

### General Description

The QM2N7002E3K1 is the highest performance trench N-CH MOSFETs with extreme high cell density, which provide excellent R<sub>DS(on)</sub> and gate charge for most of the small power switching and load switch applications.

The QM2N7002E3K1 meet the RoHS and Green Product requirement with full function reliability approved.

### Features

- High-speed switching
- Green Device Available
- ESD Protected:2KV

### Product Summary

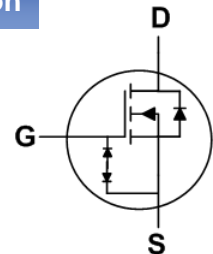
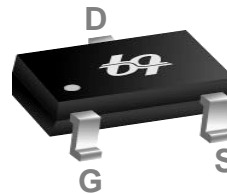


BVDSS	R <sub>DS(on)</sub>	I <sub>D</sub>
60V	3Ω	180mA

### Applications

- High Frequency Point-of-Load Synchronous Buck Converter for MB/NB/UMPC
- Networking DC-DC Power System
- Load Switch

### SOT23S Pin Configuration



### Absolute Maximum Ratings

Symbol	Parameter	Rating	Units
V <sub>DS</sub>	Drain-Source Voltage	60	V
V <sub>GS</sub>	Gate-Source Voltage	±20	V
I <sub>D</sub> @T <sub>A</sub> =25°C	Continuous Drain Current, V <sub>GS</sub> @ 10V <sup>1</sup>	180	mA
I <sub>D</sub> @T <sub>A</sub> =70°C	Continuous Drain Current, V <sub>GS</sub> @ 10V <sup>1</sup>	150	mA
I <sub>DM</sub>	Pulsed Drain Current <sup>2</sup>	1.2	A
P <sub>D</sub> @T <sub>A</sub> =25°C	Total Power Dissipation <sup>3</sup>	0.2	W
T <sub>STG</sub>	Storage Temperature Range	-55 to 150	°C
T <sub>J</sub>	Operating Junction Temperature Range	-55 to 150	°C

### Thermal Data

Symbol	Parameter	Typ.	Max.	Unit
R <sub>θJA</sub>	Thermal Resistance Junction-Ambient <sup>1</sup>	---	625	°C/W

### Electrical Characteristics ( $T_J=25^\circ\text{C}$ , unless otherwise noted)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
$BV_{DSS}$	Drain-Source Breakdown Voltage	$V_{GS}=0V, I_D=250\mu A$	60	---	---	V
$\Delta BV_{DSS}/\Delta T_J$	$BV_{DSS}$ Temperature Coefficient	Reference to $25^\circ\text{C}$ , $I_D=1\text{mA}$	---	0.05	---	V/ $^\circ\text{C}$
$R_{DS(ON)}$	Static Drain-Source On-Resistance <sup>2</sup>	$V_{GS}=10V, I_D=0.5A$	---	0.8	3	$\Omega$
		$V_{GS}=4.5V, I_D=0.2A$	---	1	4	
$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS}=V_{DS}, I_D=250\mu A$	1	---	2.5	V
$\Delta V_{GS(th)}$	$V_{GS(th)}$ Temperature Coefficient		---	-3.7	---	mV/ $^\circ\text{C}$
$I_{DSS}$	Drain-Source Leakage Current	$V_{DS}=60V, V_{GS}=0V, T_J=25^\circ\text{C}$	---	---	1	$\mu A$
		$V_{DS}=60V, V_{GS}=0V, T_J=55^\circ\text{C}$	---	---	5	
$I_{GSS}$	Gate-Source Leakage Current	$V_{GS}=\pm 20V, V_{DS}=0V$	---	---	$\pm 10$	$\mu A$
$g_{fs}$	Forward Transconductance	$V_{DS}=5V, I_D=0.3A$	---	940	---	mS
$T_{d(on)}$	Turn-On Delay Time	$V_{DD}=30V, V_{GS}=10V, R_G=3.3\Omega, I_D=0.5A$	---	3	6	ns
$T_r$	Rise Time		---	1.8	3.3	
$T_{d(off)}$	Turn-Off Delay Time		---	8	16	
$T_f$	Fall Time		---	6.8	13.6	
$C_{iss}$	Input Capacitance	$V_{DS}=25V, V_{GS}=0V, f=1\text{MHz}$	---	40	56	pF
$C_{oss}$	Output Capacitance		---	12	17	
$C_{rss}$	Reverse Transfer Capacitance		---	7.6	10.6	

