



General Description

The QM3004M6 is the highest performance trench N-ch MOSFETs with extreme high cell density , which provide excellent RDSON and gate charge for most of the synchronous buck converter applications .

The QM3004M6 meet the RoHS and Green Product requirement , 100% EAS guaranteed with full function reliability approved.

Features

- Advanced high cell density Trench technology
- Super Low Gate Charge
- Excellent CdV/dt effect decline
- 100% EAS Guaranteed
- Green Device Available

Absolute Maximum Ratings

Symbol	Parameter	Rating	Units
V_{DS}	Drain-Source Voltage	30	V
V_{GS}	Gate-Source Voltage	± 20	V
$I_D @ T_C = 25^\circ\text{C}$	Continuous Drain Current, $V_{GS} @ 10\text{V}^1$	58	A
$I_D @ T_C = 100^\circ\text{C}$	Continuous Drain Current, $V_{GS} @ 10\text{V}^1$	38	A
$I_D @ T_A = 25^\circ\text{C}$	Continuous Drain Current, $V_{GS} @ 10\text{V}^1$	12	A
$I_D @ T_A = 70^\circ\text{C}$	Continuous Drain Current, $V_{GS} @ 10\text{V}^1$	9.6	A
I_{DM}	Pulsed Drain Current ²	115	A
EAS	Single Pulse Avalanche Energy ³	130	mJ
I_{AS}	Avalanche Current	34	A
$P_D @ T_C = 25^\circ\text{C}$	Total Power Dissipation ⁴	46	W
$P_D @ T_A = 25^\circ\text{C}$	Total Power Dissipation ⁴	2	W
T_{STG}	Storage Temperature Range	-55 to 150	$^\circ\text{C}$
T_J	Operating Junction Temperature Range	-55 to 150	$^\circ\text{C}$

Thermal Data

Symbol	Parameter	Typ.	Max.	Unit
$R_{\theta JA}$	Thermal Resistance Junction-Ambient ¹	---	62	$^\circ\text{C/W}$
$R_{\theta JC}$	Thermal Resistance Junction-Case ¹	---	2.7	$^\circ\text{C/W}$

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

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
BV_{DSS}	Drain-Source Breakdown Voltage	$V_{\text{GS}}=0\text{V}$, $I_D=250\mu\text{A}$	30	---	---	V
$\Delta \text{BV}_{\text{DSS}}/\Delta T_J$	BVDSS Temperature Coefficient	Reference to 25°C , $I_D=1\text{mA}$	---	0.027	---	$\text{V}/^\circ\text{C}$
$R_{\text{DS}(\text{ON})}$	Static Drain-Source On-Resistance ²	$V_{\text{GS}}=10\text{V}$, $I_D=30\text{A}$	---	6.5	8.5	$\text{m}\Omega$
		$V_{\text{GS}}=4.5\text{V}$, $I_D=15\text{A}$	---	11	14	
$V_{\text{GS}(\text{th})}$	Gate Threshold Voltage	$V_{\text{GS}}=V_{\text{DS}}$, $I_D=250\mu\text{A}$	1.2	1.5	2.5	V
$\Delta V_{\text{GS}(\text{th})}$	$V_{\text{GS}(\text{th})}$ Temperature Coefficient		---	-5.8	---	$\text{mV}/^\circ\text{C}$
I_{DSS}	Drain-Source Leakage Current	$V_{\text{DS}}=24\text{V}$, $V_{\text{GS}}=0\text{V}$, $T_J=25^\circ\text{C}$	---	---	1	uA
		$V_{\text{DS}}=24\text{V}$, $V_{\text{GS}}=0\text{V}$, $T_J=55^\circ\text{C}$	---	---	5	
I_{GSS}	Gate-Source Leakage Current	$V_{\text{GS}}=\pm 20\text{V}$, $V_{\text{DS}}=0\text{V}$	---	---	± 100	nA
g_{fs}	Forward Transconductance	$V_{\text{DS}}=5\text{V}$, $I_D=30\text{A}$	---	38	---	S
R_g	Gate Resistance	$V_{\text{DS}}=0\text{V}$, $V_{\text{GS}}=0\text{V}$, $f=1\text{MHz}$	---	1.7	2.9	Ω
Q_g	Total Gate Charge (4.5V)	$V_{\text{DS}}=15\text{V}$, $V_{\text{GS}}=4.5\text{V}$, $I_D=15\text{A}$	---	12.6	17.6	nC
Q_{gs}	Gate-Source Charge		---	4.2	5.9	
Q_{gd}	Gate-Drain Charge		---	5.1	7.1	
$T_{\text{d}(\text{on})}$	Turn-On Delay Time	$V_{\text{DD}}=15\text{V}$, $V_{\text{GS}}=10\text{V}$, $R_G=3.3\Omega$	---	4.6	9.2	ns
T_r	Rise Time		---	12.2	22	
$T_{\text{d}(\text{off})}$	Turn-Off Delay Time		---	26.6	53	
T_f	Fall Time		---	8	16	
C_{iss}	Input Capacitance	$V_{\text{DS}}=15\text{V}$, $V_{\text{GS}}=0\text{V}$, $f=1\text{MHz}$	---	1317	1844	pF
C_{oss}	Output Capacitance		---	163	228	
C_{rss}	Reverse Transfer Capacitance		---	131	183	

