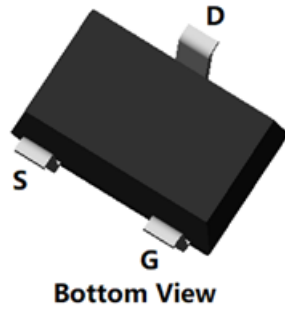
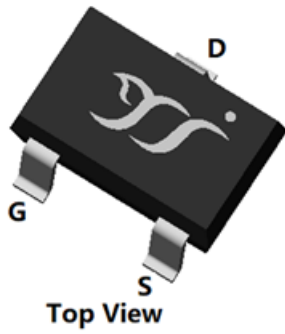
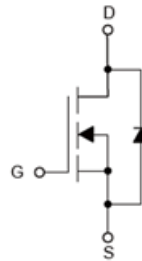


N-Channel Enhancement Mode Field Effect Transistor



SOT-323



Product Summary

• V_{DS}	60V
• I_D	0.31A
• $R_{DS(ON)}$ (at $V_{GS}=10V$)	$<1.6\Omega$
• $R_{DS(ON)}$ (at $V_{GS}=4.5V$)	$<2.5\Omega$

General Description

- Voltage controlled small signal switch
- Low input capacitance
- Fast switching speed
- Moisture Sensitivity Level 1
- Epoxy Meets UL 94 V-0 Flammability Rating
- Halogen Free
- Part no. with suffix "Q" means AEC-Q101 qualified

Applications

- Relay driver
- High-speed line driver
- Low-side loadswitch
- Switching circuits

Limiting Values

Parameter	Conditions		Symbol	Min	Max	Unit
Drain-source Voltage			V _{DS}	-	60	V
Gate-source Voltage			V _{GS}	-20	20	
Continuous Drain Current (Note 1,2)	Steady-State	T _A =25°C,V _{GS} =10V	I _D	-	0.31	A
		T _A =100°C,V _{GS} =10V		-	0.22	
Pulsed Drain Current	T _A =25°C,t _p ≤10μs		I _{DM}	-	1.24	
Maximum Body-Diode Continuous Current	T _A =25°C		I _S		0.29	
Total Power Dissipation (Note 1,2)	Steady-State	T _A =25°C	P _D	-	0.35	W
		T _A =100°C		-	0.17	
Junction and Storage Temperature Range			T _J , T _{STG}	-55	175	°C

Thermal Resistance

Parameter		Symbol	Typ	Max	Units
Thermal Resistance Junction-to-Ambient (Note 2)	Steady-State	$R_{\theta JA}$	-	429	$^\circ\text{C/W}$



2N7002WCHQ

■ Electrical Characteristics

Parameter	Symbol	Conditions	Min	Typ	Max	Units
Static Parameter						
Drain-Source Breakdown Voltage	BV _{DSS}	V _{GS} =0V, I _D =250μA, T _J =25°C	60	-	-	V
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} =60V, V _{GS} =0V, T _J =25°C	-	-	1	μA
		V _{DS} =60V, V _{GS} =0V, T _J =125°C	-	-	100	
Gate-Source Leakage Current	I _{GSS}	V _{GS} =±20V, V _{DS} =0V, T _J =25°C	-	-	±100	nA
Gate Threshold Voltage	V _{GS(th)}	V _{DS} =V _{GS} , I _D =250μA, T _J =25°C	1.1	1.7	2.4	V
Static Drain-Source On-Resistance	R _{DS(on)}	V _{GS} =10V, I _D =0.3A, T _J =25°C	-	0.86	1.6	Ω
		V _{GS} =4.5V, I _D =0.2A, T _J =25°C	-	1.06	2.5	Ω
Diode Forward Voltage	V _{SD}	I _S =0.3A, V _{GS} =0V, T _J =25°C	-	0.85	1.2	V
Gate Resistance	R _G	f=1MHz, T _J =25°C	-	8	-	Ω
Dynamic Parameters						
Input Capacitance	C _{iss}	V _{DS} =30V, V _{GS} =0V, f=1MHz, T _J =25°C	-	27	-	pF
Output Capacitance	C _{oss}		-	4.8	-	
Reverse Transfer Capacitance	C _{rss}		-	2.2	-	
Switching Parameters						
Total Gate Charge	Q _g	V _{GS} =10V, V _{DS} =30V, I _D =0.3A, T _J =25°C	-	0.98	-	nC
Gate-Source Charge	Q _{gs}		-	0.2	-	
Gate-Drain Charge	Q _{gd}		-	0.34	-	
Reverse Recovery Charge	Q _{rr}	I _F =0.3A, di/dt=100A/μs, V _{GS} =0V, V _R =30V, T _J =25°C	-	4.8	-	nC
Reverse Recovery Time	t _{rr}		-	10.7	-	ns
Turn-on Delay Time	t _{D(on)}	V _{GS} =10V, V _{DS} =30V, I _D =0.3A, R _{GEN} =3Ω, T _J =25°C	-	2	-	ns
Turn-on Rise Time	t _r		-	2.4	-	
Turn-off Delay Time	t _{D(off)}		-	4.9	-	
Turn-off Fall Time	t _f		-	29	-	

