2N7002EN-Q1

N-Channel Enhancement Mode MOSFET

Product Summary

$V_{(BR)DSS}$	$R_{DS(on)MAX}$	I_D
60V	2.5Ω@10V	0.26A
	3Ω@4.5V	

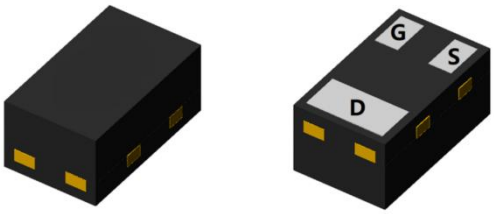
Feature

- Trench Power MV MOSFET technology
- Voltage controlled small signal switch
- Low input Capacitance
- Fast Switching Speed
- Low Input / Output Leakage
- ESD Protected Up to 2.0KV(HBM)
- Suffix "-Q1" for AEC-Q101

Application

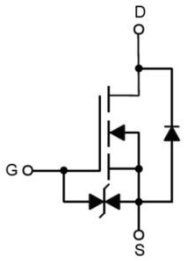
- Battery operated systems
- Solid-state relays
- Direct logic-level interface: TTL/CMOS

Package

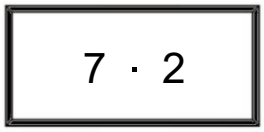


DFN1006-3L

Circuit diagram



Marking



Absolute maximum ratings (T_A=25℃ unless otherwise noted)

Parameter	Symbol	Value	Unit
Drain-Source Voltage	V_{DS}	60	V
Gate-Source Voltage	V_{GS}	±20	V
Continuous Drain Current	I_D	0.26	A
Continuous Drain Current (T_A=70℃)	I_D	0.21	A
Pulsed Drain Current[1]	I_{DM}	1.3	A
Power Dissipation (T_A=25℃)	P_D	0.2	W
Thermal Resistance from Junction to Ambient[2]	$R_{\theta JA}$	600	℃/W
Junction Temperature	T_J	150	℃
Storage Temperature	T_{STG}	-55 ~ +150	℃

Electrical characteristics (T_J=25℃ unless otherwise noted)

Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Static Characteristics						
Drain-source breakdown voltage	$V_{(BR)DSS}$	V_{GS} = 0V, I_D =250μA	60			V
Zero gate voltage drain current	I_{DSS}	V_{DS} =60V,V_{GS} = 0V			1	μA
Gate-body leakage current	I_{GSS}	V_{GS} =±20V, V_{DS} = 0V			±10	μA
Gate threshold voltage	$V_{GS(th)}$	V_{DS} =V_{GS}, I_D =250μA	1	1.5	2.5	V
Drain-source on-resistance	$R_{DS(on)}$	V_{GS} =10V, I_D =0.26A		1.9	2.5	Ω
		V_{GS} =4.5V, I_D =0.2A		2.0	3.0	
Dynamic characteristics[3]						
Input Capacitance	C_{iss}	V_{DS} =30V,V_{GS} =0V,f =1MHz		21		pF
Output Capacitance	C_{oss}			9		
Reverse Transfer Capacitance	C_{rss}			4		
Total Gate Charge	Q_g	V_{DS} =30V,V_{GS} =10V, I_D =0.26A		1.22		nC
Gate-Source Charge	Q_{gs}			0.5		
Gate-Drain Charge	Q_{gd}			0.18		
Turn-on delay time	$t_{d(on)}$	V_{DD} =50V, V_{GS} =10V, I_D =260mA, R_G=50Ω,		7		nS
Turn-on rise time	t_r			19		
Turn-off delay time	$t_{d(off)}$			20		
Turn-off fall time	t_f			84		
Source-Drain Diode characteristics						
Diode Forward Current	I_S				0.26	A
Diode Forward voltage	V_{SD}	V_{GS} =0V, I_S=0.26A			1.2	V
Reverse Recovery Charge	Q_{rr}	V_{GS} =0V, I_S=0.26A, V_R=25V, di/dt=100A/us			3.6	nC
Reverse Recovery Time	t_{rr}				16	nS

Notes:

1) Pulse Test: Pulse Width≤300us, Duty cycle ≤2%

2) Device mounted on FR-4 PCB, 1 inch x 0.85 inch x 0.062 inch.