Guaranteed Avalanche Characteristics

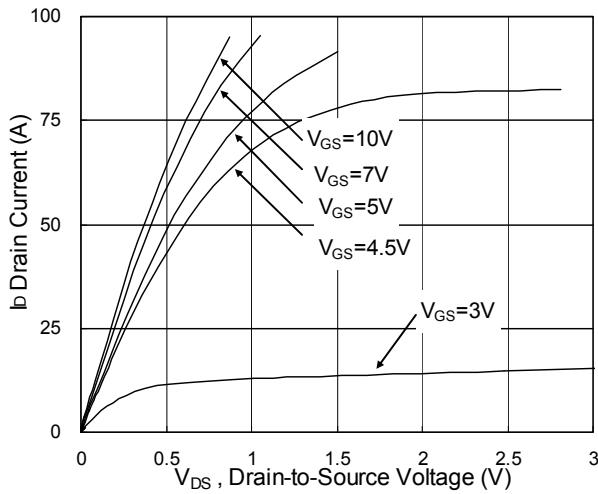
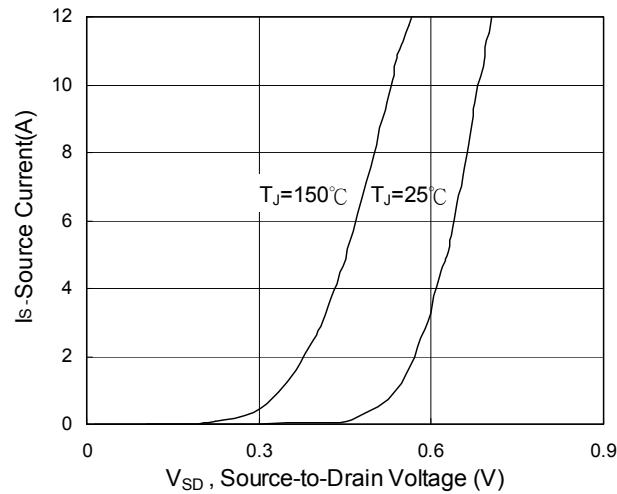
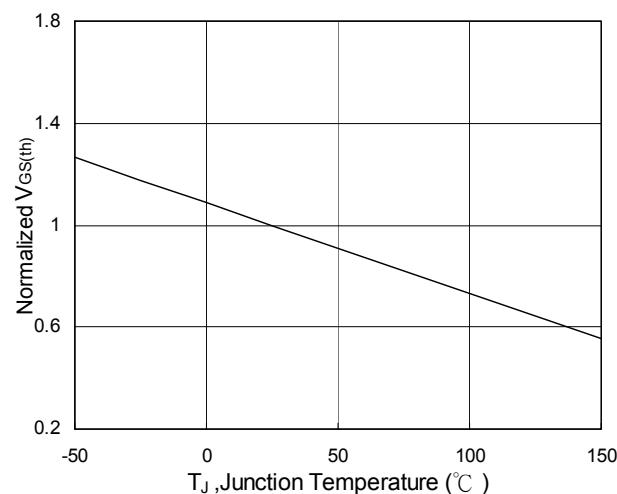
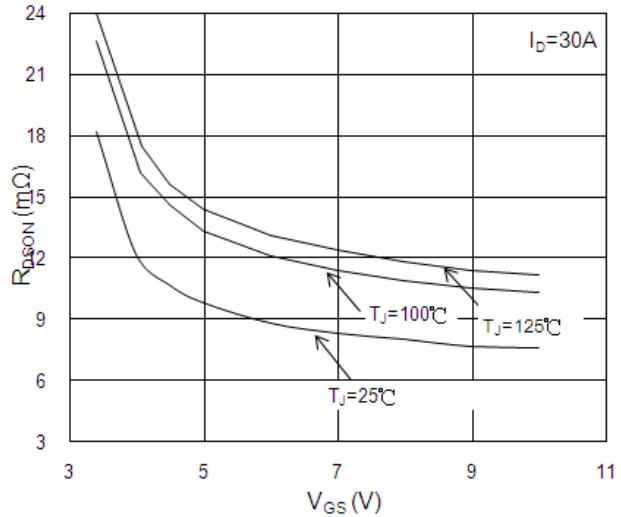
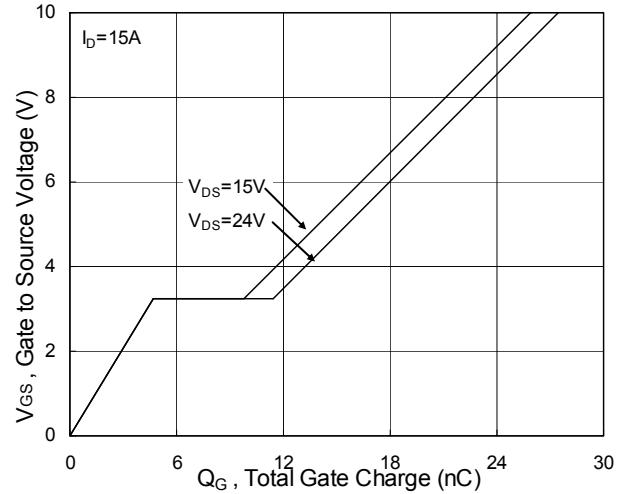
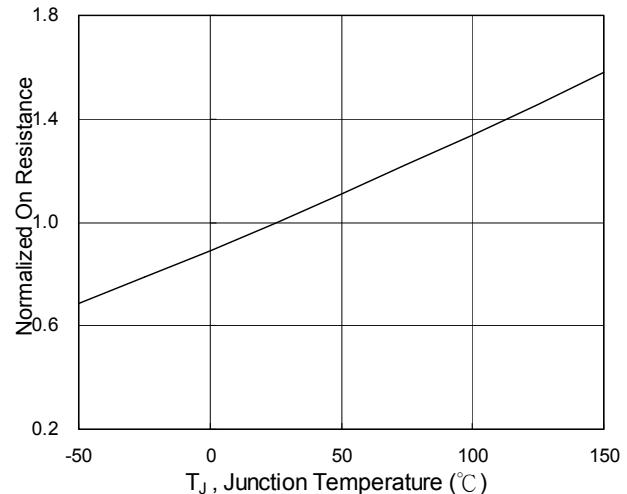
Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
EAS	Single Pulse Avalanche Energy ⁵	$V_{\text{DD}}=25\text{V}$, $L=0.1\text{mH}$, $I_{\text{AS}}=20\text{A}$	45	---	---	mJ