Note:

- The entire application environment impacts the thermal resistance values shown, they are not constants and are only valid for the particular conditions noted.
- The value of $R_{\theta JA}$ is measured with the device mounted on the 40mm*40mm*1.1mm single layer FR-4 PCB board with 1 in² pad of 2oz. Copper, in the still air environment with $T_A=25^\circ C$. The maximum allowed junction temperature of $175^\circ C$. The value in any given application depends on the user's specific board design.



■ Typical Electrical and Thermal Characteristics Diagrams

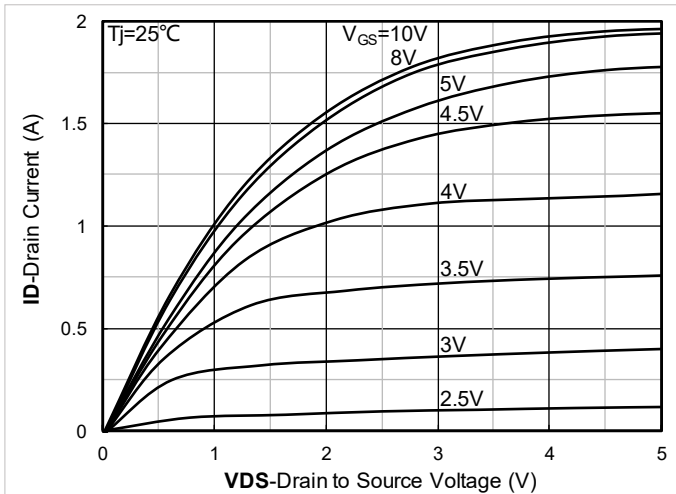


Figure 1. Output Characteristics; typical values

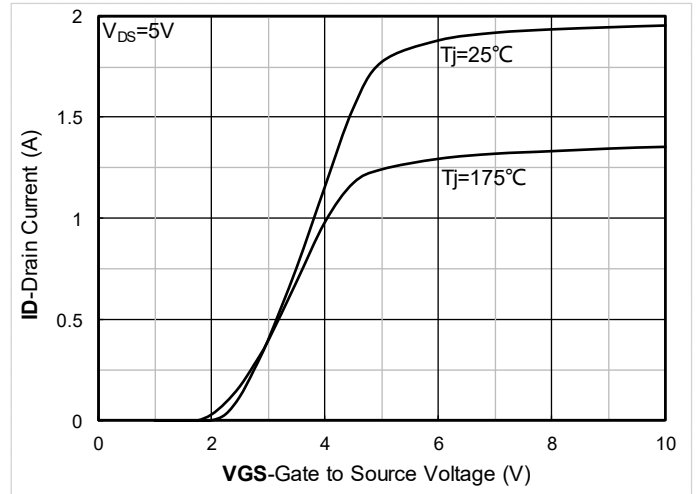


Figure 2. Transfer Characteristics; typical values

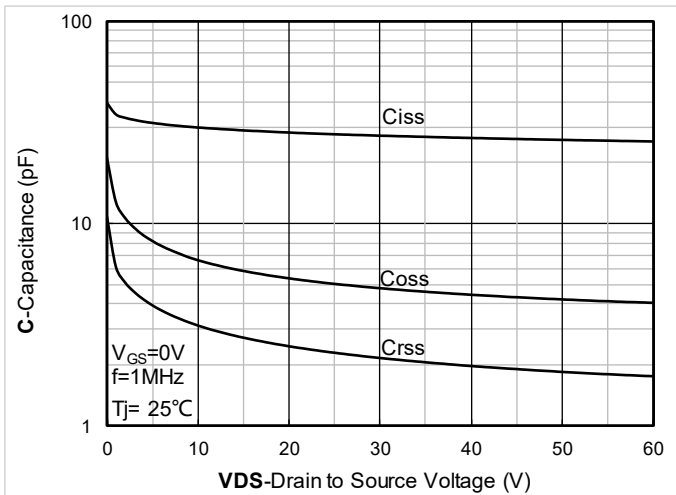


Figure 3. Capacitance Characteristics; typical values

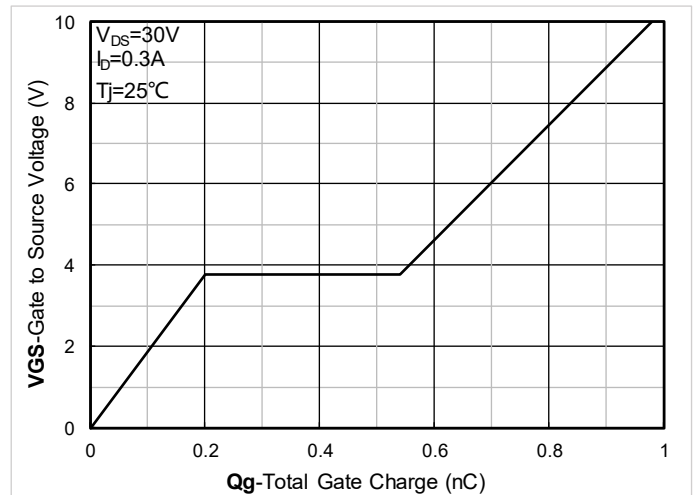


Figure 4. Gate Charge; typical values

