

NCE P-Channel Enhancement Mode Power MOSFET

Description

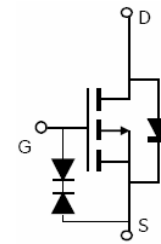
The NCE1013E uses advanced trench technology to provide excellent $R_{DS(ON)}$, low gate charge and operation with gate voltages as low as -1.8V. This device is suitable for use as a Battery protection or in other Switching application.

General Features

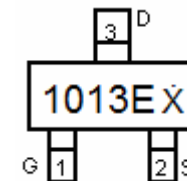
- $V_{DS} = -20V, I_D = -0.66A$
 $R_{DS(ON)} < 520m\Omega @ V_{GS} = -4.5V$
 $R_{DS(ON)} < 700m\Omega @ V_{GS} = -2.5V$
 $R_{DS(ON)} < 1000m\Omega @ V_{GS} = -1.8V$
 ESD Rating : HBM 2000V
- High power and current handling capability
- Lead free product is acquired
- Gate-Source ESD protection

Application

- Battery operated systems
- Load/ power switching cell phones pagers
- Power supply converter circuits



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
1013E X	NCE1013E	SOT-23	Ø180mm	8 mm	3000units

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

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V_{DS}	-20	V
Gate-Source Voltage	V_{GS}	± 12	V
Drain Current-Continuous	I_D	-0.66	A
Drain Current-Pulsed ^(Note 1)	I_{DM}	-3	A
Maximum Power Dissipation	P_D	0.3	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)	$R_{\theta JA}$	417	$^\circ C/W$
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Electrical Characteristics ($T_A = 25^\circ C$ unless otherwise noted)

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	BV_{DSS}	$V_{GS} = 0V, I_D = -250\mu A$	-20	-	-	V

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS}=-20V, V_{GS}=0V$	-	-	1	μA
Gate-Body Leakage Current	I_{GSS}	$V_{GS}=\pm 10V, V_{DS}=0V$	-	-	± 10	μA
On Characteristics (Note 3)						
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=-250\mu A$	-0.5	-0.6	-0.9	V
Drain-Source On-State Resistance	$R_{DS(on)}$	$V_{GS}=-4.5V, I_D=-0.6A$	-	362	520	m Ω
		$V_{GS}=-2.5V, I_D=-0.5A$	-	471	700	m Ω
		$V_{GS}=-1.8V, I_D=-0.4A$	-	837	1000	m Ω
Forward Transconductance	g_{FS}	$V_{DS}=-5V, I_D=-0.6A$	-	1	-	S
Dynamic Characteristics (Note 4)						
Input Capacitance	C_{iss}	$V_{DS} = -10 V, V_{GS} = 0 V,$ $F = 1.0 MHz,$	-	114	-	pF
Output Capacitance	C_{oss}		-	17	-	pF
Reverse Transfer Capacitance	C_{rss}		-	14	-	pF
Switching Characteristics (Note 4)						
Turn-on Delay Time	$t_{d(on)}$	$V_{DD} = -10 V, R_L = 47\Omega$ $V_G = -4.5 V, R_G = 10\Omega$	-	6.5	-	nS
Turn-on Rise Time	t_r		-	6.5	-	nS
Turn-Off Delay Time	$t_{d(off)}$		-	18.2	-	nS
Turn-Off Fall Time	t_f		-	5.5	-	nS
Total Gate Charge	Q_g	$V_{DS} = -10 V, V_{GS} = -4.5 V,$ $I_D = -0.6A$	-	1.44	-	nC
Gate-Source Charge	Q_{gs}		-	0.14	-	nC
Gate-Drain Charge	Q_{gd}		-	0.35	-	nC
Drain-Source Diode Characteristics						
Diode Forward Voltage (Note 3)	V_{SD}	$V_{GS}=0V, I_S=-0.6A$	-	-	-1.2	V
Diode Forward Current (Note 2)	I_S		-	-	-0.6	A

Notes:

1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Surface Mounted on 1in 2 FR-4 board with 2oz. Copper, in a still air environment with $T_A = 25^\circ C$. The value in any given application depends on the user's specific board design. The current rating is based on the $t \leq 10s$ thermal resistance rating.
3. Pulse Test: Pulse Width $\leq 300\mu s$, Duty Cycle $\leq 2\%$.
4. Guaranteed by design, not subject to production

Typical Electrical and Thermal Characteristics

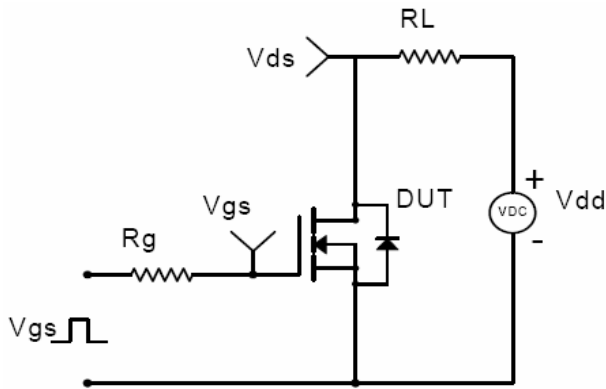


Figure 1: Switching Test Circuit

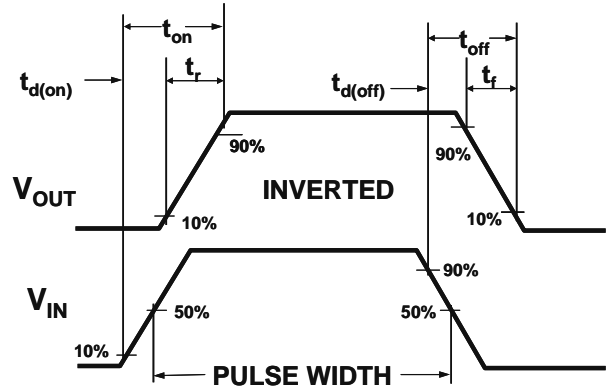


Figure 2: Switching Waveforms

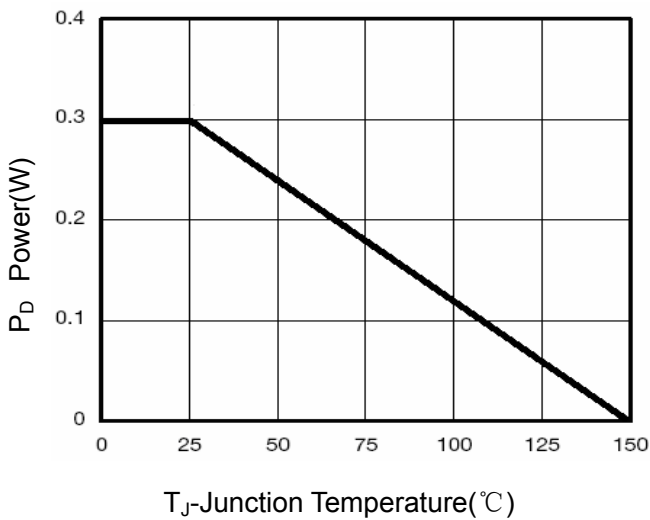


Figure 3 Power Dissipation

