

NCE N-Channel and P-Channel Enhancement Mode Power MOSFET

Description

The NCE01NP03S uses advanced trench technology to provide excellent $R_{DS(ON)}$ and low gate charge. This device is suitable for use in inverter and other applications.

General Features**N-channel**

- $V_{DS} = 100V, I_D = 3A$

$$R_{DS(ON)} < 130m\Omega @ V_{GS}=10V$$

$$R_{DS(ON)} < 140m\Omega @ V_{GS}=4.5V$$

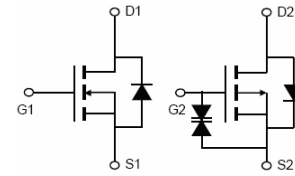
P-channel

- $V_{DS} = -100V, I_D = -3A$

$$R_{DS(ON)} < 200m\Omega @ V_{GS}=-10V$$

$$R_{DS(ON)} < 230m\Omega @ V_{GS}=-4.5V$$

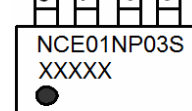
- High Power and current handing capability
- Lead free product is acquired



Schematic diagram

D1 D1 D2 D2

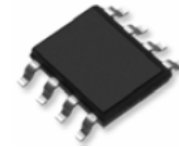
8 7 6 5

NCE01NP03S
XXXXX

1 2 3 4

S1 G1 S2 G2

Pin assignment



SOP-8 top view

Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
NCE01NP03S	NCE01NP03S	SOP-8	Ø330mm	12mm	4000 units

Absolute Maximum Ratings ($T_C=25^\circ\text{C}$ 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
Drain Current-Continuous (Note 2)	I_D	$T_A=25^\circ\text{C}$	3	-3
		$T_A=70^\circ\text{C}$	2.45	-2.45
Drain Current -Pulsed (Note 1)	I_{DM}	12	-12	A
Power Dissipation	P_D	2	2	W
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-55 To 150	-55 To 150	$^\circ\text{C}$

Thermal Characteristic

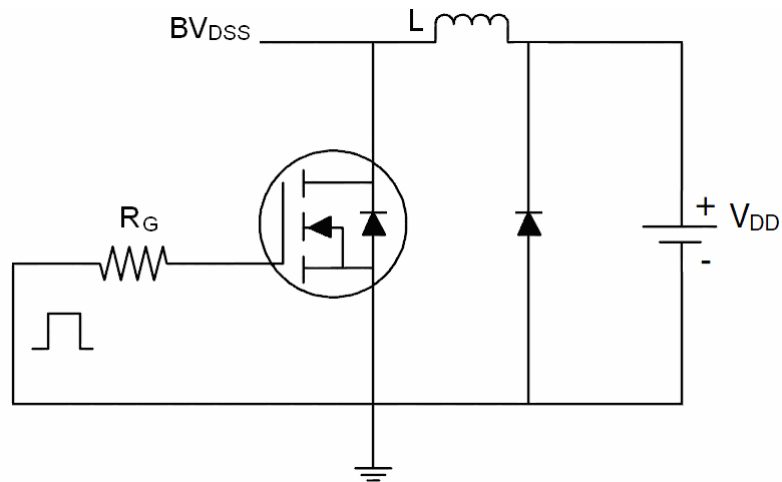
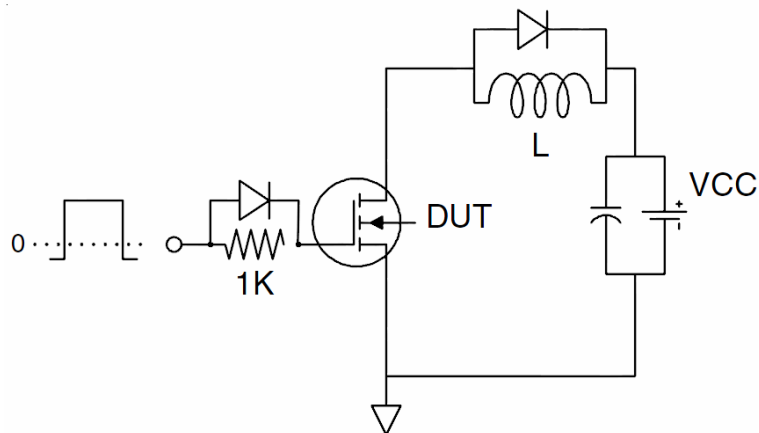
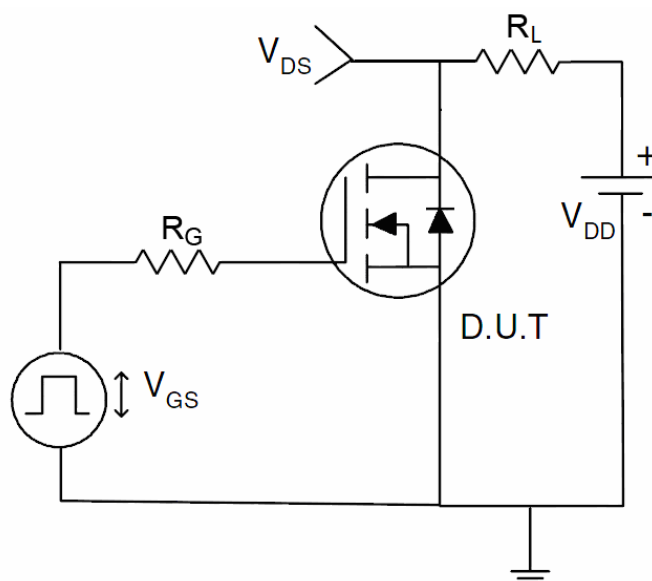
Parameter	Symbol	Typ	Max	Unit
Thermal Resistance, Junction-to-Ambient (Note 2) (N-channel)	$R_{\theta JA}$	-	62.5	$^\circ\text{C/W}$
Thermal Resistance, Junction-to-Ambient (Note 2) (P-channel)	$R_{\theta JA}$	-	62.5	$^\circ\text{C/W}$

