

General Description

The QM2401D is the highest performance trench P-ch MOSFETs with extreme high cell density , which provide excellent RDSON and gate charge for most of the synchronous buck converter applications .

The QM2401D meet the RoHS and Green Product requirement , with full function reliability approved.

Features

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

Absolute Maximum Ratings

Symbol	Parameter	Rating	Units
V_{DS}	Drain-Source Voltage	-20	V
V_{GS}	Gate-Source Voltage	± 12	V
$I_D@T_C=25^{\circ}C$	Continuous Drain Current, $V_{GS} @ -4.5V^1$	-18.4	A
$I_D@T_C=100^{\circ}C$	Continuous Drain Current, $V_{GS} @ -4.5V^1$	-11.6	A
$I_D@T_A=25^{\circ}C$	Continuous Drain Current, $V_{GS} @ -4.5V^1$	-5.2	A
$I_D@T_A=70^{\circ}C$	Continuous Drain Current, $V_{GS} @ -4.5V^1$	-4.2	A
I_{DM}	Pulsed Drain Current ²	-50	A
$P_D@T_C=25^{\circ}C$	Total Power Dissipation ³	25	W
$P_D@T_A=25^{\circ}C$	Total Power Dissipation ³	2	W
T_{STG}	Storage Temperature Range	-55 to 150	$^{\circ}C$
T_J	Operating Junction Temperature Range	-55 to 150	$^{\circ}C$

Thermal Data

Symbol	Parameter	Typ.	Max.	Unit
$R_{\theta JA}$	Thermal Resistance Junction-Ambient ¹	---	62	$^{\circ}C/W$
$R_{\theta JC}$	Thermal Resistance Junction-Case ¹	---	5	$^{\circ}C/W$

Product Summary

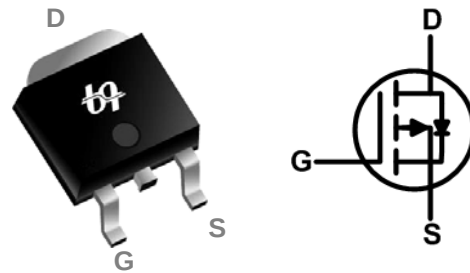


BVDSS	RDSON	ID
-20V	52mΩ	-18.4A

Applications

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

TO252 Pin Configuration



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

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
BV_{DSS}	Drain-Source Breakdown Voltage	$V_{GS}=0V$, $I_D=-250\mu A$	-20	---	---	V
$\Delta BV_{DSS}/\Delta T_J$	BV_{DSS} Temperature Coefficient	Reference to 25°C , $I_D=-1mA$	---	-0.014	---	V/ $^\circ\text{C}$
$R_{DS(ON)}$	Static Drain-Source On-Resistance ²	$V_{GS}=-4.5V$, $I_D=-15A$	---	42	52	$m\Omega$
		$V_{GS}=-2.5V$, $I_D=-10A$	---	67	85	
$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS}=V_{DS}$, $I_D=-250\mu A$	-0.5	-0.8	-1.2	V
$\Delta V_{GS(th)}$	$V_{GS(th)}$ Temperature Coefficient		---	3.95	---	mV/ $^\circ\text{C}$
I_{DSS}	Drain-Source Leakage Current	$V_{DS}=-16V$, $V_{GS}=0V$, $T_J=25^\circ\text{C}$	---	---	1	μA
		$V_{DS}=-16V$, $V_{GS}=0V$, $T_J=55^\circ\text{C}$	---	---	5	
I_{GSS}	Gate-Source Leakage Current	$V_{GS}=\pm 12V$, $V_{DS}=0V$	---	---	± 100	nA
g_{fs}	Forward Transconductance	$V_{DS}=-5V$, $I_D=-15A$	---	16.4	---	S
Q_g	Total Gate Charge (-4.5V)	$V_{DS}=-15V$, $V_{GS}=-4.5V$, $I_D=-15A$	---	11.1	15.5	nC
Q_{gs}	Gate-Source Charge		---	2.67	3.7	
Q_{gd}	Gate-Drain Charge		---	3.26	4.6	
$T_{d(on)}$	Turn-On Delay Time	$V_{DD}=-10V$, $V_{GS}=-4.5V$, $R_G=3.3\Omega$, $I_D=-15A$	---	5.2	10.4	ns
T_r	Rise Time		---	12.8	23	
$T_{d(off)}$	Turn-Off Delay Time		---	28.8	58	
T_f	Fall Time		---	16	32	
C_{iss}	Input Capacitance	$V_{DS}=-15V$, $V_{GS}=0V$, $f=1MHz$	---	857	1200	pF
C_{oss}	Output Capacitance		---	114	160	
C_{rss}	Reverse Transfer Capacitance		---	108	151	

