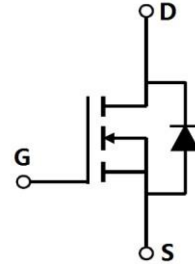
12N10D

100V N-SGT Enhancement Mode MOSFET

General Description

12N10D use advanced SGT MOSFET technology to provide low $R_{DS(ON)}$, low gate charge, fast switching and excellent avalanche characteristics. This device is specially designed to get better ruggedness and suitable to use in Synchronous-rectification applications.



Features

Low $R_{DS(on)}$ & FOM
Extremely low switching loss
Excellent stability and uniformity
Fast switching and soft recovery
Invertors
Synchronous-rectification applications

Applications

Consumer electronic power supply

Motor control

Synchronous-rectification

Isolated DC

Synchronous-rectification applications

Package Marking and Ordering Information

Product ID	Pack	Marking	Qty(PCS)
12N10D	TO-252	12N10D	2500

Absolute Maximum Ratings at T_j=25℃ unless otherwise noted

Parameter	Symbol	Value	Unit
Drain source voltage	VDS	100	V
Gate source voltage	VGS	±20	V
Continuous drain current1), T_C=25 ℃	I_D	12	A
Pulsed drain current2), T_C=25 ℃	ID, pulse	21	A
Power dissipation3), T_C=25 ℃	P_D	17	W
Single pulsed avalanche energy5)	EAS	1.2	mJ
Operation and storage temperature	Tstg，Tj	-55 to 150	℃

Thermal Characteristics

Parameter	Symbol	Value	Unit
Thermal resistance, junction-case	$R_{\theta JC}$	7.4	℃/W
Thermal resistance, junction-ambient[4)]	$R_{\theta JA}$	62	℃/W

Dynamic Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test condition
Drain-source breakdown voltage	BV_{DSS}	100			V	V_{GS}=0 V, I_D=250 μA
Gate threshold voltage	$V_{GS(th)}$	1.5		2.5	V	V_{DS}=V_{GS}, I_D=250 μA
Drain-source on-state resistance	$R_{DS(ON)}$		110	140	mΩ	V_{GS}=10 V, I_D=5 A
Drain-source on-state resistance	$R_{DS(ON)}$		160	300	mΩ	V_{GS}=4.5 V, I_D=3 A
Gate-source leakage current	I_{GSS}			100	nA	V_{GS}=20 V
				-100		V_{GS}=-20 V
Drain-source leakage current	I_{DSS}			1	uA	V_{DS}=100 V, V_{GS}=0 V
Input capacitance	C_{iss}		206.1		pF	V_{GS}=0 V, V_{DS}=50 V, f=100 kHz
Output capacitance	C_{oss}		28.9		pF	
Reverse transfer capacitance	C_{rss}		1.4		pF	
Turn-on delay time	$t_{d(on)}$		14.7		ns	V_{GS}=10 V, V_{DS}=50 V, R_G=2 Ω, I_D=5 A
Rise time	t_r		3.5		ns	
Turn-off delay time	$t_{d(off)}$		20.9		ns	
Fall time	t_f		2.7		ns	
Total gate charge	Q_g		4.3		nC	I_D=5 A, V_{DS}=50 V, V_{GS}=10 V
Gate-source charge	Q_{gs}		1.5		nC	
Gate-drain charge	Q_{gd}		1.1		nC	
Gate plateau voltage	$V_{plateau}$		5.0		V	
Diode forward current	I_S			7	A	

Pulsed source current	I_{SP}			21		V_{GS}<V_{th}
Diode forward voltage	V_{SD}			1.0	V	I_S=7 A, V_{GS}=0 V
Reverse recovery time	t_{rr}		32.1		ns	I_S=5 A, di/dt=100 A/μs
Reverse recovery charge	Q_{rr}		39.4		nC	
Peak reverse recovery current	I_{rrm}		2.1		A	

■ Note

1) Calculated continuous current based on maximum allowable junction temperature.
2) Repetitive rating; pulse width limited by max. junction temperature.
3) Pd is based on max. junction temperature, using junction-case thermal resistance.
4) The value of $R_{θJA}$ is measured with the device mounted on 1 in 2 FR-4 board with 2oz. Copper, in a still air environment with T_a=25 °C.
5) V_{DD}=50 V, R_G=50 Ω, L=0.3 mH, starting T_j=25 °C.