3) Guaranteed by design, not subject to production testing.

Typical Characteristics

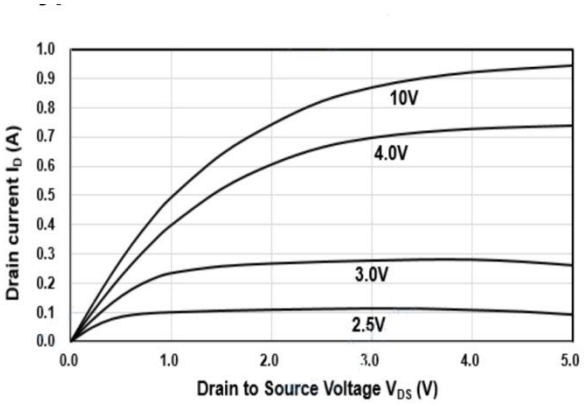


Figure1. Output Characteristics

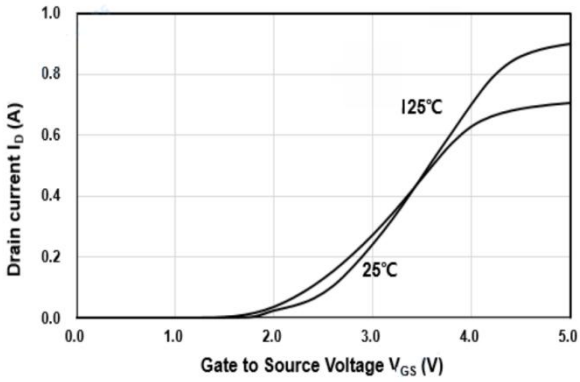


Figure2. Transfer Characteristics

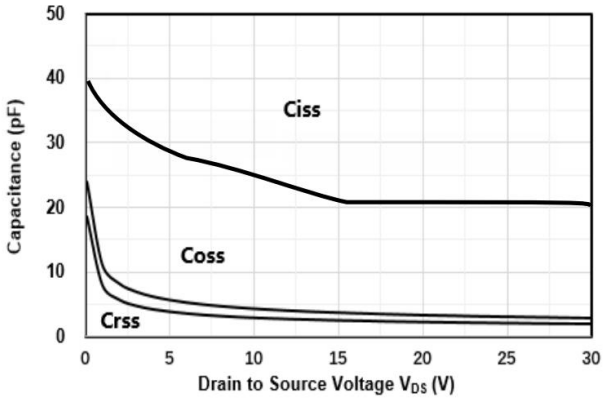


Figure3. Capacitance Characteristics

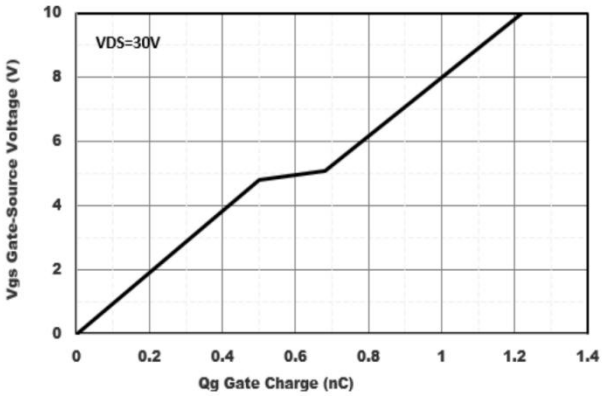


Figure4. Gate Charge

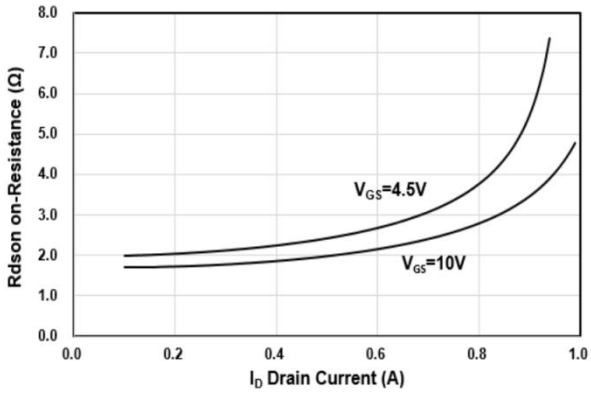


