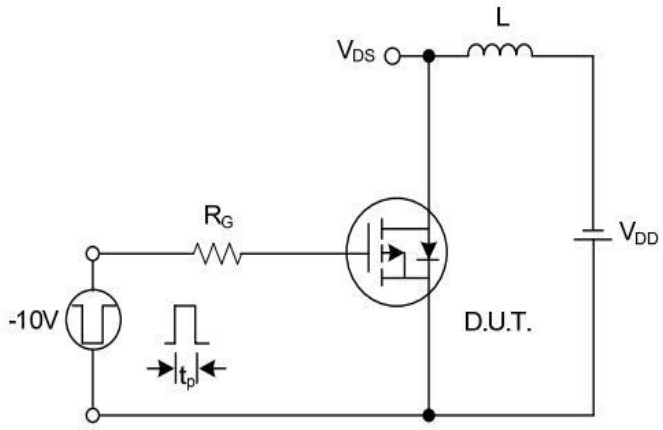
Switching Waveforms



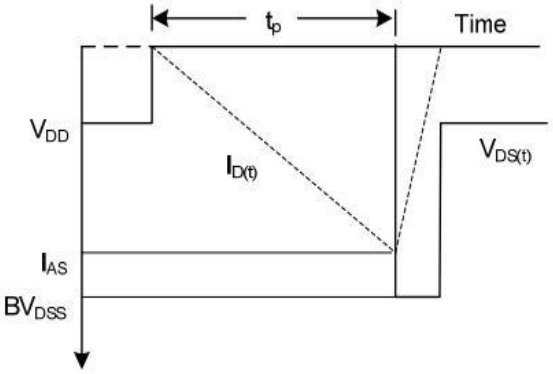
Gate Charge Test Circuit



Gate Charge Waveform



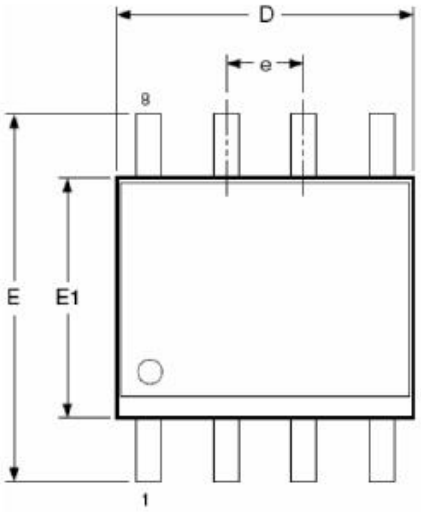
Unclamped Inductive Switching Test Circuit

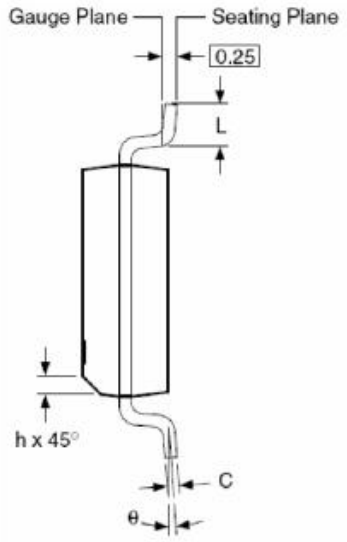


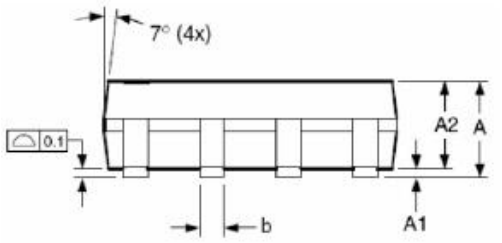
Unclamped Inductive Switching Waveforms

10 Dimension

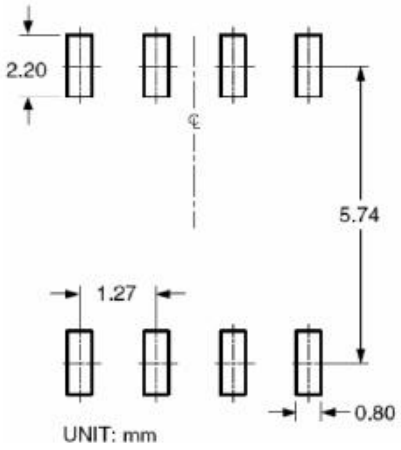
SOP-8 PACKAGE INFORMATION







RECOMMENDED LAND PATTERN



Dimensions in millimeters

Symbols	Min.	Nom.	Max.
A	1.35	1.65	1.75
A1	0.10	—	0.25
A2	1.25	1.50	1.65
b	0.31	—	0.51
c	0.17	—	0.25
D	4.80	4.90	5.00
E1	3.80	3.90	4.00
e	1.27 BSC		
E	5.80	6.00	6.20
h	0.25	—	0.50
L	0.40	—	1.27
θ	0°	—	8°

Dimensions in inches

Symbols	Min.	Nom.	Max.
A	0.053	0.065	0.069
A1	0.004	—	0.010
A2	0.049	0.059	0.065
b	0.012	—	0.020
c	0.007	—	0.010
D	0.189	0.193	0.197
E1	0.150	0.154	0.157
e	0.050 BSC		
E	0.228	0.236	0.244
h	0.010	—	0.020
L	0.016	—	0.050
θ	0°	—	8°

NOTES:

1. Dimensions are inclusive of plating
2. Package body sizes exclude mold flash and gate burrs. Mold flash at the non-lead sides should be less than 6 mils.
3. Dimension L is measured in gauge plane.
4. Controlling dimension is millimeter, converted inch dimensions are not necessarily exact.

NOTICE

The information presented in this document is for reference only. Involving product optimization and productivity improvement, ChipNobo reserves the right to adjust product indicators and upgrade some technical parameters. ChipNobo is entitled to be exempted from liability for any delay or non-delivery of the information disclosure process that occurs.
本文件中提供的信息仅供参考。涉及产品优化和生产效率改善，ChipNobo 有权调整产品指标和部分技术参数的升级，所出现信息披露过程存在延后或者不能送达的情形，ChipNobo 有获免责权。

The product listed herein is designed to be used with residential and commercial equipment, and do not support sensitive items and specialized equipment in areas where sanctions do exist. ChipNobo Co., Ltd or anyone on its behalf, assumes no responsibility or liability for any damages resulting from improper use.
此处列出的产品旨在民用和商业设备上使用，不支持确有制裁地区的敏感项目和特殊设备，ChipNobo 有限公司或其代表，对因不当使用而造成的任何损害不承担任何责任。

For additional information, please visit our website https://www.chipnobo.com/en or consult your nearest Chipnobo sales office for further assistance.
欲了解更多信息，请访问我们的网站 https://www.chipnobo.com/en，或咨询离您最近的 Chipnobo 销售办事处以获得进一步帮助。