General Description :

The 8NP04V-D8 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 SOP-8, which accords with the RoHS standard.

	N-Channel	P-Channel	
V_{DSS}	40	-40	V
I_D	8	-8	A
P_D	2	2	W
$R_{DS(ON)type}$	14	26	mΩ

Features :
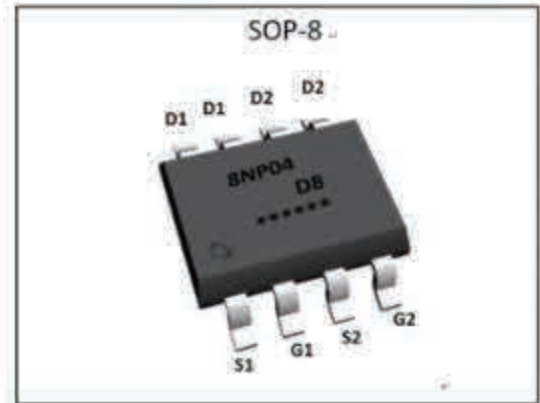
N-Channel :

$R_{DS(ON)}$ <18mΩ @ V_{GS}=10V (Typ14mΩ)

P-Channel :

$R_{DS(ON)}$ <33mΩ @ V_{GS}=10V (Typ26mΩ)

High density cell design for ultra low R_{dson}

Fully characterized avalanche voltage and current

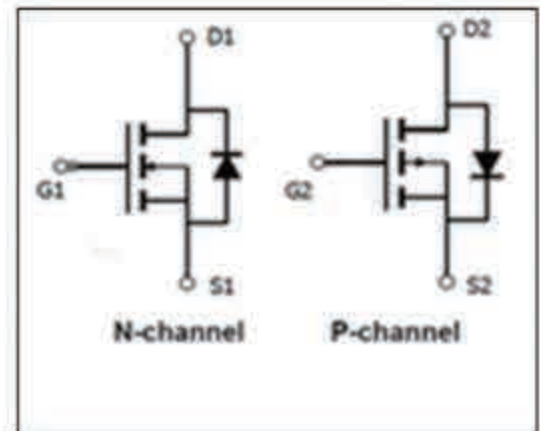Excellent package for good heat dissipation

Applications :

Power switching application

Hard switched and high frequency circuits

Uninterruptible power supply

Absolute (Tc= 25℃ unless otherwise specified) :

Symbol	Parameter	N-Channel	P-Channel	Units
V_{DSS}	Drain-to-Source Voltage	40	-40	V
I_D	Continuous Drain Current	8	-8	A
I_{DM}	Pulsed Drain Current	40	-40	A
V_{GS}	Gate-to-Source Voltage	±20	±20	V
P_D	Power Dissipation	2	2	W
T_j , T_{stg}	Operating Junction and Storage Temperature Range	−55 to 150	−55 to 150	℃

N-CH Electrical Characteristics (Tc= 25℃ unless otherwise specified) :

OFF Characteristics							
Symbol	Parameter	Test Conditions	Rating		Units		
			Min.	Typ.		Max.	
V_{DSS}	Drain to Source Breakdown Voltage	V_{GS}=0V, I_D=250μA	40	--		--	V
I_{DSS}	Drain to Source Leakage Current	V_{DS}=40V, V_{GS}= 0 V,T_a=25℃	--	--		1.0	μA
$I_{GSS(F)}$	Gate to Source Forward Leakage	V_{GS}=+10V	--	--		0.1	μA
$I_{GSS(R)}$	Gate to Source Reverse Leakage	V_{GS}=-10V	--	--		-0.1	μA

ON Characteristics[a3]

Symbol	Parameter	Test Conditions	Rating	Units		
			Min.	Typ.	Max.	
$R_{DS(ON)}$	Drain-to-Source On-Resistance	$V_{GS}=10V, I_D=8A$	--	14	18	$m\Omega$
$V_{GS(TH)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_D=250 \mu A$	1.0	1.5	2.0	V
Pulse width tp≤380μs,δ≤2%						

Dynamic Characteristics[a4]

Symbol	Parameter	Test Conditions	Rating	Units		
			Min.	Typ.	Max.	
g_{fs}	Forward Transconductance	$V_{DS}=5V, I_D=8A$	30	--	--	S
C_{iss}	Input Capacitance	$V_{GS}=0V, V_{DS}=20V$ $f=1.0MHz$	--	415	--	pF
C_{oss}	Output Capacitance		--	115	--	
C_{rss}	Reverse Transfer Capacitance		--	11	--	

Resistive Switching Characteristics[a4]			Rating	Units		
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	
$t_{d(ON)}$	Turn-on Delay Time	$V_{DD}=15V$, $R_L=2.5\Omega$ $V_{GS}=10V$, $R_G=3\Omega$	--	4.5	--	ns
tr	Rise Time		--	3.0	--	
$t_{d(OFF)}$	Turn-Off Delay Time		--	14.5	--	
t_f	Fall Time		--	3.0	--	
Q_g	Total Gate Charge	$V_{DD}=20V$, $I_D=8A$ $V_{GS}=10V$	--	12	--	nC
Q_{gs}	Gate to Source Charge		--	3.2	--	
Q_{gd}	Gate to Drain ("Miller")Charge		--	3.1	--	

Source-Drain Diode Characteristics			Rating	Units		
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	
I_S	Continuous Source Current [a2](Body Diode)		--	--	6	A
V_{SD}	Diode Forward Voltage[a3]	$I_S=6A$, $V_{GS}=0V$	--	--	1.2	V

P-CH Electrical Characteristics (Tc= 25℃ unless otherwise specified) :

OFF Characteristics							
Symbol	Parameter	Test Conditions	Rating		Units		
			Min.	Typ.		Max.	
V_{DSS}	Drain to Source Breakdown Voltage	V_{GS}=0V, I_D=250μA	-40	--		--	V
I_{DSS}	Drain to Source Leakage Current	V_{DS}=-40V, V_{GS}= 0 V,T_a=25℃	--	--		-1.0	μA
$I_{GSS(F)}$	Gate to Source Forward Leakage	V_{GS}=+10V	--	--		-0.1	μA
$I_{GSS(R)}$	Gate to Source Reverse Leakage	V_{GS}=-10V	--	--		0.1	μA

ON Characteristics^{a3}							
Symbol	Parameter	Test Conditions	Rating		Units		
			Min.	Typ.		Max.	
$R_{DS(ON)}$	Drain-to-Source On-Resistance	V_{GS}=-10V,I_D=-5 A	--	32		36	mΩ
$V_{GS(TH)}$	Gate Threshold Voltage	V_{DS}=V_{GS},I_D=-250μA	-1.0	-1.5		-2.0	V
Pulse width tp≤380μs,δ≤2%							

Dynamic Characteristics[a4]						
Symbol	Parameter	Test Conditions	Rating	Units		
			Min.	Typ.	Max.	
g_{fs}	Forward Transconductance	$V_{DS}=-5V, I_D=-5A$	10	--	--	S
C_{iss}	Input Capacitance	$V_{GS}=0V, V_{DS}=-20V$ $f=1.0MHz$	--	940	--	pF
C_{oss}	Output Capacitance		--	97	--	
C_{rss}	Reverse Transfer Capacitance		--	72	--	

Resistive Switching Characteristics[a4]						
Symbol	Parameter	Test Conditions	Rating	Units		
			Min.	Typ.	Max.	
$t_{d(ON)}$	Turn-on Delay Time	$V_{DD}=-20V, R_L=2.3\Omega$ $V_{GS}=-10V, R_G=6\Omega$	--	6.2	--	ns
tr	Rise Time		--	8.4	--	
$t_{d(OFF)}$	Turn-Off Delay Time		--	44.8	--	
t_f	Fall Time		--	16	--	
Q_g	Total Gate Charge	$V_{DD}=-20V, I_D=-5A$ $V_{GS}=-10V$	--	17	--	nC
Q_{gs}	Gate to Source Charge		--	3.4	--	
Q_{gd}	Gate to Drain ("Miller")Charge		--	3.2	--	

Source-Drain Diode Characteristics						
Symbol	Parameter	Test Conditions	Rating	Units		
			Min.	Typ.	Max.	
I_S	Continuous Source Current [a2] (Body Diode)		--	--	-6	A
V_{SD}	Diode Forward Voltage[a3]	I_S=-6A,V_{GS}=0V	--	--	-1.2	V

Symbol	Parameter	Typ.	Units
$R_{\theta JA}$	Junction-to-Case[a2],N-Ch	62.5	°C/W
$R_{\theta JA}$	Junction-to-Case[a2],P-Ch	62.5	

[a1] : Repetitive Rating: Pulse width limited by maximum junction temperature.