Figure5. Drain-Source on Resistance

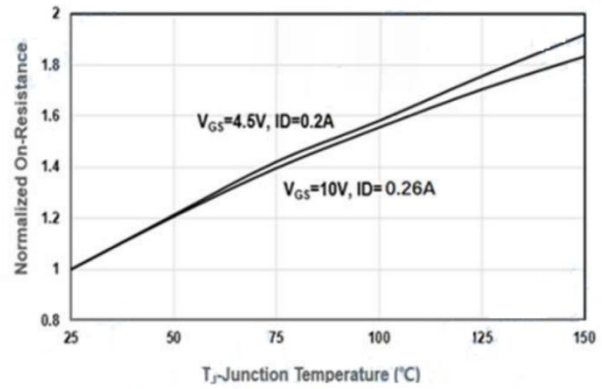


Figure6. Drain-Source on Resistance

Typical Characteristics

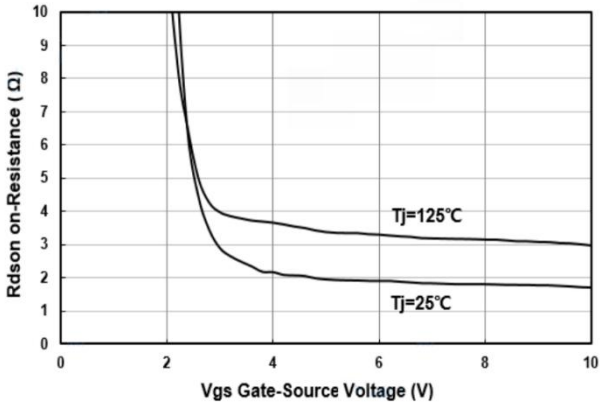


Figure7. On-Resistance vs V_{GS}

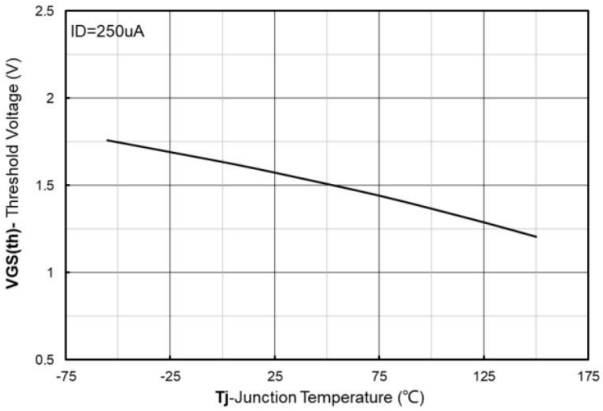


Figure8. Threshold Voltage vs Temperature

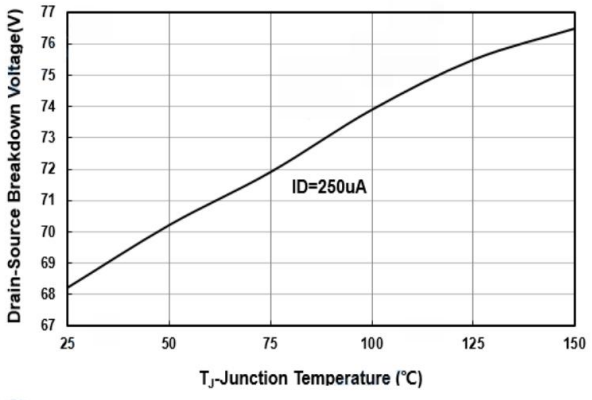


Figure9. Breakdown Voltage vs Temperature

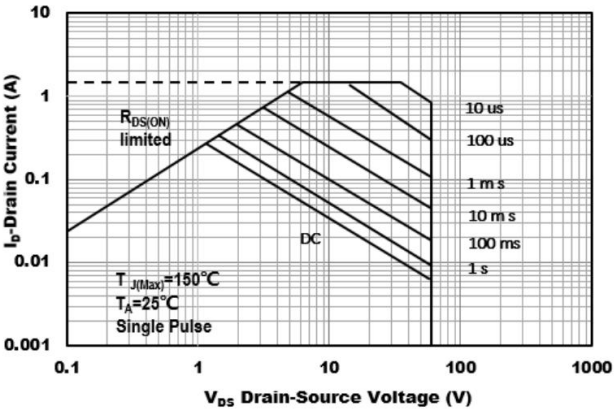


Figure10. Safe Operation Area

