

## Silicon N-Channel Power MOSFET

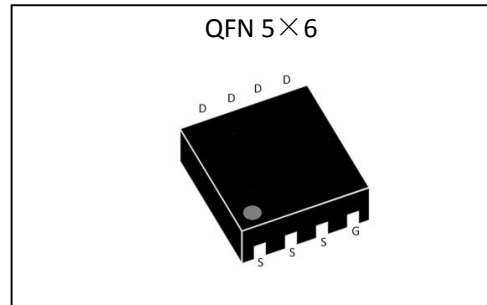
### General Description :

The HMQ170N03 uses advanced trench technology and design to provide excellent  $R_{DS(ON)}$  with low gate charge. It can be used in a wide variety of applications. The package form is QFN 5×6 which accords with the RoHS standard.

$V_{DSS}$	30	V
$I_D$	170	A
$P_D$	88	W
$R_{DS(ON)type}$	1.35	mΩ

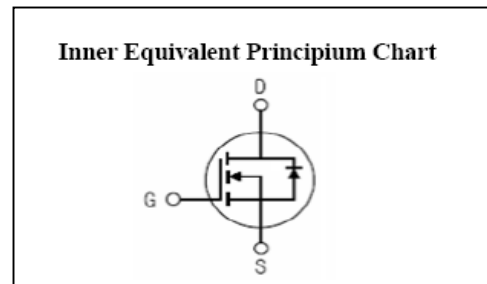
### Features :

- $R_{DS(ON)} < 1.65m\Omega @ V_{GS}=10V$  (Typ1.35mΩ)
- High density cell design for ultra low  $R_{dson}$
- Fully characterized avalanche voltage and current
- Excellent package for good heat dissipation



### Applications :

- Power switching application
- Hard switched and high frequency circuits
- Uninterruptible power supply



### Absolute ( $T_c= 25^\circ C$ unless otherwise specified ) :

Symbol	Parameter	Rating	Units
$V_{DSS}$	Drain-to-Source Voltage	30	V
$I_D$	Continuous Drain Current	170	A
$I_{DM}$	Pulsed Drain Current	400	A
$V_{GS}$	Gate-to-Source Voltage	±20	V
$P_D$	Power Dissipation	88	W
$E_{AS}$	Single pulse avalanche energy <sup>a5</sup>	890	mJ
$T_J , T_{stg}$	Operating Junction and Storage Temperature Range	150 , -55 to 150	°C

**Electrical Characteristics** (  $T_c = 25^\circ\text{C}$  unless otherwise specified ) :

<b>OFF Characteristics</b>						
Symbol	Parameter	Test Conditions	Rating			Units
			Min.	Typ.	Max.	
$V_{DSS}$	Drain to Source Breakdown Voltage	$V_{GS}=0V, I_D=250\mu A$	30	--	--	V
$I_{DSS}$	Drain to Source Leakage Current	$V_{DS}=30V, V_{GS}=0V, T_a=25^\circ\text{C}$	--	--	1.0	$\mu A$
$I_{GSS(F)}$	Gate to Source Forward Leakage	$V_{GS}=+20V$	--	--	0.1	$\mu A$
$I_{GSS(R)}$	Gate to Source Reverse Leakage	$V_{GS}=-20V$	--	--	-0.1	$\mu A$

<b>ON Characteristics<sup>a3</sup></b>						
Symbol	Parameter	Test Conditions	Rating			Units
			Min.	Typ.	Max.	
$R_{DS(ON)}$	Drain-to-Source On-Resistance	$V_{GS}=10V, I_D=85A$	--	1.35	1.65	$m\Omega$
$V_{GS(TH)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_D=250\mu A$	1.0	--	2.5	V

Pulse width  $t_p \leq 380\mu s, \delta \leq 2\%$

<b>Dynamic Characteristics<sup>a4</sup></b>						
Symbol	Parameter	Test Conditions	Rating			Units
			Min.	Typ.	Max.	
$g_{fs}$	Forward Transconductance	$V_{DS}=5V, I_D=85A$	--	80	--	S
$C_{iss}$	Input Capacitance	$V_{GS}=0V, V_{DS}=15V$ $f=1.0\text{MHz}$	--	6150	7300	pF
$C_{oss}$	Output Capacitance		--	1550	2000	
$C_{rss}$	Reverse Transfer Capacitance		--	105	155	