[a2] : Surface Mounted on FR4 Board, t≤10sec.

[a3] : Pulse Test: Pulse Width≤300μs, Duty Cycle≤2%.

[a4] : Guaranteed by design, not subject to production

N-Channel Characteristics Curve :
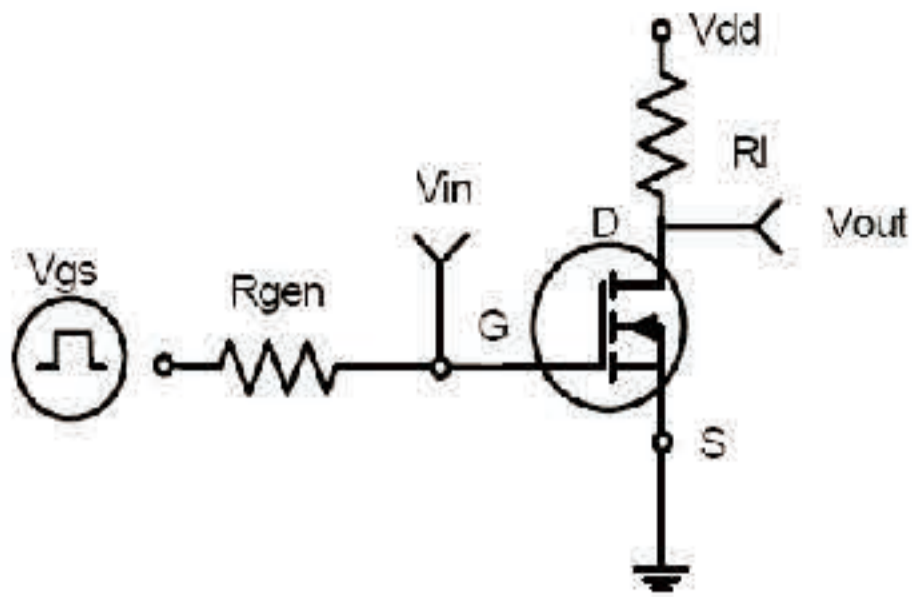
Figure 1:Switching Test Circuit
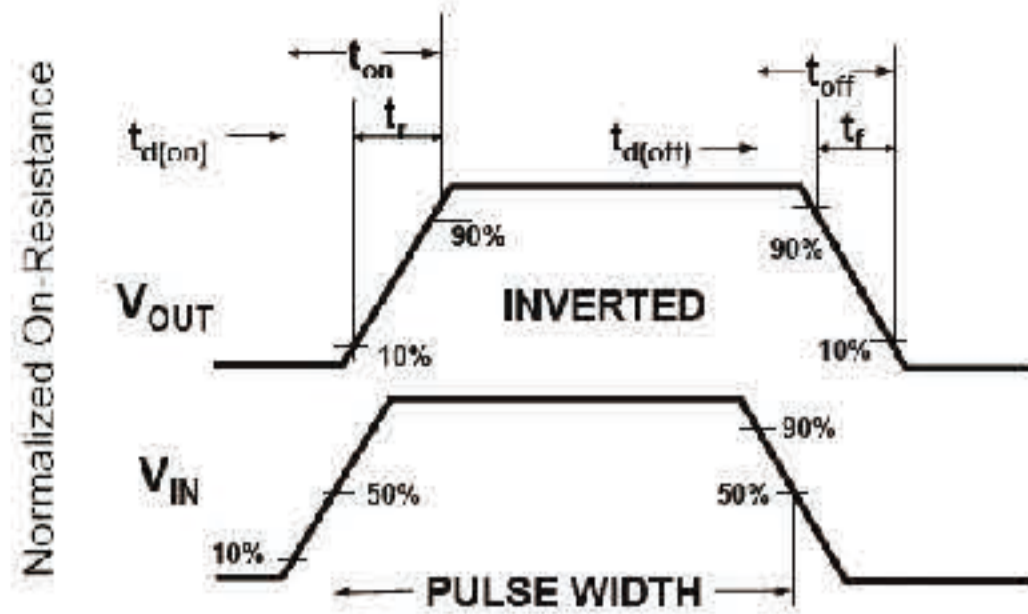
Figure 2:Switching Waveforms