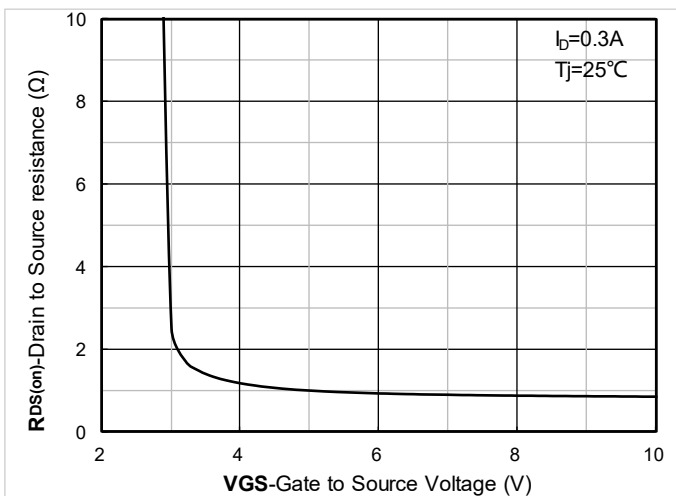


Figure 5. On-Resistance vs. Gate to Source Voltage; typical values

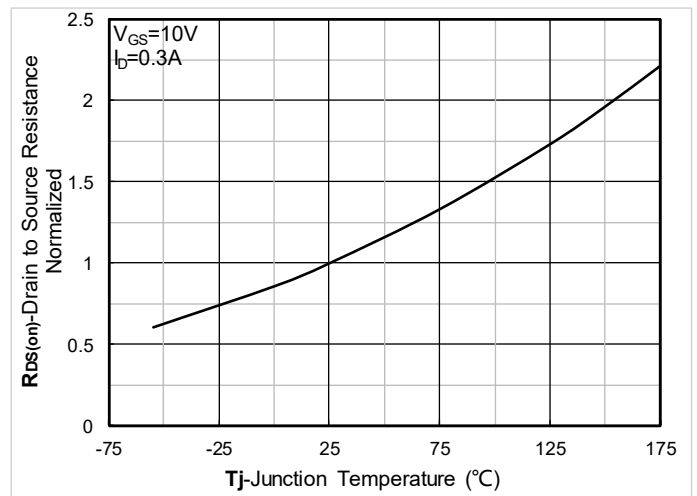


Figure 6. Normalized On-Resistance

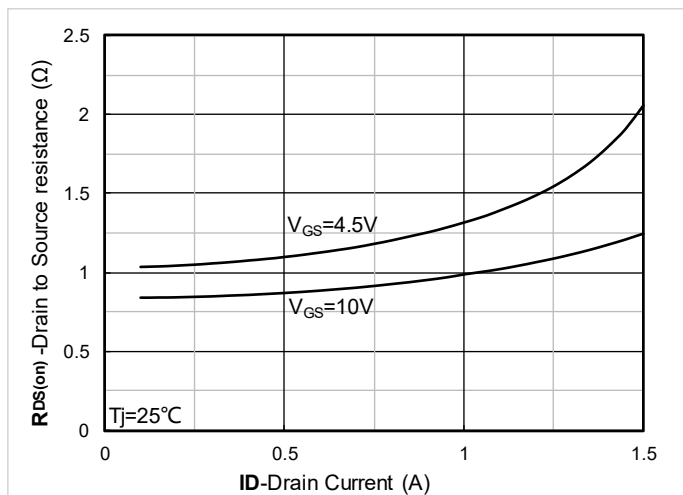


Figure 7. $R_{DS(on)}$ vs. Drain Current; typical values

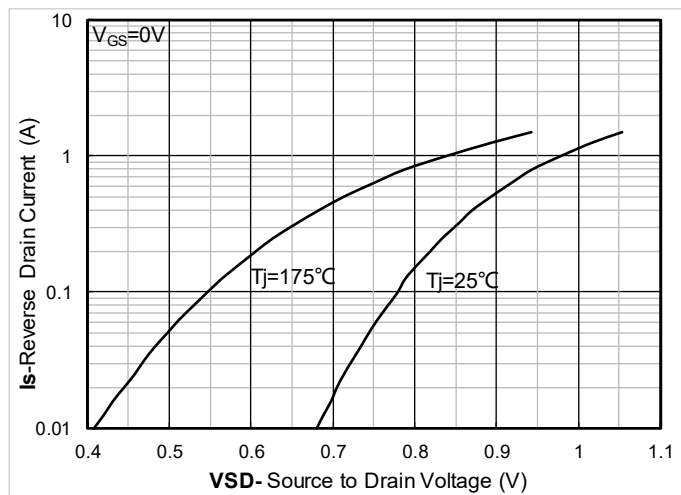


Figure 8. Forward characteristics of reverse diode; typical values

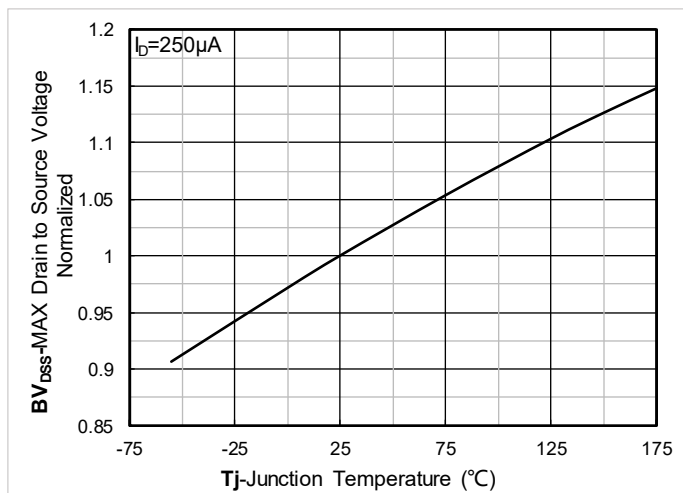


Figure 9. Normalized breakdown voltage

