

NCE N-Channel Enhancement Mode Power MOSFET

Description

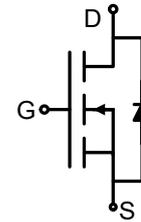
The NCE6003X uses advanced trench technology to provide excellent $R_{DS(ON)}$, low gate charge. This device is suitable for use as a Battery protection or in other switching application.

General Features

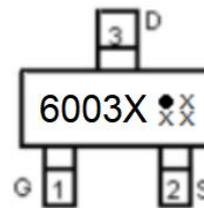
- $V_{DS} = 60V, I_D = 3A$
 $R_{DS(ON)} < 90m\Omega @ V_{GS} = 10V$
 $R_{DS(ON)} < 110m\Omega @ V_{GS} = 4.5V$
- High power and current handling capability
- Lead free product is acquired
- Surface mount package

Application

- Industrial application
- Battery switch
- DC/DC converter



Schematic Diagram



Marking and Pin Assignment



SOT-23 Top View

Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
6003X	NCE6003X	SOT-23	Ø180mm	8 mm	3000 units

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

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V_{DS}	60	V
Gate-Source Voltage	V_{GS}	± 20	V
Drain Current-Continuous	I_D	3	A
Drain Current-Pulsed ^(Note 1)	I_{DM}	10	A
Single pulse avalanche Current ^(Note 5)	I_{AS}	8	A
Single pulse avalanche energy ^(Note 5)	E_{AS}	16	mJ
Maximum Power Dissipation	P_D	1.7	W
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-55 To 150	$^\circ C$

Thermal Characteristic

Thermal Resistance, Junction-to-Ambient ^(Note 2)	$R_{\theta JA}$	73.5	$^\circ C/W$
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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	60	-	-	V
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} =60V, 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	0.9	1.3	2.0	V
Drain-Source On-State Resistance	R _{DS(ON)}	V _{GS} =10V, I _D =3A	-	68	90	mΩ
		V _{GS} =4.5V, I _D =3A	-	80	110	mΩ
Forward Transconductance	g _{FS}	V _{DS} =5V, I _D =3A	-	3	-	S
Dynamic Characteristics (Note 4)						
Input Capacitance	C _{iss}	V _{DS} =30V, V _{GS} =0V, F=1.0MHz	-	270	-	PF
Output Capacitance	C _{oss}		-	16	-	PF
Reverse Transfer Capacitance	C _{rss}		-	15	-	PF
Switching Characteristics (Note 4)						
Turn-on Delay Time	t _{d(on)}	V _{DD} =30V, I _D =3A V _{GS} =10V, R _{GEN} =1Ω	-	5	-	nS
Turn-on Rise Time	t _r		-	10	-	nS
Turn-Off Delay Time	t _{d(off)}		-	12	-	nS
Turn-Off Fall Time	t _f		-	8	-	nS
Total Gate Charge	Q _g	V _{DS} =30V, I _D =3A, V _{GS} =10V	-	10.2	-	nC
Gate-Source Charge	Q _{gs}		-	1.8	-	nC
Gate-Drain Charge	Q _{gd}		-	2.2	-	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

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. EAS condition : T_j=25°C, V_{DD}=30V, V_G=10V, L=0.5mH, R_g=25Ω

