

## N And P-Channel Enhancement Mode MOSFET

### Description

The HM4615Q uses advanced trench technology to provide excellent  $R_{DS(ON)}$  and low gate charge. The complementary MOSFETs may be used to form a level shifted high side switch, and for a host of other applications.

### General Features

#### ◆ N-channel:

$V_{DS} = 100V, I_D = 8A$

$R_{DS(ON)} = 150m\Omega$  (typical) @  $V_{GS} = 10V$

$R_{DS(ON)} = 160m\Omega$  (typical) @  $V_{GS} = 4.5V$

#### P-Channel:

$V_{DS} = -100V, I_D = -6A$

$R_{DS(ON)} = 300m\Omega$  (typical) @  $V_{GS} = -10V$

$R_{DS(ON)} = 330m\Omega$  (typical) @  $V_{GS} = -4.5V$

- ◆ Excellent gate charge x  $R_{DS(ON)}$  product(FOM)
- ◆ Very low on-resistance  $R_{DS(ON)}$
- ◆ 150 °C operating temperature
- ◆ Pb-free lead plating
- ◆ 100% UIS tested

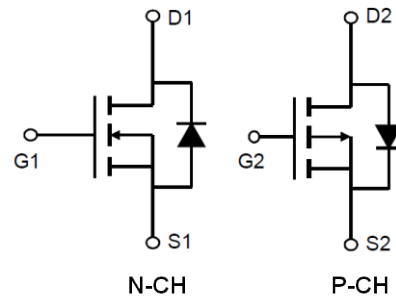
*100% UIS TESTED!*

### Application

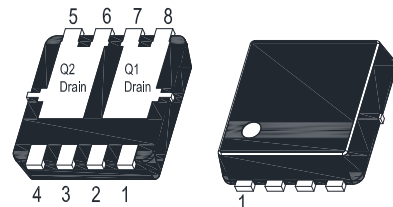
*100%  $\Delta V_{ds}$  TESTED!*

- ◆ Pch+Nch Complementary MOSFET for DC-FAN
- ◆ H-Bridge application

### Schematic diagram



### Marking and pin assignment



Q1:1.Source 2.Gate 7.Drain 8.Drain  
Q2:3.Source 4.Gate 5.Drain 6.Drain  
DFN3X3-8L Plastic Package

### Ordering Information

Part Number	Storage Temperature	Package	Devices Per Reel
HM4615Q	-55°C to +150°C	DFN3X3-8L	5000

### Absolute Maximum Ratings (TA=25°C unless otherwise noted)

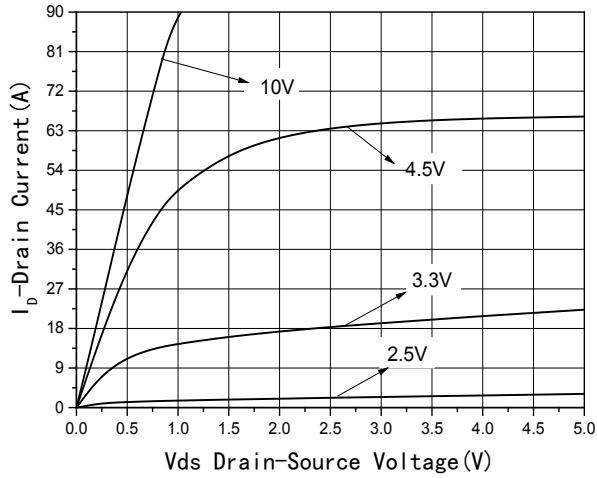
Parameter	Symbol	Limit		Unit
		N	P	
Drain-source voltage	$V_{DS}$	100	-100	V
Gate-source voltage	$V_{GS}$	±20	±20	V
Operating junction Temperature range	$T_j$	-55—150	-55—150	°C
Drain Current-Continuous (Silicon Limited)	$T_A = 25^\circ C$	$I_D$	18	A
	$T_A = 75^\circ C$		5.6	