Diode Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
I_S	Continuous Source Current ^{1,4}	$V_G=V_D=0V$, Force Current	---	---	-18.4	A
I_{SM}	Pulsed Source Current ^{2,4}		---	---	-50	A
V_{SD}	Diode Forward Voltage ²	$V_{GS}=0V$, $I_S=-1A$, $T_J=25^\circ\text{C}$	---	---	-1	V
t_{rr}	Reverse Recovery Time	$I_F=-15A$, $dI/dt=100A/\mu s$, $T_J=25^\circ\text{C}$	---	11.6	---	nS
Q_{rr}	Reverse Recovery Charge		---	2.6	---	nC

Note :

1.The data tested by surface mounted on a 1 inch² FR-4 board with 20Z copper.

2.The data tested by pulsed , pulse width $\leq 300\mu s$, duty cycle $\leq 2\%$

3.The power dissipation is limited by 150°C junction temperature

4.The data is theoretically the same as I_D and I_{DM} , in real applications , should be limited by total power dissipation.

Typical Characteristics

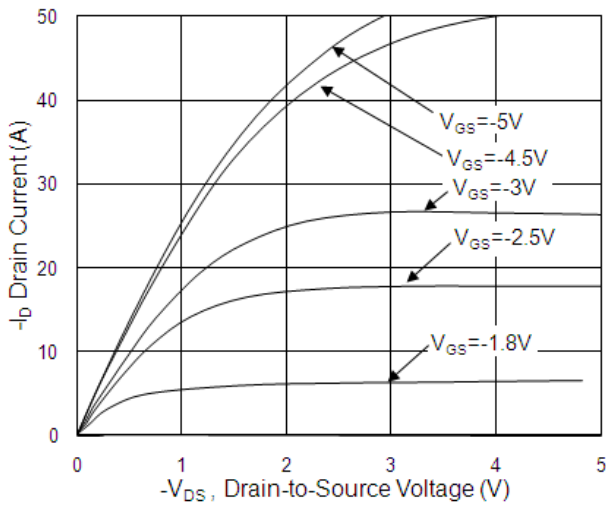


Fig.1 Typical Output Characteristics

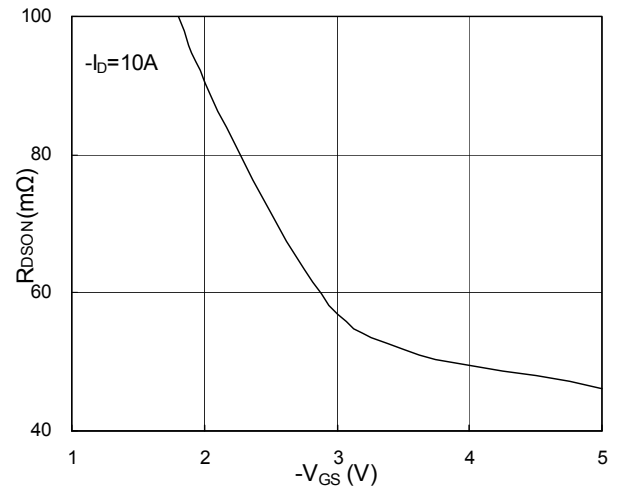


Fig.2 On-Resistance vs. G-S Voltage

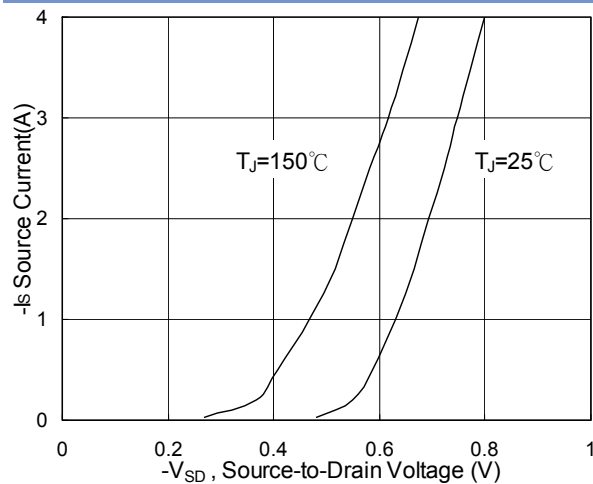


Fig.3 Forward Characteristics of Reverse

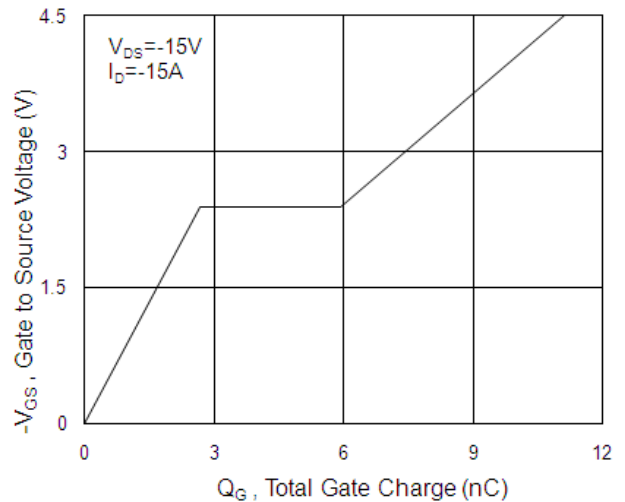


Fig.4 Gate-Charge Characteristics