Typical Electrical and Thermal Characteristics

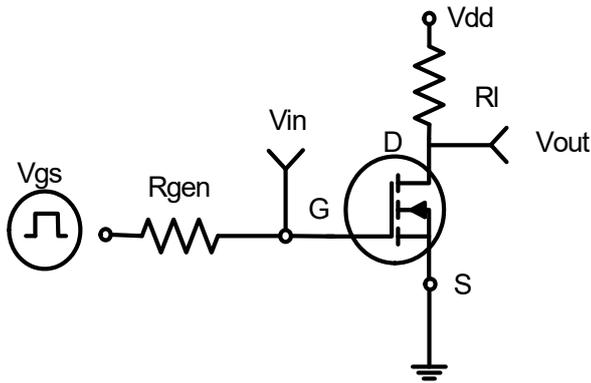


Figure 1: Switching Test Circuit

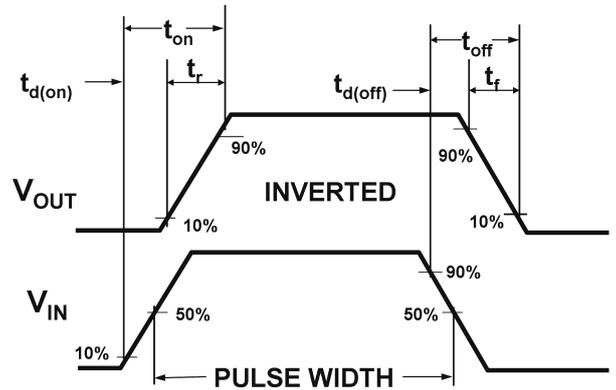


Figure 2: Switching Waveforms

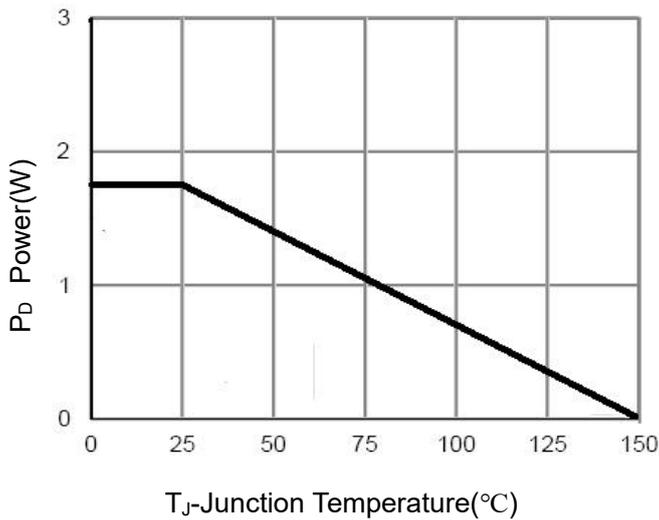


Figure 3 Power Dissipation

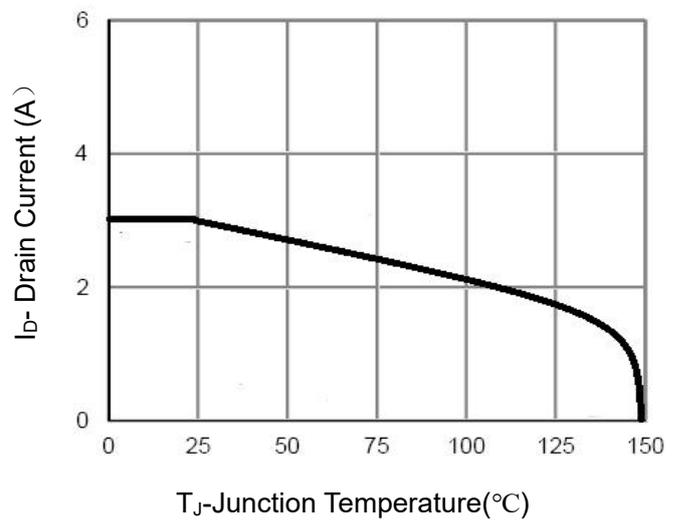


