

FEATURES

- Lower $R_{ds(on)}$
- Improved Inductive Ruggedness
- Fast Switching Times
- Lower Input Capacitance
- Extended Safe Operating Area
- Improved High Temperature Reliability

$$BV_{DSS} = 60\text{ V}$$

$$R_{DS(on)} = 5.0\Omega$$

$$I_D = 115\text{ mA}$$

SOT-23



1.Gate 2. Drain 3. Source

Product Summary

Part Number	BV_{dss}	$R_{ds(on)}$	I_D
2N7002	60V	5.0 Ω	115mA

Absolute Maximum Ratings

Symbol	Characteristic	Value	Units
V_{DSS}	Drain-to-Source Voltage	60	V
I_D	Continuous Drain Current ($T_C=25^\circ\text{C}$)	115	mA
	Continuous Drain Current ($T_C=100^\circ\text{C}$)	73	
I_{DM}	Drain Current-Pulsed ^①	800	mA
V_{GS}	Gate-to-Source Voltage	± 20	V
P_D	Total Power Dissipation ($T_C=25^\circ\text{C}$)	0.2	W
	Linear Derating Factor	0.16	W/ $^\circ\text{C}$
T_J, T_{STG}	Operating and Junction Storage Temperature Range	- 55 to +150	$^\circ\text{C}$

Thermal Resistance

Symbol	Characteristic	Typ.	Max.	Units
$R_{\theta JA}$	Junction-to-Ambient	-	62.5	$^\circ\text{C}/\text{W}$

Electrical Characteristics ($T_C=25^\circ\text{C}$ unless otherwise specified)

Symbol	Characteristic	Min.	Typ.	Max.	Units	Test Condition
BV_{DSS}	Drain-Source Breakdown Voltage	60	-	-	V	$V_{GS}=0V, I_D=250\mu A$
$V_{GS(th)}$	Gate Threshold Voltage	1.0	-	2.5	V	$V_{DS}=5V, I_D=250\mu A$
I_{GSS}	Gate-Source Leakage, Forward	-	-	100	nA	$V_{GS}=20V$
	Gate-Source Leakage, Reverse	-	-	-100		$V_{GS}=-20V$
I_{DSS}	Drain-to-Source Leakage Current	-	-	1.0	μA	$V_{DS}=40V$
		-	-	500		$V_{DS}=40V, T_C=125^\circ\text{C}$
$I_{D(on)}$	On-State Drain-Source Current	0.5	-	-	A	$V_{DS}=10V, V_{GS}=10V$
$R_{DS(on)}$	Static Drain-Source	-	-	-	Ω	$V_{GS}=10V, I_D=0.5A$
	On-State Resistance ②	-	-	5.0		
g_{fs}	Forward Transconductance ②	0.08	-	-	S	$V_{DS}=15V, I_D=0.2A$
C_{iss}	Input Capacitance	-	-	50	pF	$V_{DS}=25V, V_{GS}=0V,$ $f=1.0\text{MHz}$
C_{oss}	Output Capacitance	-	-	25		
C_{rss}	Reverse Transfer Capacitance	-	-	5		
$t_{d(on)}$	Turn-On Delay Time	-	-	20	ns	$V_{DD}=30V, I_D=0.2A,$ $R_G=25.0\Omega$ ② ③
t_r	Rise Time	-	-	-		
$t_{d(off)}$	Turn-Off Delay Time	-	-	20		
t_f	Fall Time	-	-	-		
Q_g	Total Gate Charge	-	1.44	2.16	nC	$V_{DS}=24V, V_{GS}=5V,$ $I_D=60A$ See Fig 6 & Fig 12 ④ ⑤
Q_{gs}	Gate-Source Charge	-	0.6	-		
Q_{gd}	Gate-Drain(" Miller ") Charge	-	0.9	-		

Source-Drain Diode Ratings and Characteristics

Symbol	Characteristic	Min.	Typ.	Max.	Units	Test Condition
I_S	Continuous Source Current	-	-	115	mA	Integral reverse pn-diode in the MOSFET
I_{SD}	Pulse Source Current ①	-	-	800	mA	
V_{SD}	Diode Forward Voltage ②	-	-	1.5	V	$T_A=25^\circ\text{C}, I_S=115\text{mA}, V_{GS}=0V$

Notes ;

- ① Repetitive Rating : Pulse Width Limited by Maximum Junction Temperature
 ② Pulse Test : Pulse Width = $250\mu s$, Duty Cycle $\leq 2\%$
 ③ Essentially Independent of Operating Temperature