Pulsed Drain Current (Package Limited)		$I_{DM}$	54	-48	A
Avalanche Current <sup>C</sup>		$I_{AS}, I_{AR}$	22	-27	A
Avalanche energy $L=0.1mH^C$		$E_{AS}, E_{AR}$	24	36	mJ
Power Dissipation <sup>B</sup>	$T_A=25^{\circ}C$	$P_D$	12	20	W
	$T_A=75^{\circ}C$		5	8	
Junction and Storage Temperature Range		$T_J, T_{STG}$	-55—150		$^{\circ}C$

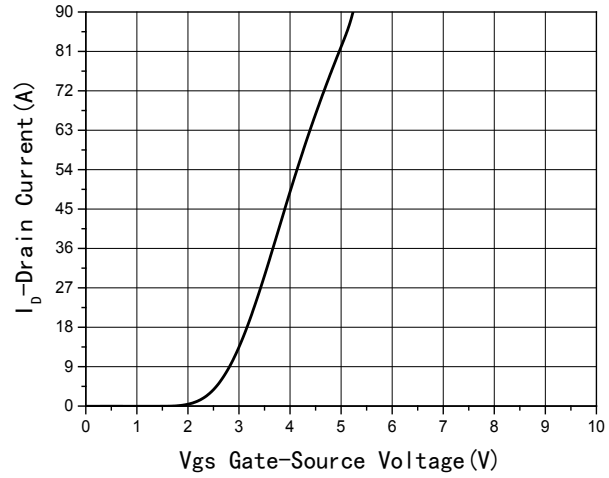
## N-Channel Electrical Characteristics ( $T_J=25^{\circ}C$ unless otherwise noted)

Parameter	Symbol	Condition	Min	Typ	Max	Unit
<b>OFF Characteristics</b>						
Drain-source breakdown voltage	$BV_{DSS}$	$V_{GS}=0V, I_D=250\mu A$	100	-	-	V
Zero gate voltage drain current	$I_{DSS}$	$V_{DS}=100V, V_{GS}=0V$	-	-	1	$\mu A$
Gate-body leakage	$I_{GSS}$	$V_{DS}=0V, V_{GS}=\pm 20V$	-	-	$\pm 100$	nA
<b>ON Characteristics</b>						
Gate threshold voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=250\mu A$	1.3		2.5	V
Drain-source on-state resistance	$R_{DS(ON)}$	$V_{GS}=10V, I_D=15A$	-		150	m $\Omega$
		$V_{GS}=4.5V, I_D=15A$	-		160	
Forward transconductance	$g_{fs}$	$V_{DS}=5V, I_D=20A$	-	43	-	S
<b>Dynamic Characteristics</b>						
Input capacitance	$C_{ISS}$	$V_{DS}=15V, V_{GS}=0V$ $f=1.0MHz$	-	985	-	pF
Output capacitance	$C_{OSS}$		-	132	-	
Reverse transfer capacitance	$C_{RSS}$		-	114	-	
Gate resistance	$R_g$	$V_{GS}=0V, V_{DS}=0V,$ $f=1.0MHz$	-	1.6	2.4	$\Omega$
<b>Switching Characteristics</b>						
Turn-on delay time	$t_{D(ON)}$	$V_{DS}=15V$ $V_{GS}=10V$ $R_L=1.5\Omega$ $R_{GEN}=3\Omega$	-	4.4	-	ns
Rise time	$t_r$		-	9	-	
Turn-off delay time	$t_{D(OFF)}$		-	17	-	
Fall time	$t_f$		-	6	-	
Total gate charge	$Q_g$	$V_{DS}=15V, I_D=15A$ $V_{GS}=10V$	-	19.9	-	nC
Gate-source charge	$Q_{gs}$		-	3.7	-	
Gate-drain charge	$Q_{gd}$		-	4	-	