N-channel Electrical Characteristics (T_C=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	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} =±20V, V _{DS} =0V	-	-	±100	nA
On Characteristics (Note 3)						
Gate Threshold Voltage	V _{GS(th)}	V _{DS} =V _{GS} , I _D =250μA	1.0	1.5	2.0	V
Drain-Source On-State Resistance	R _{DS(ON)}	V _{GS} =10V, I _D =3A	-	95	130	mΩ
		V _{GS} =4.5V, I _D =3A		100	140	
Forward Transconductance	g _{FS}	V _{DS} =5V, I _D =3A	3.5	-	-	S
Dynamic Characteristics (Note4)						
Input Capacitance	C _{iss}	V _{DS} =50V, V _{GS} =0V, F=1.0MHz	-	730	-	PF
Output Capacitance	C _{oss}		-	37	-	PF
Reverse Transfer Capacitance	C _{rss}		-	27	-	PF
Switching Characteristics (Note 4)						
Turn-on Delay Time	t _{d(on)}	V _{DD} =50V, R _L =15Ω V _{GS} =10V, R _G =2.5Ω	-	11	-	nS
Turn-on Rise Time	t _r		-	7.4	-	nS
Turn-Off Delay Time	t _{d(off)}		-	35	-	nS
Turn-Off Fall Time	t _f		-	9.1	-	nS
Total Gate Charge	Q _g	V _{DS} =50V, I _D =3A, V _{GS} =10V	-	21.5	-	nC
Gate-Source Charge	Q _{gs}		-	3.2	-	nC
Gate-Drain Charge	Q _{gd}		-	6	-	nC
Drain-Source Diode Characteristics						
Diode Forward Voltage (Note 3)	V _{SD}	V _{GS} =0V, I _S =3A	-	-	1.2	V
Diode Forward Current (Note 2)	I _S		-	-	3	A
Reverse Recovery Time	t _{rr}	T _J = 25°C, I _F =3A di/dt = 100A/μs (Note3)	-	26	-	nS
Reverse Recovery Charge	Q _{rr}		-	27	-	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. The value of R_{θJA} is measured with the device mounted on 1in² FR-4 board with 2oz. Copper, in a still air environment with T_A=25°C. The value in any given application depends on the user's specific board design. Surface Mounted on FR4 Board, t ≤ 10 sec. The current rating is based on the t ≤ 10s thermal resistance rating.
3. Pulse Test: Pulse Width ≤ 300μs, Duty Cycle ≤ 2%.
4. Guaranteed by design, not subject to production .

Test Circuit**1) E_{AS} test Circuit****2) Gate charge test Circuit****3) Switch Time Test Circuit**

N-channel Typical Electrical and Thermal Characteristics (Curves)