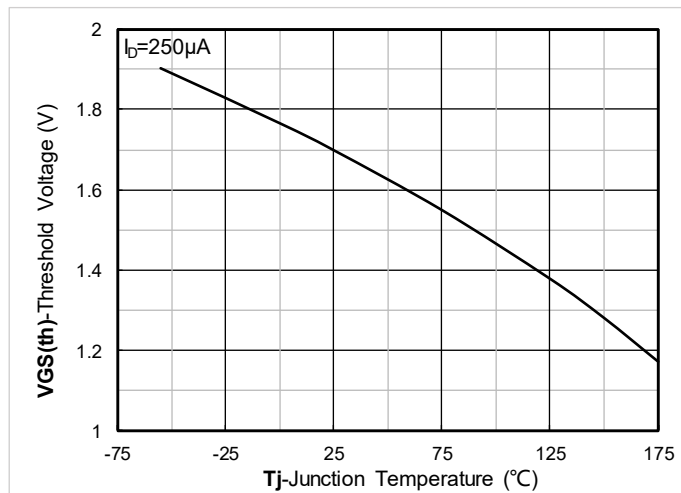


Figure 10. Gate Threshold voltage; typical values

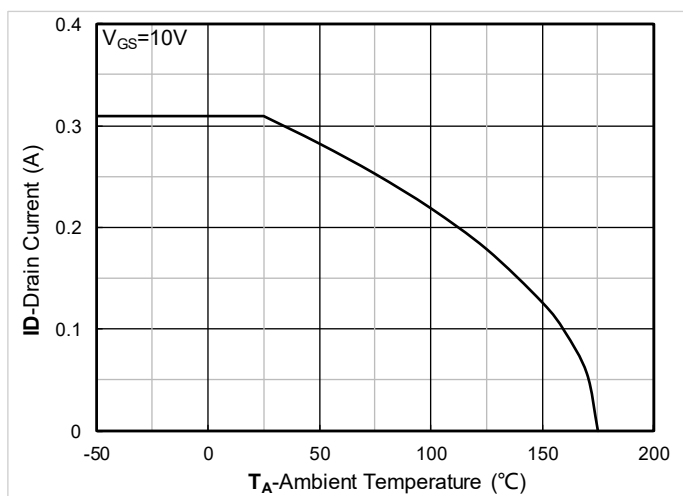


Figure 11. Current dissipation

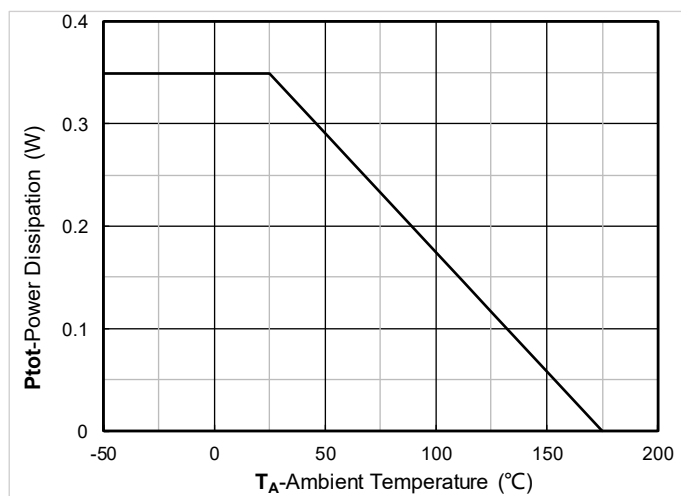


Figure 12. Power dissipation

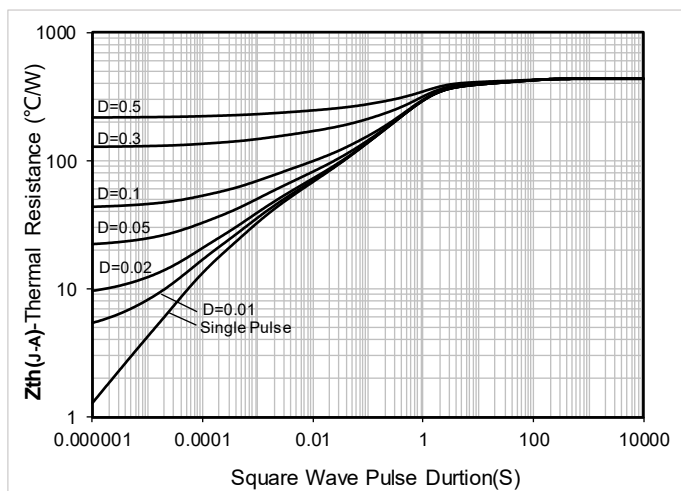


Figure 13. Maximum Transient Thermal Impedance

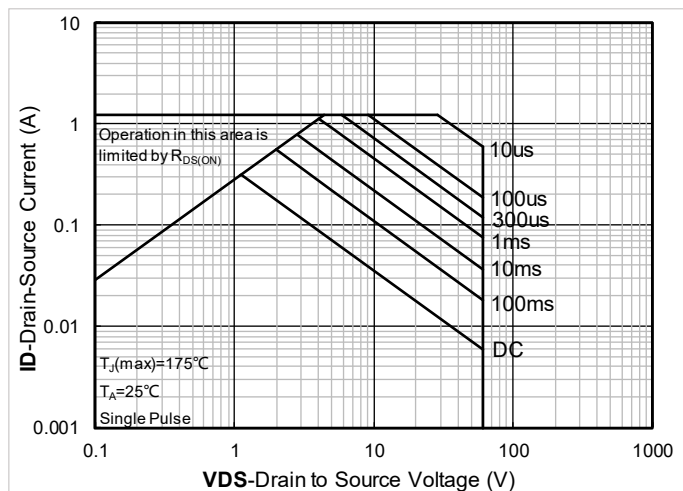


Figure 14. Safe Operation Area

■ Test Circuits & Waveforms

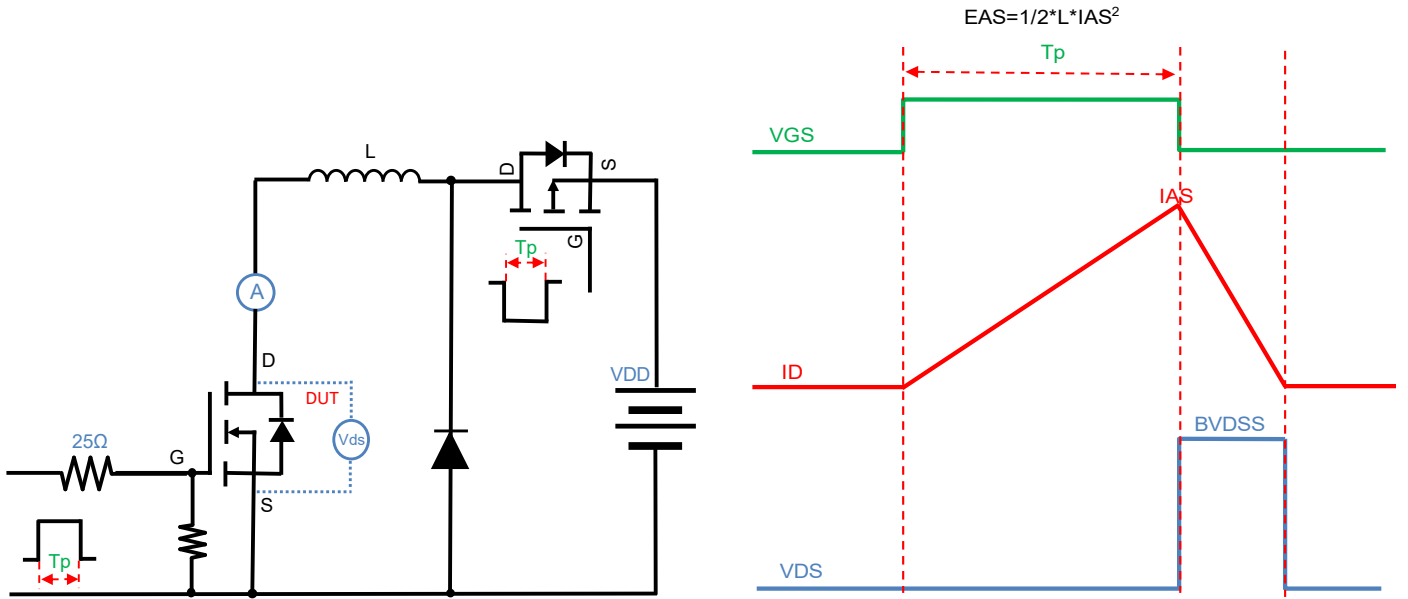