Electrical Characteristics Diagrams

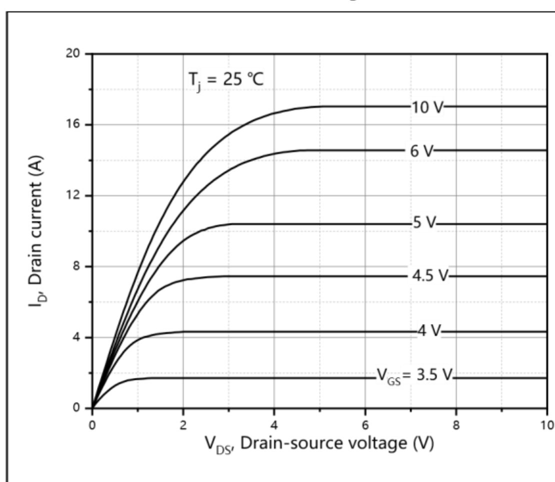


Figure 1, Typ. output characteristics

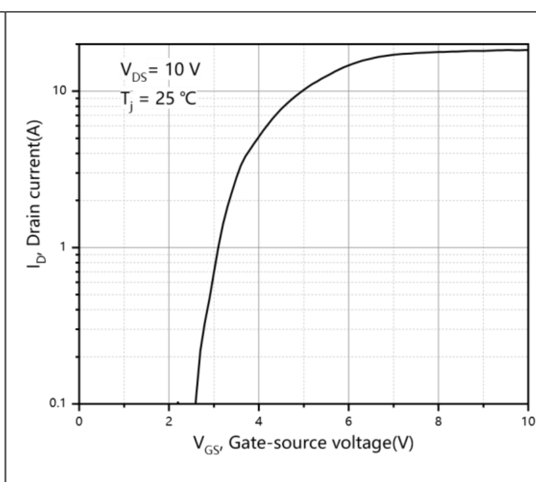


Figure 2, Typ. transfer characteristics

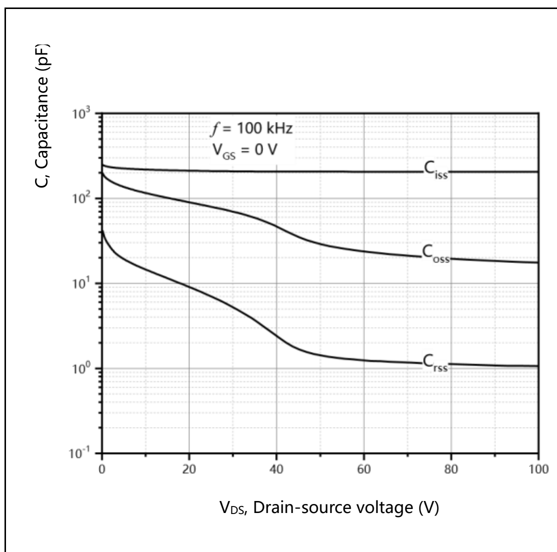


Figure 3, Typ. capacitances

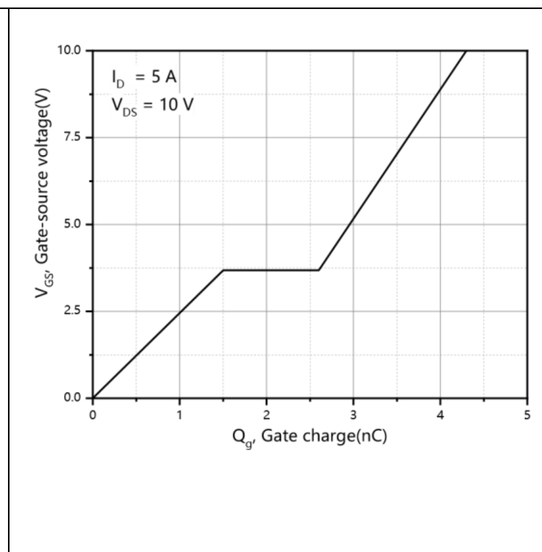