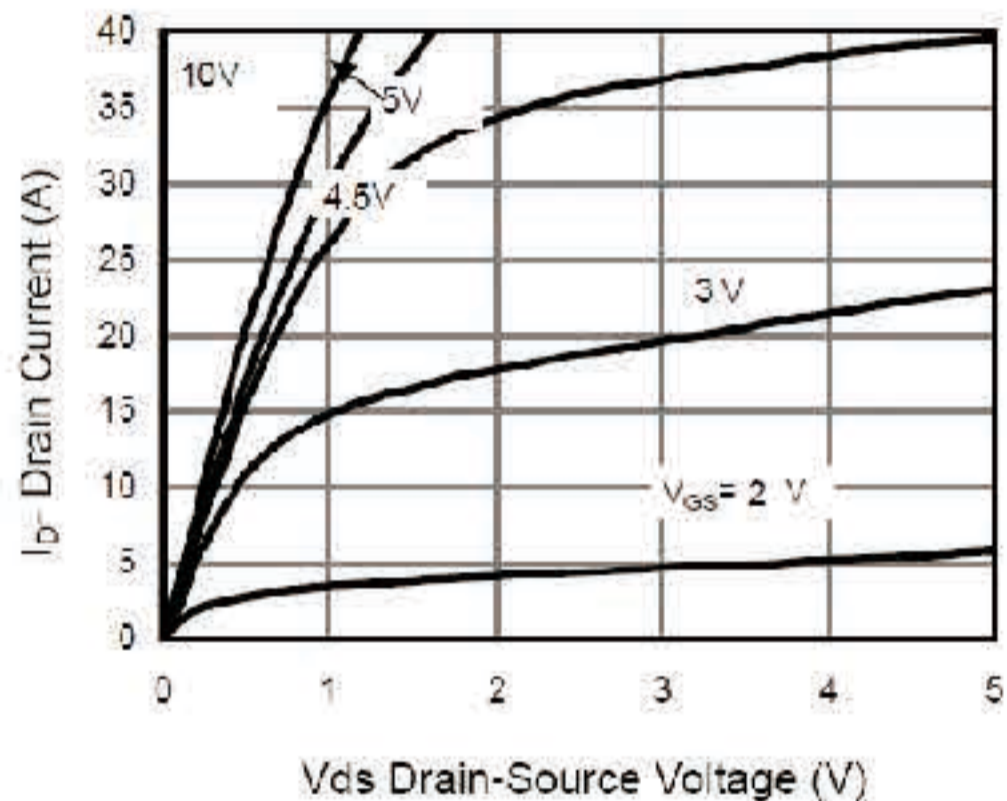
Figure 3 Output Characteristics
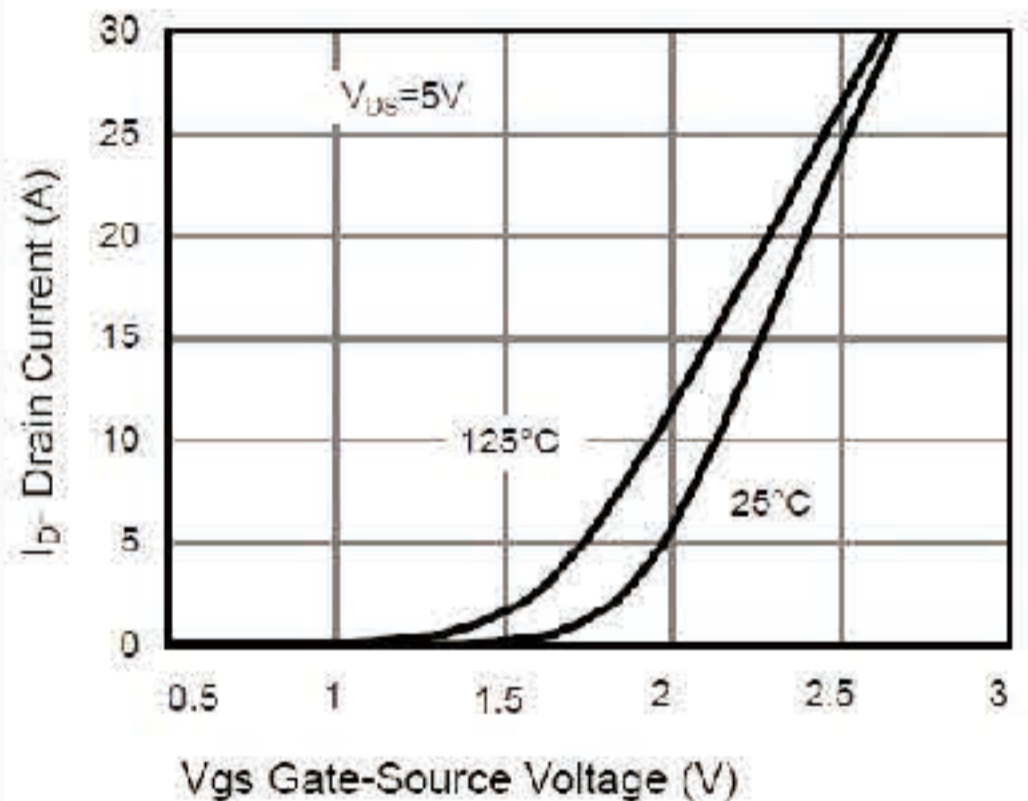
Figure 4 Transfer Characteristics
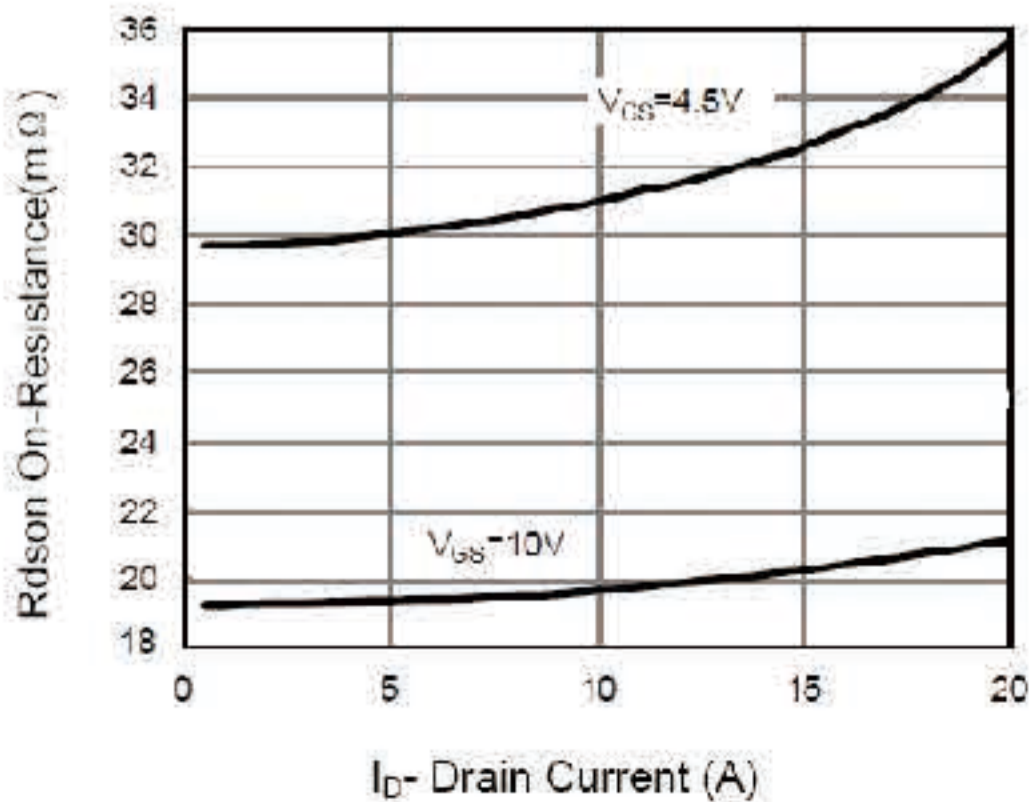
Figure 5 Drain-Source On-Resistance
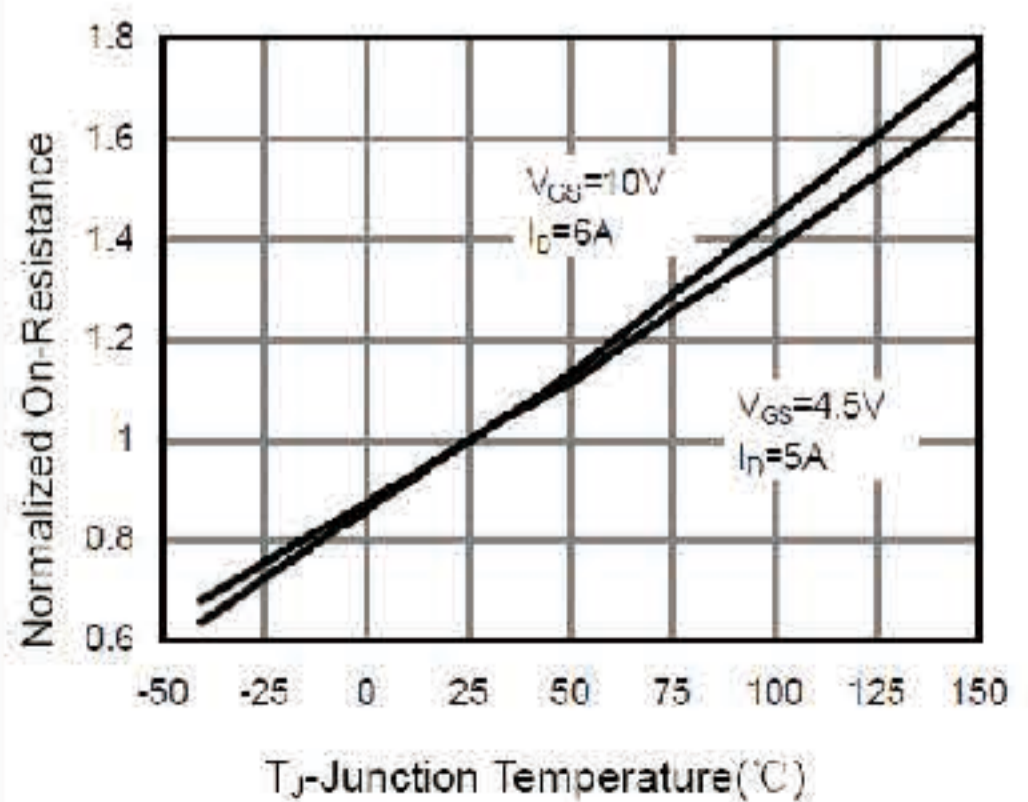
Figure 6 Drain-Source On-Resistance
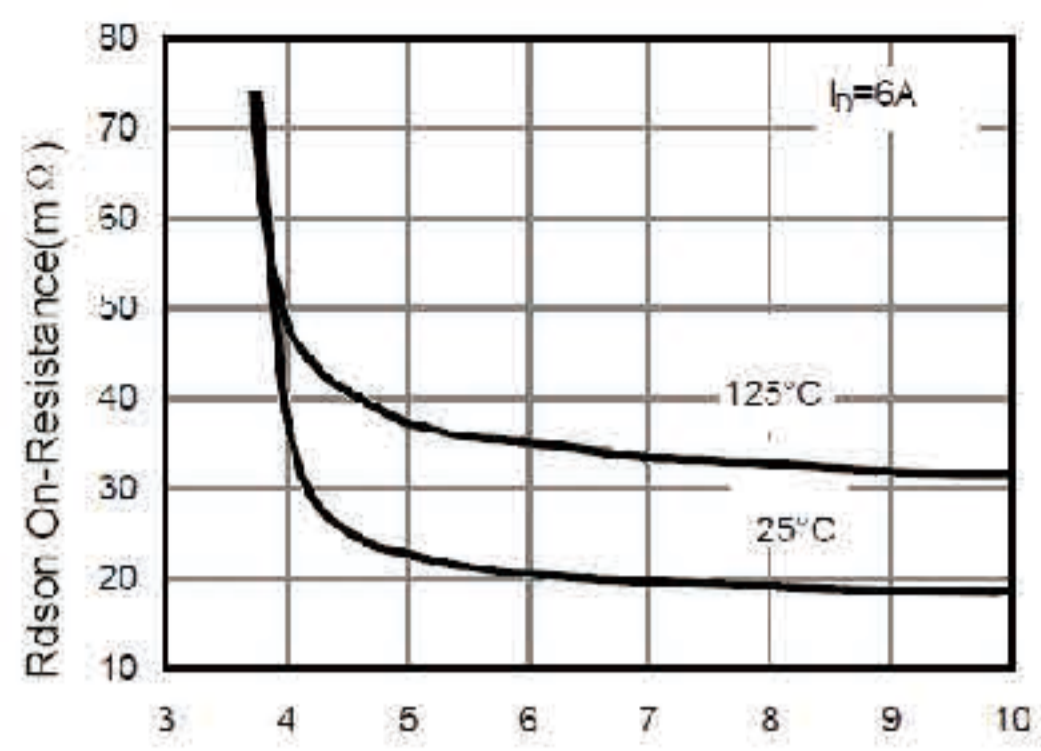
Vgs Gate-Source Voltage (V)

