

N and P-Channel Enhancement Mode Power MOSFET

Description

The HM4615 uses advanced trench technology to provide excellent $R_{DS(ON)}$ and low gate charge. The SOP-8 package is universally preferred for all commercial industrial surface mount applications and suited for low voltage applications such as DC/DC converters.

General Features

● N-Channel

$V_{DS} = 100V, I_D = 6.5A$

$R_{DS(ON)} < 37m\Omega @ V_{GS}=10V$ (Typ:33m Ω)

● P-Channel

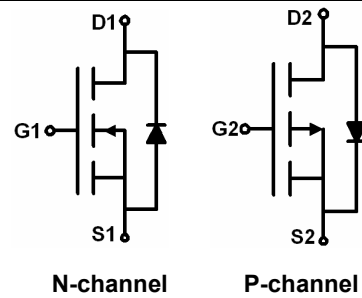
$V_{DS} = 100V, I_D = -4.5A$

$R_{DS(ON)} < 100m\Omega @ V_{GS}=-10V$ (Typ:85m Ω)

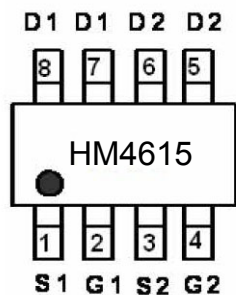
- High power and current handling capability
- Lead free product is acquired
- Surface mount package

Application

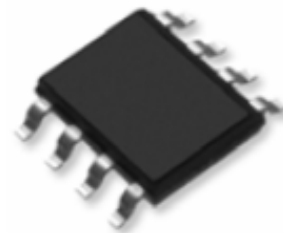
- Battery protection
- Load switch
- Power management



Schematic diagram



Marking and pin assignment



SOP-8 top view

Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
HM4615	HM4615	SOP-8	Ø330mm	12mm	2500 units

Absolute Maximum Ratings ($T_A=25^\circ C$ unless otherwise noted)

Parameter	Symbol	N-Channel	P-Channel	Unit	
Drain-Source Voltage	V_{DS}	100	-100	V	
Gate-Source Voltage	V_{GS}	± 20	± 20	V	
Continuous Drain Current	I_D	$T_A=25^\circ C$	6.5	-4.5	A
		$T_A=70^\circ C$	4.6	-3.0	
Pulsed Drain Current (Note 1)	I_{DM}	26	-18	A	
Maximum Power Dissipation	P_D	3	3	W	
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-55 To 150	-55 To 150	$^\circ C$	

Thermal Characteristic

Thermal Resistance, Junction-to-Ambient (Note2)	$R_{\theta JA}$	N-Ch	50	°C/W
		P-Ch	50	

N-CH Electrical Characteristics ($T_A=25^\circ\text{C}$ unless otherwise noted)

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	BV_{DSS}	$V_{GS}=0V, I_D=250\mu A$	100	110	-	V
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS}=100V, V_{GS}=0V$	-	-	1	μA
Gate-Body Leakage Current	I_{GSS}	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	± 100	nA
On Characteristics (Note 3)						
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=250\mu A$	2	3.3	4	V
Drain-Source On-State Resistance	$R_{DS(ON)}$	$V_{GS}=10V, I_D=6.5A$	-	33	37	m Ω
Forward Transconductance	g_{FS}	$V_{DS}=5V, I_D=6.5A$	20	-	-	S
Dynamic Characteristics (Note4)						
Input Capacitance	C_{iss}	$V_{DS}=50V, V_{GS}=0V,$ $F=1.0\text{MHz}$	-	2000	-	PF
Output Capacitance	C_{oss}		-	300	-	PF
Reverse Transfer Capacitance	C_{rss}		-	250	-	PF
Switching Characteristics (Note 4)						
Turn-on Delay Time	$t_{d(on)}$	$V_{DD}=50V, I_D=6.5A, R_L=5\Omega,$ $R_G=1\Omega, V_{GS}=10V$	-	12	-	nS
Turn-on Rise Time	t_r		-	10	-	nS
Turn-Off Delay Time	$t_{d(off)}$		-	19	-	nS
Turn-Off Fall Time	t_f		-	8	-	nS
Total Gate Charge	Q_g	$I_D=6.5A, V_{DD}=50V, V_{GS}=10V$	-	42	-	nC
Gate-Source Charge	Q_{gs}		-	9	-	nC
Gate-Drain Charge	Q_{gd}		-	10	-	nC
Drain-Source Diode Characteristics						
Diode Forward Voltage (Note 3)	V_{SD}	$V_{GS}=0V, I_S=6.5A$	-	0.85	1.2	V
Diode Forward Current (Note 2)	I_S		-	-	6.5	A
Reverse Recovery Time	t_{rr}	$T_J = 25^\circ\text{C}, I_F = 6.5A$ $di/dt = 100A/\mu\text{s}$ (Note3)	-	30		nS
Reverse Recovery Charge	Q_{rr}		-	44		nC

P-CH Electrical Characteristics (T_A=25°C unless otherwise noted)