### Diode Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
$I_S$	Continuous Source Current <sup>1,4</sup>	$V_G=V_D=0V$ , Force Current	---	---	180	mA
$I_{SM}$	Pulsed Source Current <sup>2,4</sup>		---	---	1.2	A
$V_{SD}$	Diode Forward Voltage <sup>2</sup>	$V_{GS}=0V, I_S=1A, T_J=25^\circ\text{C}$	---	---	1	V

Note :

- The data tested by surface mounted on a 1 inch<sup>2</sup> FR-4 board with 2OZ copper.
- The data tested by pulsed, pulse width  $\leq 300\mu s$ , duty cycle  $\leq 2\%$
- The power dissipation is limited by  $150^\circ\text{C}$  junction temperature.
- The data is theoretically the same as  $I_D$  and  $I_{DM}$ , in real applications, should be limited by total power dissipation.

### Typical Characteristics

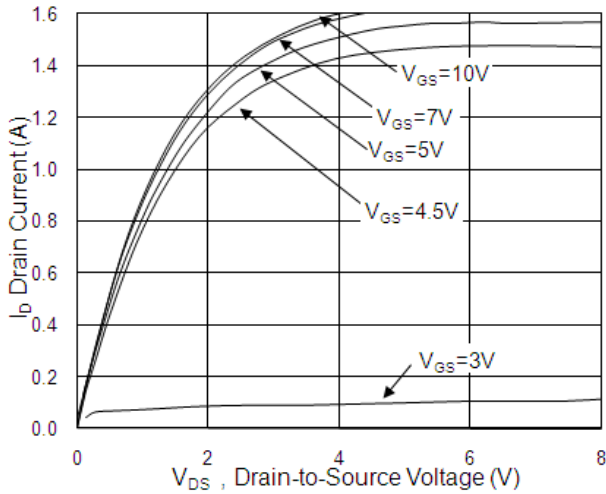


Fig.1 Typical Output Characteristics

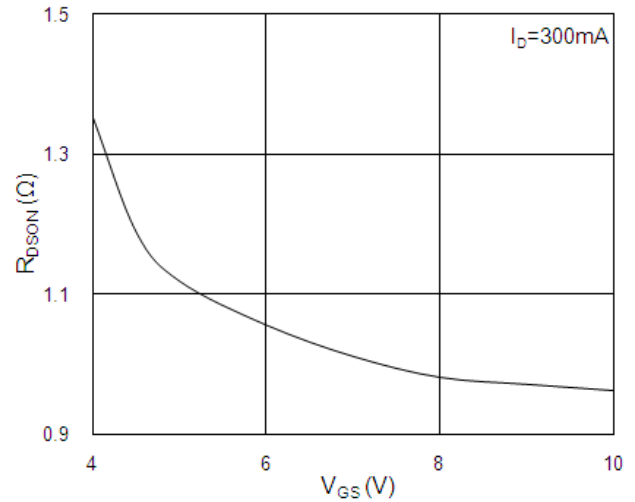


Fig.2 On-Resistance vs. Gate-Source Voltage

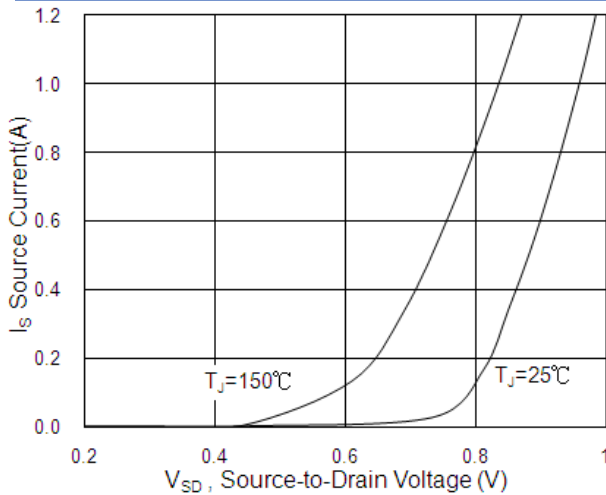


Fig.3 Forward Characteristics of Reverse