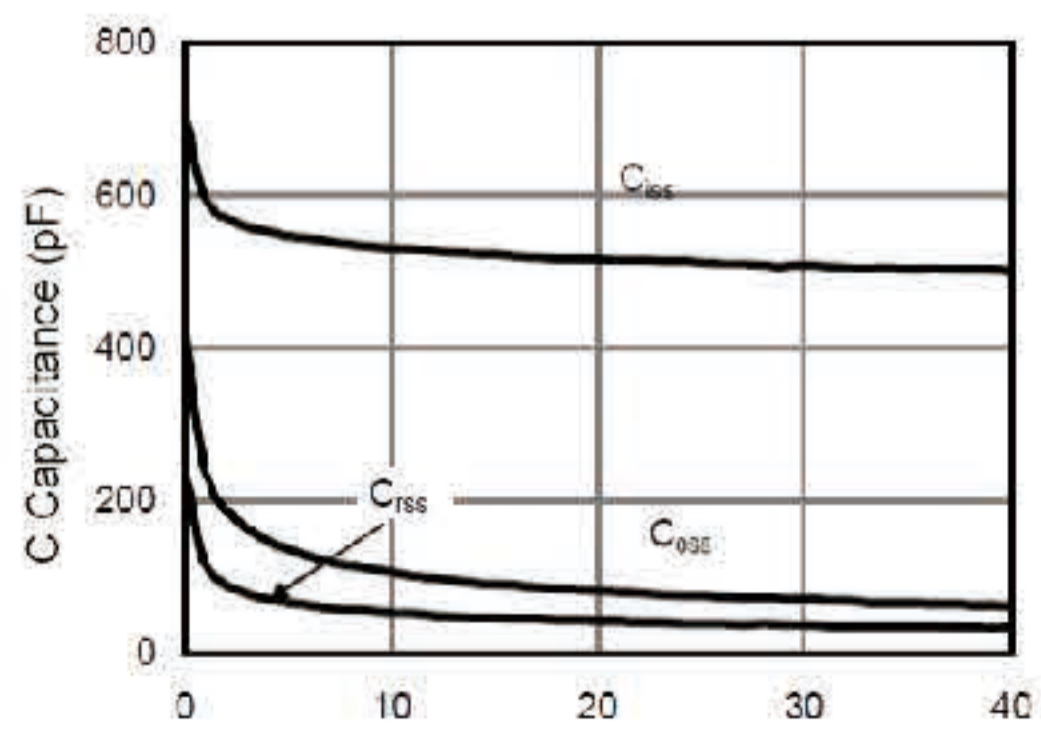**Figure7 Rdson vs Vgs**
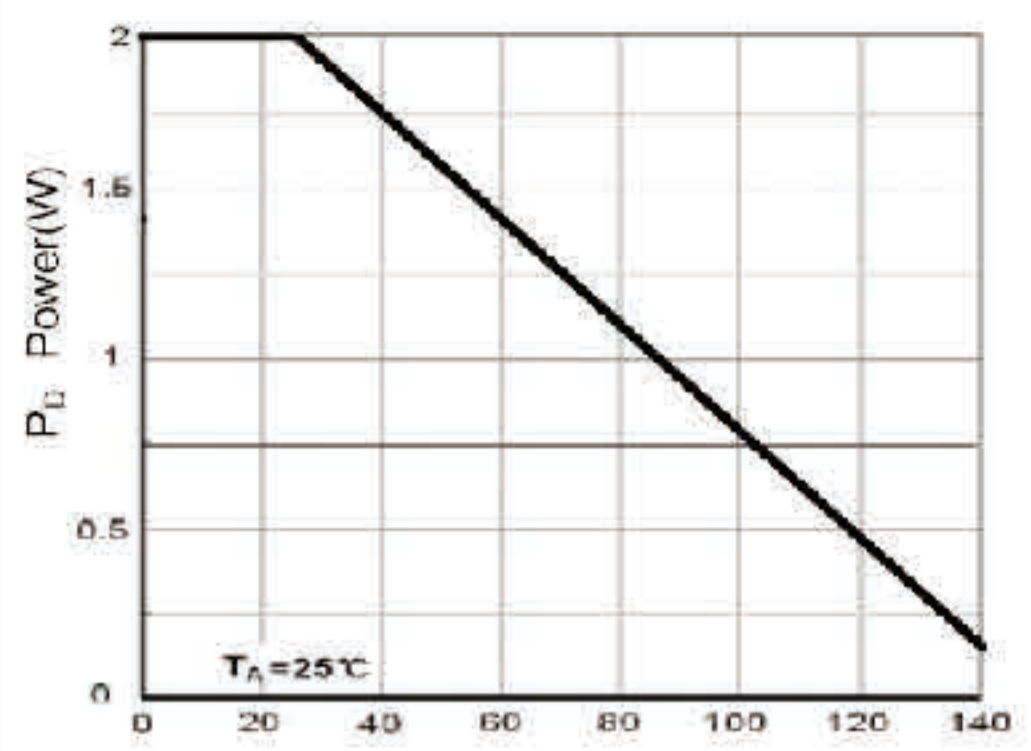
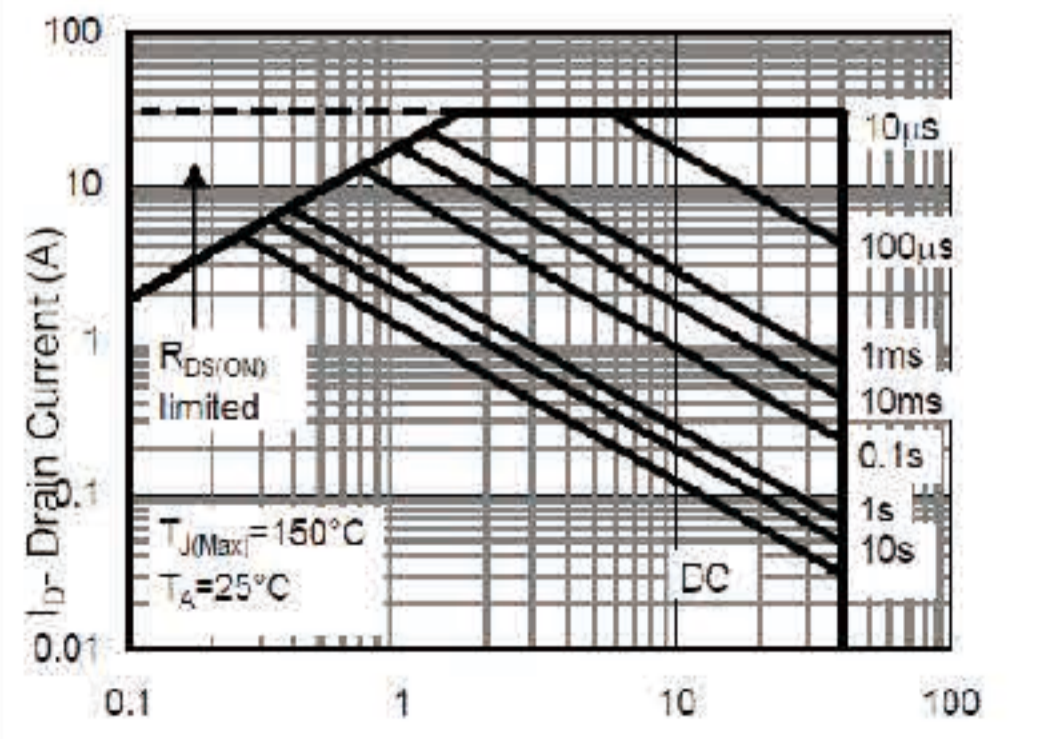T_J-Junction Temperature(℃)

