



Description

The 4N65 can be used in various power switching circuit for system miniaturization and higher efficiency. The package form is TO-252-2L, which accords with the RoHS standard.

General Features

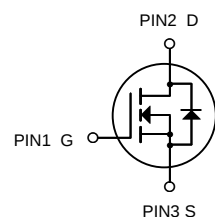
$V_{DS} = 650V, I_D = 4A$
 $R_{DS(ON)} < 2.7\Omega @ V_{GS}=10V$

Application

- Power switch circuit of adaptor and charger.



TO252-2L



N-Channel MOSFET

Package Marking and Ordering Information

Product ID	Pack	Marking	Qty(PCS)
4N65	TO252-2L	4N65 XXX YYYY	2500

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

Symbol	Parameter	Rating	Units
V_{DS}	Drain-Source Voltage	650	V
V_{GS}	Gate-Source Voltage	± 30	V
$I_D @ T_C=25^{\circ}C$	Drain Current, $V_{GS} @ 4.5V$	4	A
$I_D @ T_C=100^{\circ}C$	Drain Current, $V_{GS} @ 4.5V$	2.5	A
I_{DM}	Pulsed Drain Current ¹	16	A
$P_D @ T_C=25^{\circ}C$	Total Power Dissipation	75	W
E_{AS}	Single Pulse Avalanche Energy ⁴	200	mJ
TSTG	Storage Temperature Range	-45 to 125	$^{\circ}C$
T_J	Operating Junction Temperature Range	-45 to 125	$^{\circ}C$



Electrical Characteristics (TJ= 25℃ unless otherwise specified):

OFF Characteristics						
Symbol	Parameter	Test Conditions	Rating			Units
			Min.	Typ.	Max.	
V_{DSS}	Drain to Source Breakdown Voltage	$V_{GS}=0V, I_D=250\mu A$	650	--	--	V
$\Delta BV_{DSS}/\Delta T_J$	Bvdss Temperature Coefficient	$I_D=250\mu A, \text{Reference } 25^\circ C$	--	0.67	--	V/℃
I_{DSS}	Drain to Source Leakage Current	$V_{DS}=650V, V_{GS}=0V, T_J=25^\circ C$	--	--	1	μA
		$V_{DS}=520V, V_{GS}=0V, T_J=125^\circ C$	--	--	100	μA
$I_{GSS(F)}$	Gate to Source Forward Leakage	$V_{GS}=+30V$	--	--	100	nA
$I_{GSS(R)}$	Gate to Source Reverse Leakage	$V_{GS}=-30V$	--	--	-100	nA

ON Characteristics						
Symbol	Parameter	Test Conditions	Rating			Units
			Min.	Typ.	Max.	
$R_{DS(ON)}$	Drain-to-Source On-Resistance	$V_{GS}=10V, I_D=2A$	--	2.4	2.7	Ω
$V_{GS(TH)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_D=250\mu A$	2.0	--	4.0	V
Pulse width $t_p \leq 300\mu s, \delta \leq 2\%$						

Dynamic Characteristics						
Symbol	Parameter	Test Conditions	Rating			Units
			Min.	Typ.	Max.	
g_{fs}	Forward Transconductance	$V_{DS}=15V, I_D=2A$	--	3.5	--	S
C_{iss}	Input Capacitance	$V_{GS}=0V, V_{DS}=25V, f=1.0MHz$	--	610	--	pF
C_{oss}	Output Capacitance		--	53	--	
C_{rss}	Reverse Transfer Capacitance		--	3.5	--	

Resistive Switching Characteristics						
Symbol	Parameter	Test Conditions	Rating			Units
			Min.	Typ.	Max.	
$t_{d(ON)}$	Turn-on Delay Time	$I_D=4A, V_{DD}=325V, R_G=10\Omega$	--	14	--	ns
t_r	Rise Time		--	16	--	
$t_{d(OFF)}$	Turn-Off Delay Time		--	32	--	
t_f	Fall Time		--	11	--	
Q_g	Total Gate Charge	$I_D=4A, V_{DD}=520V, V_{GS}=10V$	--	14.5	--	nC
Q_{gs}	Gate to Source Charge		--	3	--	
Q_{gd}	Gate to Drain ("Miller") Charge		--	6.5	--	