Figure 4, Typ. gate charge

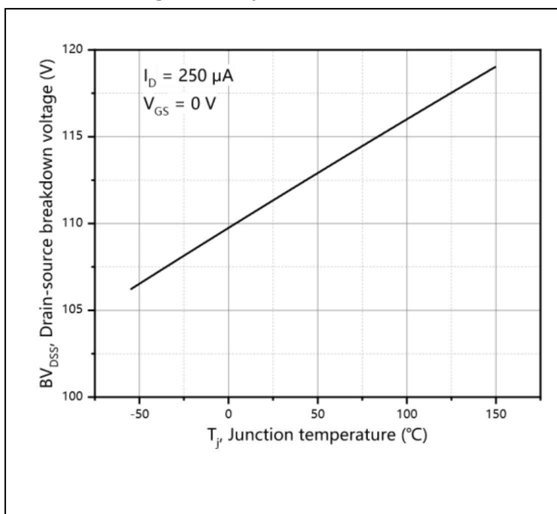


Figure 5, Drain-source breakdown voltage

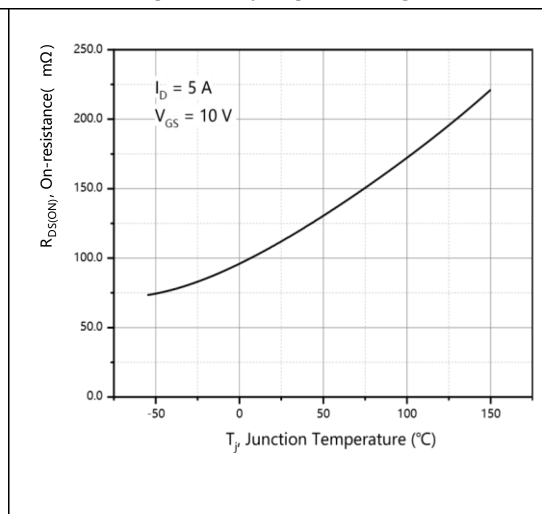


Figure 6, Drain-source on-state resistance

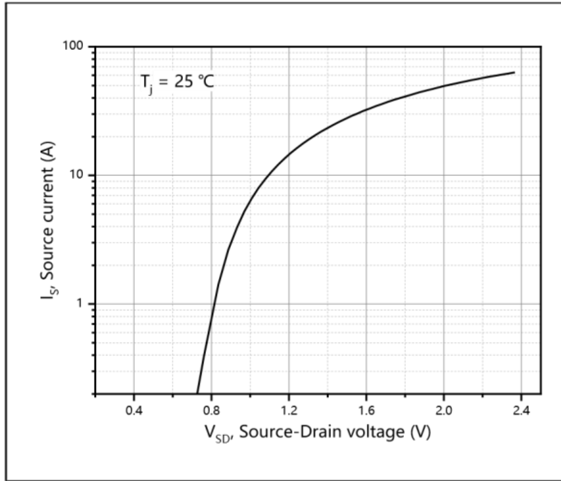


Figure 7, Forward characteristic of body diode