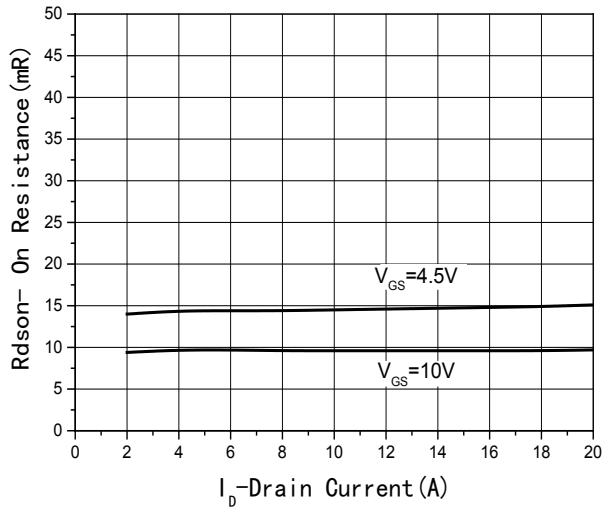
## Typical Performance Characteristics



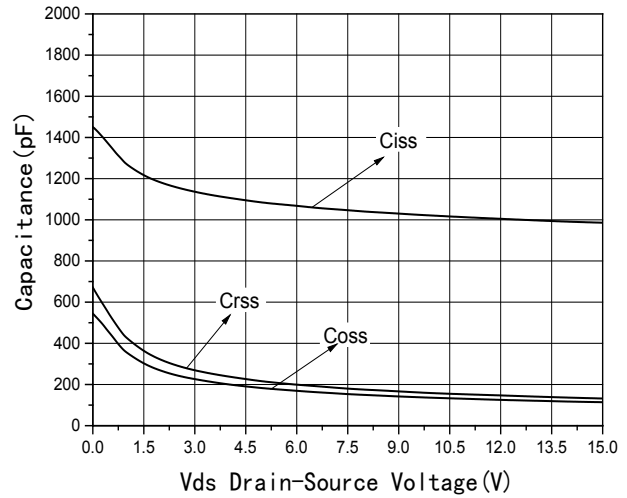
**Fig1 Output Characteristics**



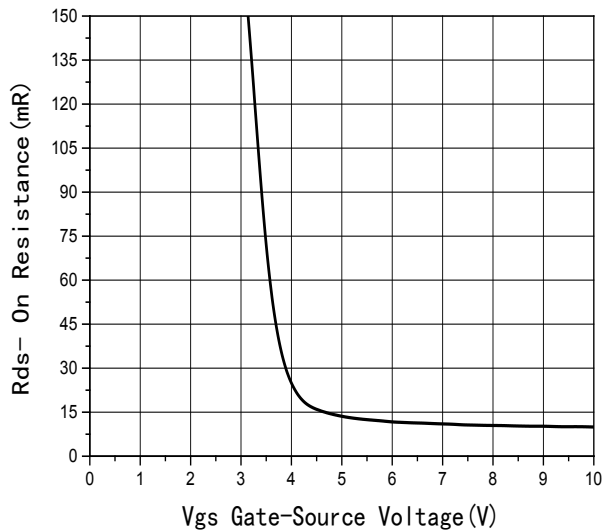
**Fig2 Transfer Characteristics**



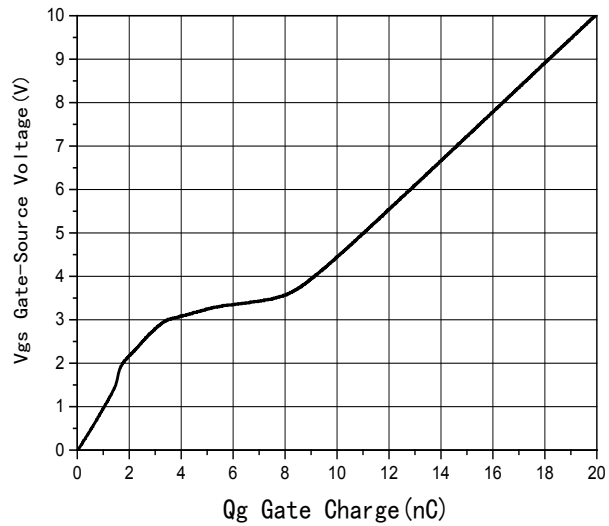
**Fig3 Rdson-Drain current**



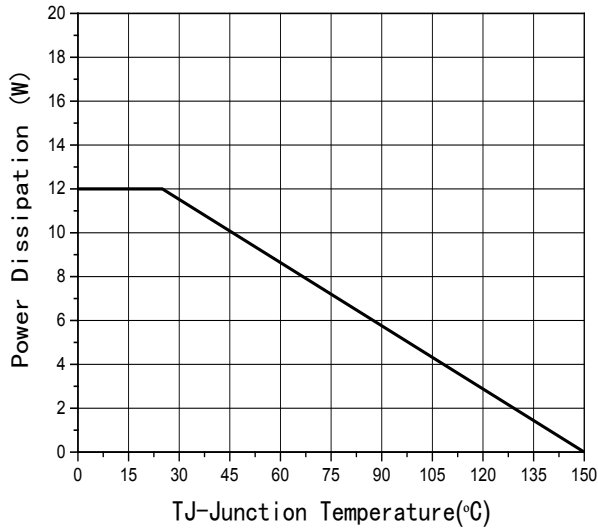