Figure A. Unclamped Inductive Switching (UIS) Test Circuit & Waveform

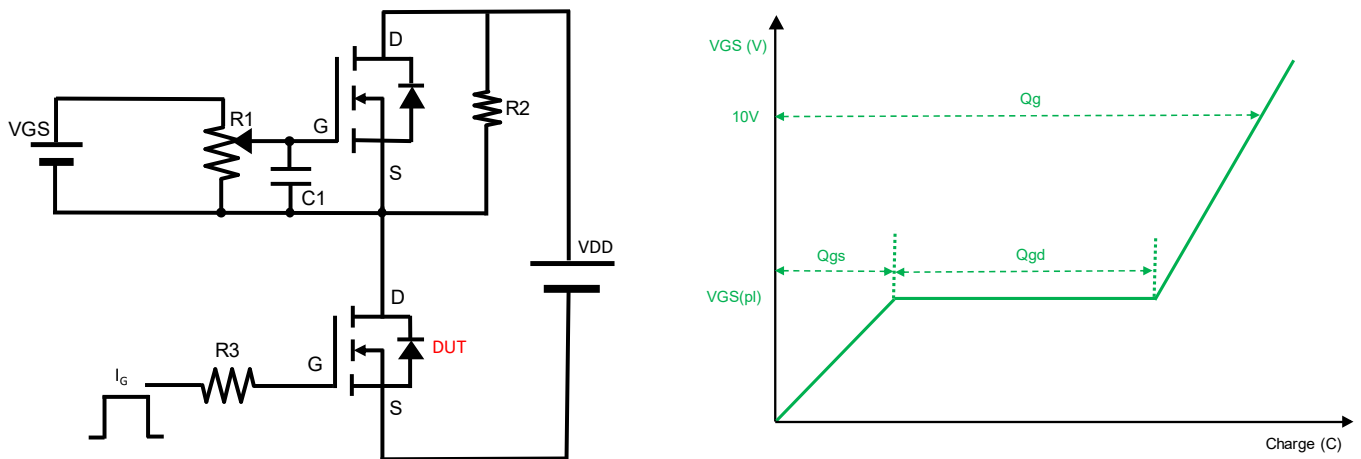


Figure B. Gate Charge Test Circuit & Waveform

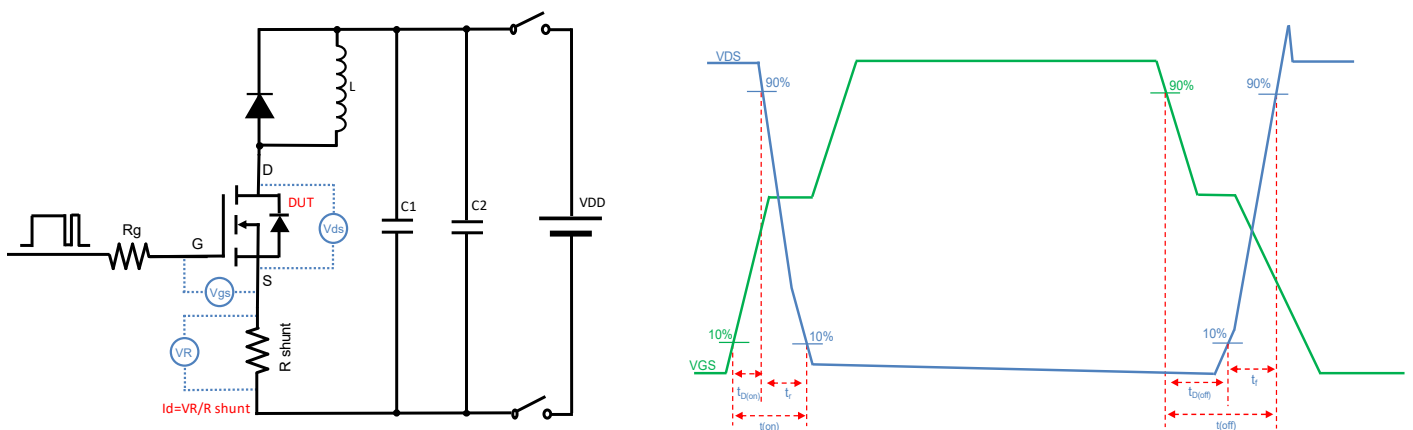


Figure C. Resistive Switching Test Circuit & Waveform

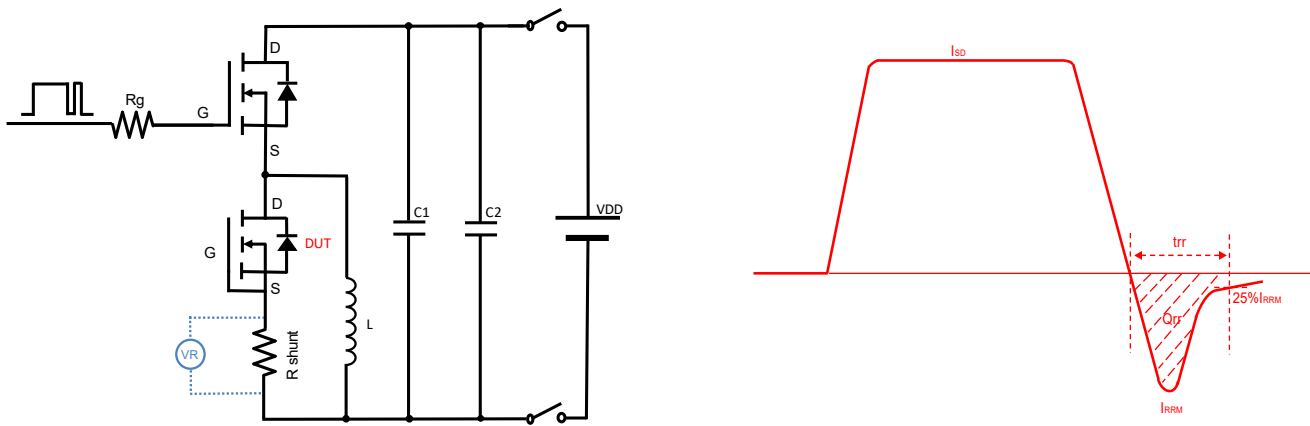
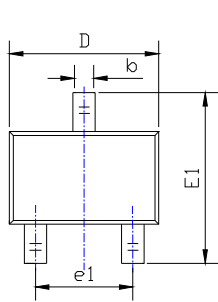
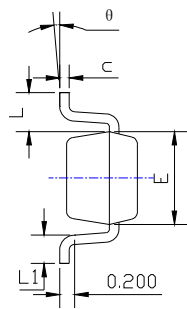


Figure D. Diode Recovery Test Circuit & Waveform

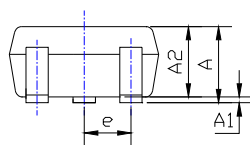
