

P-Ch 30V Fast Switching MOSFETs

General Description

The QM3015D is the highest performance trench P-ch MOSFETs with extreme high cell density, which provide excellent R_{DS(on)} and gate charge for most of the synchronous buck converter applications.

The QM3015D 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
		10s	Steady State	
V _{DS}	Drain-Source Voltage	-30		V
V _{GS}	Gate-Source Voltage	±20		V
I _D @T _C =25°C	Continuous Drain Current, V _{GS} @ -10V ¹	-57		A
I _D @T _C =100°C	Continuous Drain Current, V _{GS} @ -10V ¹	-36		A
I _D @T _A =25°C	Continuous Drain Current, V _{GS} @ -10V ¹	-17.8	-11.3	A
I _D @T _A =70°C	Continuous Drain Current, V _{GS} @ -10V ¹	-14.2	-9	A
I _{DM}	Pulsed Drain Current ²	-180		A
EAS	Single Pulse Avalanche Energy ³	408		mJ
I _{AS}	Avalanche Current	-55.4		A
P _D @T _C =25°C	Total Power Dissipation ⁴	52.1		W
P _D @T _A =25°C	Total Power Dissipation ⁴	5	2	W
T _{STG}	Storage Temperature Range	-55 to 150		°C
T _J	Operating Junction Temperature Range	-55 to 150		°C

Thermal Data

Symbol	Parameter	Typ.	Max.	Unit
R _{θJA}	Thermal Resistance Junction-Ambient ¹	---	62	°C/W
R _{θJA}	Thermal Resistance Junction-Ambient ¹ (t ≤ 10s)	---	25	°C/W
R _{θJC}	Thermal Resistance Junction-Case ¹	---	2.4	°C/W

Product Summary

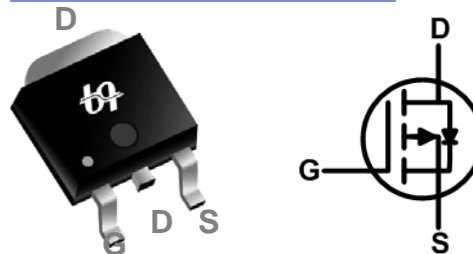


BVDSS	R _{DS(on)}	ID
-30V	10.5mΩ	-57A

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	$V_{GS}=0V, I_D=-250\mu A$	-30	---	---	V
$\Delta BV_{DSS}/\Delta T_J$	BV_{DSS} Temperature Coefficient	Reference to 25°C , $I_D=-1\text{mA}$	---	-0.018	---	V/ $^\circ\text{C}$
$R_{DS(ON)}$	Static Drain-Source On-Resistance ²	$V_{GS}=-10V, I_D=-30A$	---	8	10.5	m Ω
		$V_{GS}=-4.5V, I_D=-15A$	---	14	18.5	
$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS}=V_{DS}, I_D=-250\mu A$	-1.0	-1.6	-2.5	V
$\Delta V_{GS(th)}$	$V_{GS(th)}$ Temperature Coefficient		---	5.04	---	mV/ $^\circ\text{C}$
I_{DSS}	Drain-Source Leakage Current	$V_{DS}=-24V, V_{GS}=0V, T_J=25^\circ\text{C}$	---	---	1	μA
		$V_{DS}=-24V, V_{GS}=0V, T_J=55^\circ\text{C}$	---	---	5	
I_{GSS}	Gate-Source Leakage Current	$V_{GS}=\pm 20V, V_{DS}=0V$	---	---	± 100	nA
g_{fs}	Forward Transconductance	$V_{DS}=-5V, I_D=-30A$	---	26.4	---	S
Q_g	Total Gate Charge (-4.5V)	$V_{DS}=-15V, V_{GS}=-4.5V, I_D=-15A$	---	33	---	nC
Q_{gs}	Gate-Source Charge		---	10.7	---	
Q_{gd}	Gate-Drain Charge		---	12.8	---	
$T_{d(on)}$	Turn-On Delay Time	$V_{DD}=-15V, V_{GS}=-10V, R_G=3.3\Omega, I_D=-15A$	---	8	---	ns
T_r	Rise Time		---	17.8	---	
$T_{d(off)}$	Turn-Off Delay Time		---	78.4	---	
T_f	Fall Time		---	43.6	---	
C_{iss}	Input Capacitance	$V_{DS}=-15V, V_{GS}=0V, f=1\text{MHz}$	---	3448	---	pF
C_{oss}	Output Capacitance		---	508	---	
C_{rss}	Reverse Transfer Capacitance		---	421	---	

Guaranteed Avalanche Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
EAS	Single Pulse Avalanche Energy ⁵	$V_{DD}=-25V, L=0.1\text{mH}, I_{AS}=-30A$	120	---	---	mJ