Fig 1. Output Characteristics

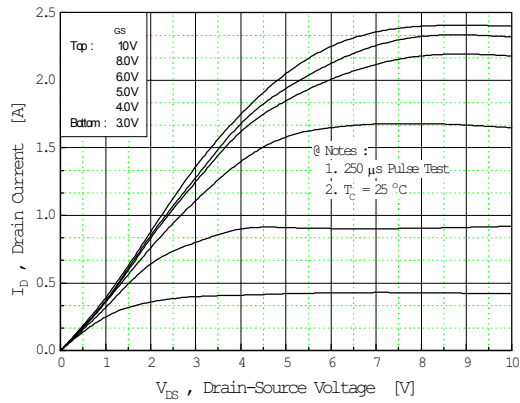


Fig 2. Transfer Characteristics

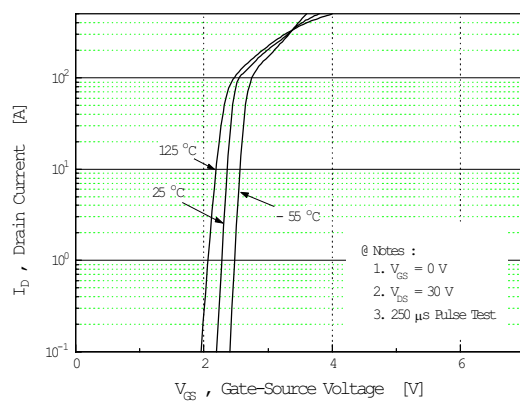


Fig 3. On-Resistance vs. Drain Current

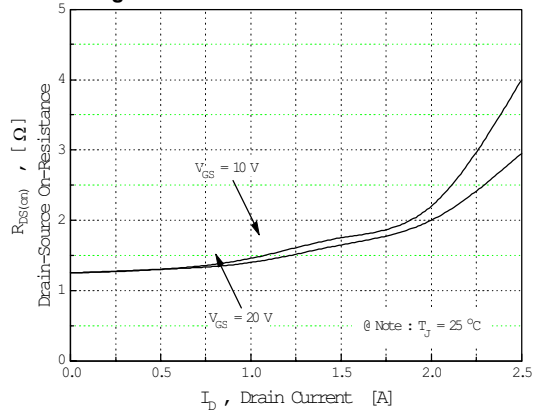


Fig 4. Source-Drain Diode Forward Voltage

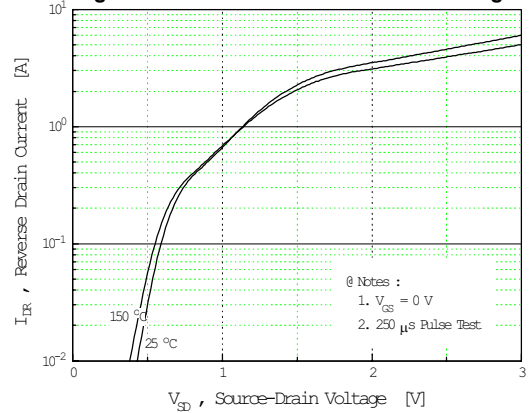


Fig 5. Capacitance vs. Drain-Source Voltage

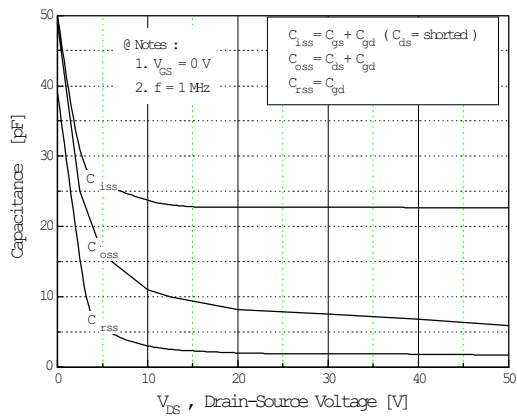


Fig 6. Breakdown Voltage vs. Temperature