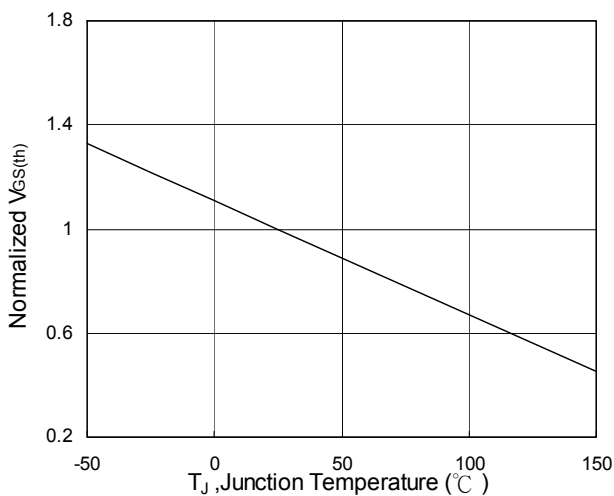


Fig.5 Normalized $V_{GS(th)}$ vs. T_J

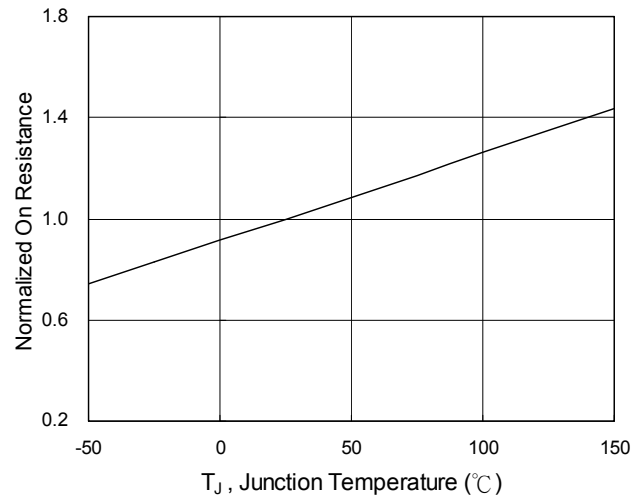


Fig.6 Normalized $R_{DS(on)}$ vs. T_J

P-Ch 20V Fast Switching MOSFETs

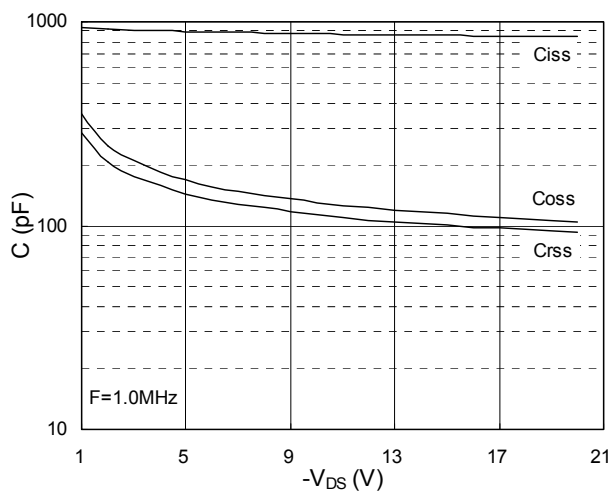


Fig.7 Capacitance

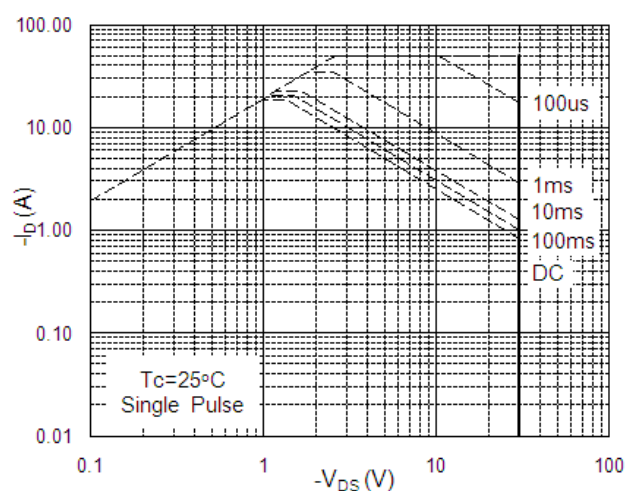


Fig.8 Safe Operating Area

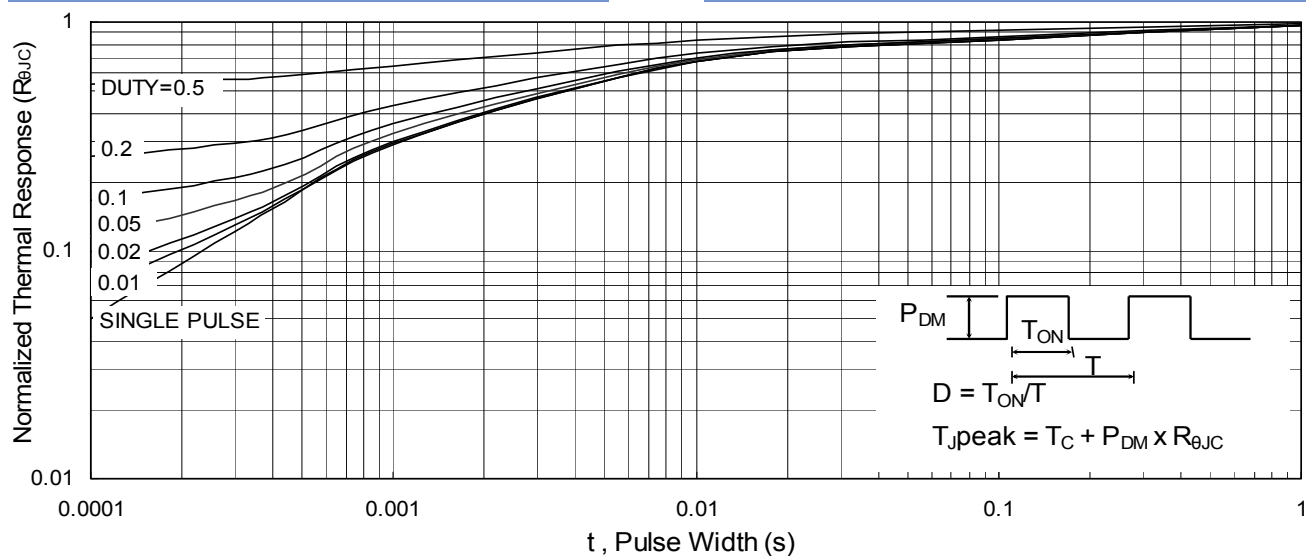


Fig.9 Normalized Maximum Transient Thermal Impedance

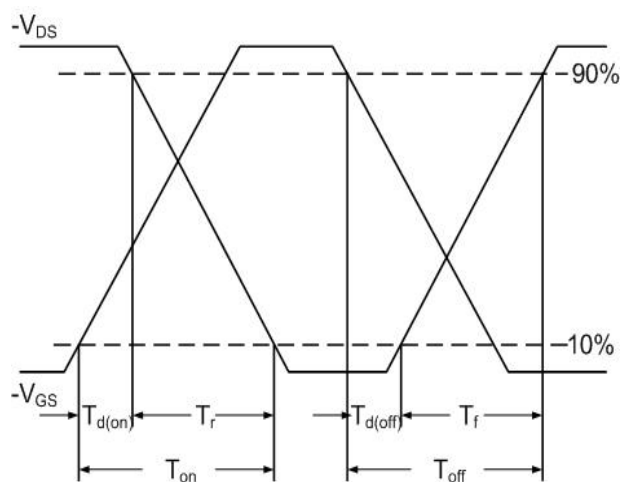


Fig.10 Switching Time Waveform

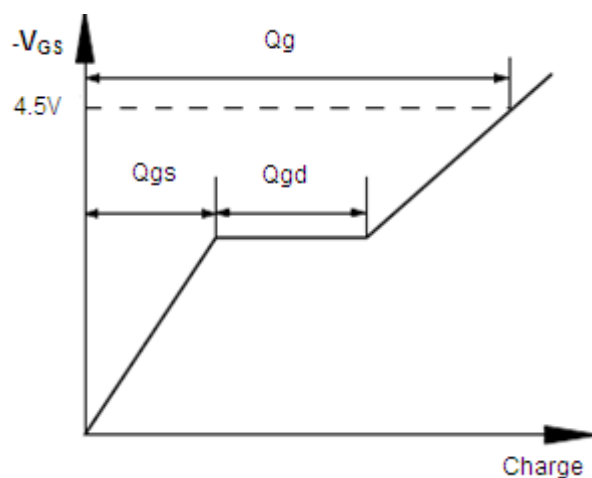


Fig.11 Gate Charge Waveform