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	BV _{DSS}	V _{GS} =0V, I _D =-250μA	-100	-	-	V
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} =-100V, V _{GS} =0V	-	-	1	μA
Gate-Body Leakage Current	I _{GSS}	V _{GS} =±20V, V _{DS} =0V	-	-	±20	μA
On Characteristics (Note 3)						
Gate Threshold Voltage	V _{GS(th)}	V _{DS} =V _{GS} , I _D =-250μA	-1	-1.9	-3	V
Drain-Source On-State Resistance	R _{DS(ON)}	V _{GS} =-10V, I _D =-4.5A	-	85	100	mΩ
Forward Transconductance	g _{FS}	V _{DS} =-50V, I _D =-4.5A	5	-	-	S
Dynamic Characteristics (Note4)						
Input Capacitance	C _{iss}	V _{DS} =-25V, V _{GS} =0V, F=1.0MHz	-	2100	-	PF
Output Capacitance	C _{oss}		-	590	-	PF
Reverse Transfer Capacitance	C _{rss}		-	140	-	PF
Switching Characteristics (Note 4)						
Turn-on Delay Time	t _{d(on)}	V _{DD} =-50V, I _D =-4.5A V _{GS} =-10V, R _{GEN} =9.1Ω	-	16	-	nS
Turn-on Rise Time	t _r		-	73	-	nS
Turn-Off Delay Time	t _{d(off)}		-	34	-	nS
Turn-Off Fall Time	t _f		-	57	-	nS
Total Gate Charge	Q _g	V _{DS} =-80V, I _D =-4.5A, V _{GS} =-10V	-	61	-	nC
Gate-Source Charge	Q _{gs}		-	14	-	nC
Gate-Drain Charge	Q _{gd}		-	29	-	nC
Drain-Source Diode Characteristics						
Diode Forward Voltage (Note 3)	V _{SD}	V _{GS} =0V, I _S =-4.5A	-	-	-1.2	V
Diode Forward Current (Note 2)	I _S	-	-	-	-4.5	A
Reverse Recovery Time	t _{rr}	T _J = 25°C, I _F = -4.5A di/dt = 100A/μs(Note3)	-	88.3	-	nS
Reverse Recovery Charge	Q _{rr}		-	65.9	-	nC
Forward Turn-On Time	t _{on}	Intrinsic turn-on time is negligible (turn-on is dominated by LS+LD)				

Notes:

1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Surface Mounted on FR4 Board, t ≤ 10 sec.
3. Pulse Test: Pulse Width ≤ 300μs, Duty Cycle ≤ 2%.
4. Guaranteed by design, not subject to production

N- Channel Typical Electrical and Thermal Characteristics (Curves)