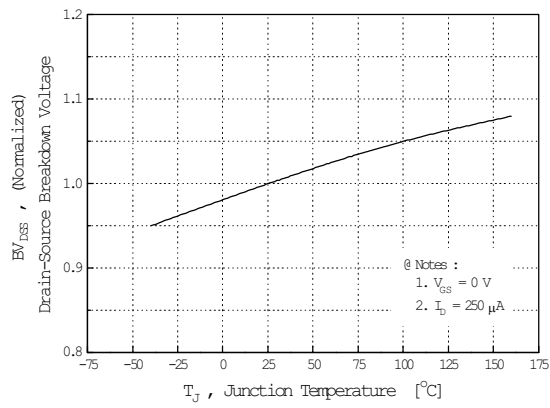


Fig 7. On-Resistance vs. Temperature

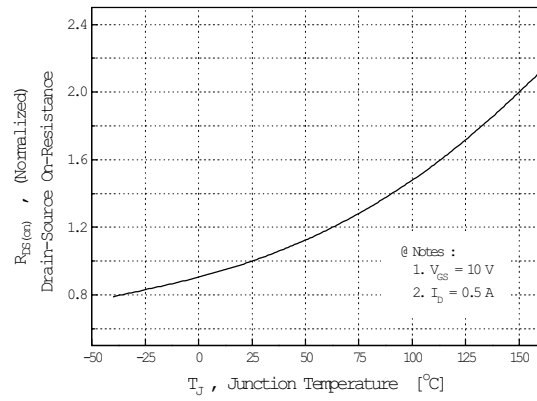


Fig 12. Gate Charge Test Circuit & Waveform

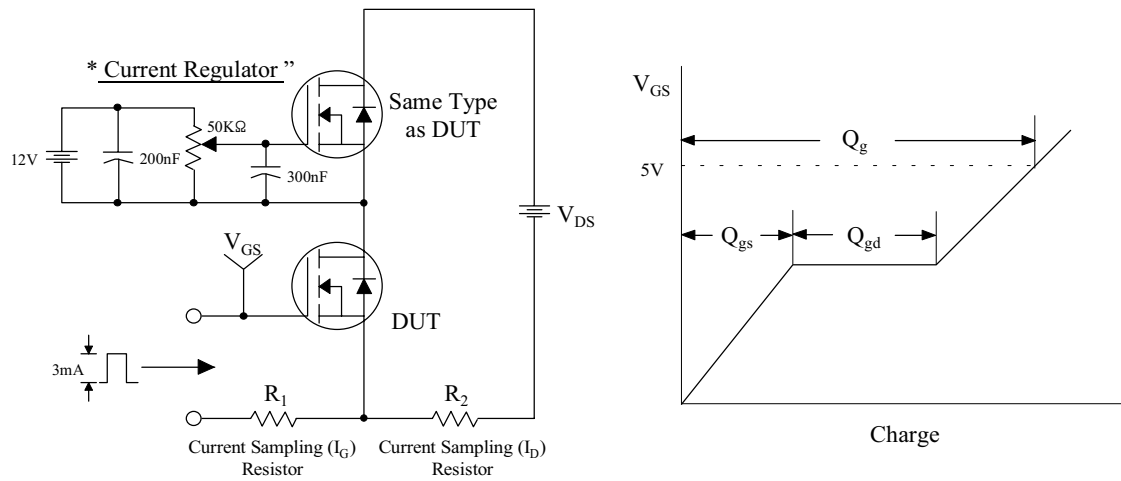


Fig 13. Resistive Switching Test Circuit & Waveforms

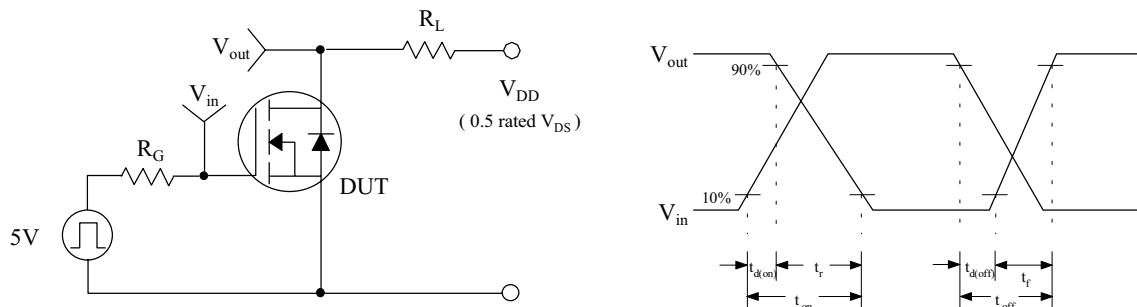


Fig 14. Unclamped Inductive Switching Test Circuit & Waveforms

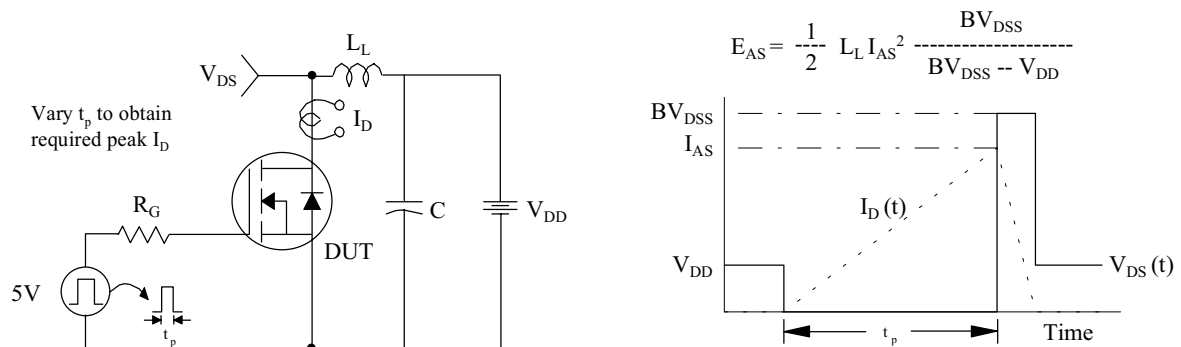


Fig 15. Peak Diode Recovery dv/dt Test Circuit & Waveforms