Figure 4 Drain Current

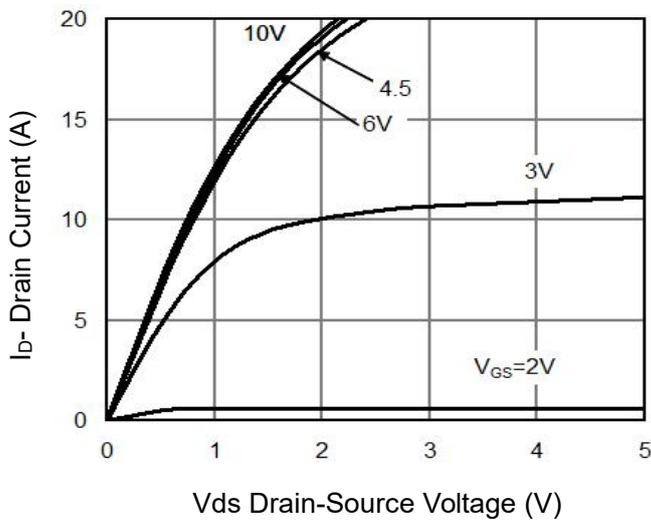


Figure 5 Output Characteristics

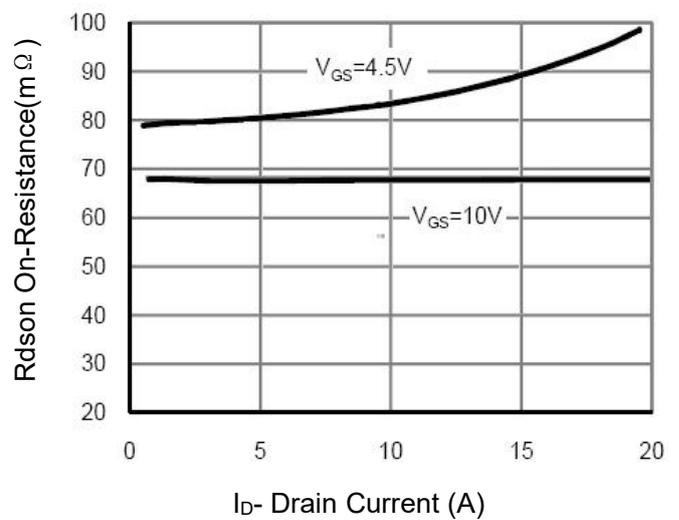


Figure 6 Drain-Source On-Resistance

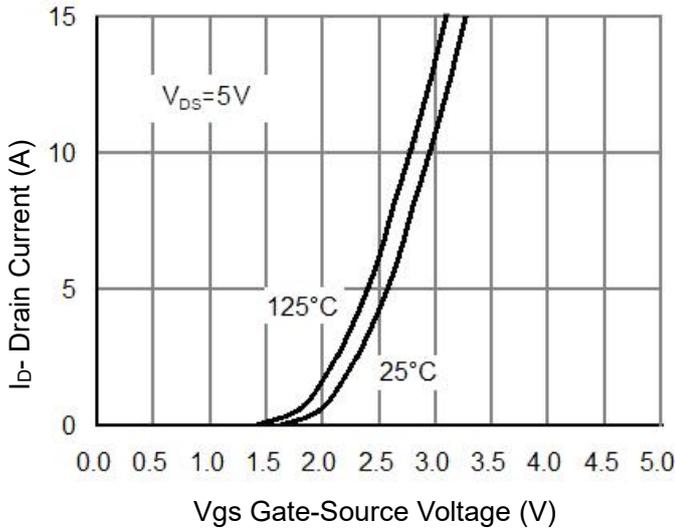


Figure 7 Transfer Characteristics

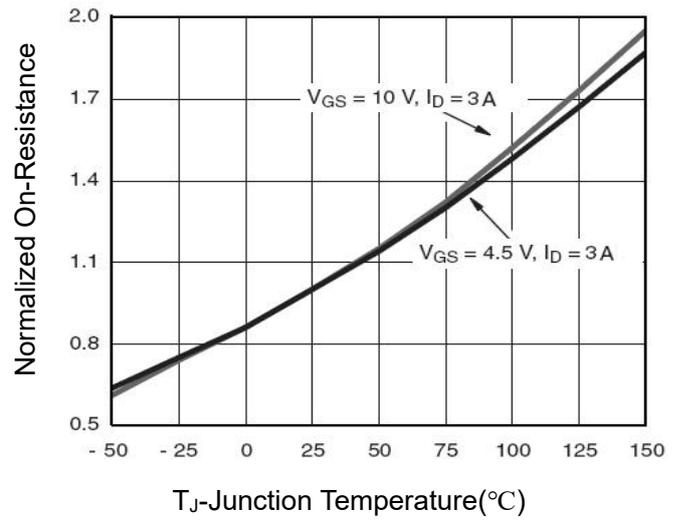