Source-Drain Diode Characteristics						
Symbol	Parameter	Test Conditions	Rating			Units
			Min.	Typ.	Max.	
I _S	Continuous Source Current (Body Diode)	T _C = 25 °C	--	--	4	A
I _{SM}	Maximum Pulsed Current (Body Diode)		--	--	16	A
V _{SD}	Diode Forward Voltage	I _S =4.0A,V _{GS} =0V	--	--	1.5	V
trr	Reverse Recovery Time	I _S =4.0A,T _j = 25 °C dI _F /dt=100A/us, V _{GS} =0V	--	256	--	ns
Q _{rr}	Reverse Recovery Charge		--	1200	--	nC
I _{RRM}	Reverse Recovery Current		--	9.4	--	A
Pulse width tp≤300μs, δ ≤2%						

Symbol	Parameter	Max.	Units
$R_{\theta JC}$	Junction-to-Case	1.67	$^{\circ}\text{C/W}$
$R_{\theta JA}$	Junction-to-Ambient	100	$^{\circ}\text{C/W}$

^{a1}: Repetitive rating; pulse width limited by maximum junction temperature

^{a2}: $L=10\text{mH}, I_D=6.3\text{A}, \text{Start } T_J=25\text{ }^{\circ}\text{C}$

^{a3}: $I_{SD}=4\text{A}, di/dt \leq 100\text{A/us}, V_{DD} \leq BV_{DS}, \text{Start } T_J=25\text{ }^{\circ}\text{C}$

^{a4}: Recommend soldering temperature defined by IPC/JEDEC J-STD 020



Characteristics Curve:

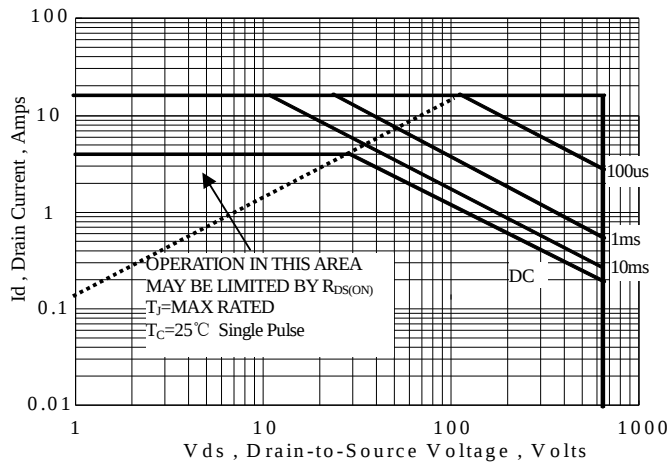


Figure 1 Maximum Forward Bias Safe Operating Area

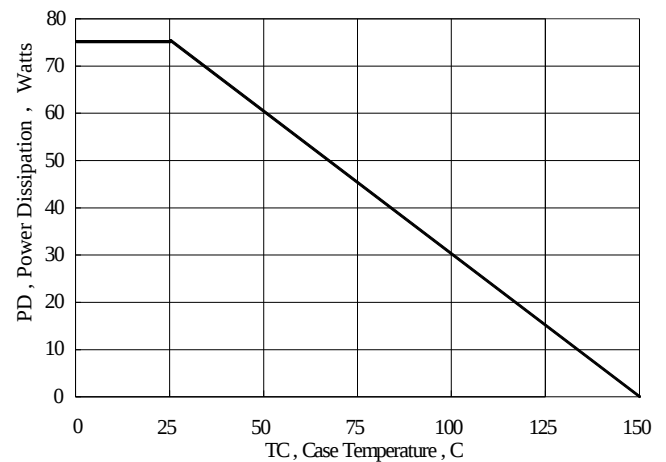


Figure 2 Maximum Power Dissipation vs Case Temperature

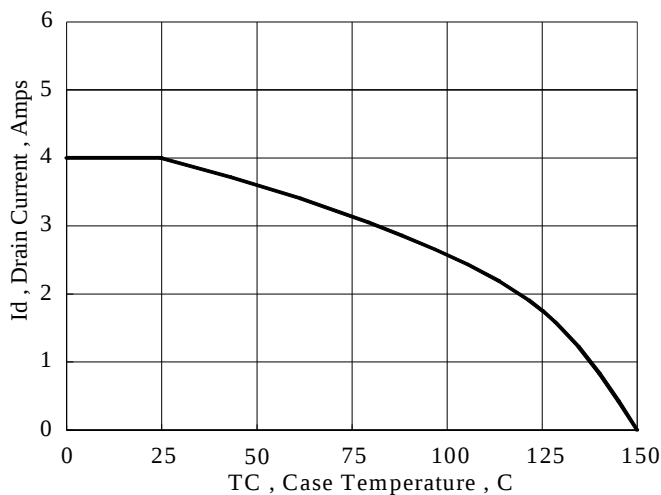


Figure 3 Maximum Continuous Drain Current vs Case Temperature

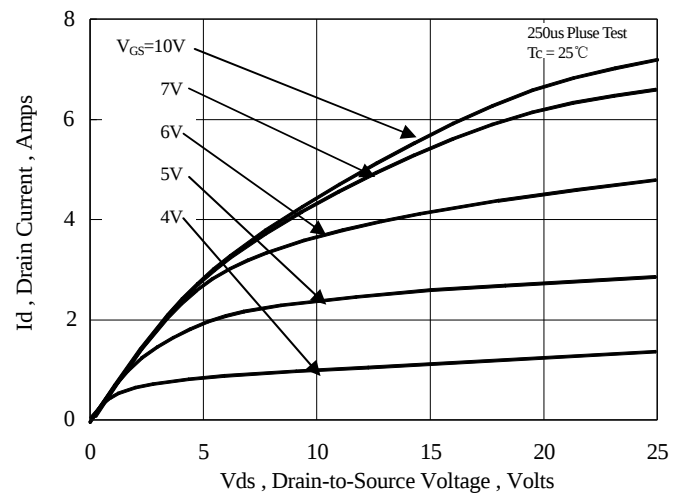


Figure 4 Typical Output Characteristics

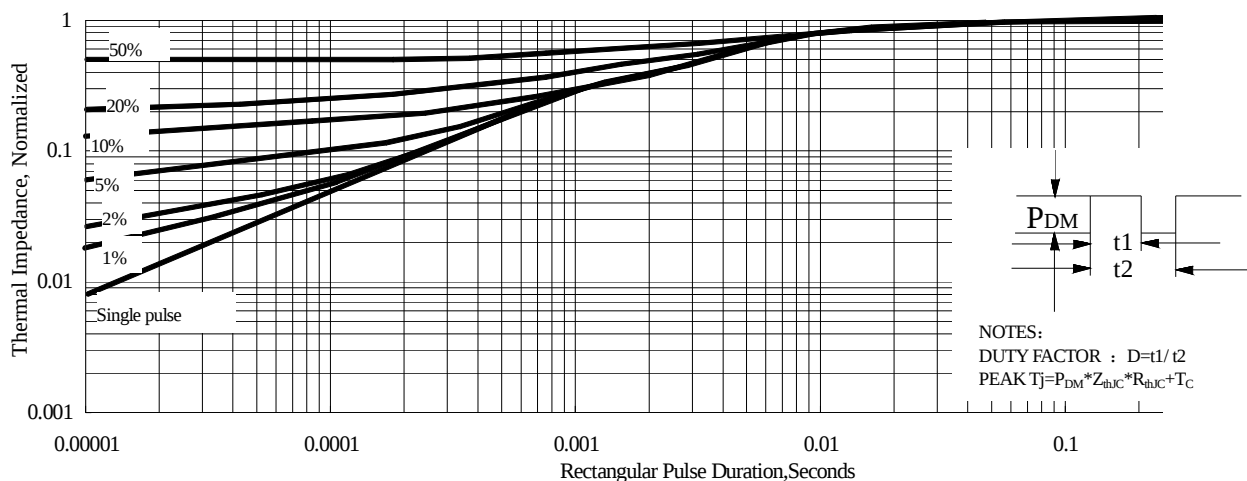