Figure 8 Power Dissipation
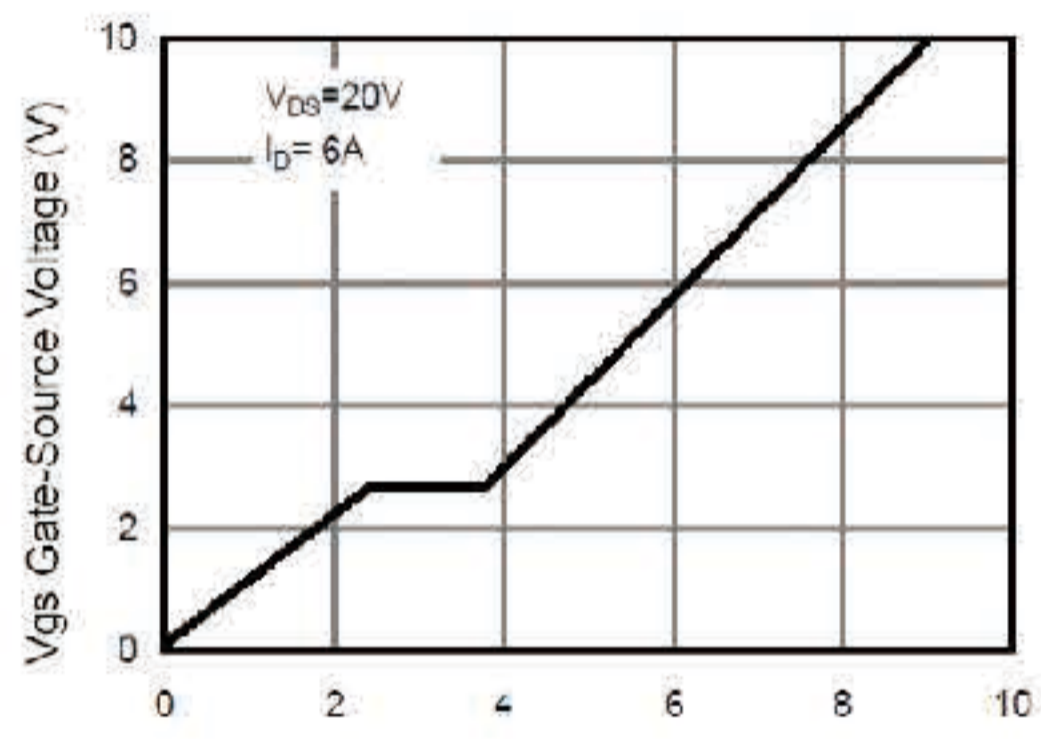
Qg Gate Charge (nC)

Figure 9 Gate Charge
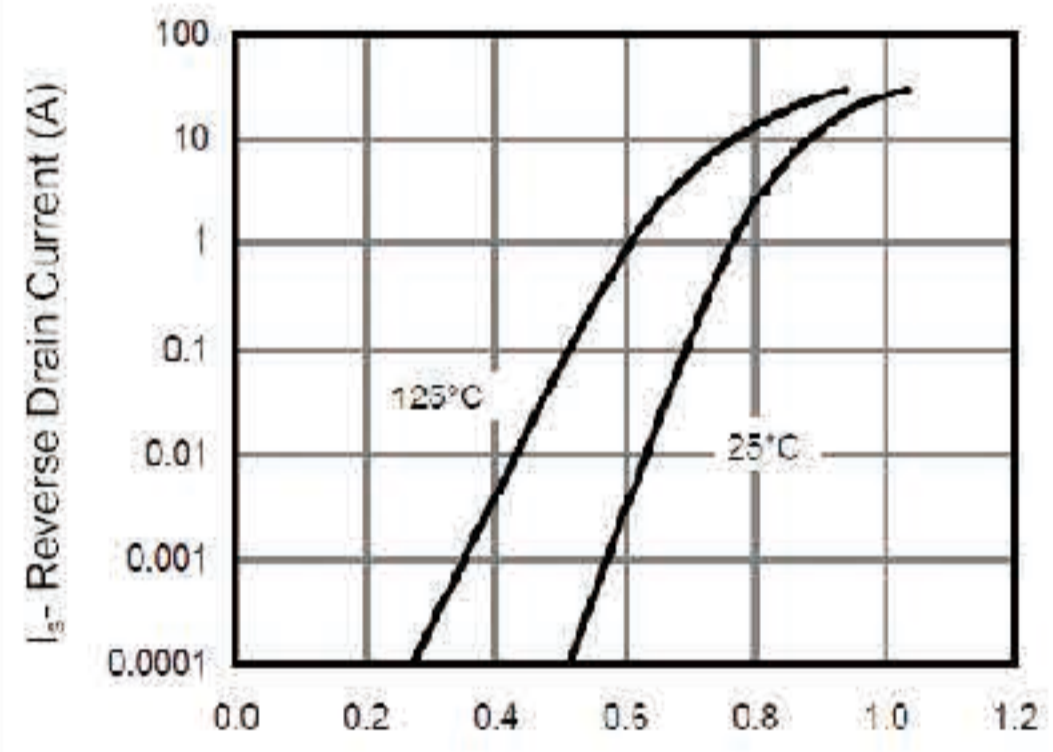
Vds Drain-Source Voltage (V)

Figure 10 Source- Drain Diode Forward

Vds Drain-Source Voltage (V)

Figure 11 Capacitance vs Vds

Vds Drain-Source Voltage (V)