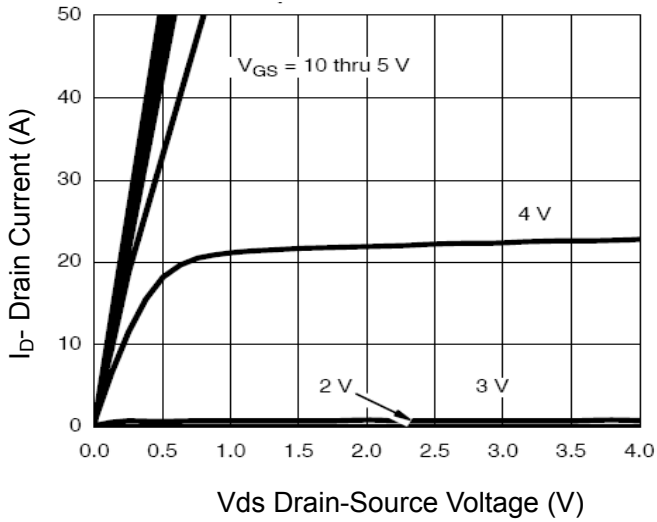


Figure 1 Output Characteristics

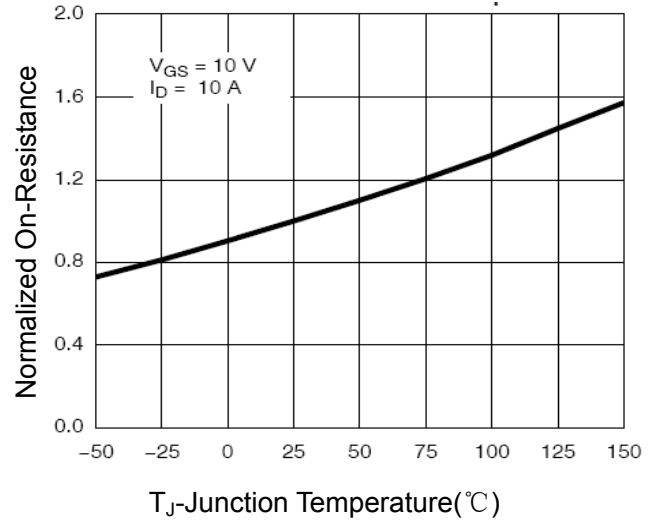


Figure 4 Rdson- Junction Temperature

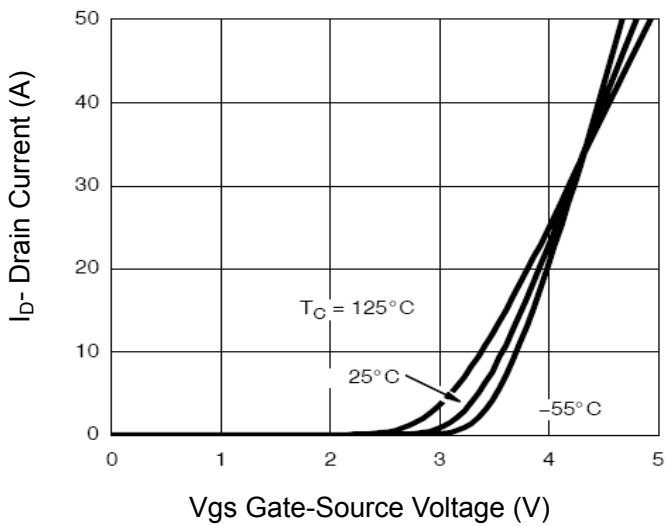


Figure 2 Transfer Characteristics

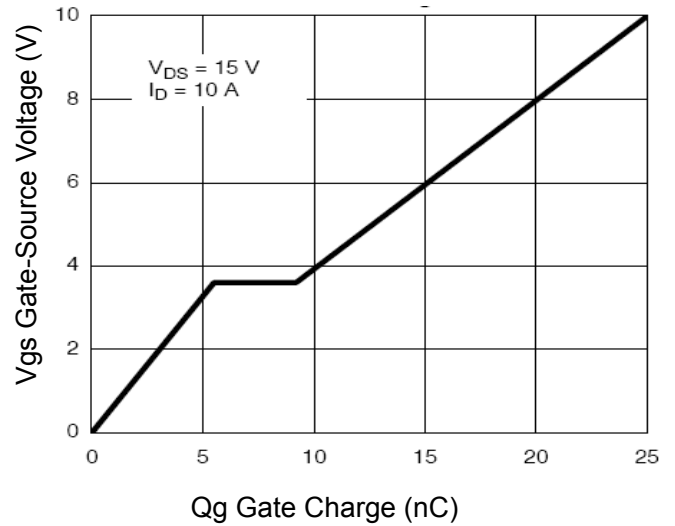


Figure 5 Gate Charge

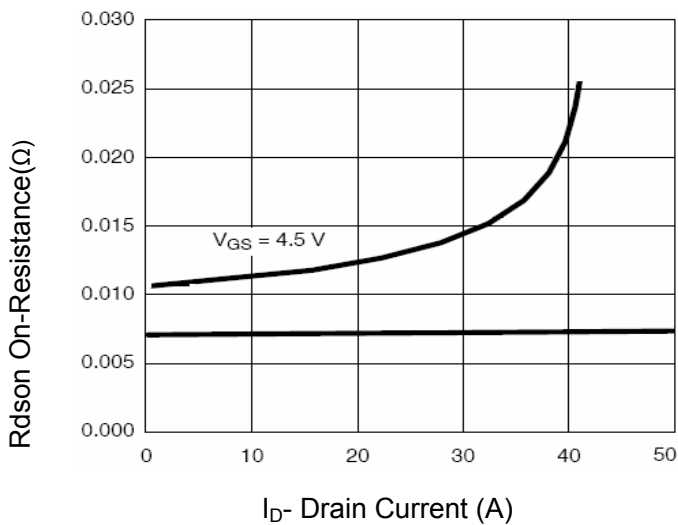


Figure 3 Rdson- Drain Current

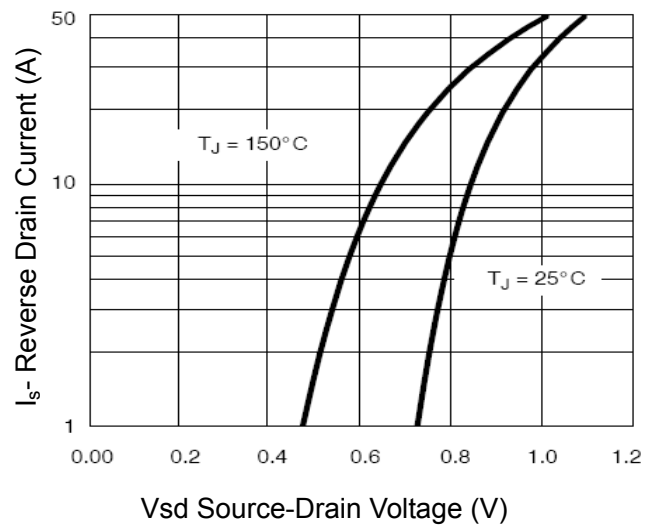