■ SOT-323 Package information



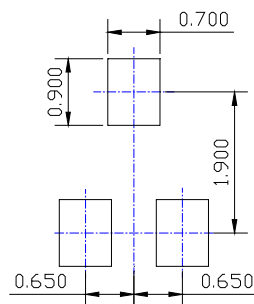
TOP VIEW



SIDE VIEW



SIDE VIEW



UNIT: mm

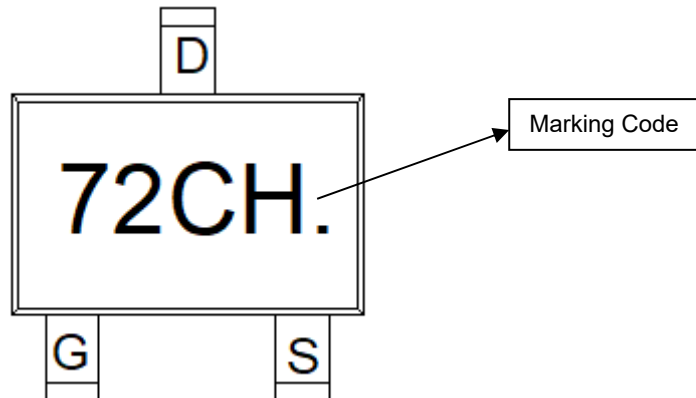
SUGGESTED SOLDER PAD LAYOUT

SYMBOL	DIMENSIONS			
	INCHES		Millimeter	
	MIN.	MAX.	MIN.	MAX.
A	0.035	0.043	0.900	1.100
A1	0.000	0.004	0.000	0.100
A2	0.035	0.039	0.900	1.000
b	0.006	0.016	0.150	0.400
c	0.004	0.010	0.100	0.250
D	0.071	0.087	1.800	2.200
E	0.045	0.053	1.150	1.350
E1	0.085	0.096	2.150	2.450
e	0.026TYP		0.650TYP	
e1	0.047	0.055	1.200	1.400
L	0.021REF		0.525REF	
L1	0.010	0.018	0.260	0.460
θ	0°	8°	0°	8°

NOTE:

- 1.PACKAGE BODY SIZES EXCLUDE MOLD FLASH AND GATE BURRS.
- 2.TOLERANCE 0.1mm UNLESS OTHERWISE SPECIFIED.
- 3.THE PAD LAYOUT IS FOR REFERENCE PURPOSES ONLY.

■ Marking Information



Note:

1. All marking is at middle of the product body
2. All marking is in laser printing
3. 72CH. is marking code
4. Body color: Black



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