Figure 12 Safe Operation Area
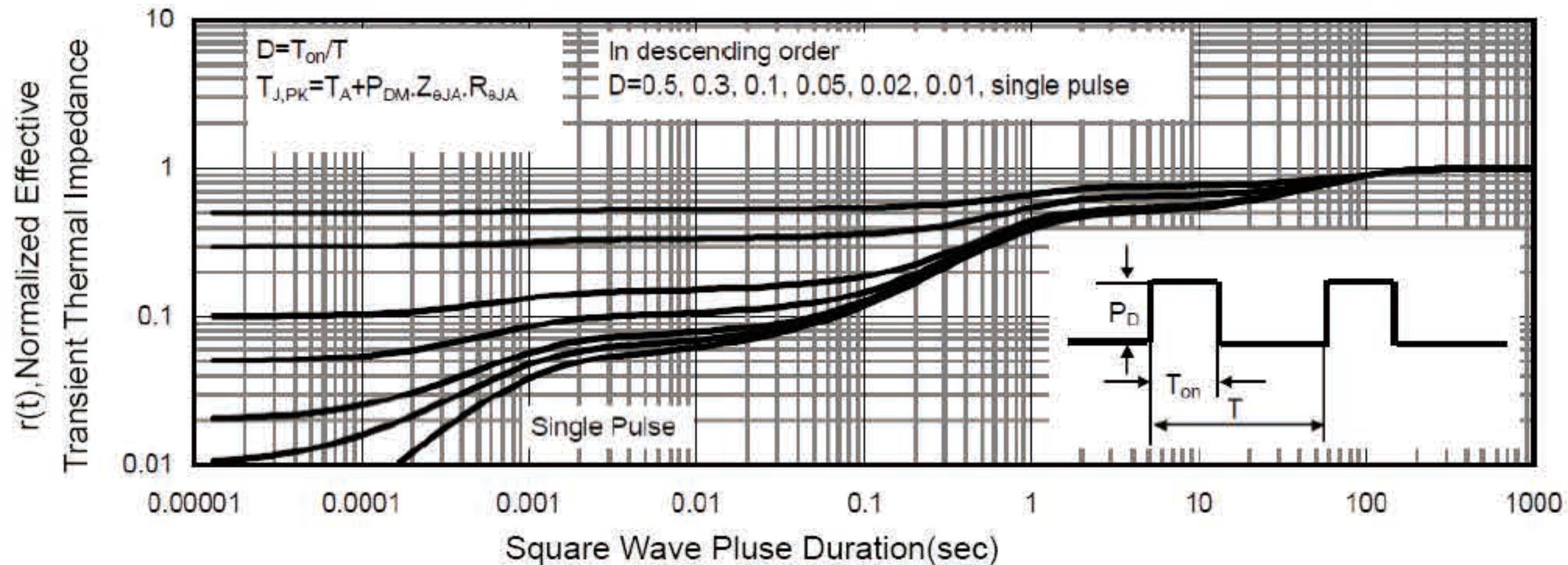
Figure 13 Normalized Maximum Transient Thermal Impedance

P-Channel Characteristics Curve :
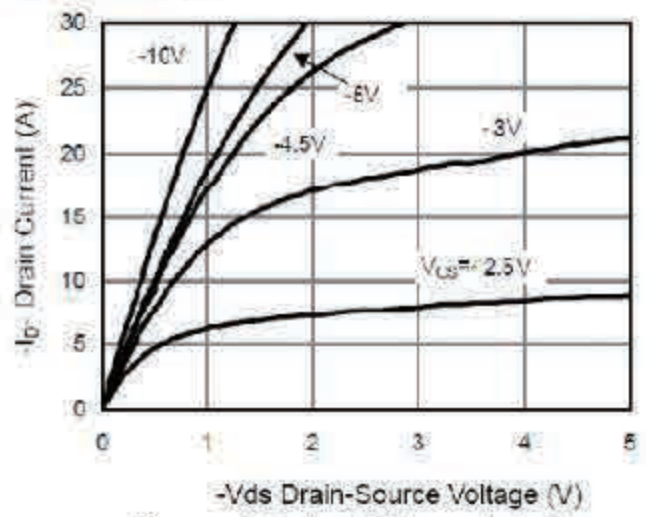
Figure 1 Output Characteristics
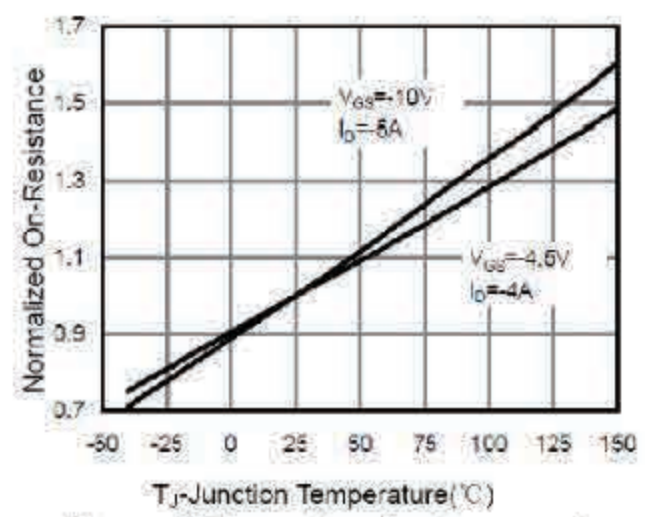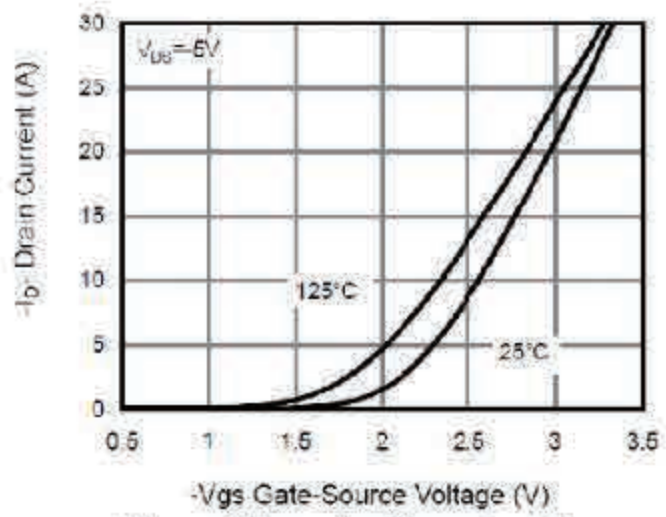

Figure 4 Rdson-Junction Temperature

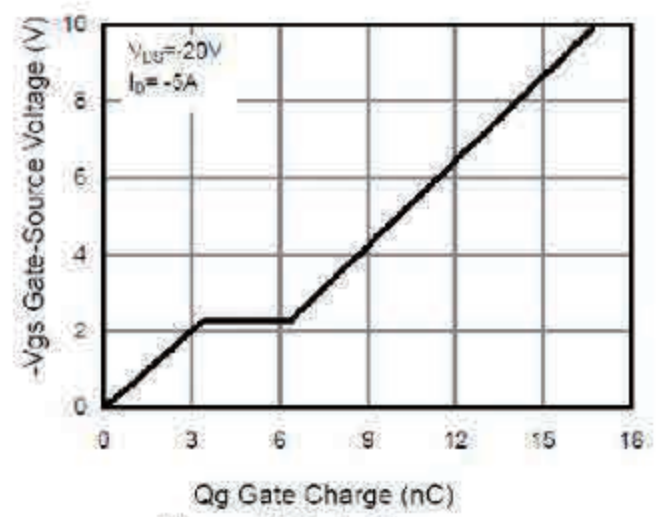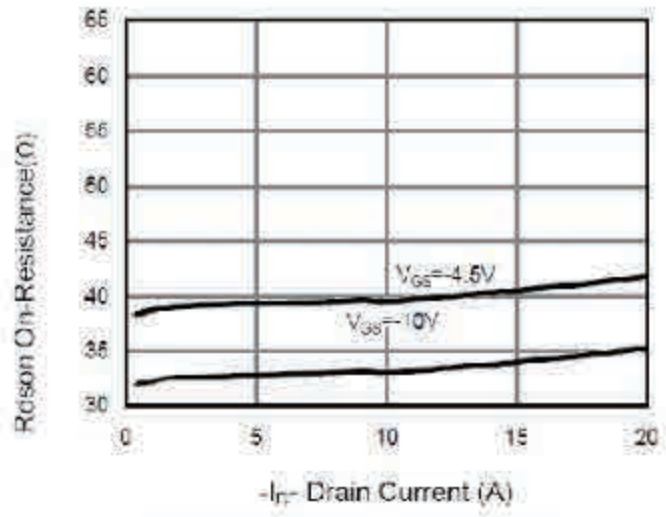**Figure 2 Transfer Characteristics**