<b>Resistive Switching Characteristics<sup>a4</sup></b>						
Symbol	Parameter	Test Conditions	Rating			Units
			Min.	Typ.	Max.	
$t_{d(ON)}$	Turn-on Delay Time	$V_{DD}=15V, I_D=85A$ $V_{GS}=10V, R_G=1.6\Omega$	--	13	--	ns
$t_r$	Rise Time		--	7.5	--	
$t_{d(OFF)}$	Turn-Off Delay Time		--	51	--	
$t_f$	Fall Time		--	8.6	--	
$Q_g$	Total Gate Charge	$V_{DD}=15V, I_D=85A$ $V_{GS}=10V$	--	98	117	nC
$Q_{gs}$	Gate to Source Charge		--	16	--	
$Q_{gd}$	Gate to Drain ( "Miller" ) Charge		--	11	--	

## Source-Drain Diode Characteristics

Symbol	Parameter	Test Conditions	Rating			Units
			Min.	Typ.	Max.	
$I_S$	Continuous Source Current <sup>a2</sup> (Body Diode)		--	--	170	A
$V_{SD}$	Diode Forward Voltage <sup>a3</sup>	$I_S=85A, V_{GS}=0V$	--	--	1.2	V

Symbol	Parameter	Typ.	Units
$R_{\theta JC}$	Junction-to-Case <sup>a2</sup>	1.42	°C/W

<sup>a1</sup> : Repetitive Rating: Pulse width limited by maximum junction temperature.

<sup>a2</sup> : Surface Mounted on FR4 Board,  $t \leq 10\text{sec}$ .

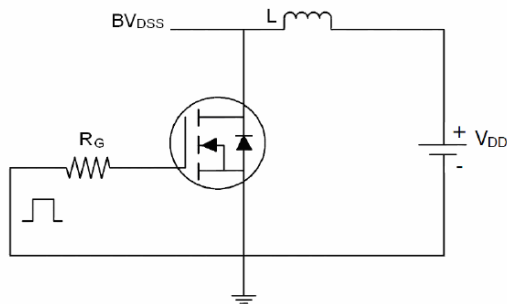
<sup>a3</sup> : Pulse Test: Pulse Width  $\leq 300\mu\text{s}$ , Duty Cycle  $\leq 2\%$ .

<sup>a4</sup> : Guaranteed by design, not subject to production

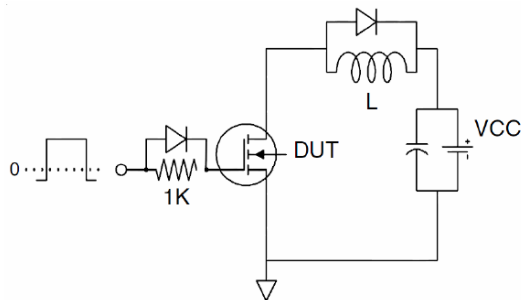
<sup>a5</sup> : EAS condition :  $T_j=25^\circ\text{C}, V_{DD}=20\text{V}, V_G=10\text{V}, L=0.5\text{mH}, R_g=25\Omega$