Figure 5 Maximum Effective Thermal Impedance, Junction to Case

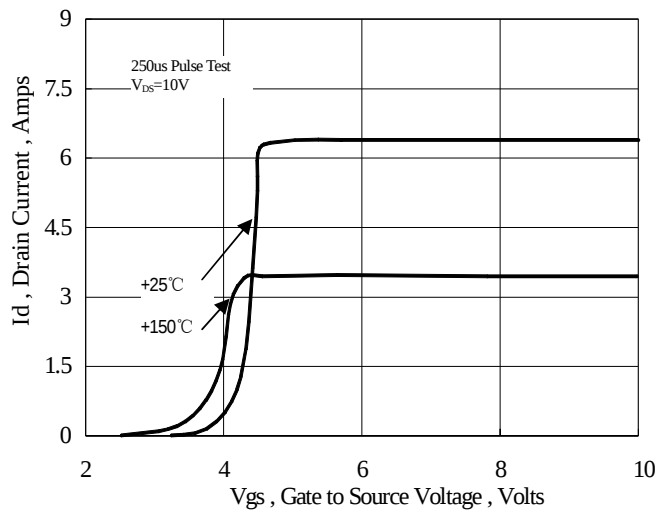


Figure 6 Typical Transfer Characteristics

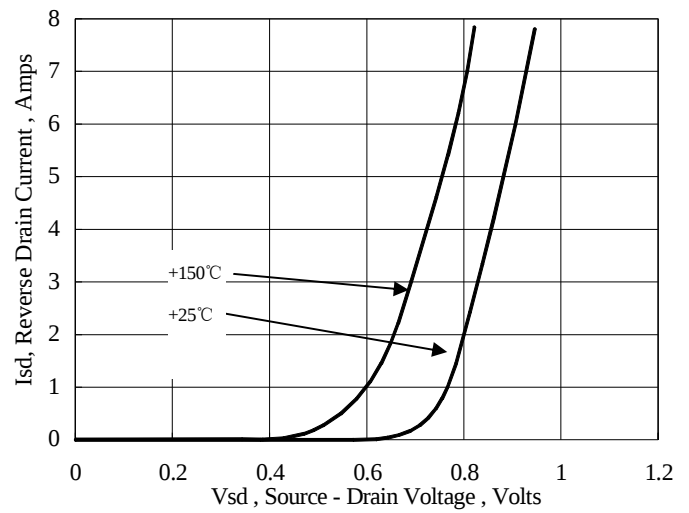


Figure 7 Typical Body Diode Transfer Characteristics

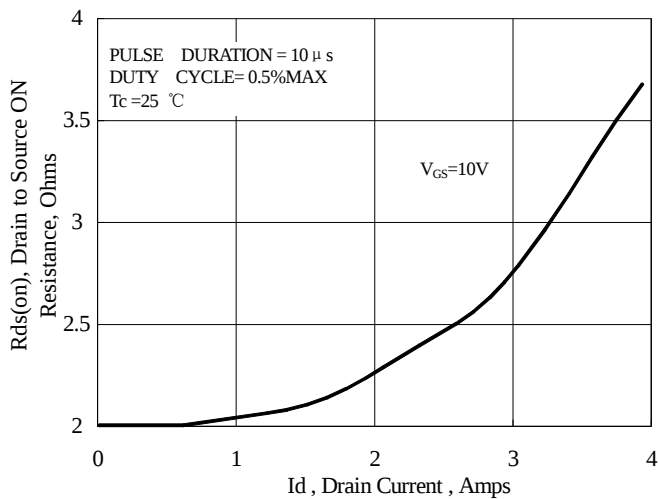


Figure 8 Typical Drain to Source ON Resistance vs Drain Current

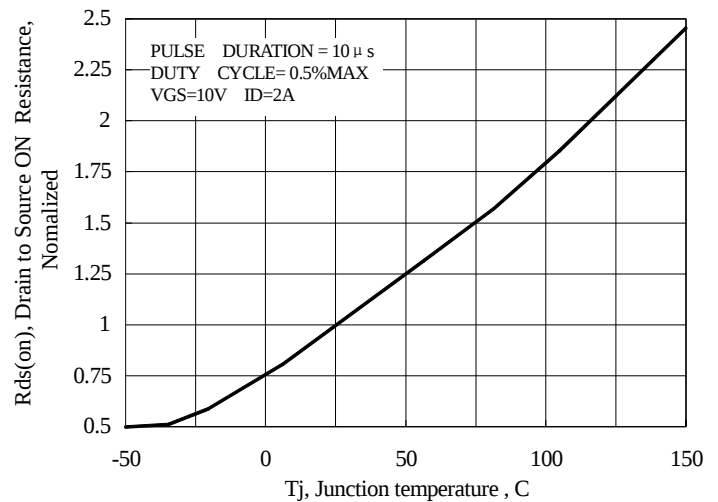


Figure 9 Typical Drain to Source on Resistance vs Junction Temperature