Figure 8 Drain-Source On-Resistance

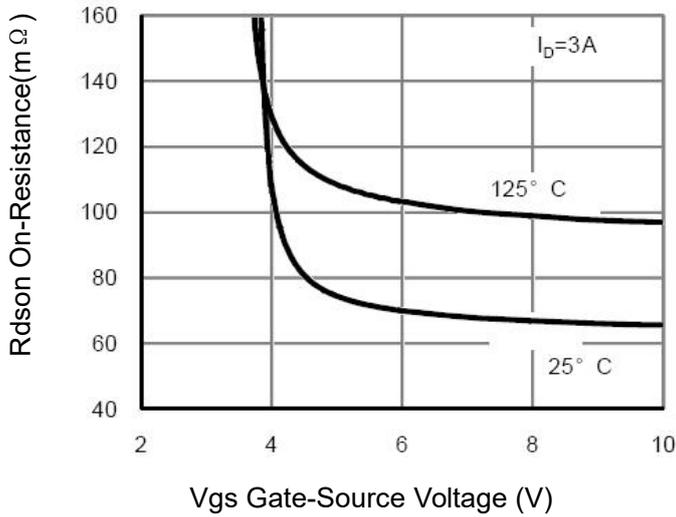


Figure 9 Rdson vs Vgs

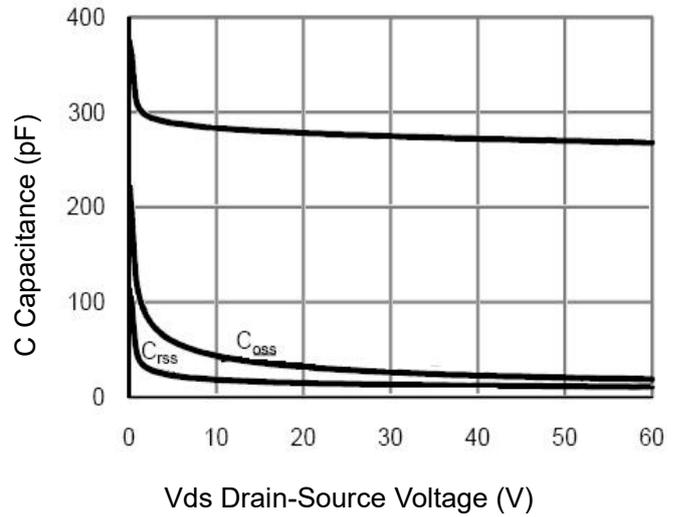


Figure 10 Capacitance vs Vds

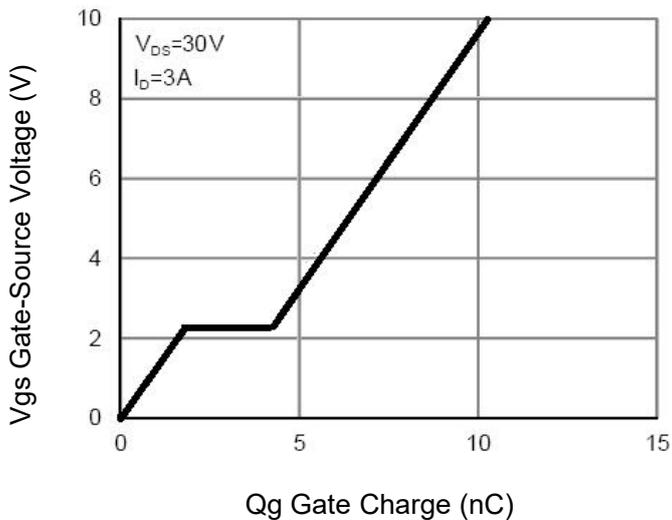


Figure 11 Gate Charge

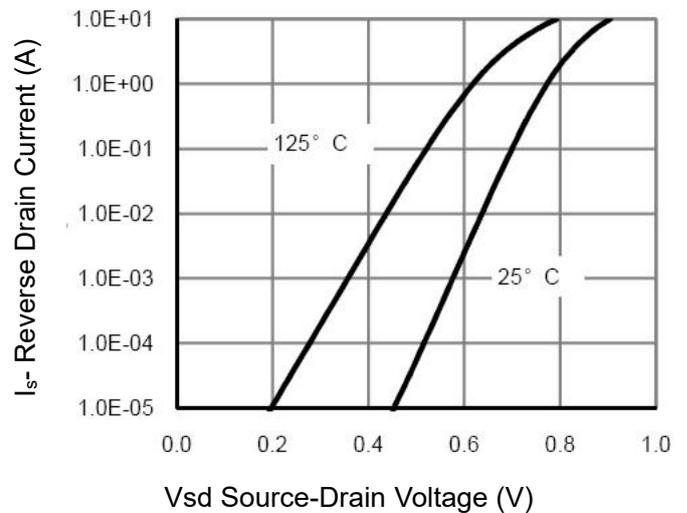