## Test circuit

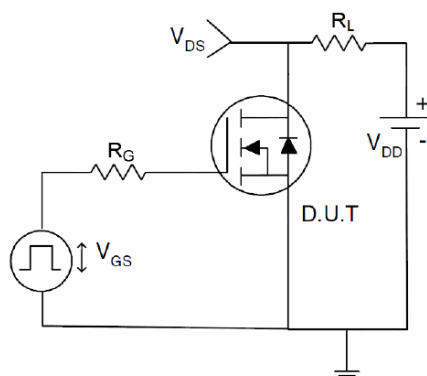
### 1) EAS test Circuit



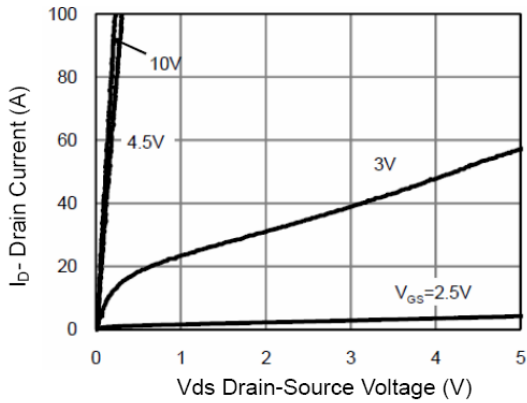
### 2) Gate charge test Circuit



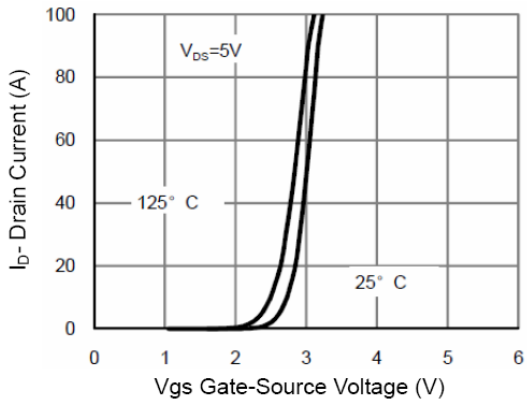
### 3) Switch Time Test Circuit



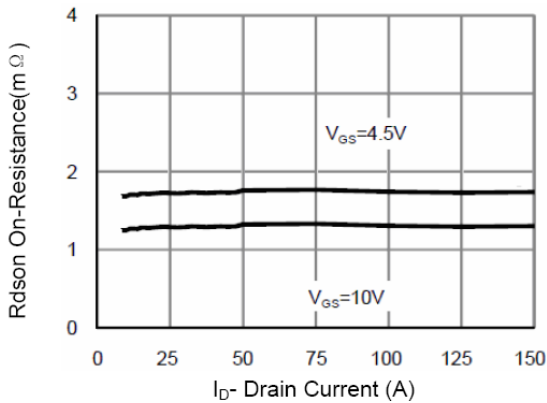
## Characteristics Curve :