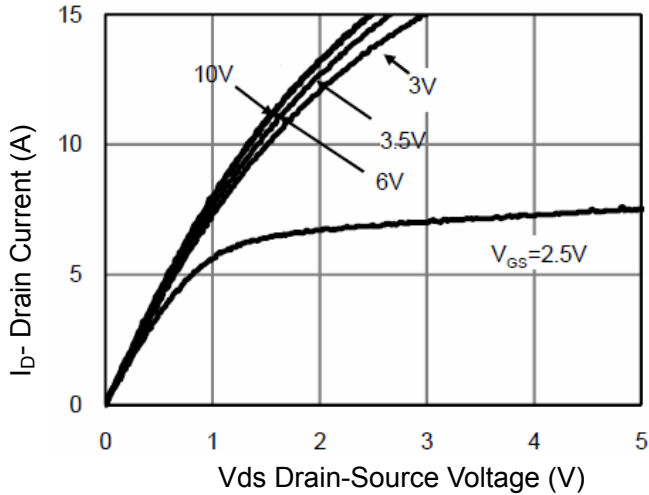


Figure 1 Output Characteristics

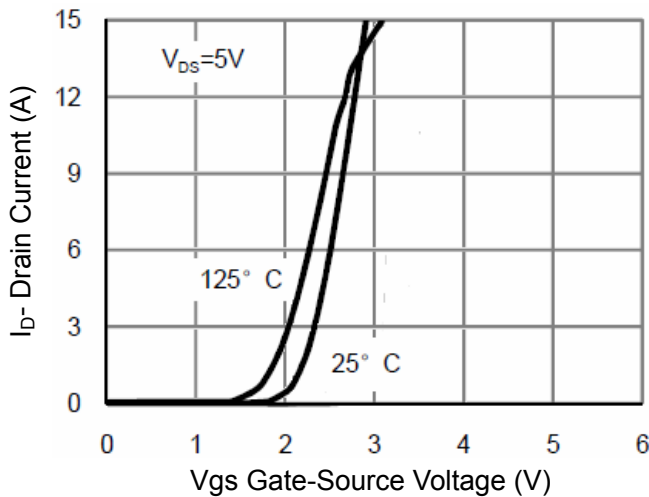


Figure 2 Transfer Characteristics

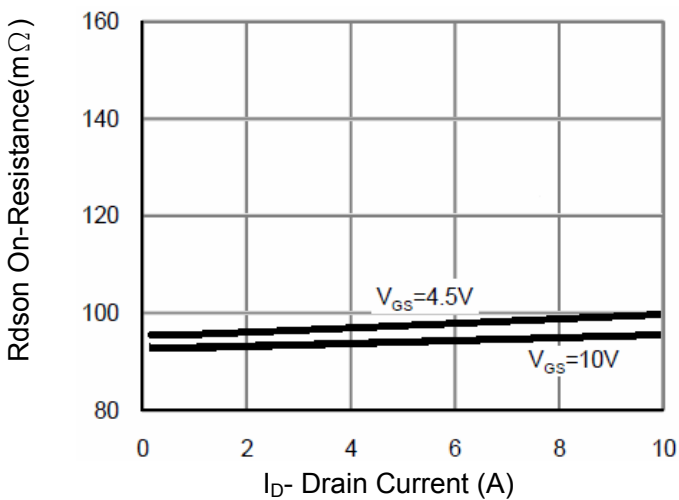


Figure 3 Rdson- Drain Current

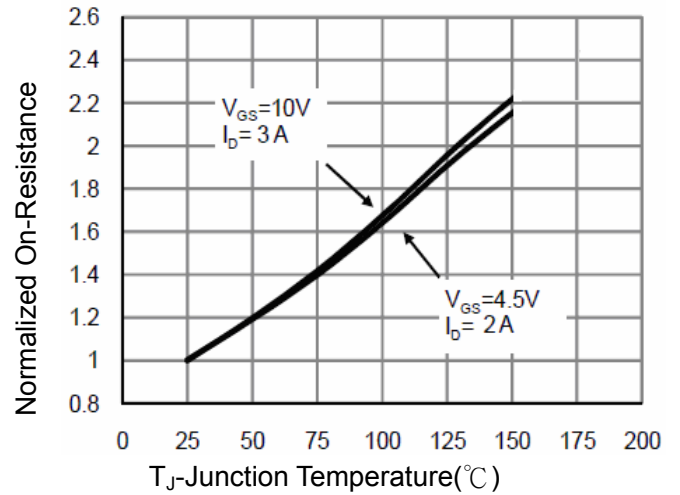


Figure 4 Rdson-Junction Temperature

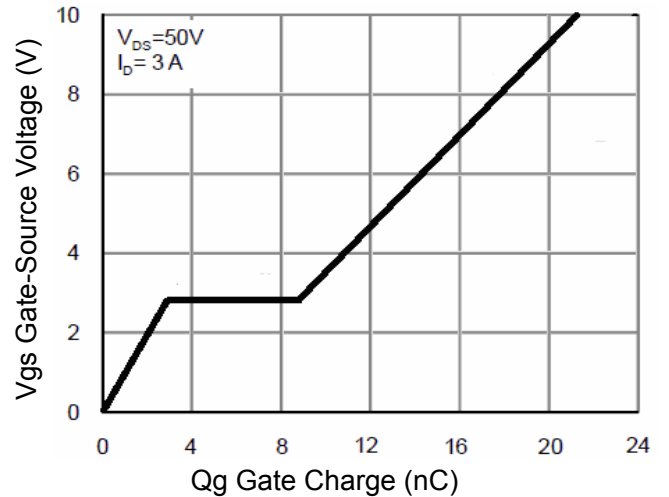


Figure 5 Gate Charge

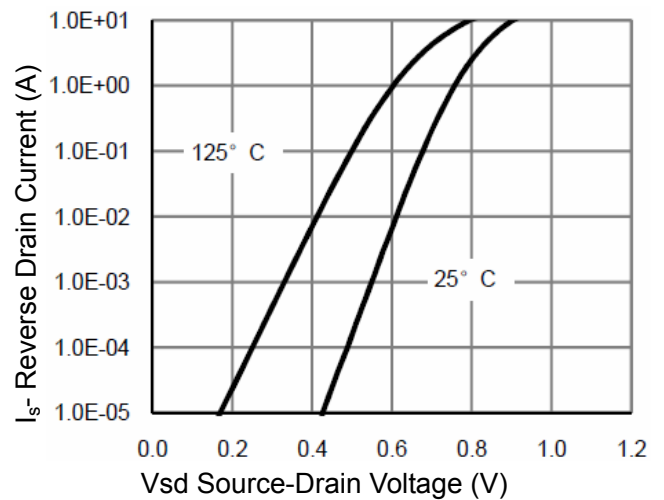


Figure 6 Source- Drain Diode Forward

<http://www.ncepower.com>

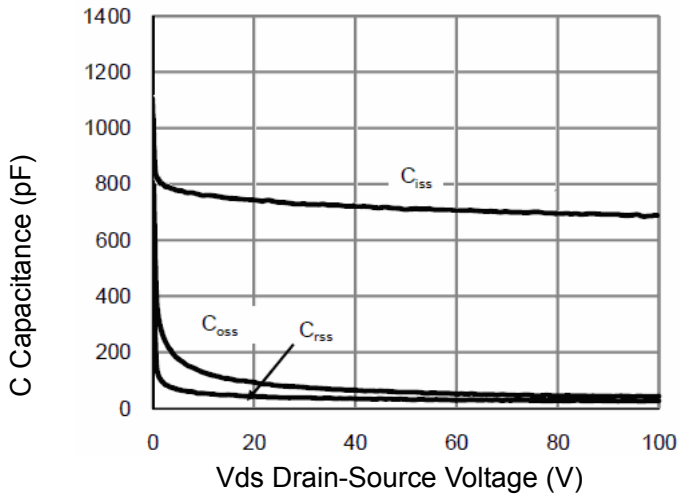


Figure 7 Capacitance vs Vds

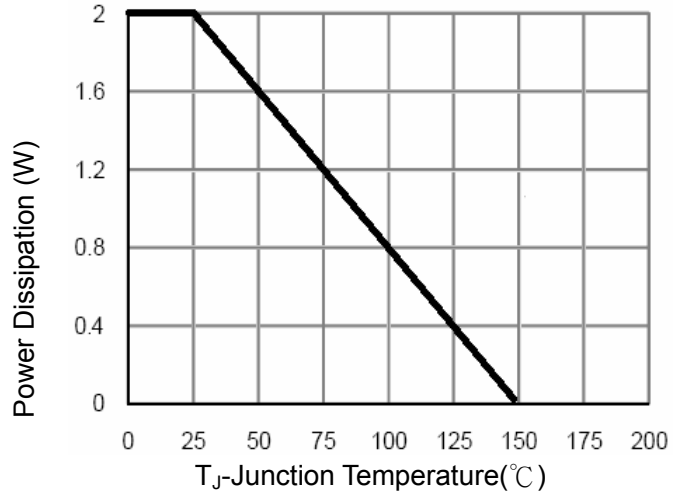


Figure 9 Power De-rating

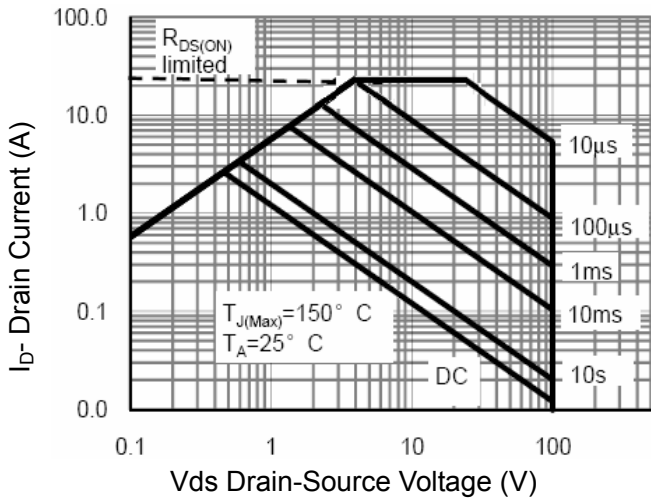


Figure 8 Safe Operation Area

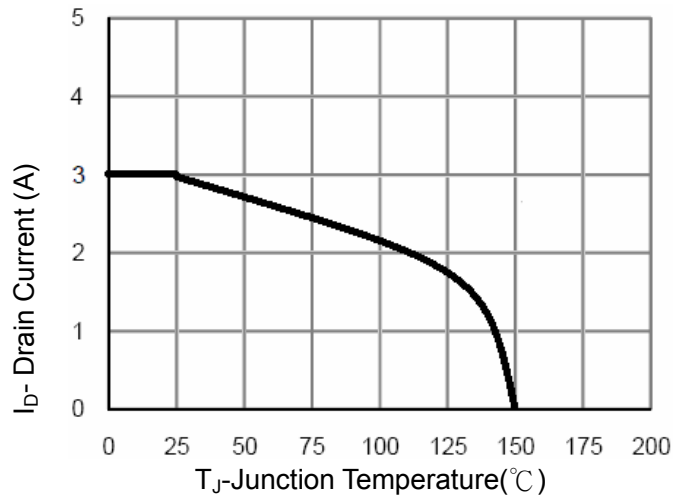


Figure 10 Current De-rating

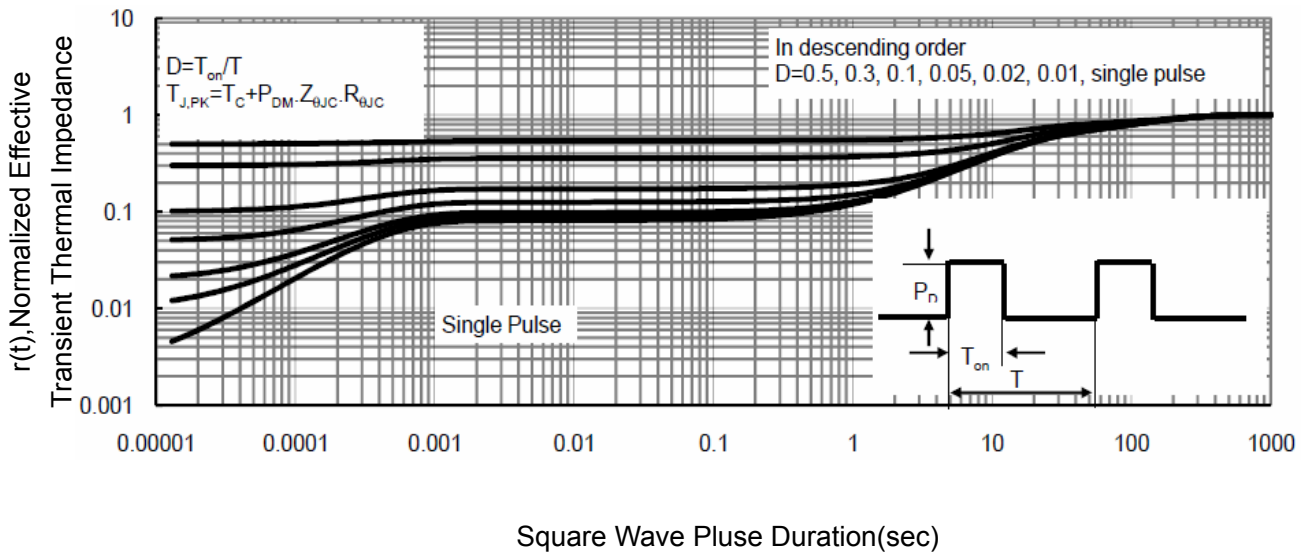


Figure 11 Normalized Maximum Transient Thermal Impedance

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

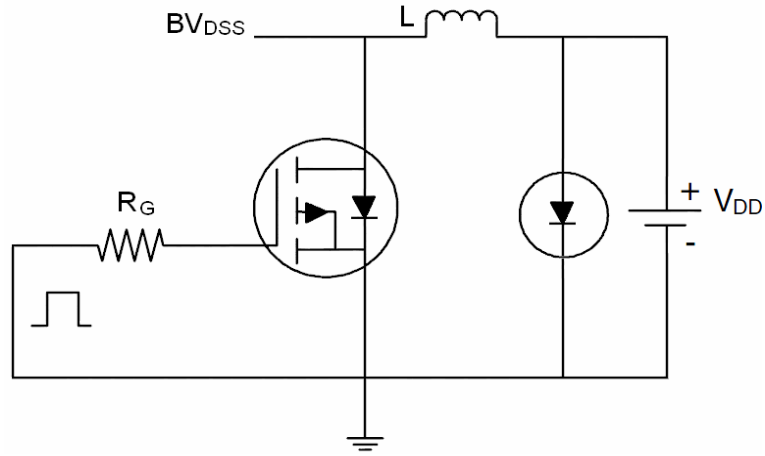