Figure 12 Source- Drain Diode Forward

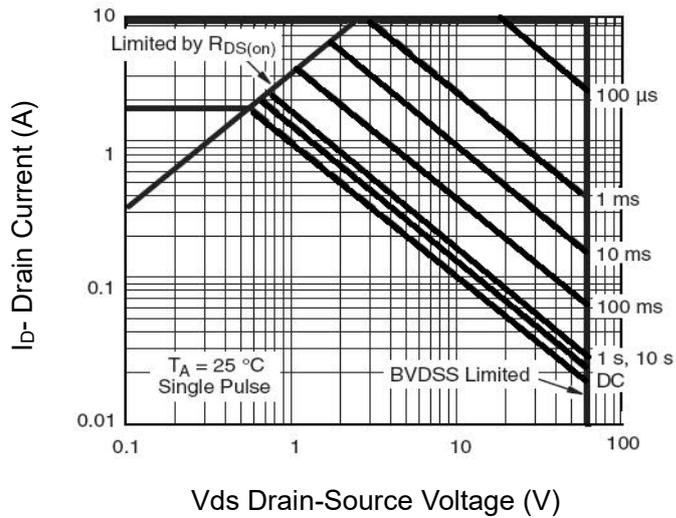


Figure 13 Safe Operation Area

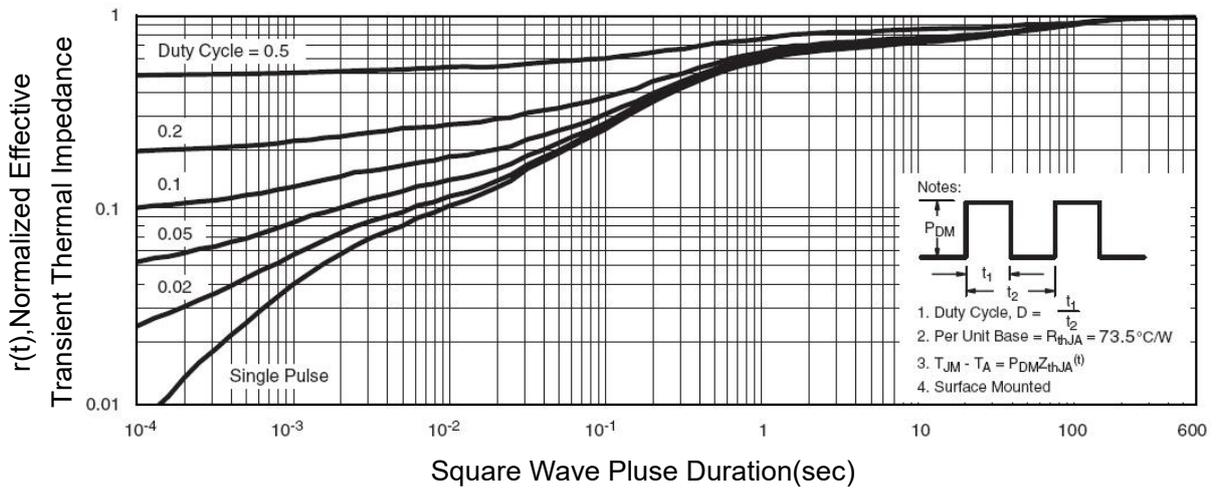
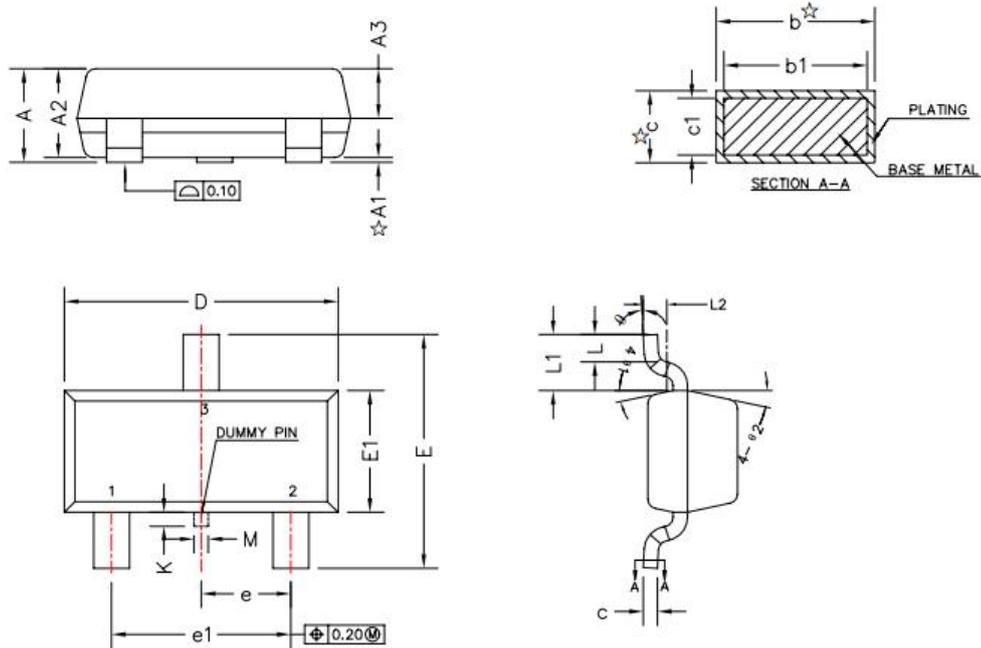


Figure 14 Normalized Maximum Transient Thermal Impedance

SOT-23 Package Information



Symbol	Millimeters	
	Min.	Max.
A	0.89	1.12
A1	0.01	0.10
A2	0.88	1.02
A3	0.43	0.63
b	0.36	0.50
b1	0.35	0.45
c	0.14	0.20
c1	0.14	0.16
D	2.80	3.00
E	2.35	2.64
E1	1.20	1.40
e	0.90	1.00
e1	1.80	2.00
L	0.40	0.60
L1	0.6REF	
L2	0.25BSC	
M	0.10	0.25
K	0.00	0.25
θ	0°	8°
θ_1	10°	14°
θ_2	10°	14°

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