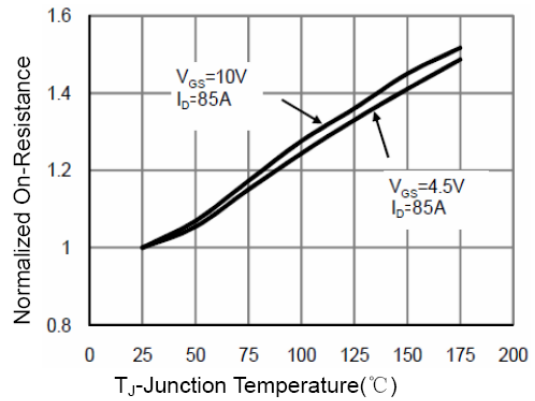
**Figure 1 Output Characteristics**



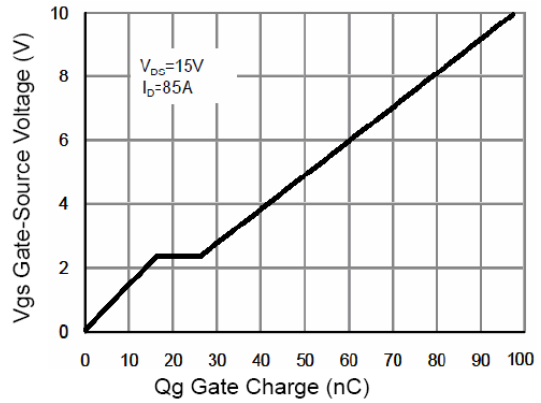
**Figure 2 Transfer Characteristics**



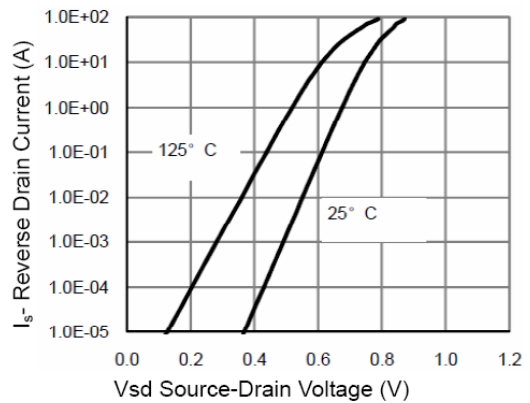
**Figure 3 Rdson- Drain Current**



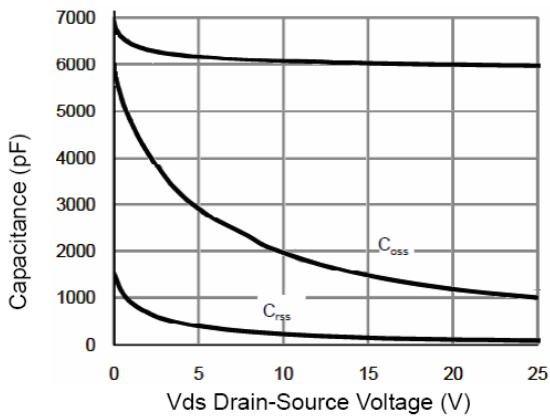
**Figure 4 Rdson-Junction Temperature**



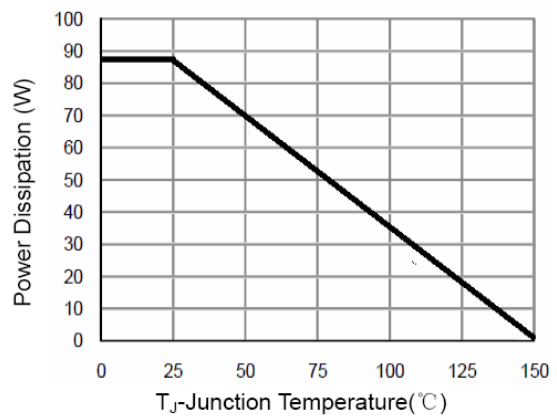
**Figure 5 Gate Charge**



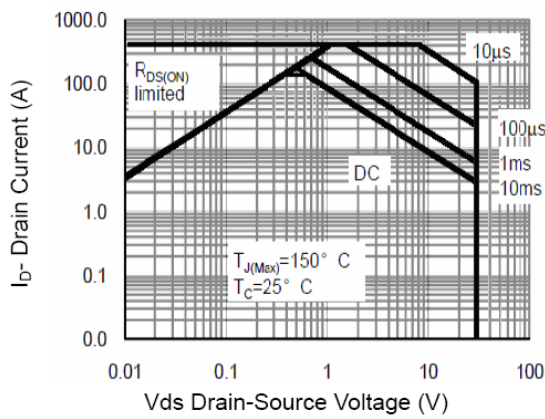
**Figure 6 Source- Drain Diode Forward**



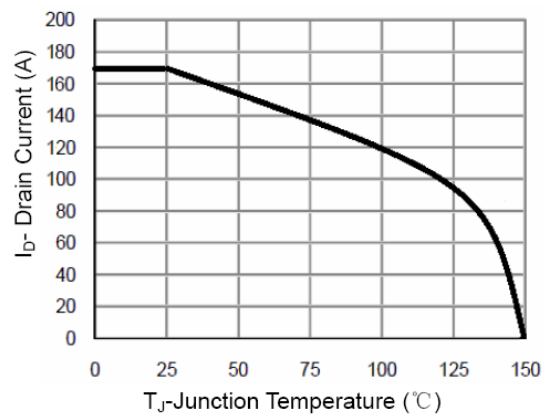
**Figure 7 Capacitance vs Vds**



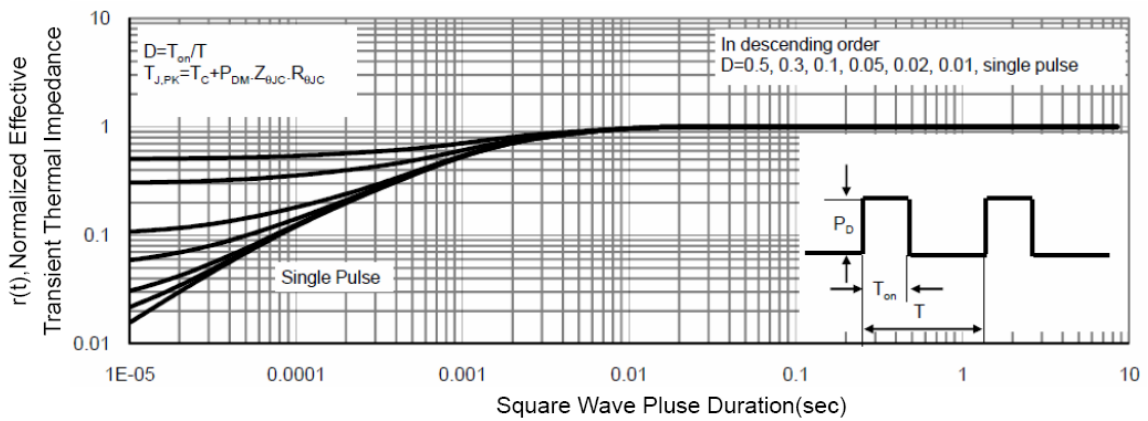
**Figure 9 Power De-rating**



**Figure 8 Safe Operation Area**



**Figure 10 Current De-rating**



**Figure 11 Normalized Maximum Transient Thermal Impedance**