**Fig4 Capacitance vs V\_DS**



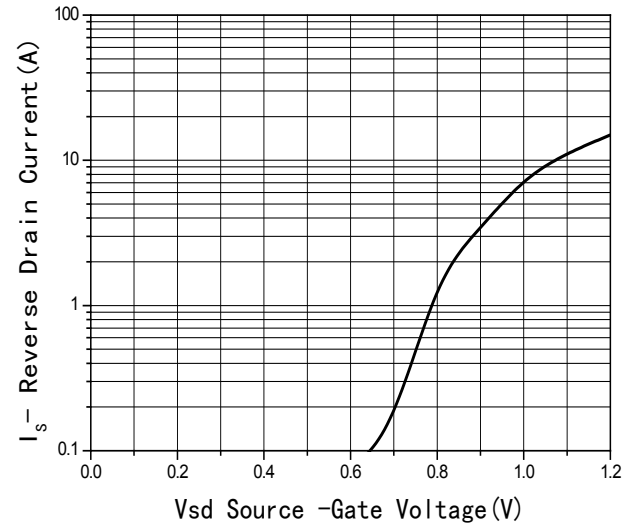
**Fig5 Rdson-Gate Drain voltage**



**Fig6 Gate Charge**



**Fig7 Power De-rating**

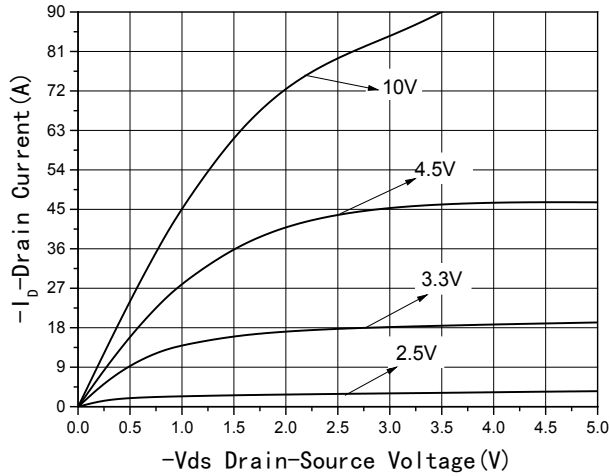


**Fig8 Source-Drain Diode Forward**

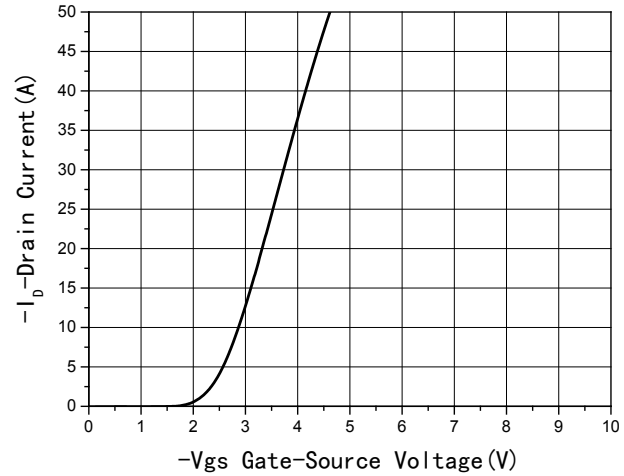
**P-Channel Electrical Characteristics** (T<sub>J</sub>=25°C unless otherwise noted)