Figure 6 Source- Drain Diode Forward

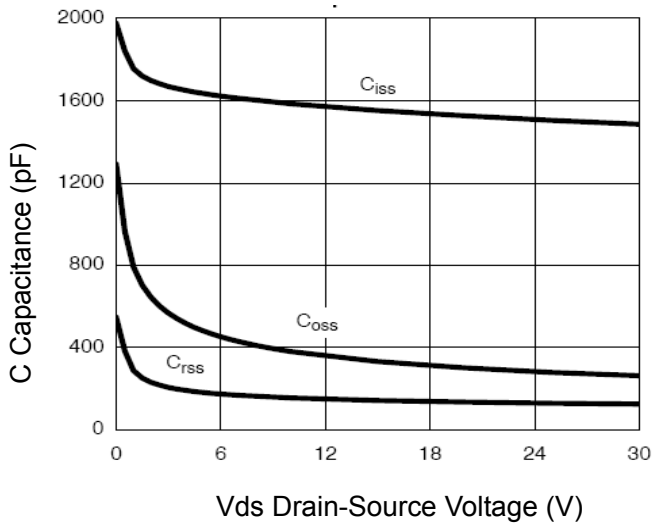


Figure 7 Capacitance vs Vds

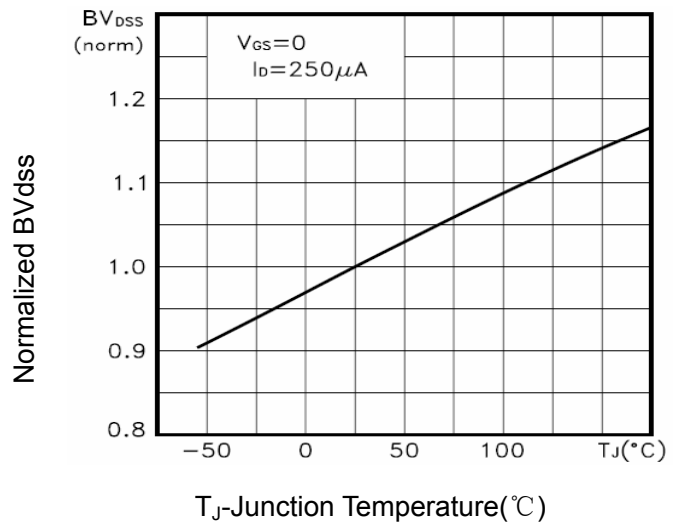


Figure 9 BV_{DSS} vs Junction Temperature

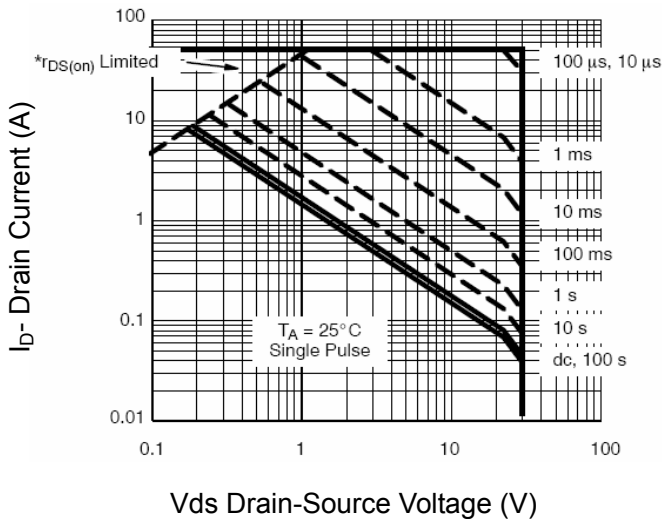


Figure 8 Safe Operation Area

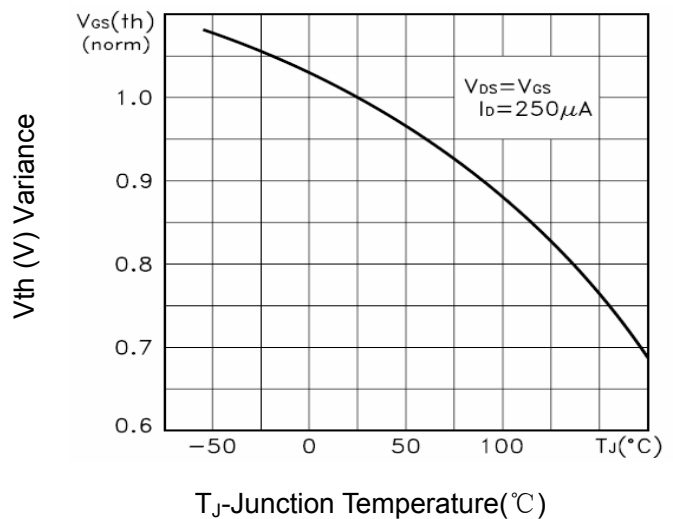


Figure 10 $V_{GS(th)}$ vs Junction Temperature

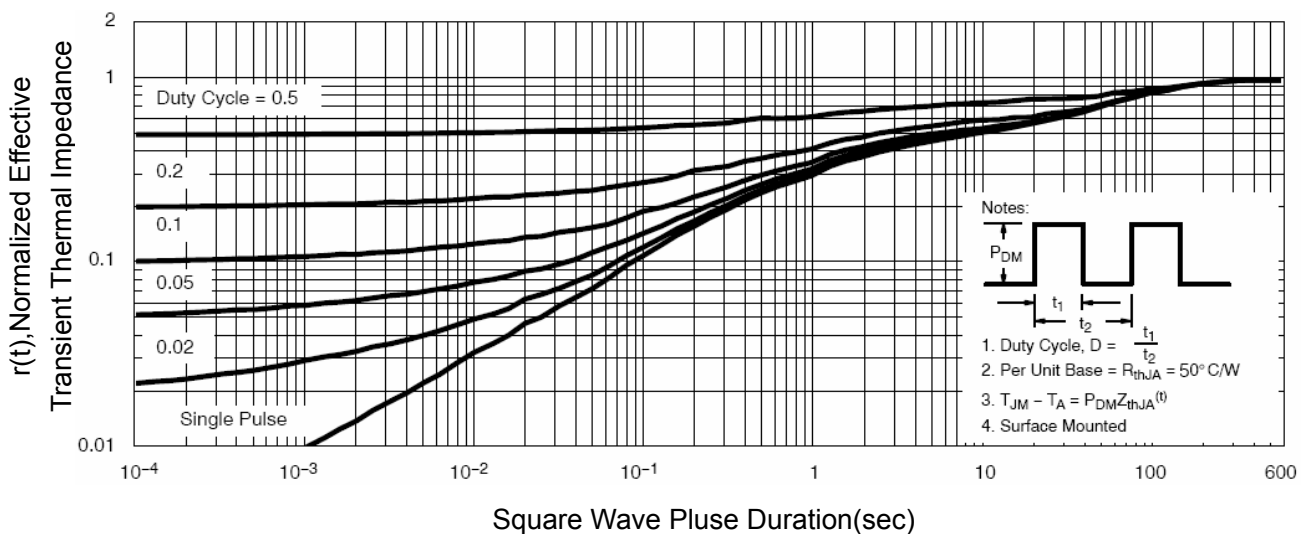