Parameter	Symbol	Condition	Min	Typ	Max	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	BV _{DSS}	V _{GS} =0V, I _D =-250μA	-100	-	-	V
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} =-100V, V _{GS} =0V	-	-	1	μA
Gate-Body Leakage Current	I _{GSS}	V _{GS} =±20V, V _{DS} =0V	-	-	±10	μA
On 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 =-3A	-	170	200	mΩ
		V _{GS} =-4.5V, I _D =-2A	-	200	230	
Forward Transconductance	g _{FS}	V _{DS} =-5V, I _D =-3A	2	-	-	S
Dynamic Characteristics (Note 4)						
Input Capacitance	C _{iss}	V _{DS} =-25V, V _{GS} =0V, F=1.0MHz	-	760	-	PF
Output Capacitance	C _{oss}		-	260	-	PF
Reverse Transfer Capacitance	C _{rss}		-	170	-	PF
Switching Characteristics (Note 4)						
Turn-on Delay Time	t _{d(on)}	V _{DD} =-50V, I _D =-3A V _{GS} =-10V, R _{GEN} =9Ω	-	14	-	nS
Turn-on Rise Time	t _r		-	18	-	nS
Turn-Off Delay Time	t _{d(off)}		-	50	-	nS
Turn-Off Fall Time	t _f		-	18	-	nS
Total Gate Charge	Q _g	V _{DS} =-50V, I _D =-3A, V _{GS} =-10V	-	25	-	nC