Parameter	Symbol	Condition	Min	Typ	Max	Unit
<b>OFF Characteristics</b>						
Drain-source breakdown voltage	BV <sub>DSS</sub>	V <sub>GS</sub> =0V, I <sub>D</sub> =-250μA	-100	-	-	V
Zero gate voltage drain current	I <sub>DSS</sub>	V <sub>DS</sub> =-100V, V <sub>GS</sub> =0V	-	-	-1	μA
Gate-body leakage	I <sub>GSS</sub>	V <sub>DS</sub> =0V, V <sub>GS</sub> =±20V	-	-	±100	nA
<b>ON Characteristics</b>						
Gate threshold voltage	V <sub>GS(th)</sub>	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =-250μA	-1.2		-2.5	V
Drain-source on-state resistance	R <sub>DS(ON)</sub>	V <sub>GS</sub> =-10V, I <sub>D</sub> =-20A	-		300	mΩ
		V <sub>GS</sub> =-4.5V, I <sub>D</sub> =-20A	-		330	
Forward transconductance	g <sub>fs</sub>	V <sub>DS</sub> =-5V, I <sub>D</sub> =-10A	-	18	-	S
<b>Dynamic Characteristics</b>						
Input capacitance	C <sub>ISS</sub>	V <sub>DS</sub> =-15V, V <sub>GS</sub> =0V f=1.0MHz	-	24	-	pF
Output capacitance	C <sub>OSS</sub>		-	4.6	-	
Reverse transfer capacitance	C <sub>RSS</sub>		-	4.2	-	
Gate resistance	R <sub>g</sub>	V <sub>GS</sub> =0V, V <sub>DS</sub> =0V, f=1.0MHz	-	4	-	Ω
<b>Switching Characteristics</b>						
Turn-on delay time	t <sub>D(ON)</sub>	V <sub>DS</sub> =-15V V <sub>GS</sub> =-10V R <sub>L</sub> =2.3Ω R <sub>GEN</sub> =3Ω	-	10	-	ns
Rise time	t <sub>r</sub>		-	5.5	-	
Turn-off delay time	t <sub>D(OFF)</sub>		-	3.6	-	
Fall time	t <sub>f</sub>		-	4.6	-	
Total gate charge	Q <sub>g</sub>	V <sub>DS</sub> =-15V, I <sub>D</sub> =-20A V <sub>GS</sub> =-10V	-	1261	-	nC
Gate-source charge	Q <sub>gs</sub>		-	152	-	
Gate-drain charge	Q <sub>gd</sub>		-	137	-	