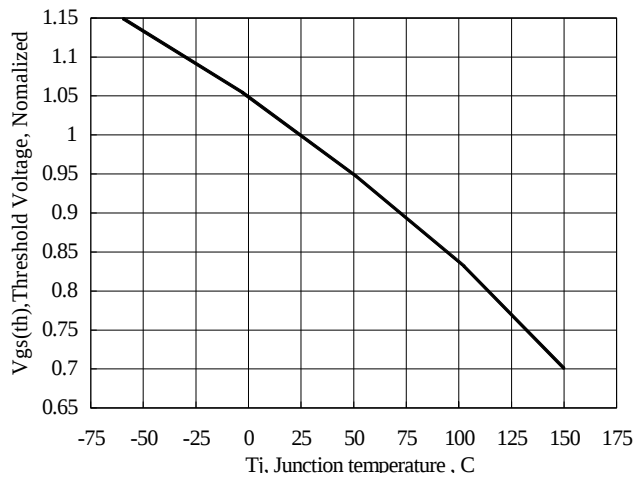


Figure 10 Typical Theshold Voltage vs Junction Temperature

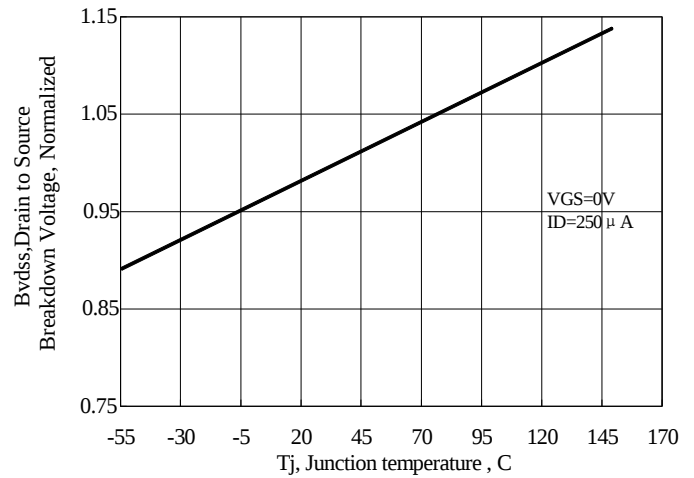


Figure 11 Typical Breakdown Voltage vs Junction Temperature

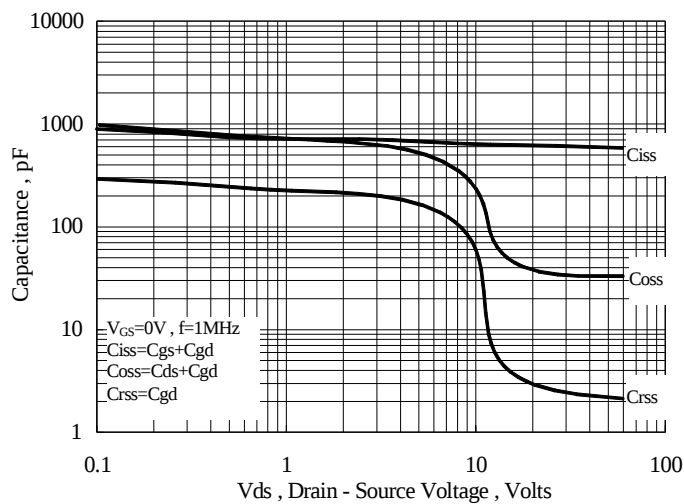


Figure 12 Typical Capacitance vs Drain to Source Voltage

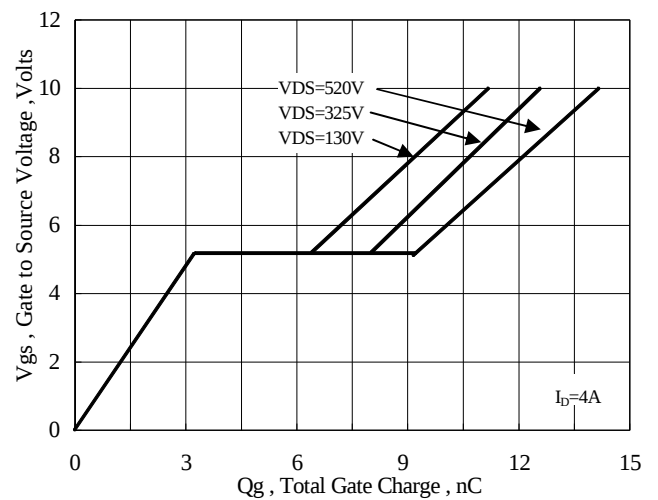


Figure 13 Typical Gate Charge vs Gate to Source Voltage



Test Circuit and Waveform