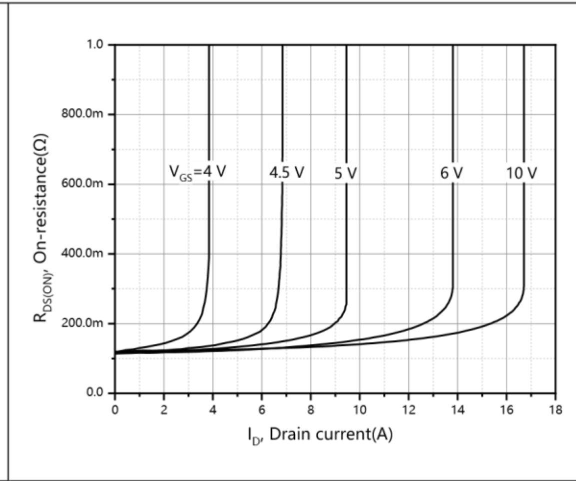


Figure 8, Drain-source on-state resistance

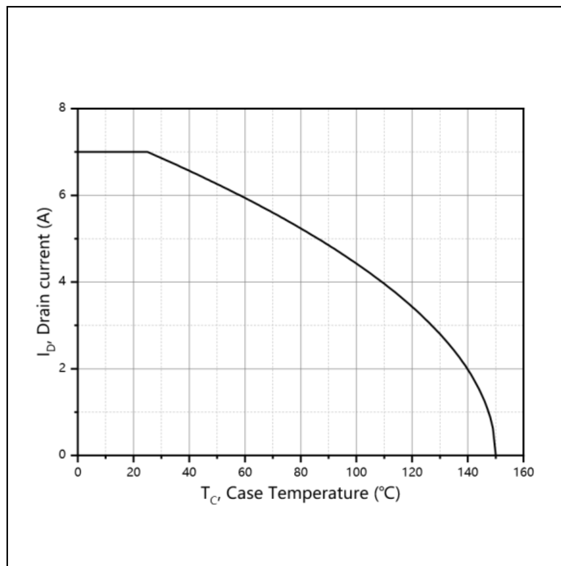


Figure 9, Drain current

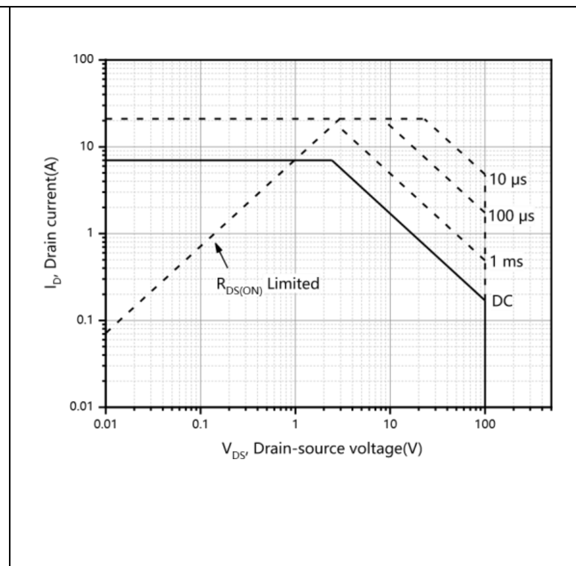


Figure 10, Safe operation area T_C=25 ℃

Test circuits and waveforms

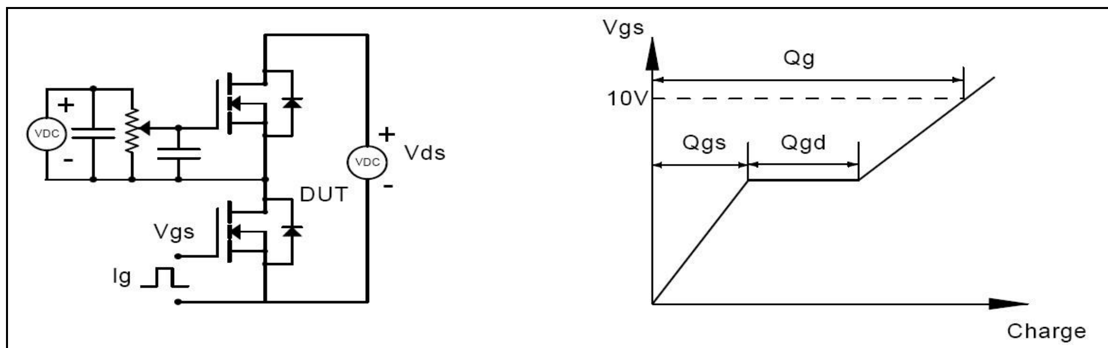


Figure 1, Gate charge test circuit & waveform