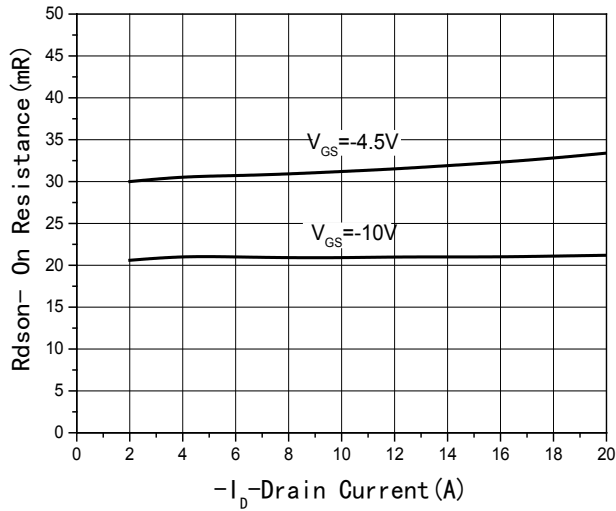
## Typical Performance Characteristics



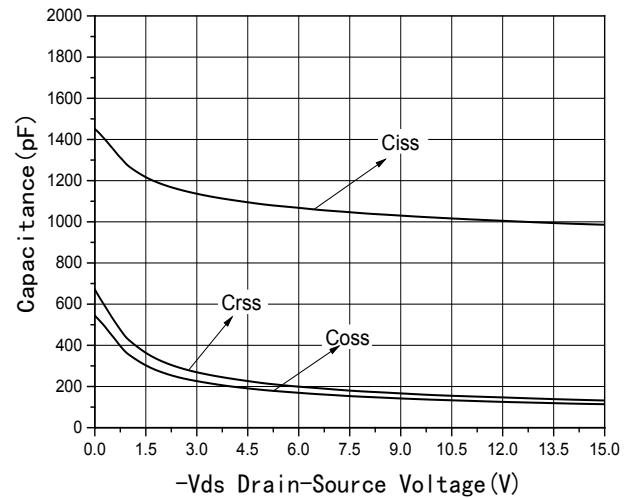
**Fig1 Output Characteristics**



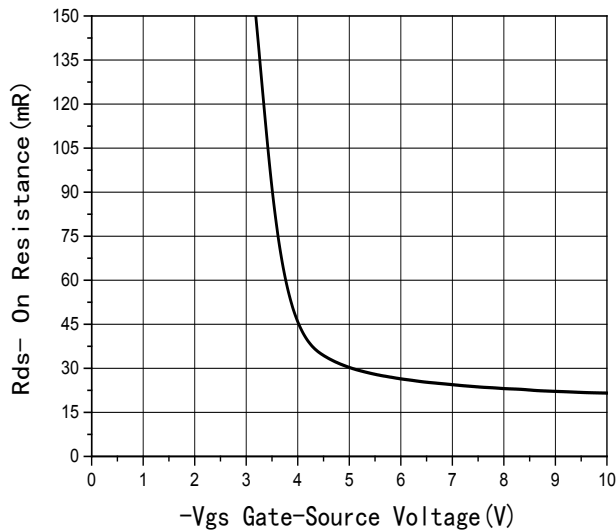
**Fig2 Transfer Characteristics**



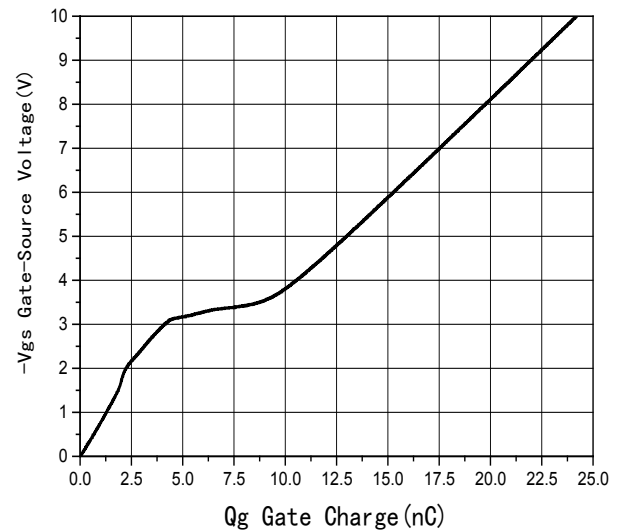
**Fig3 Rdson-Drain current**



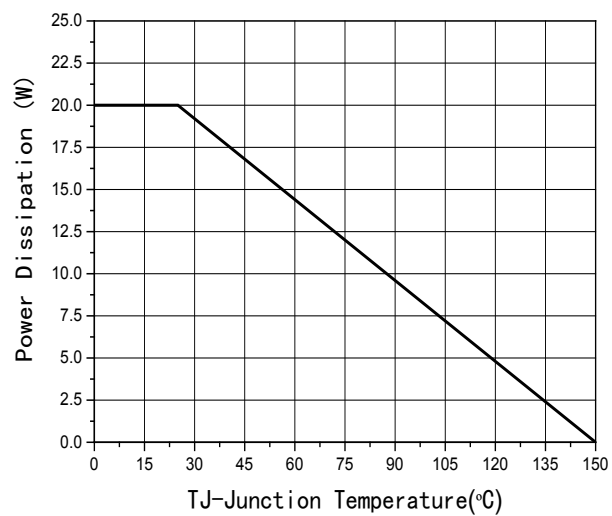
**Fig4 Capacitance vs Vds**



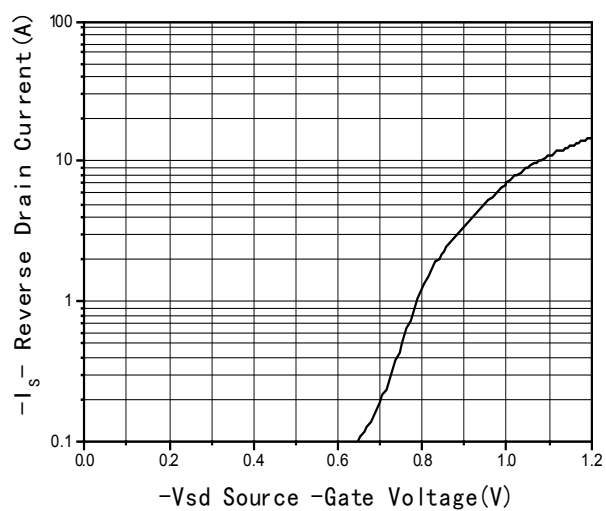
**Fig5 Rdson-Gate Drain voltage**



**Fig6 Gate Charge**



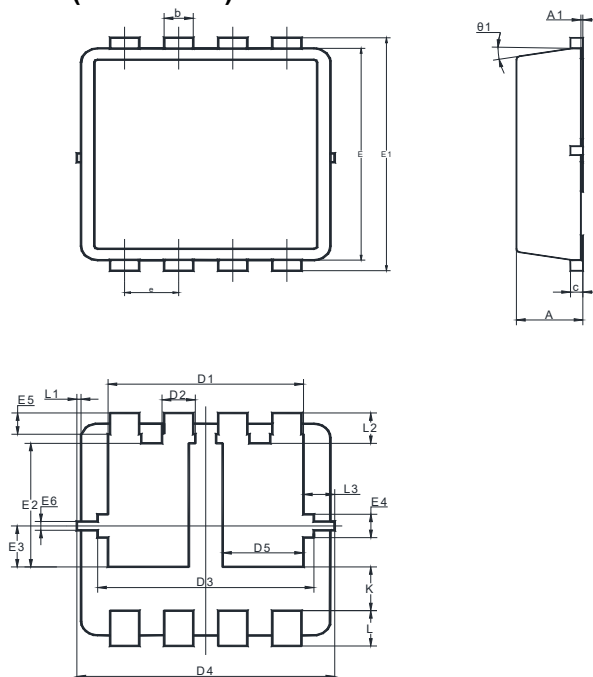