Diode Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
I_S	Continuous Source Current ^{1,6}	$V_G=V_D=0V$, Force Current	---	---	-57	A
I_{SM}	Pulsed Source Current ^{2,6}		---	---	-180	A
V_{SD}	Diode Forward Voltage ²	$V_{GS}=0V, I_S=-1A, T_J=25^\circ\text{C}$	---	---	-1.2	V
t_{rr}	Reverse Recovery Time	$I_F=-15A, dI/dt=100A/\mu s,$	---	29	---	nS
Q_{rr}	Reverse Recovery Charge	$T_J=25^\circ\text{C}$	---	15	---	nC

Note :

- The data tested by surface mounted on a 1 inch² FR-4 board with 20Z copper.
- The data tested by pulsed, pulse width $\leq 300\mu s$, duty cycle $\leq 2\%$
- The EAS data shows Max. rating. The test condition is $V_{DD}=-25V, V_{GS}=-10V, L=0.1\text{mH}, I_{AS}=-55.4A$
- The power dissipation is limited by 150°C junction temperature
- The Min. value is 100% EAS tested guarantee.
- The data is theoretically the same as I_D and I_{DM} , in real applications, should be limited by total power dissipation.

Typical Characteristics

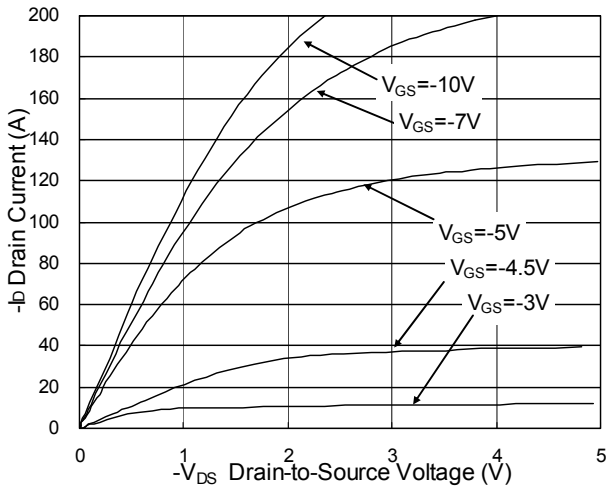


Fig.1 Typical Output Characteristics

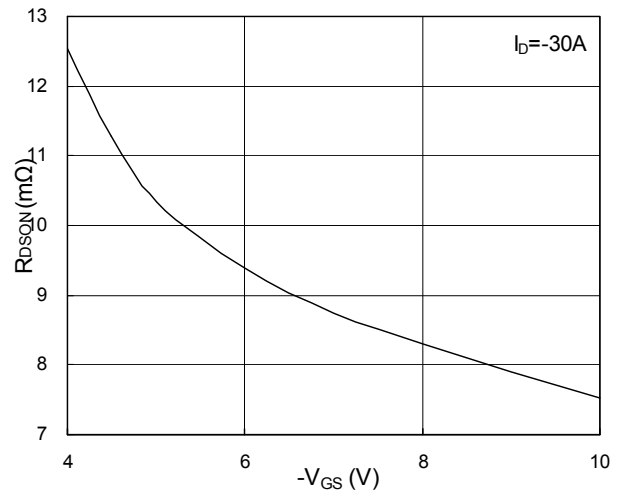


Fig.2 On-Resistance v.s Gate-Source

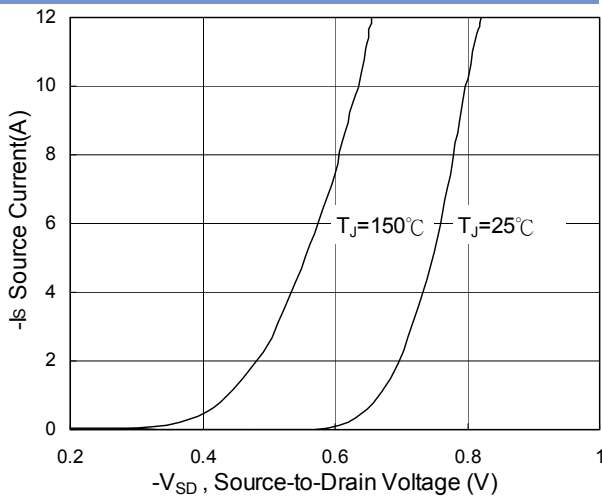


Fig.3 Forward Characteristics Of Reverse

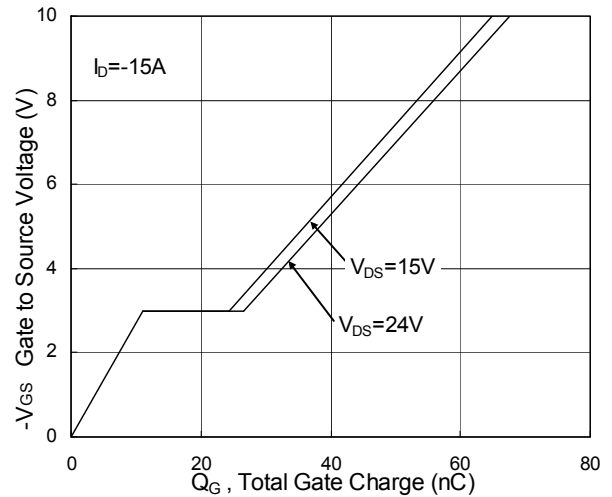


Fig.4 Gate-Charge Characteristics

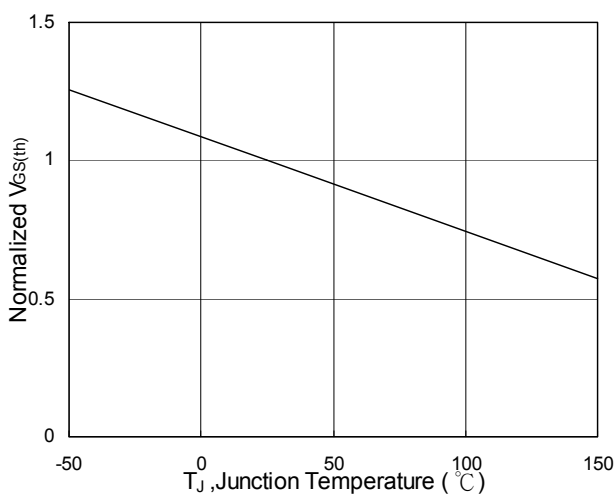


Fig.5 Normalized V_{GS(th)} v.s T_J

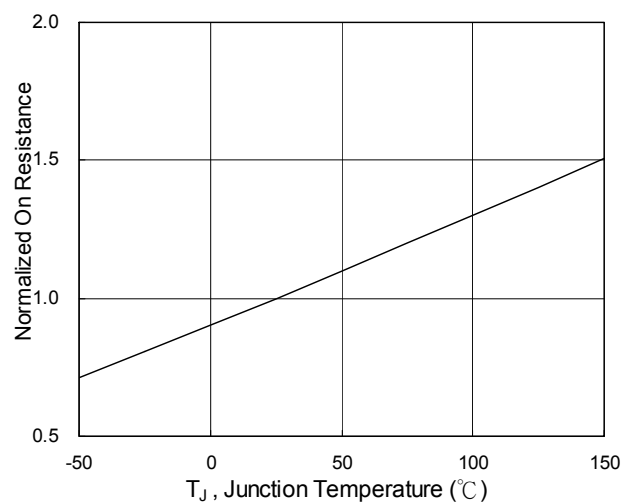


Fig.6 Normalized R_{DS(on)} v.s T_J

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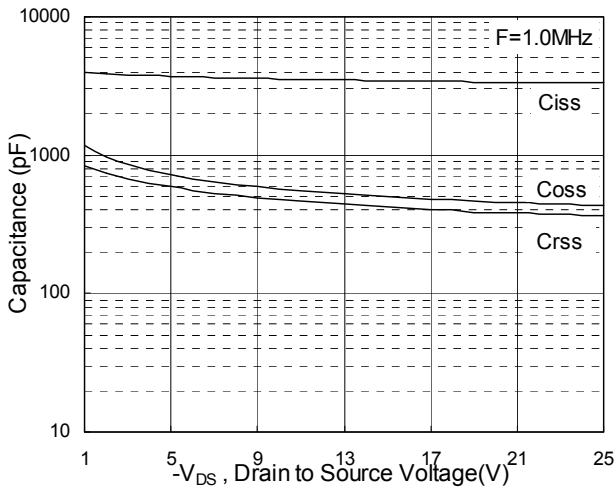