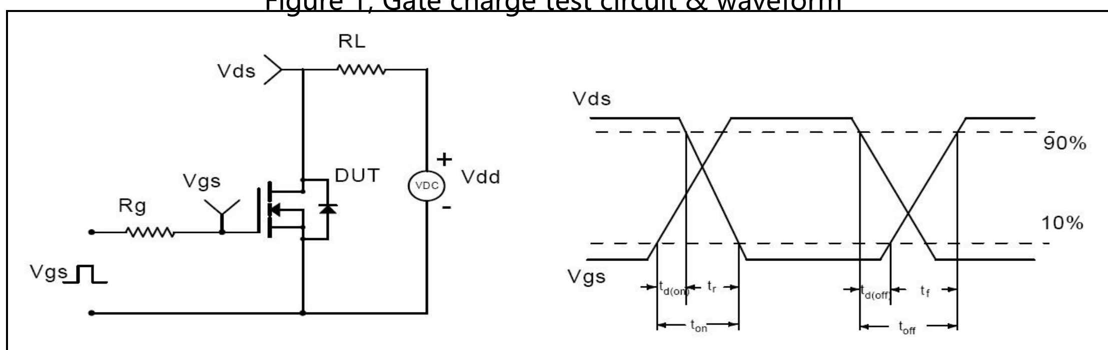


Figure 2, Switching time test circuit & waveforms

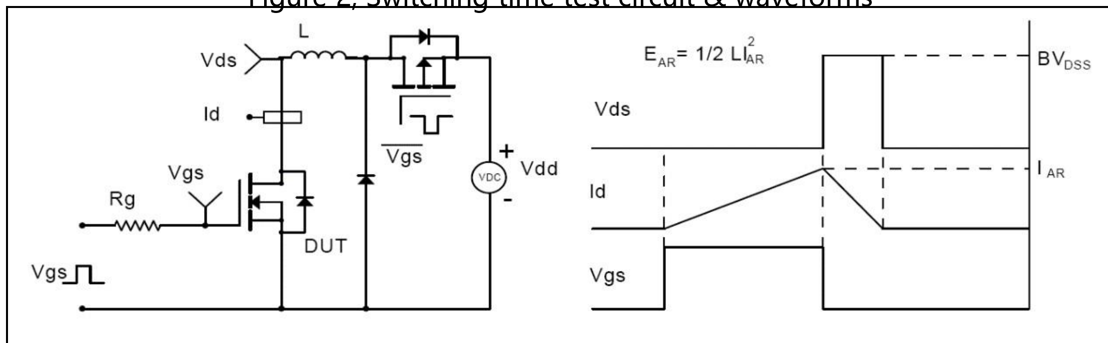


Figure 3, Unclamped inductive switching (UIS) test circuit & waveforms

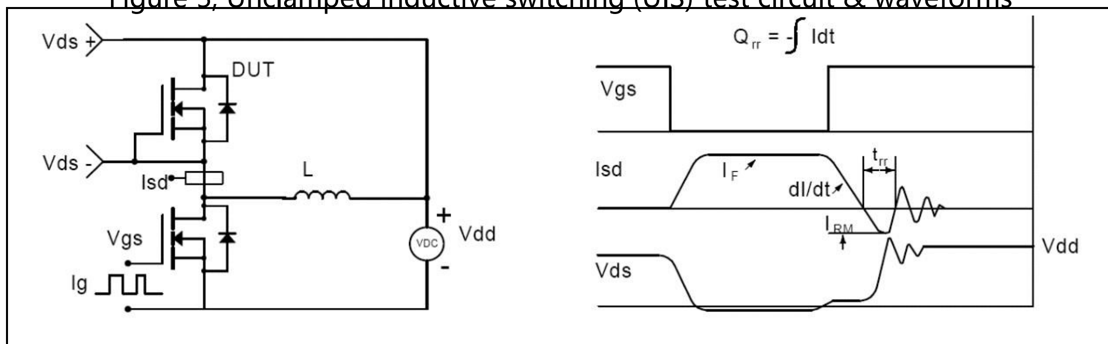
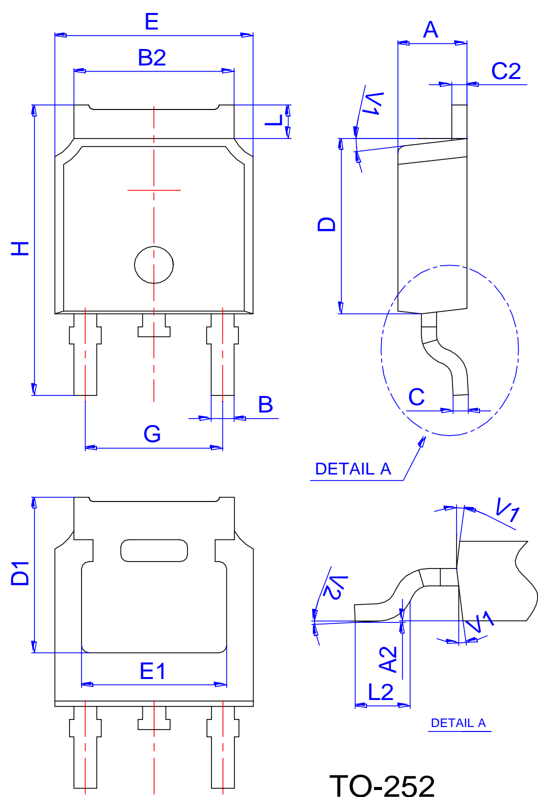