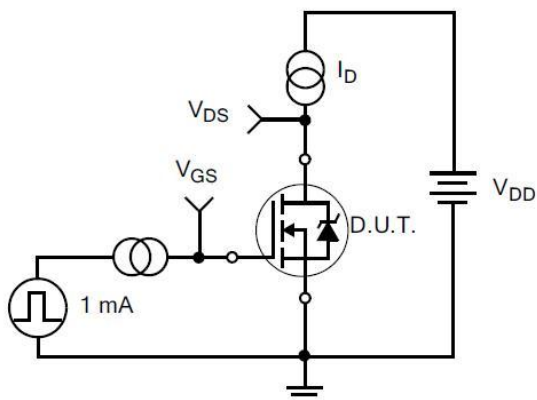


Figure 14. Gate Charge Test Circuit

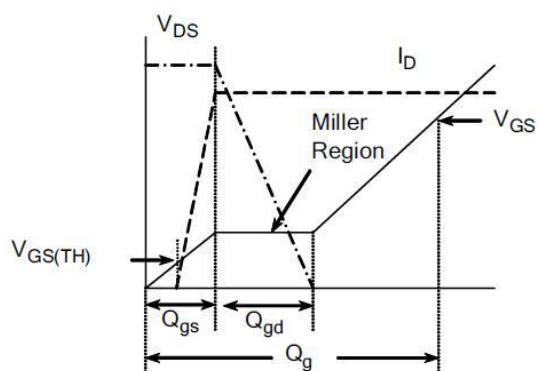


Figure 15. Gate Charge Waveforms

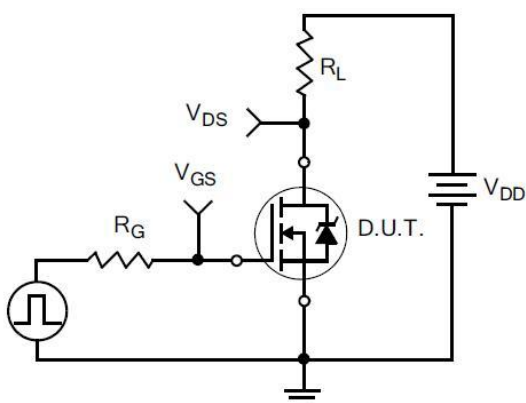


Figure 16. Resistive Switching Test Circuit

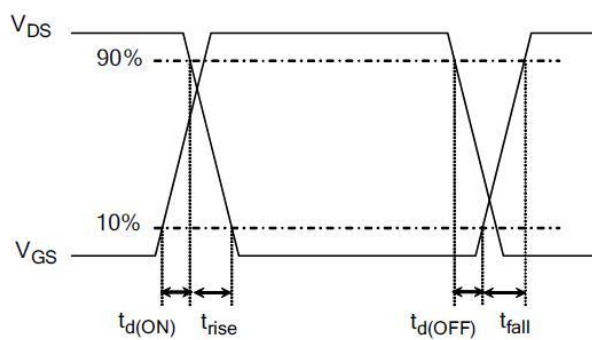


Figure 17. Resistive Switching Waveforms

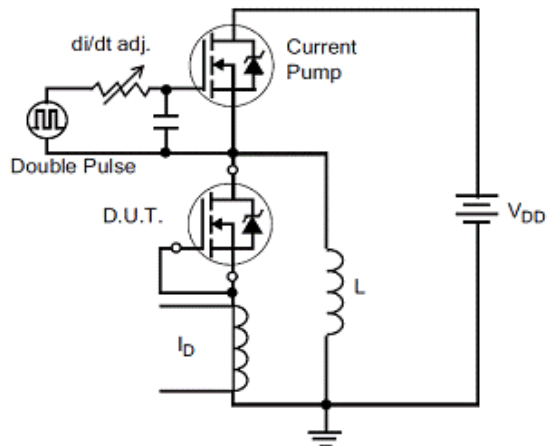


Figure 18. Diode Reverse Recovery Test Circuit

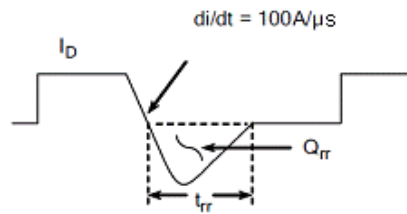