Gate-Source Charge	Q _{gs}		-	5	-	nC
Gate-Drain Charge	Q _{gd}		-	7	-	nC
Drain-Source Diode Characteristics						
Diode Forward Voltage	V _{SD}	V _{GS} =0V, I _S =-3A	-	-	-1.2	V
Diode Forward Current	I _S	-	-	-	-3	A
Reverse Recovery Time	t _{rr}	T _J = 25°C, I _F = -3A di/dt = 100A/μs (Note 3)	-	35	-	nS
Reverse Recovery Charge	Q _{rr}		-	46	-	nC
Forward Turn-On Time	t _{on}	Intrinsic turn-on time is negligible (turn-on is dominated by LS+LD)				

Notes:

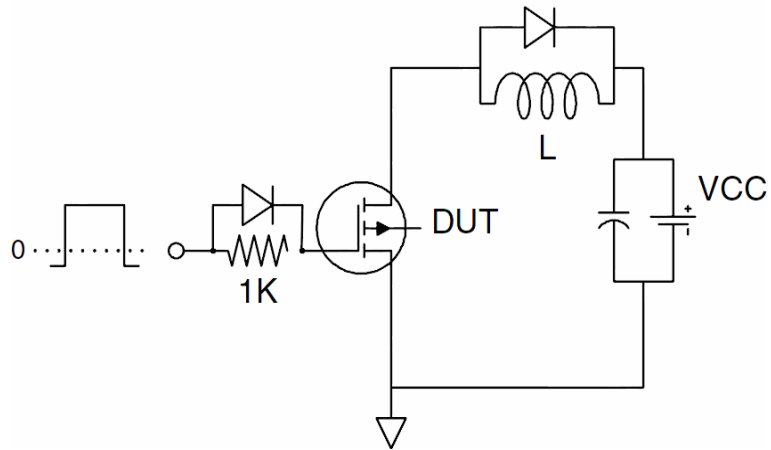
1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Surface Mounted on FR4 Board, t ≤ 10 sec.
3. Pulse Test: Pulse Width ≤ 300μs, Duty Cycle ≤ 2%.
4. Guaranteed by design, not subject to production
5. E_{AS} condition: T_J=25°C, V_{DD}=-50V, V_G=-10V, L=0.5mH, R_g=25Ω

Test Circuit

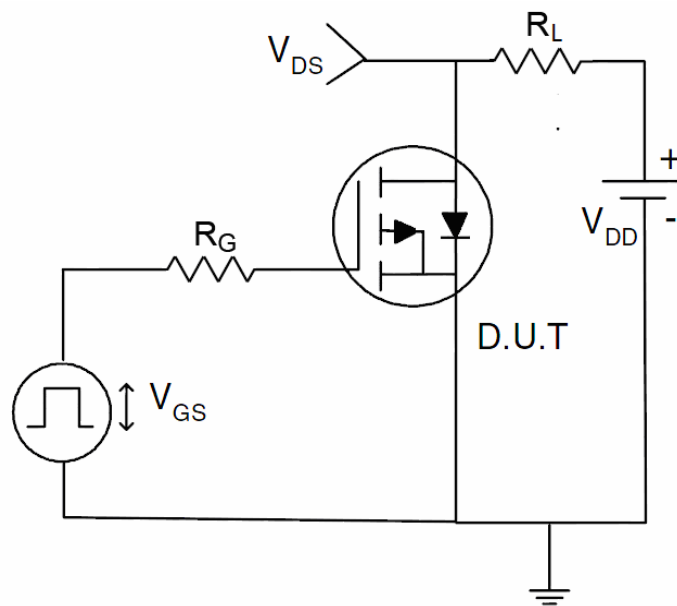
1) E_{AS} Test Circuit



2) Gate Charge Test Circuit



3) Switch Time Test Circuit



Typical Electrical and Thermal Characteristics (Curves)