**Fig7 Power De-rating**



**Fig8 Source-Drain Diode Forward**

**Package Outline Dimensions (Units: mm)**

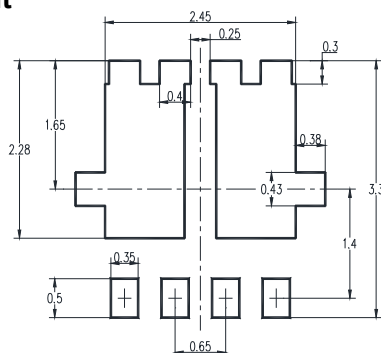
**8 : B' L' !, @**



UNIT	A	A1	b	c	D1	D2	D3	D4	D5	E	E1	E2	E3
mm	0.9	0.05	0.35	0.25	2.6	0.5	2.7	3.2	1.135	3.1	3.3	1.85	0.68
	0.7	0	0.24	0.1	2.4	0.3	2.5	3	0.935	2.9	3.1	1.65	0.48

UNIT	E4	E5	E6	e	K	L	L1	L2	L3	θ1
mm	0.43	0.4	0.25	0.7	0.72	0.5	0.1	0.53	0.475	12°
	0.23	0.2	0.15	0.6	0.52	0.3	0	0.33	0.275	0°

**Recommended Soldering Footprint**



**Packing information**

Package	Tape Width (mm)	Pitch		Reel Size		Per Reel Packing Quantity
		mm	inch	mm	inch	
DFN3X3-8L	12	8 ± 0.1	0.315 ± 0.004	330	13	3,000