Figure 11 Normalized Maximum Transient Thermal Impedance

P-Channel Typical Electrical and Thermal Characteristics

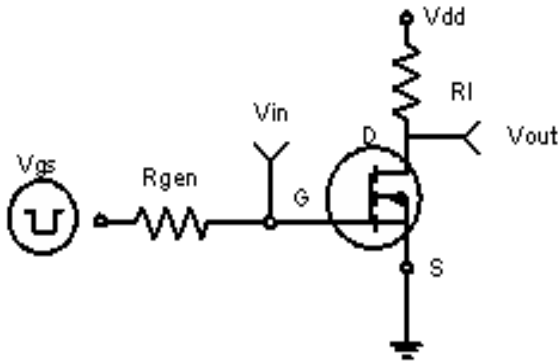


Figure 1: Switching Test Circuit

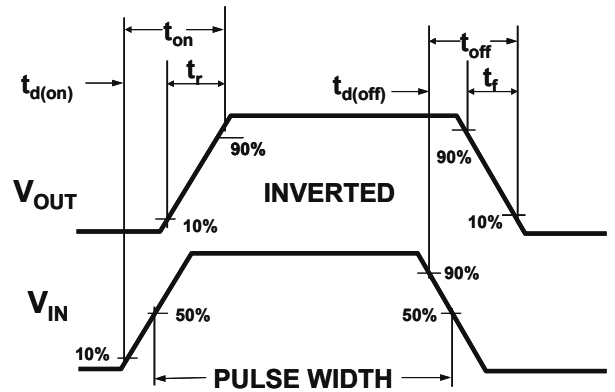


Figure 2: Switching Waveforms

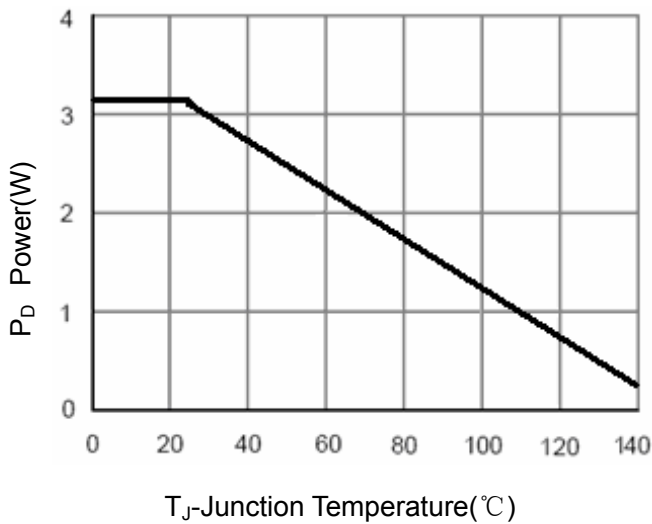


Figure 3 Power Dissipation

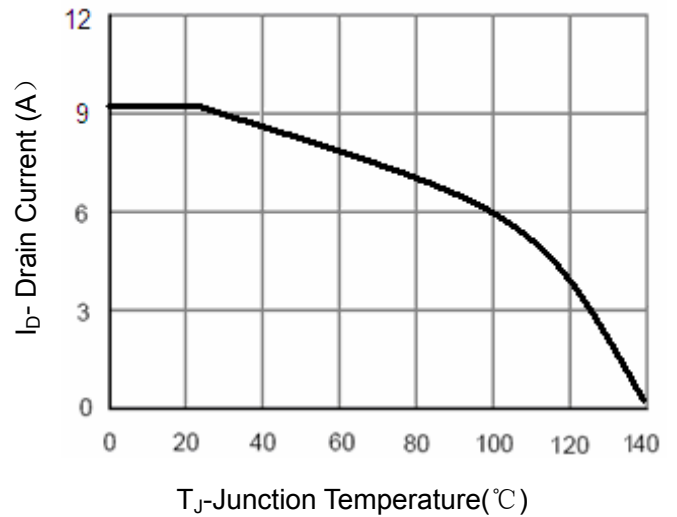