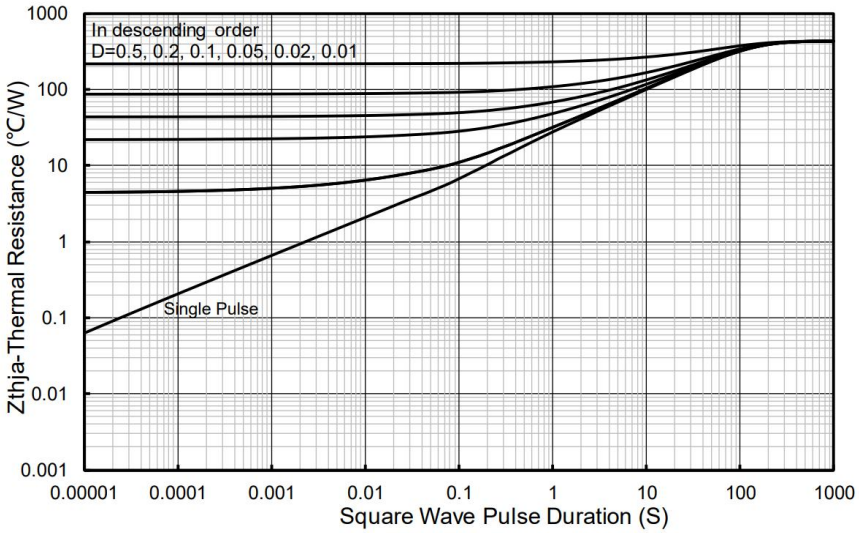
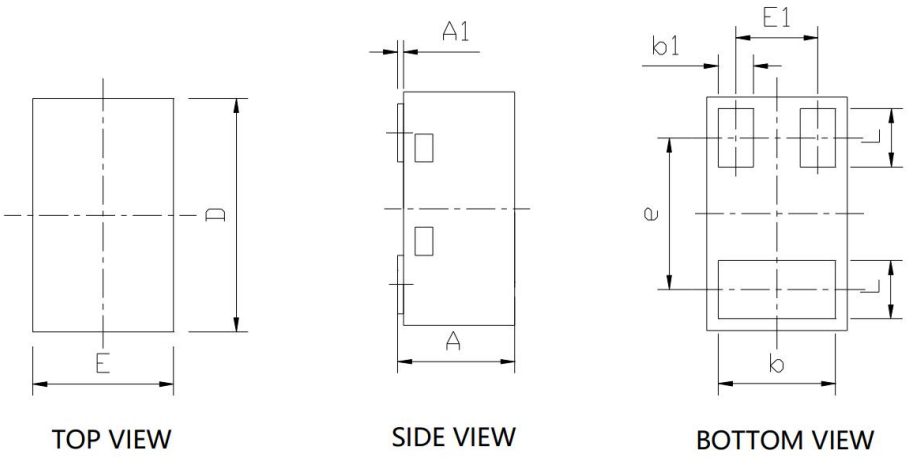


Figure11. Maximum Transient Thermal Impedance

DFN1006-3L Package Information



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	0.420	0.550	0.017	0.022
A1	0.025 REF		0.001 REF	
b	0.450	0.550	0.018	0.022
b1	0.100	0.200	0.004	0.008
D	0.950	1.050	0.037	0.041
E	0.550	0.650	0.022	0.026
E1	0.350 BSC		0.014 BSC	
e	0.650 BSC		0.026 BSC	
L	0.200	0.300	0.008	0.012