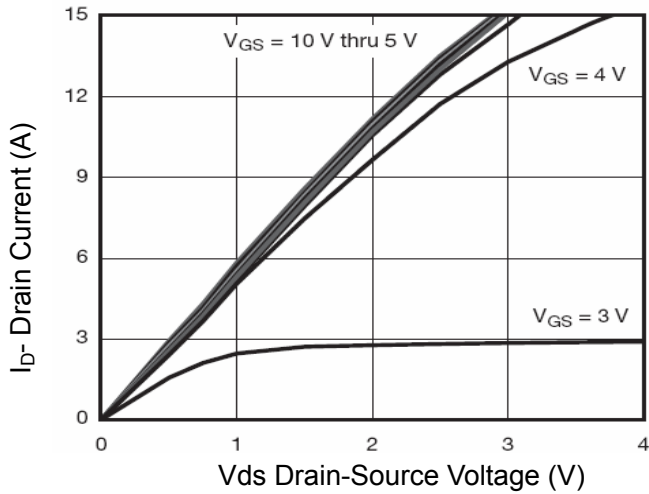


Figure 1 Output Characteristics

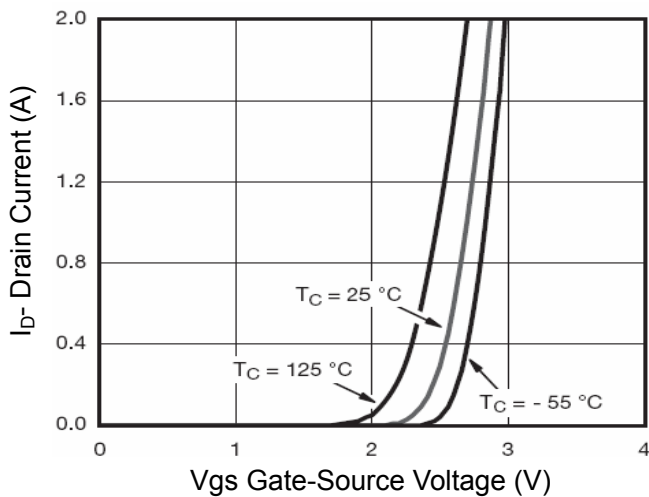


Figure 2 Transfer Characteristics

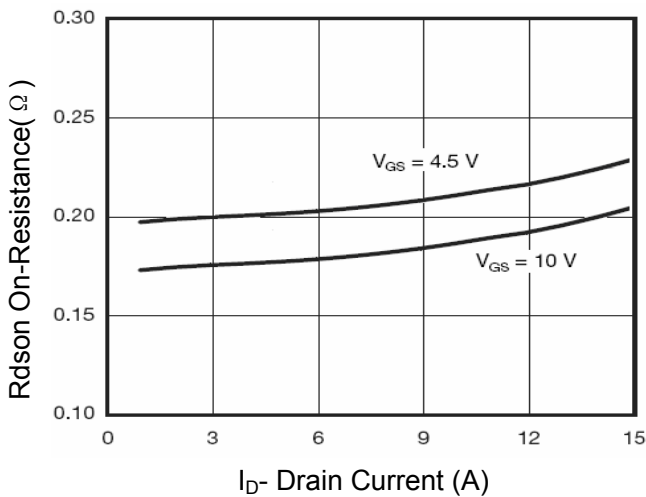


Figure 3 Rdson- Drain Current

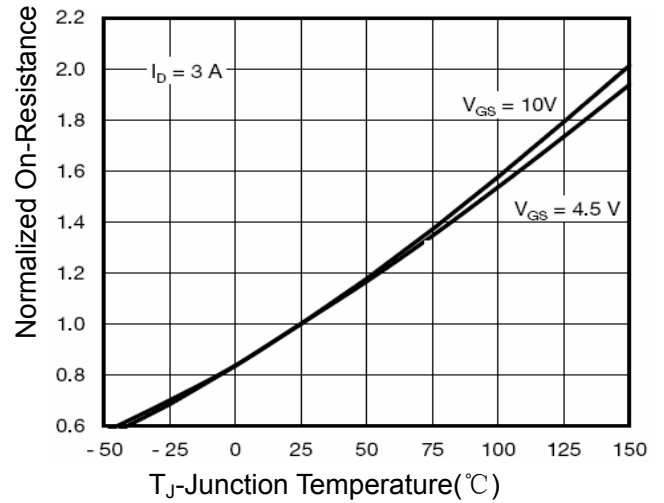


Figure 4 Rdson-Junction Temperature

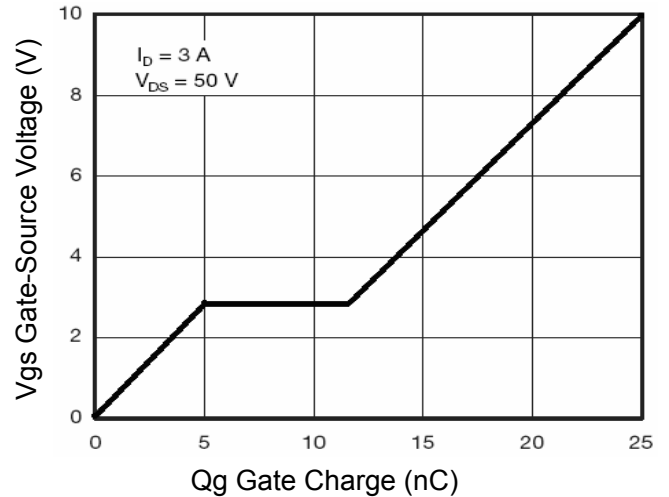