Figure 19. Diode Reverse Recovery Waveform

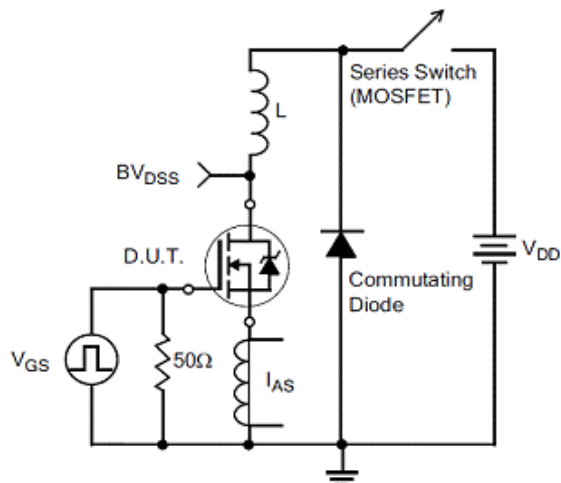


Figure20.Unclamped Inductive Switching Test Circuit

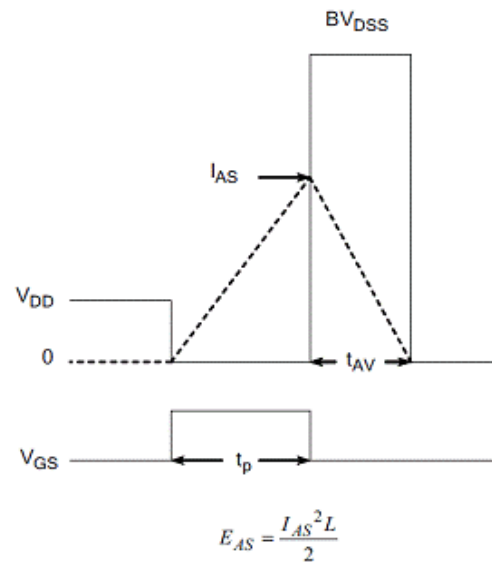
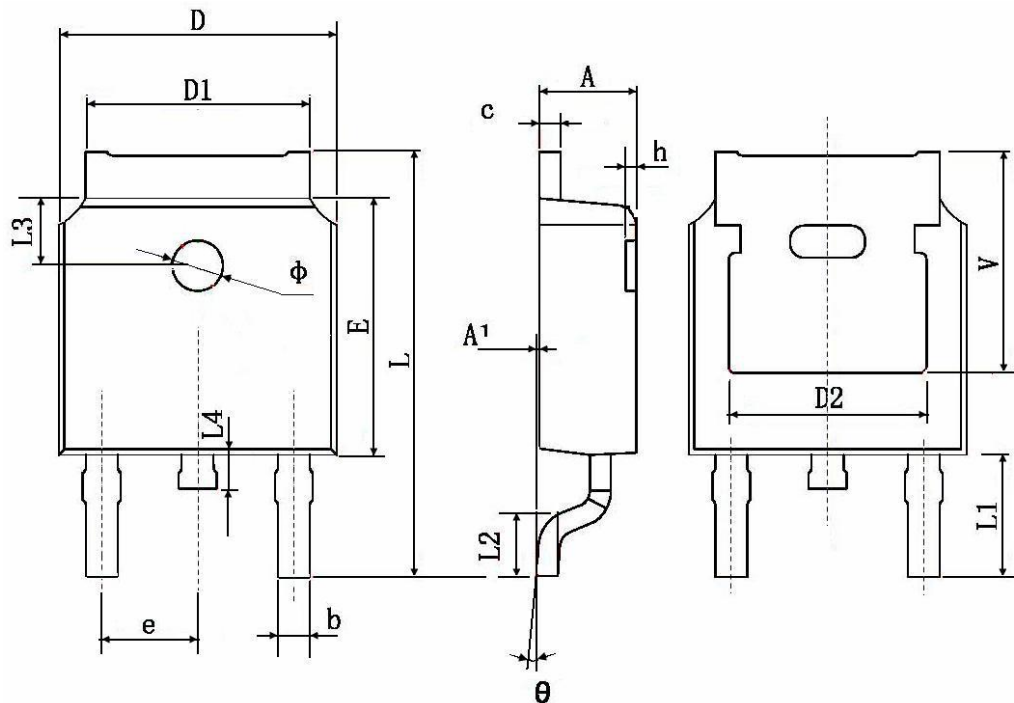


Figure21.Unclamped Inductive Switching Waveform



TO252-2L Package Information



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	2.200	2.400	0.087	0.094
A1	0.000	0.127	0.000	0.005
b	0.660	0.860	0.026	0.034
c	0.460	0.580	0.018	0.023
D	6.500	6.700	0.256	0.264
D1	5.100	5.460	0.201	0.215
D2	0.483 TYP.		0.190 TYP.	
E	6.000	6.200	0.236	0.244
e	2.186	2.386	0.086	0.094
L	9.800	10.400	0.386	0.409
L1	2.900 TYP.		0.114 TYP.	
L2	1.400	1.700	0.055	0.067
L3	1.600 TYP.		0.063 TYP.	
L4	0.600	1.000	0.024	0.039
Φ	1.100	1.300	0.043	0.051
θ	0°	8°	0°	8°
h	0.000	0.300	0.000	0.012
V	5.350 TYP.		0.211 TYP.	



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