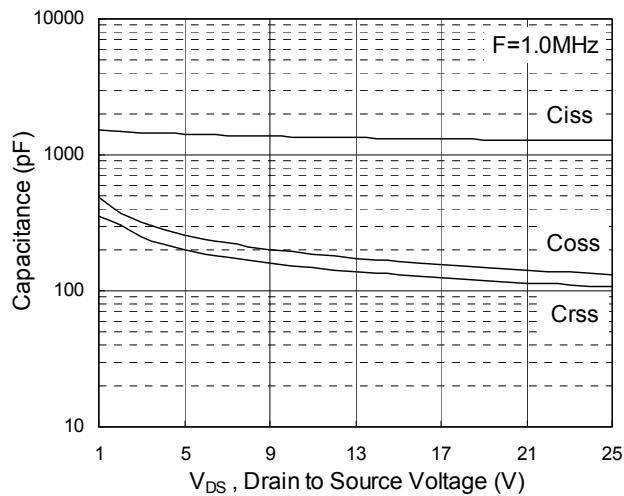
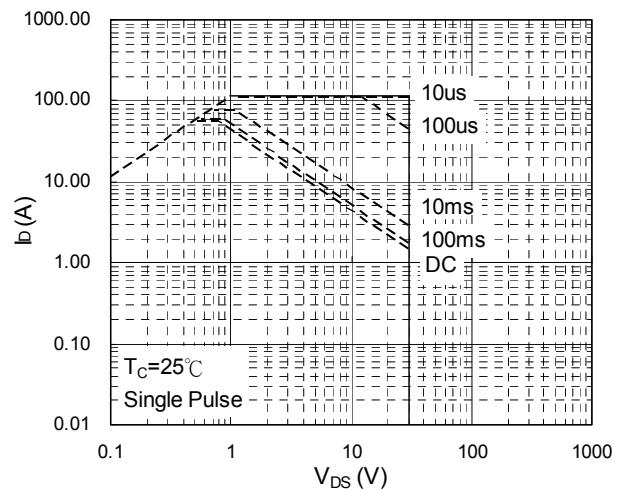
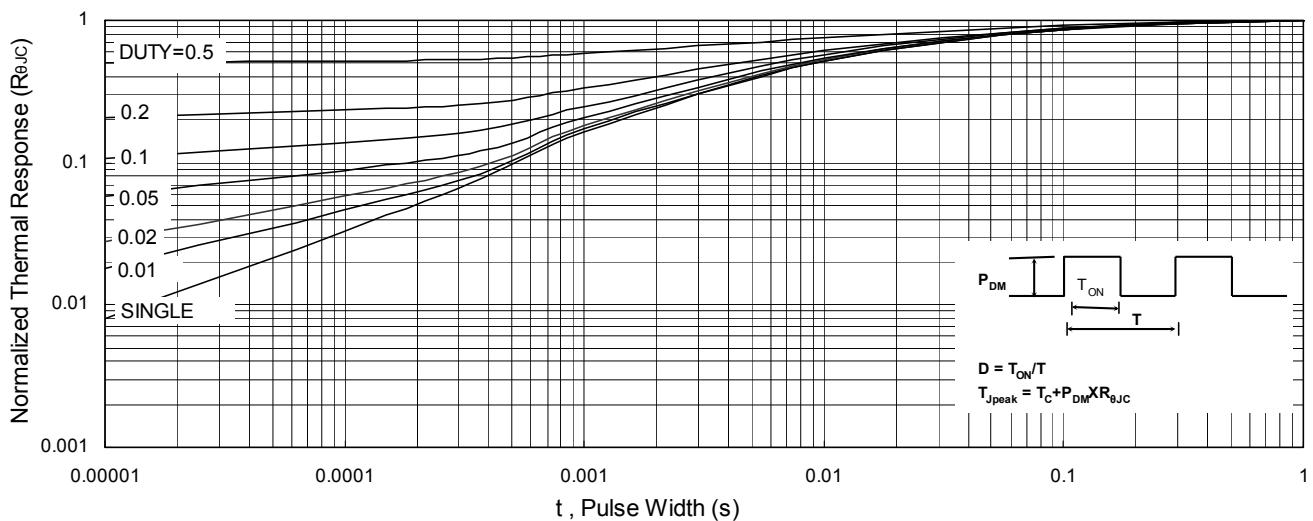
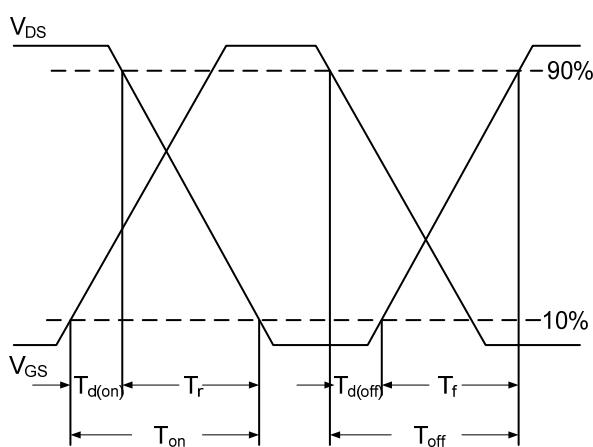
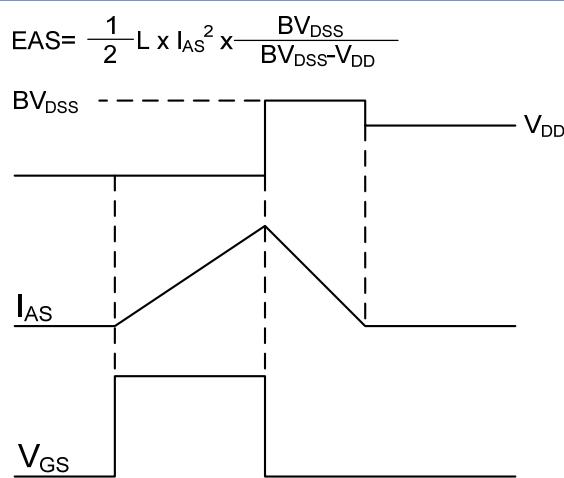
Diode Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
I_S	Continuous Source Current ^{1,6}	$V_G=V_D=0\text{V}$, Force Current	---	---	58	A
			---	---	115	A
I_{SM}	Pulsed Source Current ^{2,6}					
V_{SD}	Diode Forward Voltage ²	$V_{\text{GS}}=0\text{V}$, $I_S=1\text{A}$, $T_J=25^\circ\text{C}$	---	---	1	V
t_{rr}	Reverse Recovery Time		---	9.2	---	nS
Q_{rr}	Reverse Recovery Charge	$I_F=30\text{A}$, $dI/dt=100\text{A}/\mu\text{s}$, $T_J=25^\circ\text{C}$	---	2	---	nC

Note :

- 1.The data tested by surface mounted on a 1 inch² FR-4 board with 2OZ copper.
- 2.The data tested by pulsed , pulse width $\leq 300\mu\text{s}$, duty cycle $\leq 2\%$
- 3.The EAS data shows Max. rating . The test condition is $V_{\text{DD}}=25\text{V}, V_{\text{GS}}=10\text{V}, L=0.1\text{mH}, I_{\text{AS}}=34\text{A}$
- 4.The power dissipation is limited by 150°C junction temperature
- 5.The Min. value is 100% EAS tested guarantee.
- 6.The data is theoretically the same as I_D and I_{DM} , in real applications , should be limited by total power dissipation.

N-Ch 30V Fast Switching MOSFETs
Typical Characteristics

Fig.1 Typical Output Characteristics

Fig.3 Forward Characteristics of reverse

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

Fig.2 On-Resistance vs. Gate-Source

Fig.4 Gate-Charge Characteristics

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

N-Ch 30V Fast Switching MOSFETs

Fig.7 Capacitance

Fig.8 Safe Operating Area

Fig.9 Normalized Maximum Transient Thermal Impedance

Fig.10 Switching Time Waveform

Fig.17 Unclamped Inductive Switching Waveform