Figure 5 Gate Charge

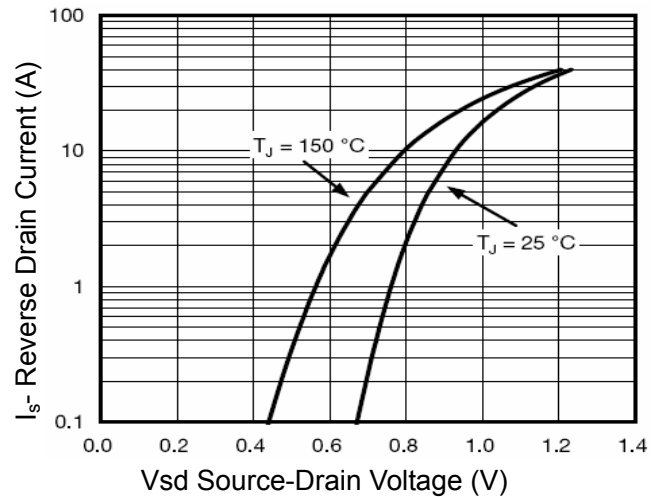


Figure 6 Source- Drain Diode Forward

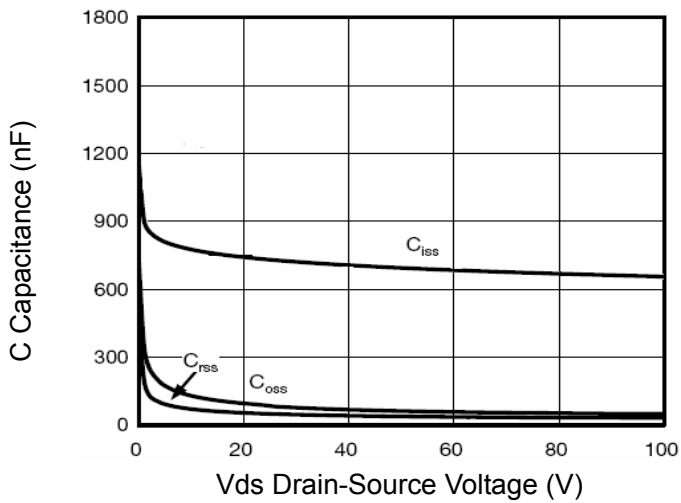


Figure 7 Capacitance vs Vds

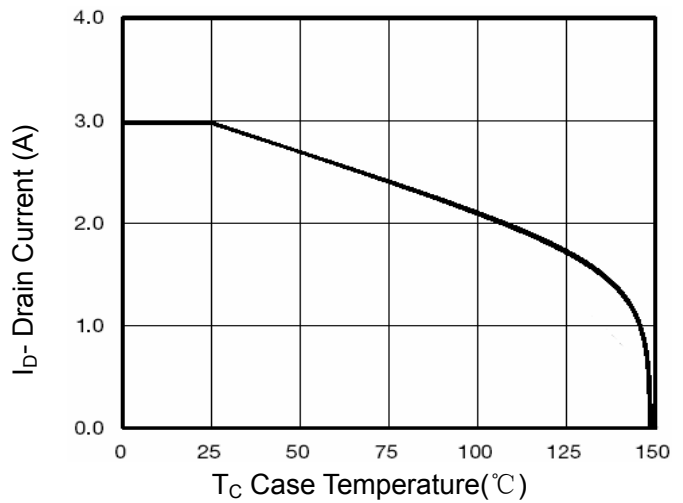


Figure 9 Drain Current vs Case Temperature

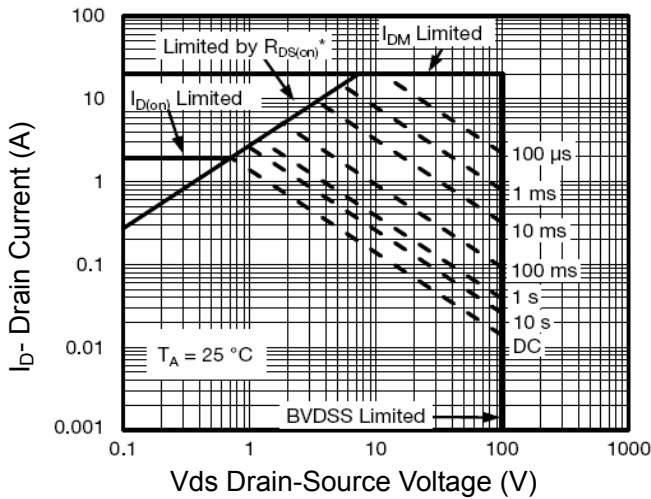


Figure 8 Safe Operation Area