Fig.7 Capacitance

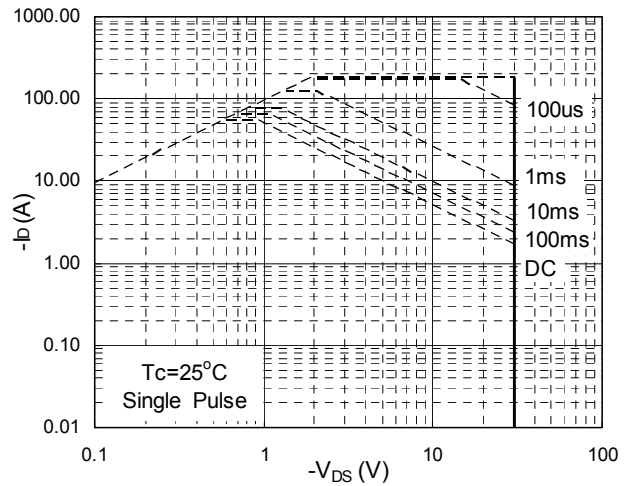


Fig.8 Safe Operating Area

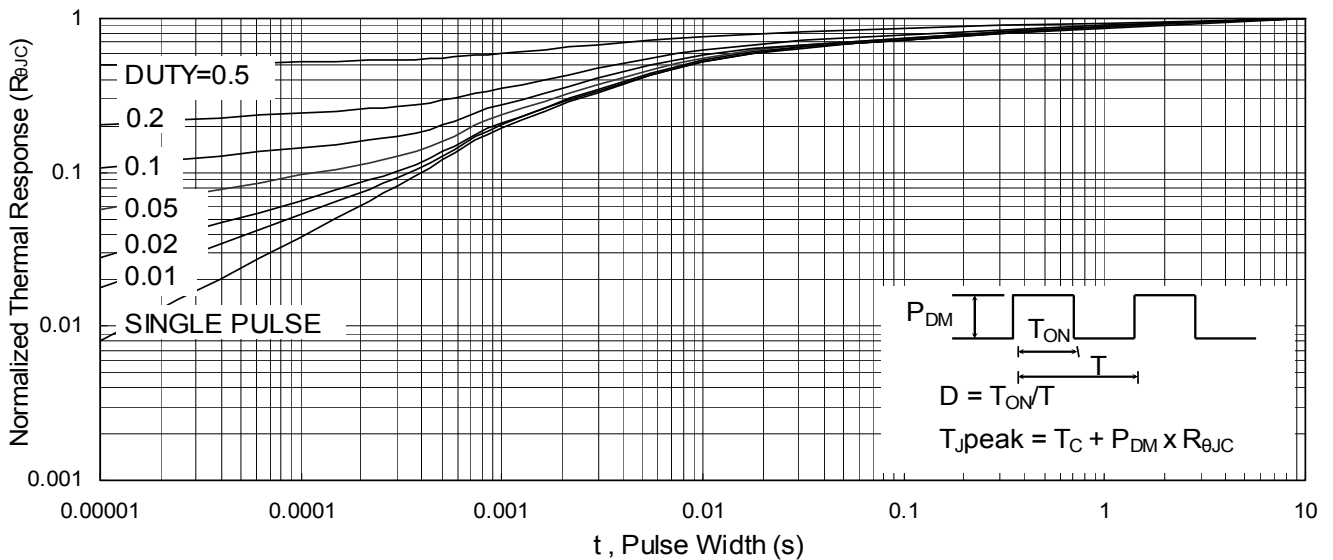


Fig.9 Normalized Maximum Transient Thermal Impedance

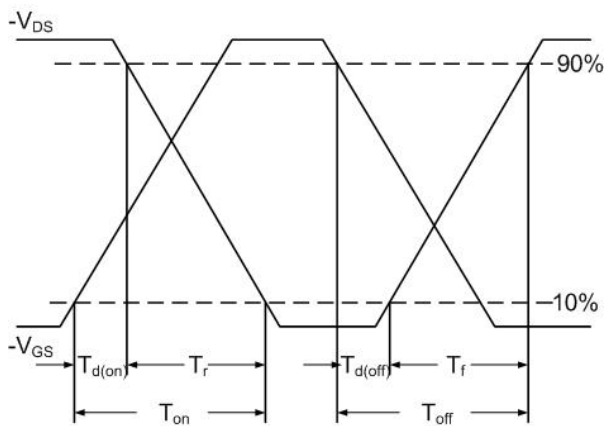


Fig.10 Switching Time Waveform

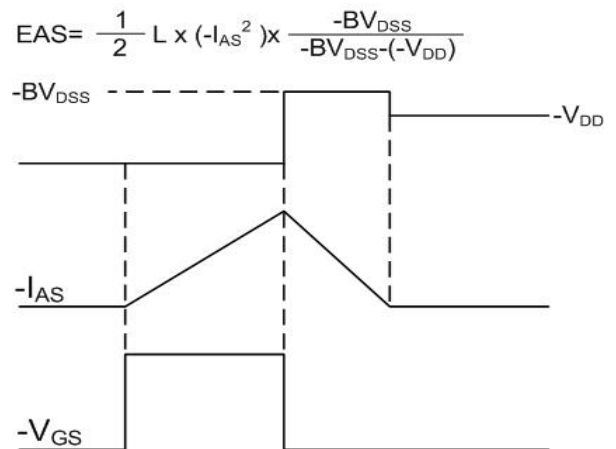


Fig.11 Unclamped Inductive Switching Waveform