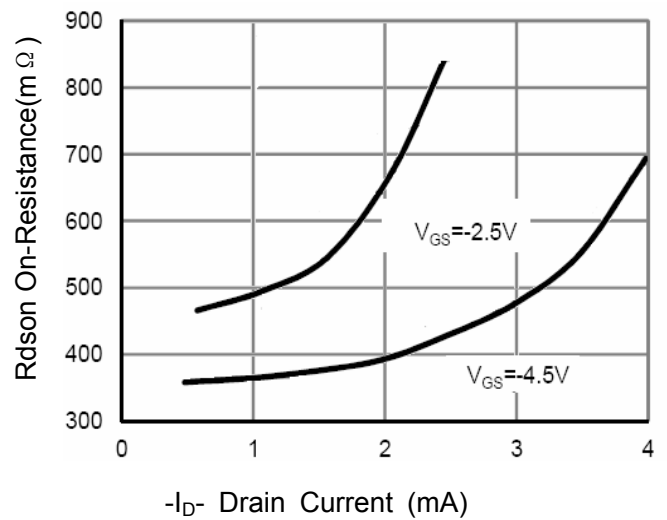


Figure 4 Drain-Source On-Resistance

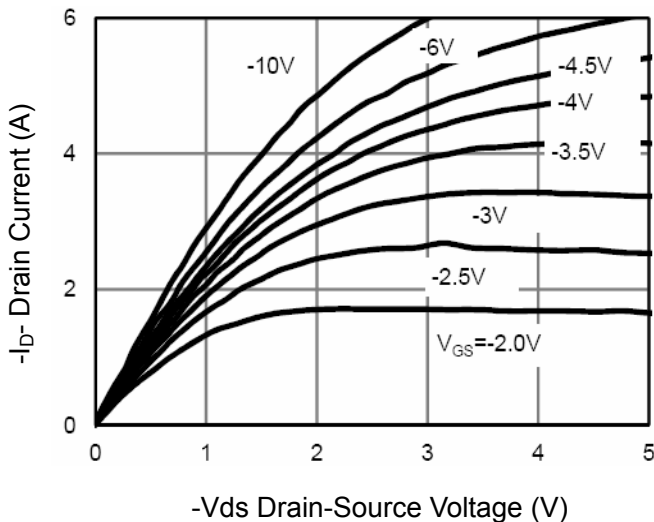


Figure 5 Output Characteristics

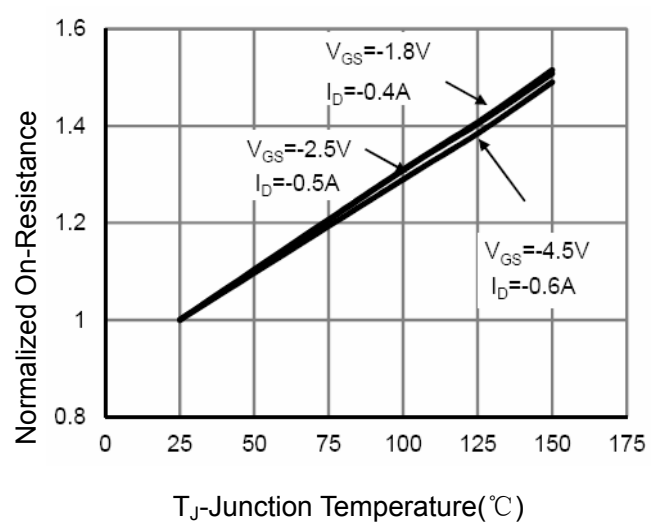


Figure 6 Drain-Source On-Resistance

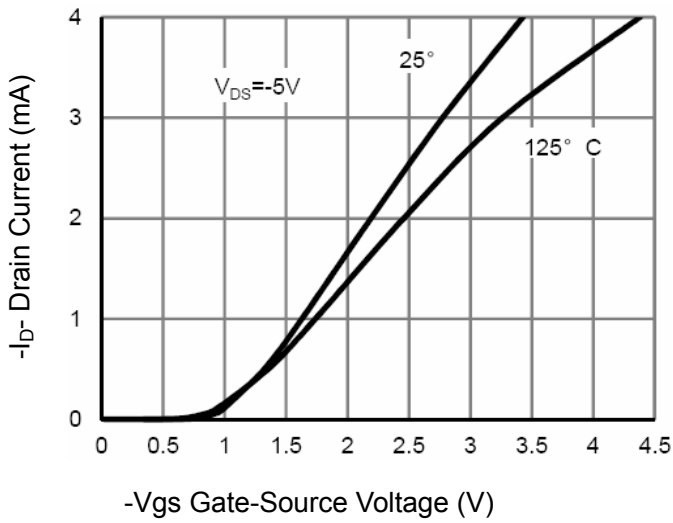


Figure 7 Transfer Characteristics

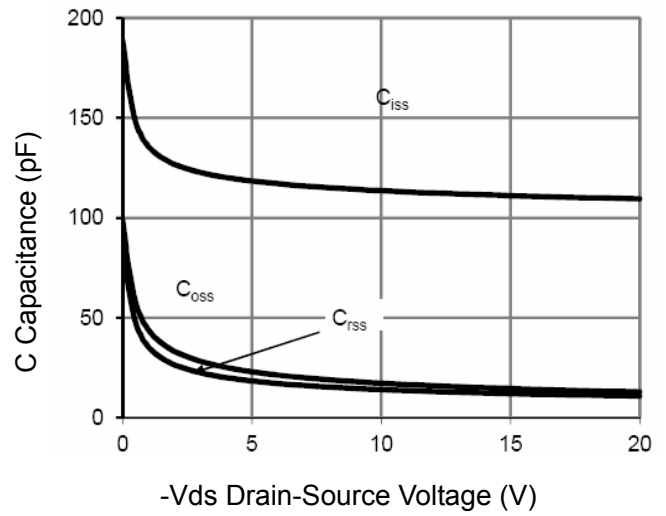