Figure 5 Gate Charge

Figure 3 Rdson- Drain Current
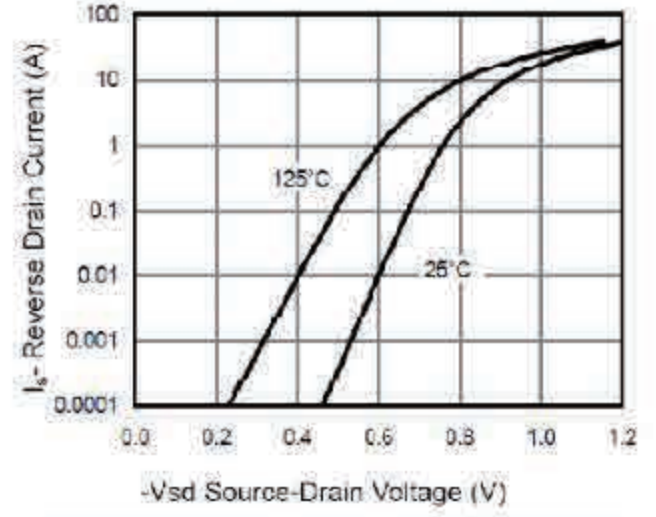
Figure 6 Source- Drain Diode Forward
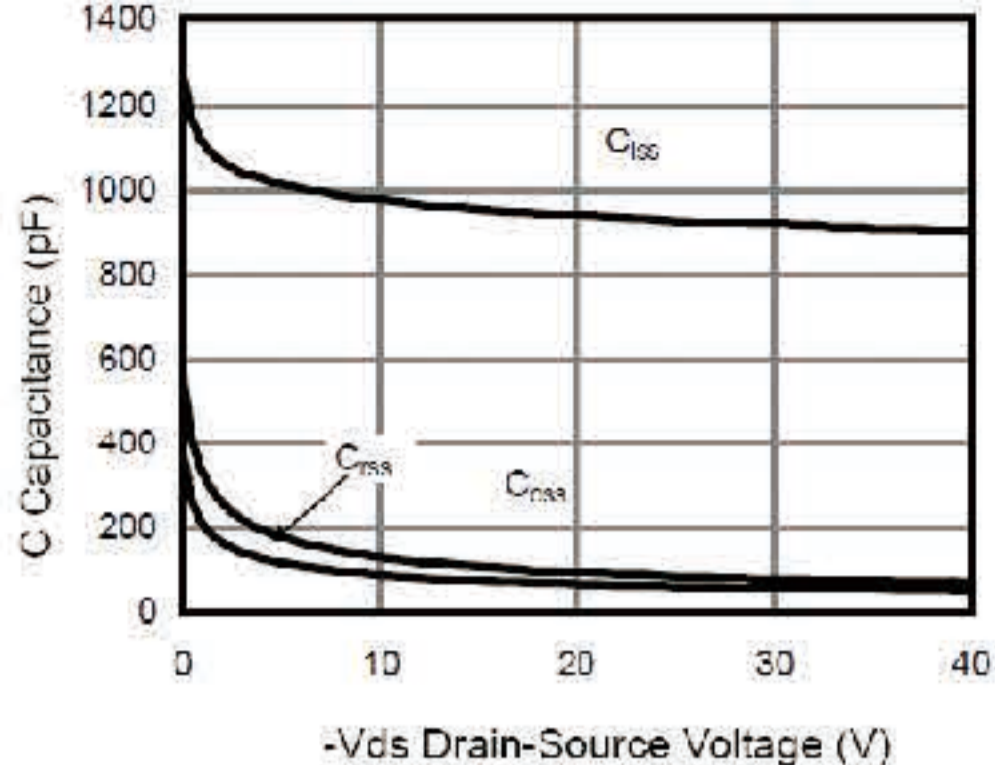
Figure 7 Capacitance vs Vds

C Capacitance (pF)

C_{iss}

C_{rss} C_{oss}

-Vds Drain-Source Voltage (V)
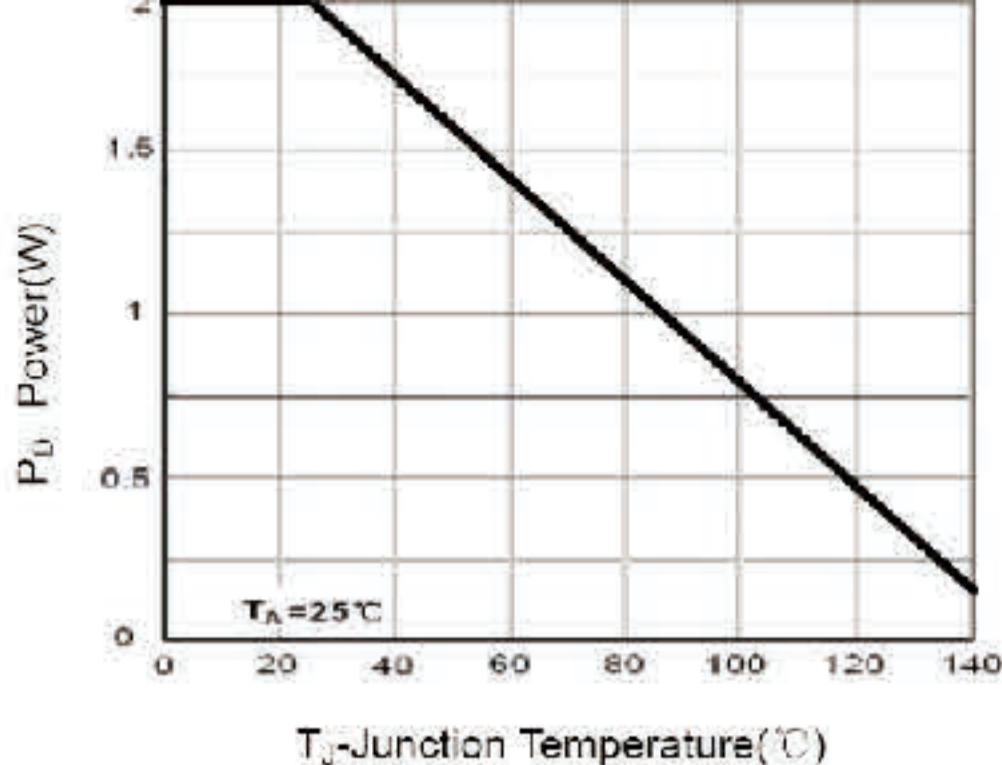
Figure 9 Power Dissipation

P_D Power(W)

$T_A = 25°C$

T_J-Junction Temperature(°C)
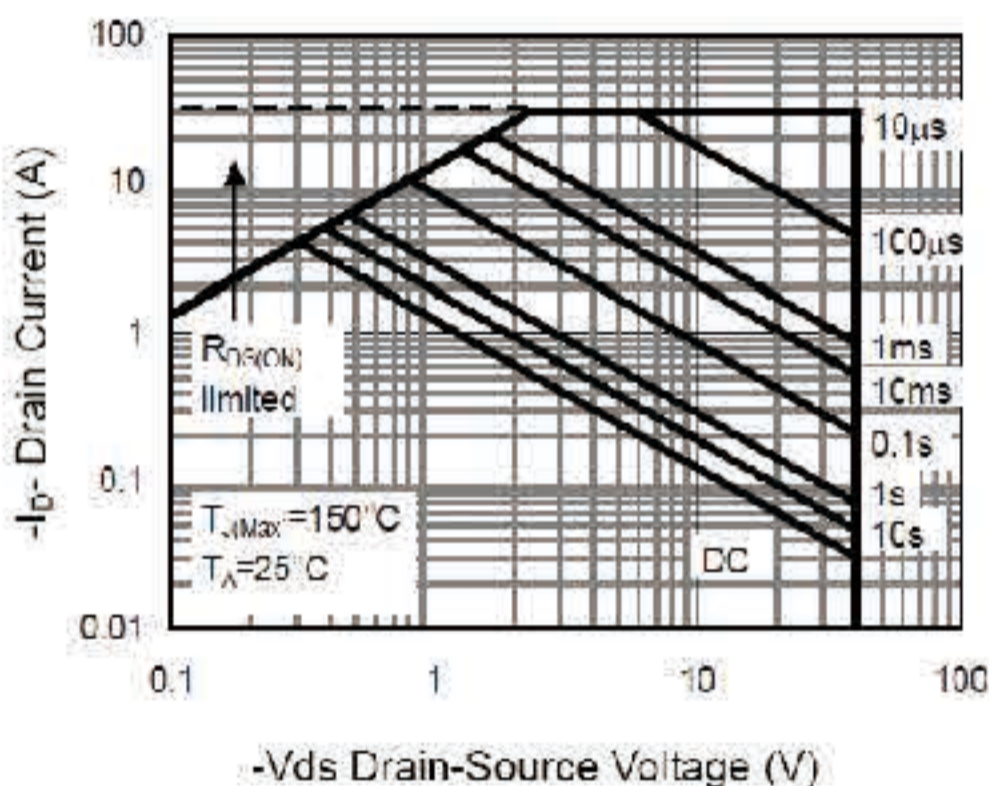
Figure 8 Safe Operation Area