Figure 4 Drain Current

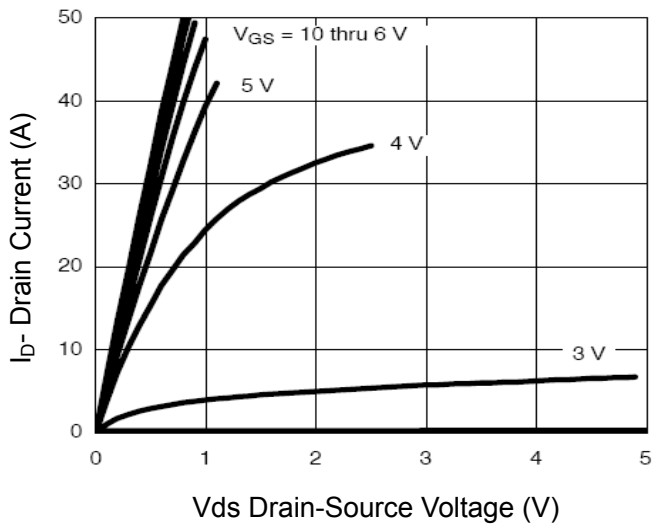


Figure 5 Output Characteristics

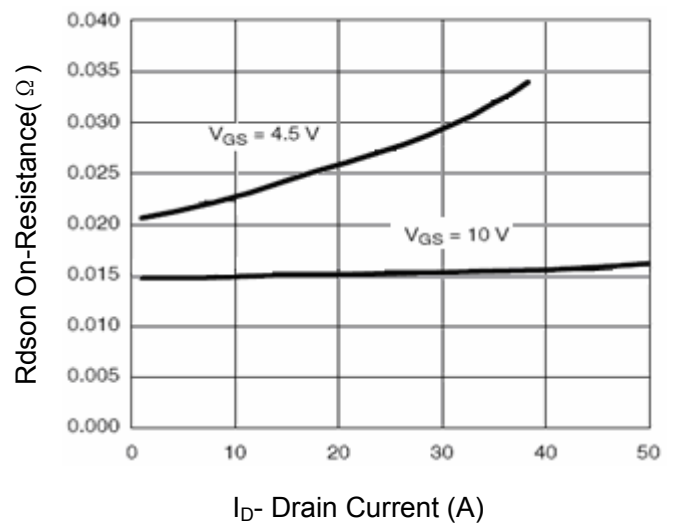


Figure 6 Drain-Source On-Resistance

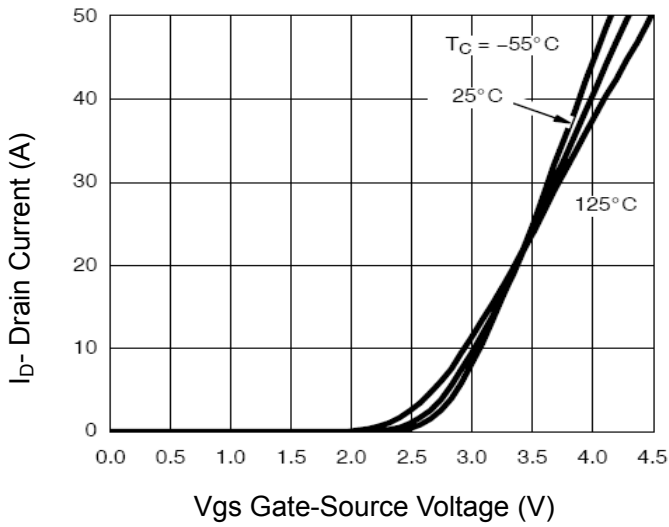


Figure 7 Transfer Characteristics

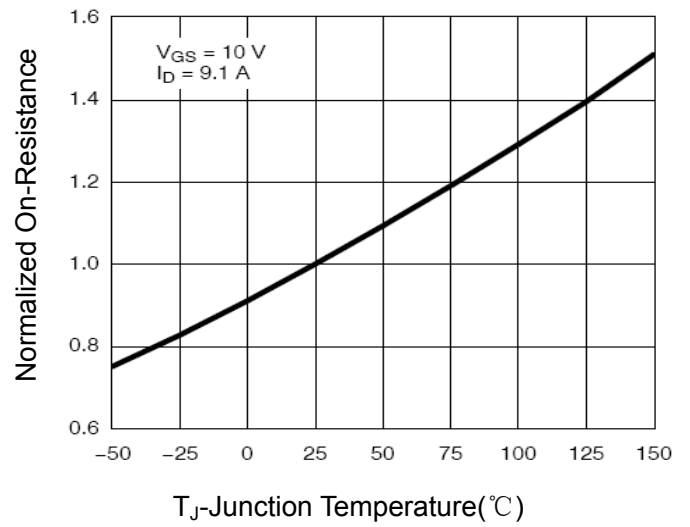


Figure 8 Drain-Source On-Resistance

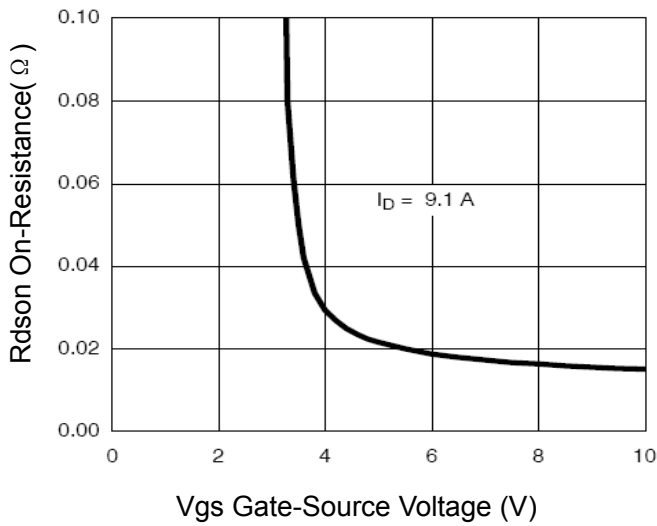


Figure 9 Rdson vs Vgs