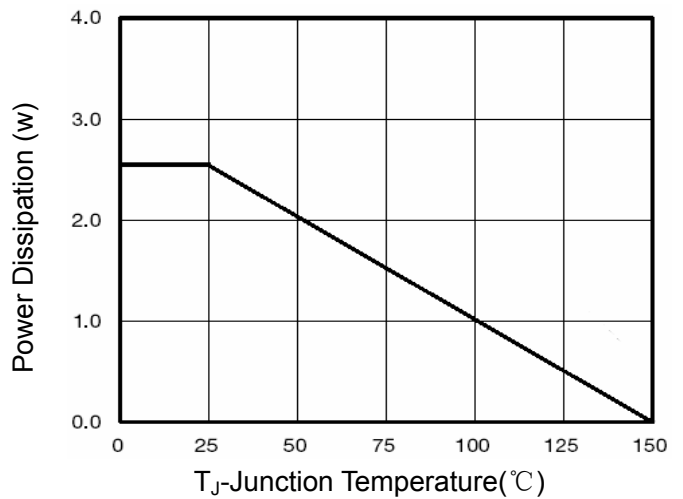


Figure 10 Power De-rating

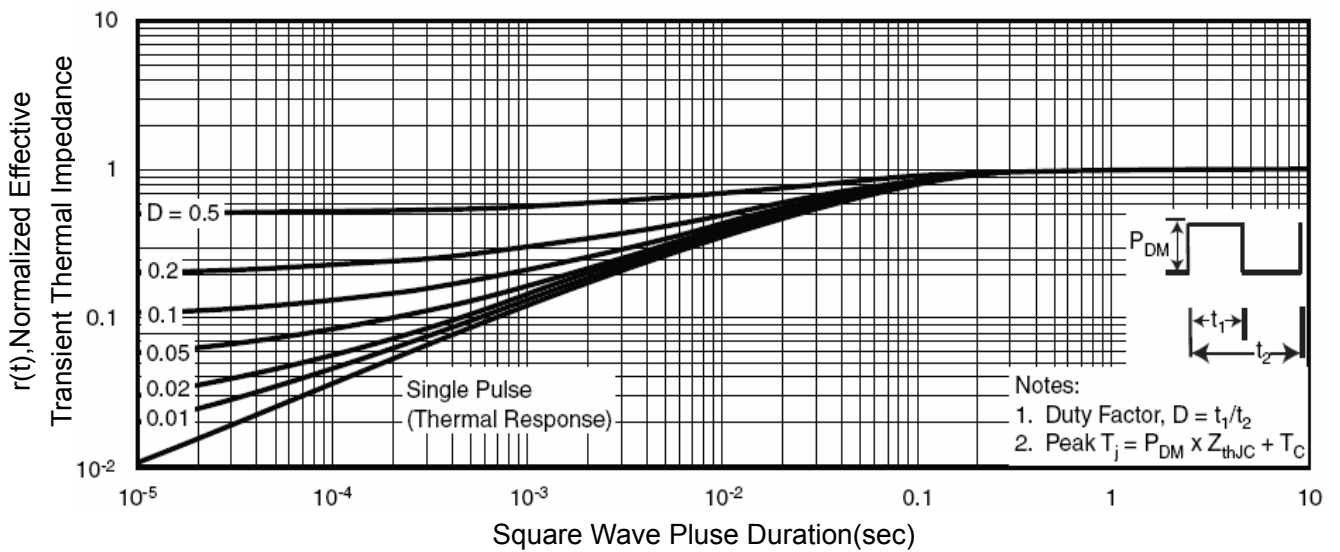
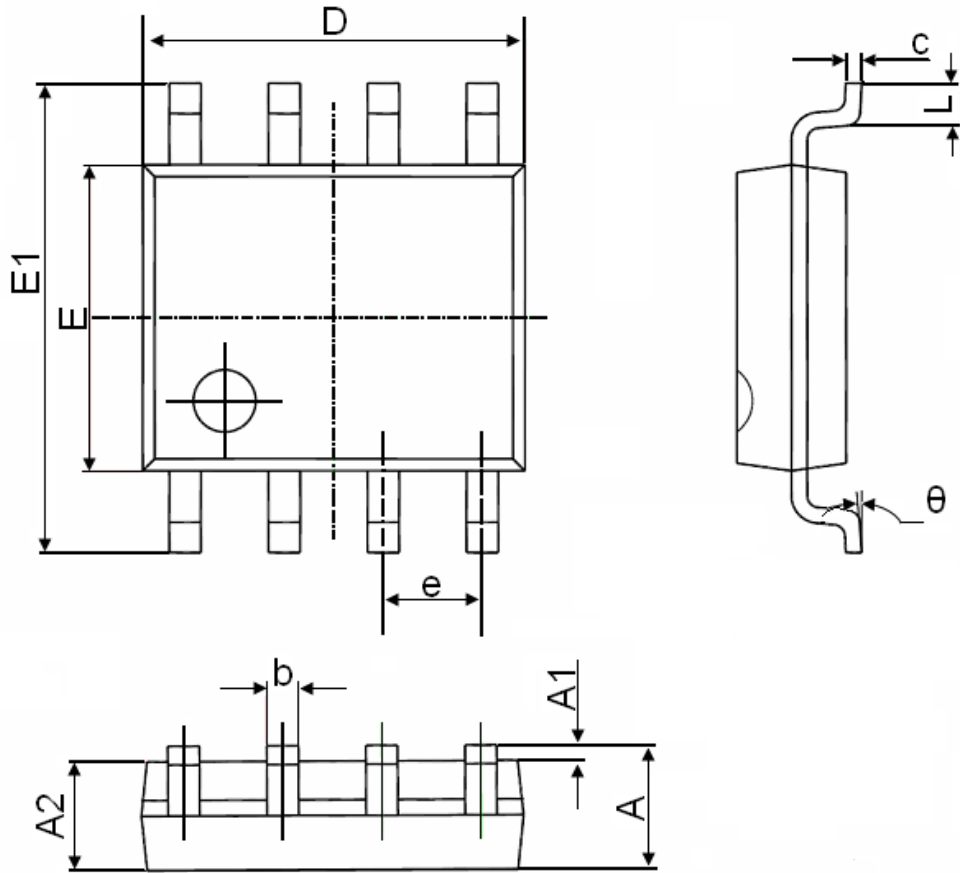


Figure 11 Normalized Maximum Transient Thermal Impedance

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
theta	0°	8°	0°	8°

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