-I_D- Drain Current (A)

$R_{DS(ON)}$ limited

10µs
100µs
1ms
10ms
0.1s
1s
10s
DC

$T_{JMax} = 150°C$
$T_A = 25°C$

-Vds Drain-Source Voltage (V)
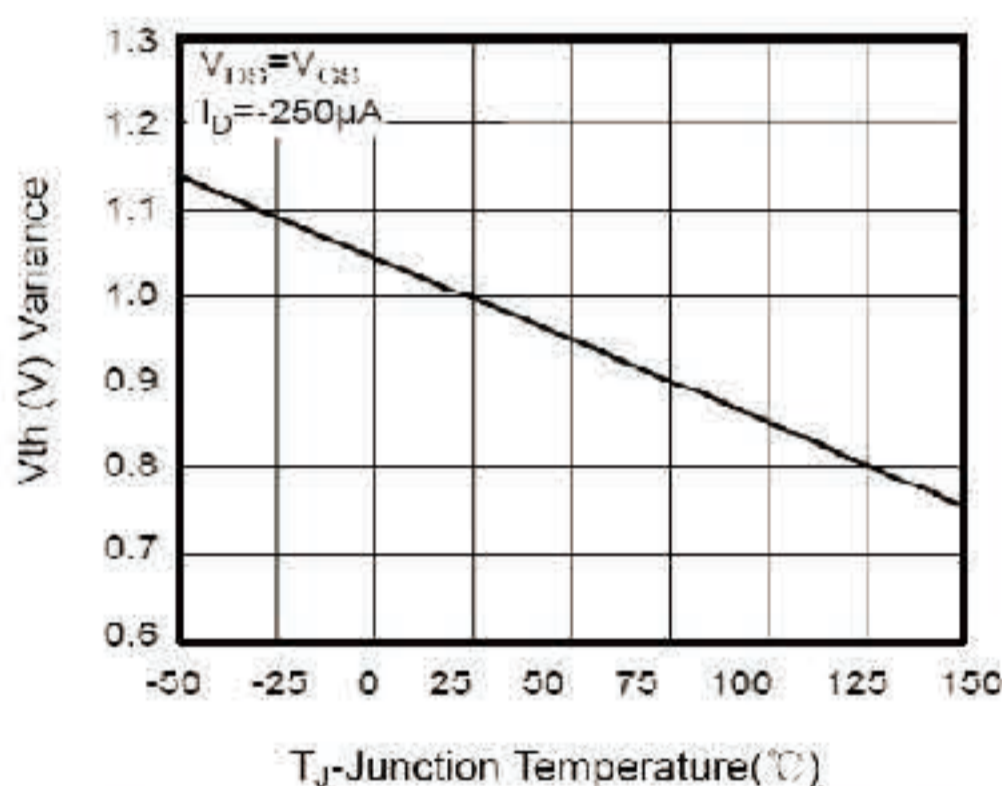
Figure 10 $V_{GS(th)}$ vs Junction Temperature

Vth (V) Variance

$V_{DS} = V_{GS}$
$I_D = -250µA$
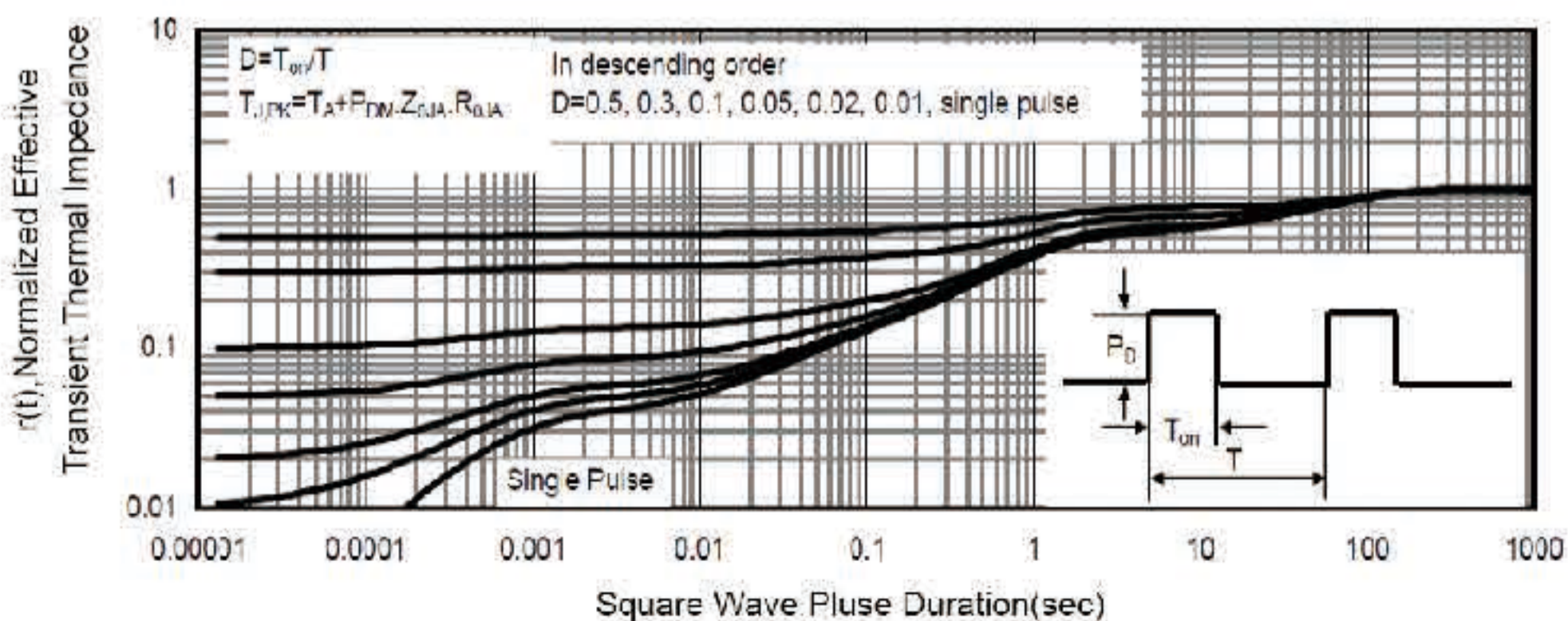
T_J-Junction Temperature(°C)

Figure 11 Normalized Maximum Transient Thermal Impedance

r(t), Normalized Effective Transient Thermal Impedance

$D = T_{on}/T$
$T_{JPK} = T_A + P_{DM} \cdot Z_{\theta JA} \cdot R_{\theta JA}$

In descending order
D=0.5, 0.3, 0.1, 0.05, 0.02, 0.01, single pulse

Single Pulse

P_D
T_{on}
T

Square Wave Pluse Duration(sec)