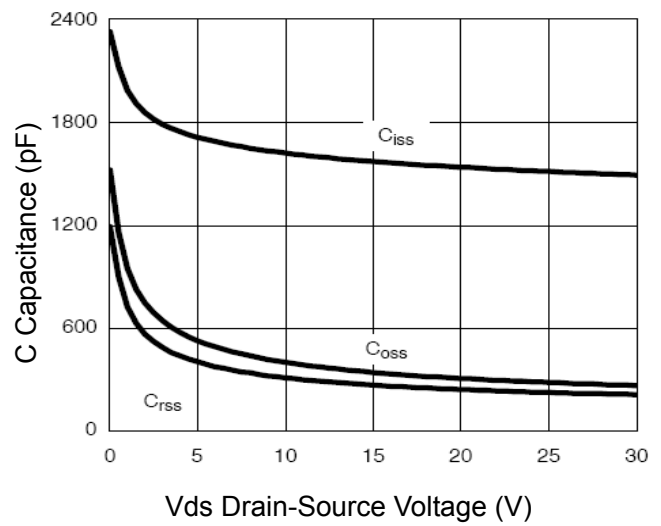


Figure 10 Capacitance vs Vds

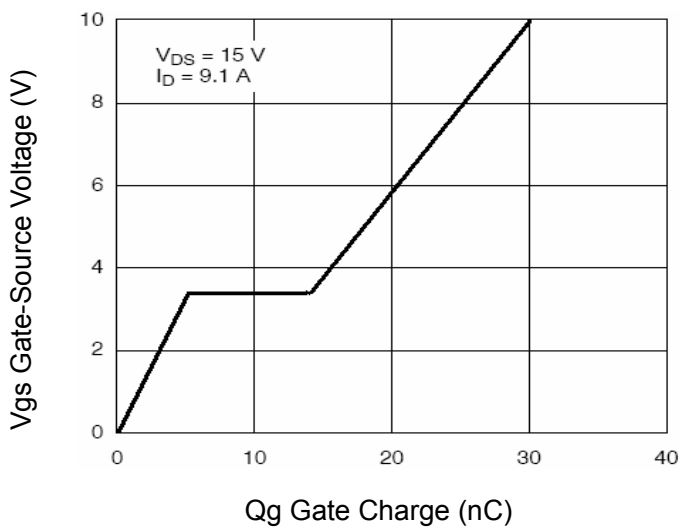


Figure 11 Gate Charge

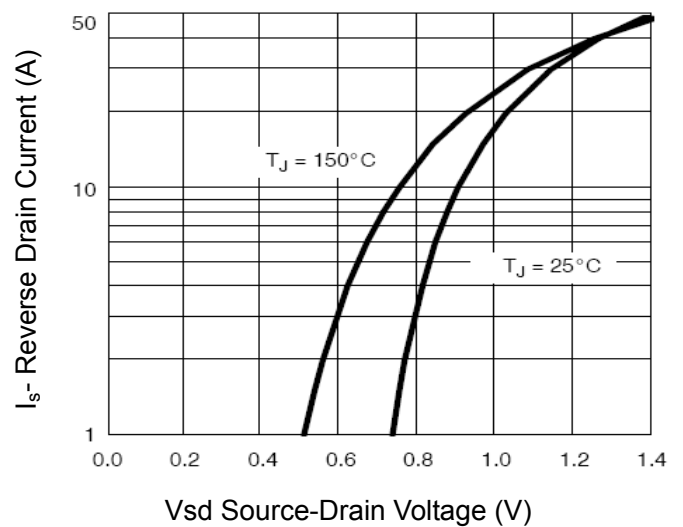


Figure 12 Source- Drain Diode Forward

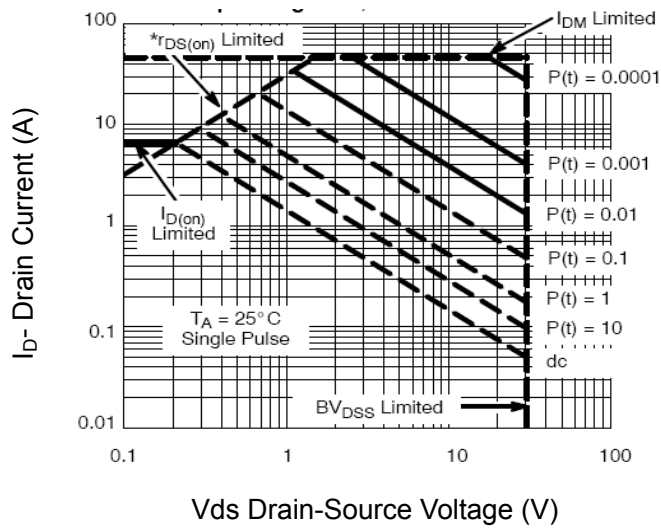


Figure 13 Safe Operation Area

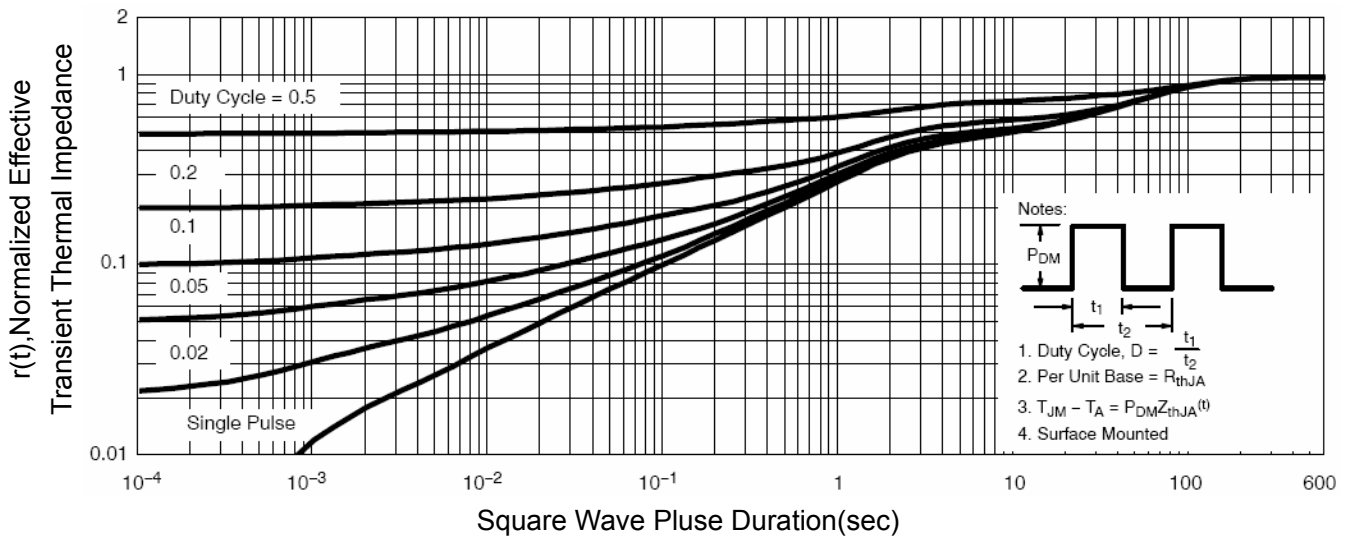
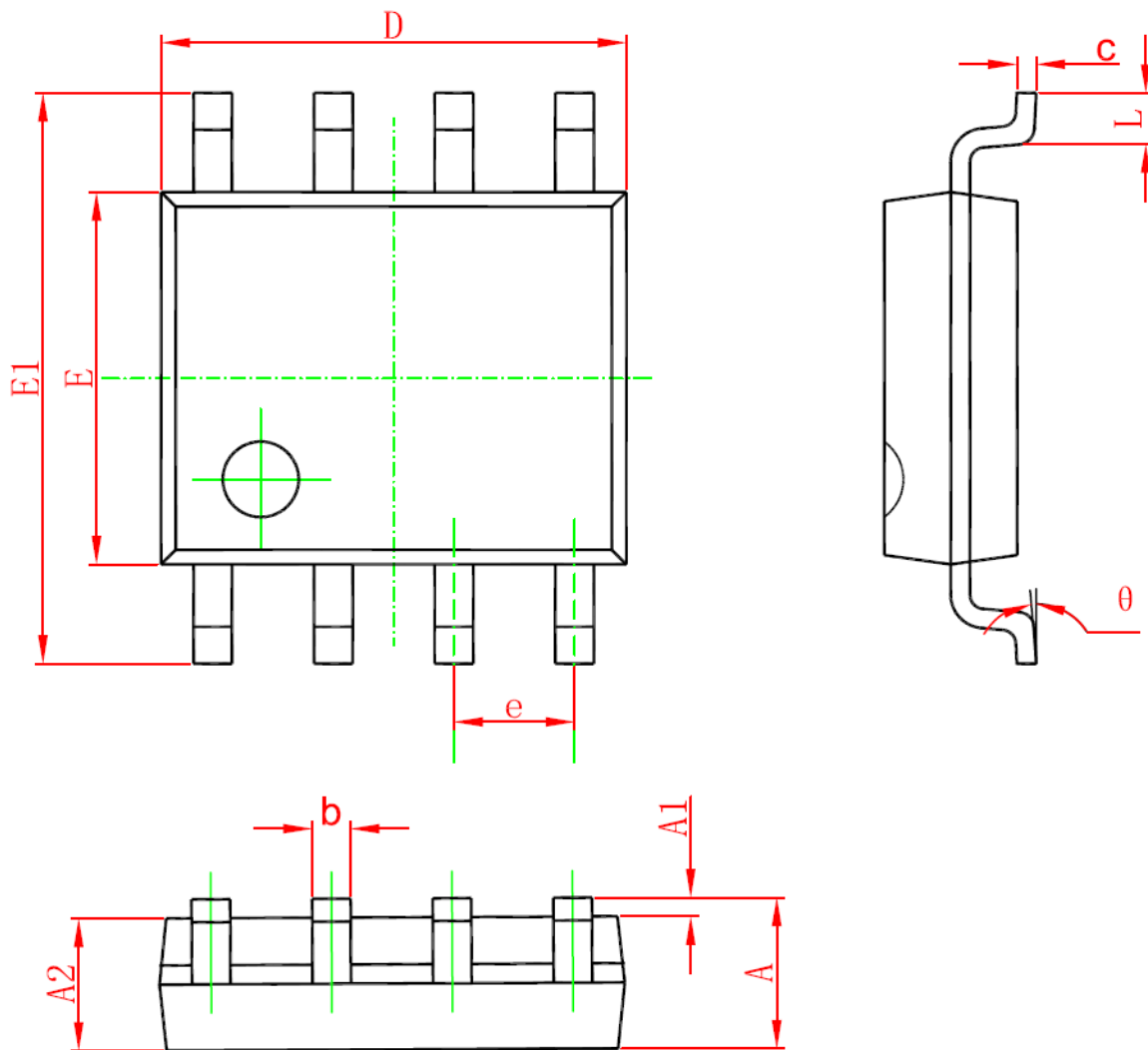


Figure 14 Normalized Maximum Transient Thermal Impedance

SOP-8 Package Information



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.350	1.750	0.053	0.069
A1	0.100	0.250	0.004	0.010
A2	1.350	1.550	0.053	0.061
b	0.330	0.510	0.013	0.020
c	0.170	0.250	0.006	0.010
D	4.700	5.100	0.185	0.200
E	3.800	4.000	0.150	0.157
E1	5.800	6.200	0.228	0.244
e	1.270 (BSC)		0.050 (BSC)	
L	0.400	1.270	0.016	0.050
θ	0°	8°	0°	8°