Figure 4, Diode reverse recovery test circuit & waveforms

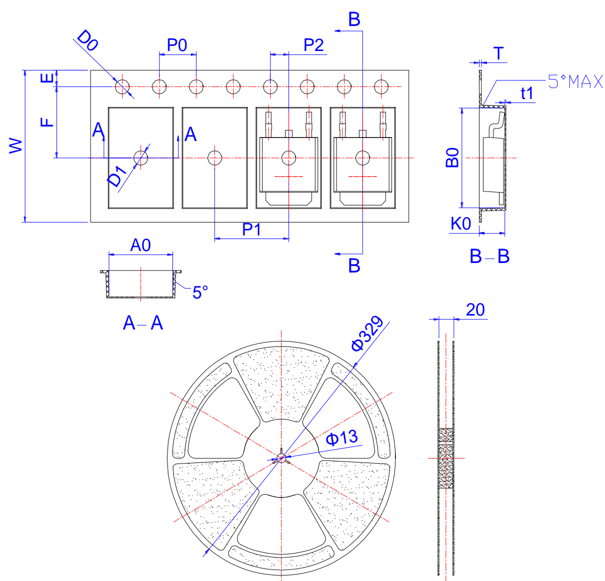
Package Mechanical Data



TO-252

Ref.	Dimensions					
	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	2.10		2.50	0.083		0.098
A2	0		0.10	0		0.004
B	0.66		0.86	0.026		0.034
B2	5.18		5.48	0.202		0.216
C	0.40		0.60	0.016		0.024
C2	0.44		0.58	0.017		0.023
D	5.90		6.30	0.232		0.248
D1	5.30REF			0.209REF		
E	6.40		6.80	0.252		0.268
E1	4.63			0.182		
G	4.47		4.67	0.176		0.184
H	9.50		10.70	0.374		0.421
L	1.09		1.21	0.043		0.048
L2	1.35		1.65	0.053		0.065
V1		7°			7°	
V2	0°		6°	0°		6°

Reel Specification-TO-252



Ref.	Dimensions					
	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
W	15.90	16.00	16.10	0.626	0.630	0.634
E	1.65	1.75	1.85	0.065	0.069	0.073
F	7.40	7.50	7.60	0.291	0.295	0.299
D0	1.40	1.50	1.60	0.055	0.059	0.063
D1	1.40	1.50	1.60	0.055	0.059	0.063
P0	3.90	4.00	4.10	0.154	0.157	0.161
P1	7.90	8.00	8.10	0.311	0.315	0.319
P2	1.90	2.00	2.10	0.075	0.079	0.083
A0	6.85	6.90	7.00	0.270	0.271	0.276
B0	10.45	10.50	10.60	0.411	0.413	0.417
K0	2.68	2.78	2.88	0.105	0.109	0.113
T	0.24		0.27	0.009		0.011
t1	0.10			0.004		
10P0	39.80	40.00	40.20	1.567	1.575	1.583