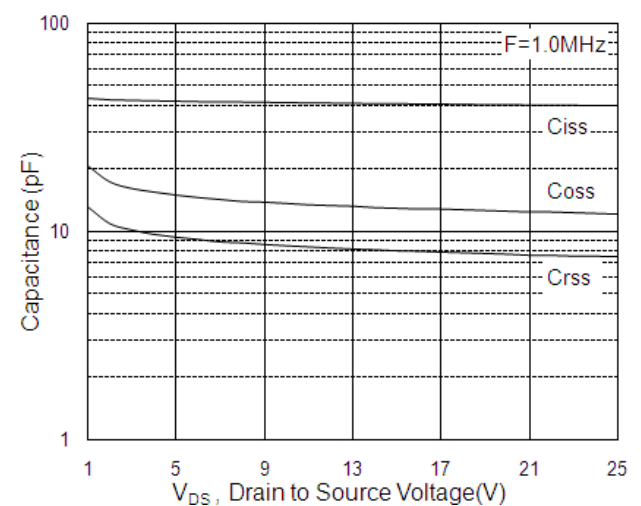


Fig.4 Capacitance

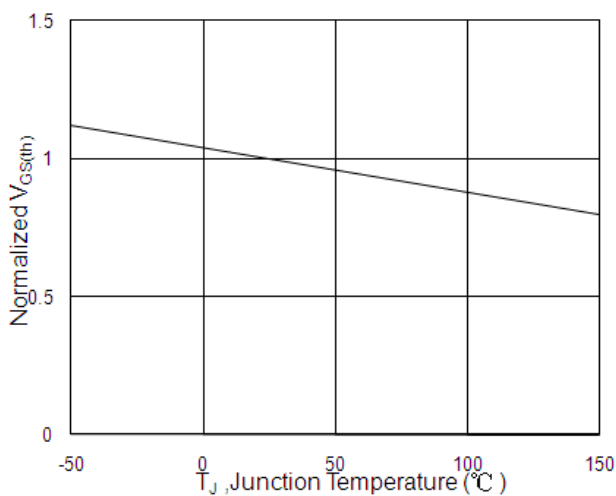


Fig.5 Normalized  $V_{GS(th)}$  vs.  $T_J$

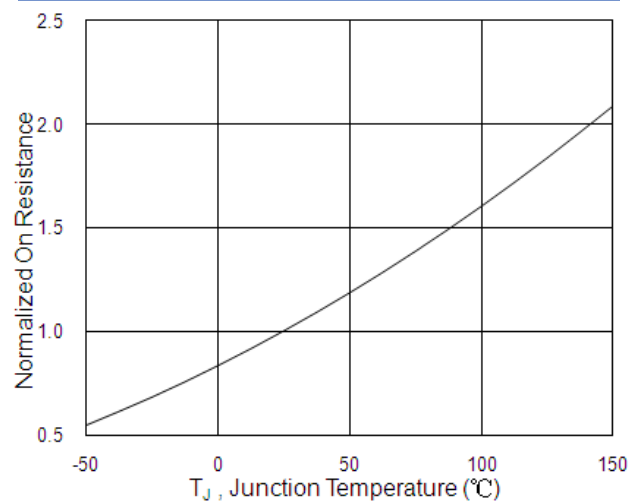


Fig.6 Normalized  $R_{DS(on)}$  vs.  $T_J$

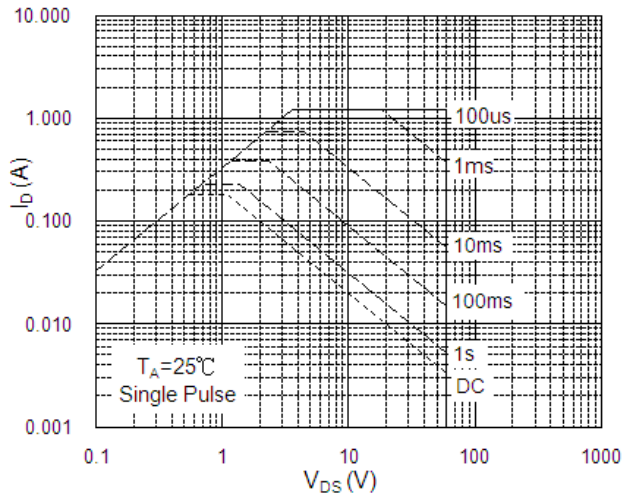


Fig.8 Safe Operating Area

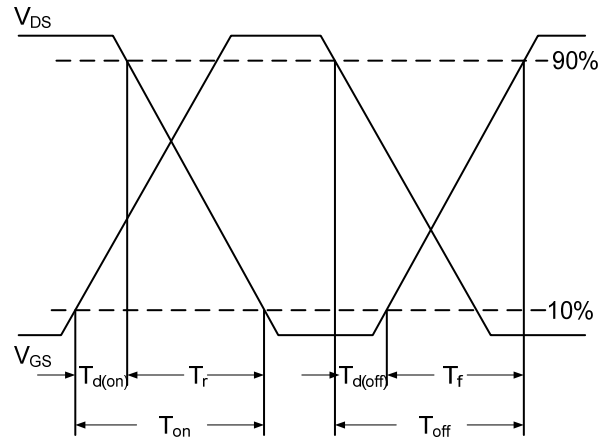


Fig.10 Switching Time Waveform

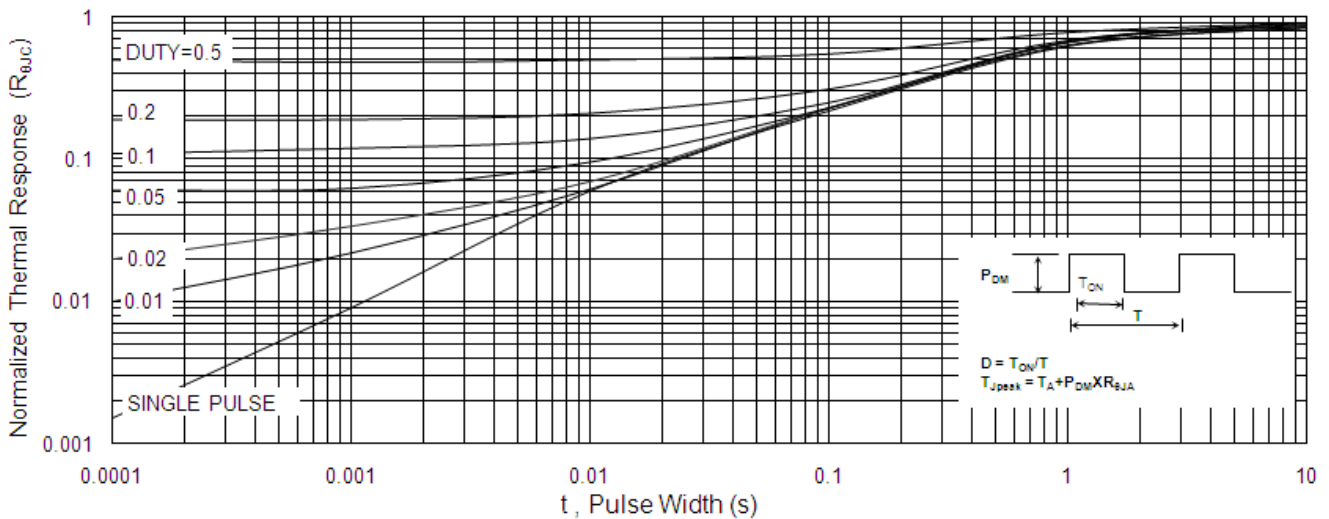


Fig.9 Normalized Maximum Transient Thermal Impedance