Figure 8 Capacitance vs Vds

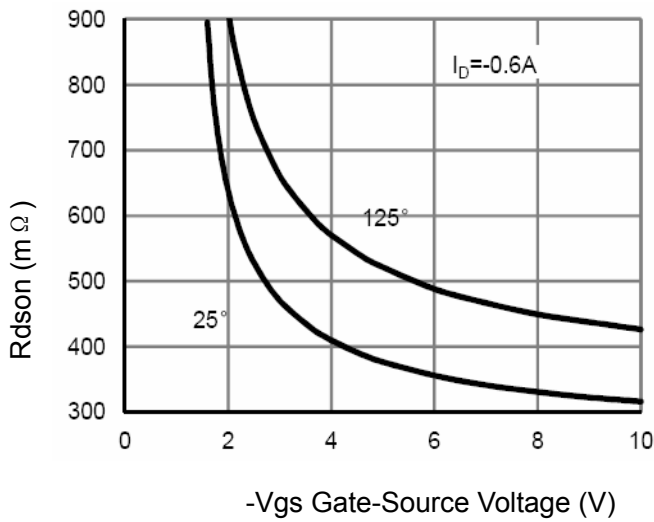


Figure 9 Rdson vs Vgs

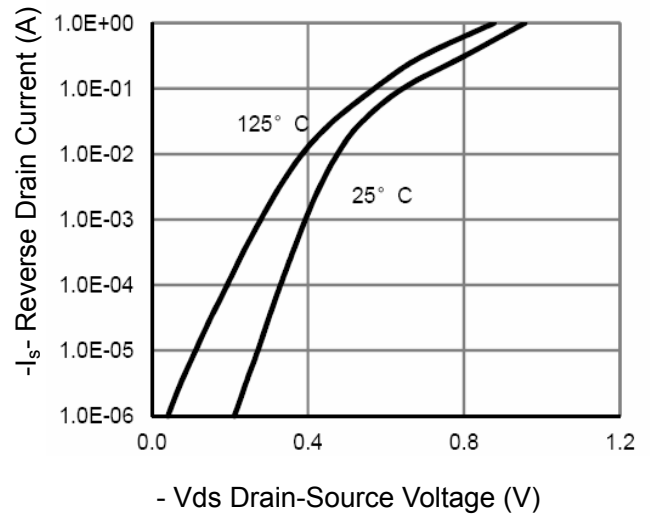


Figure 10 Source-Drain Diode Forward

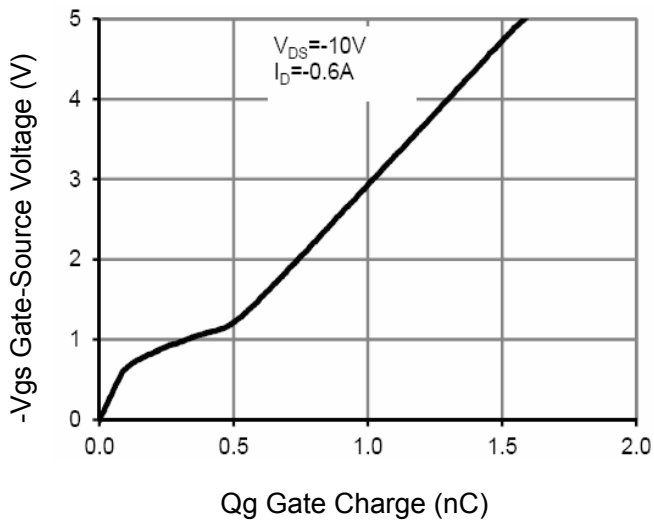


Figure 11 Gate Charge

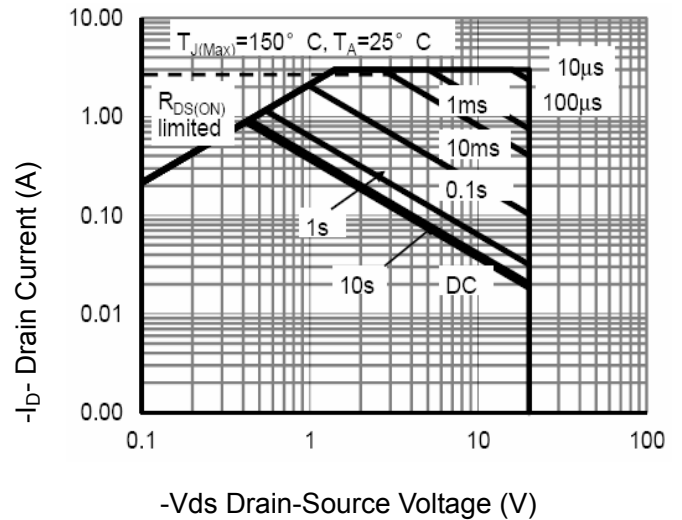


Figure 12 Safe Operation Area

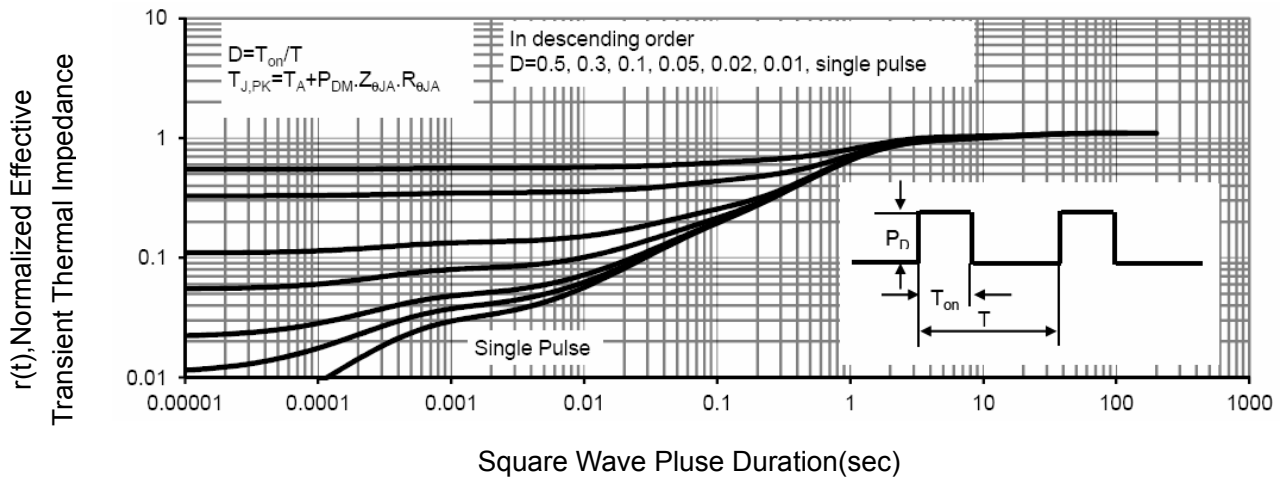
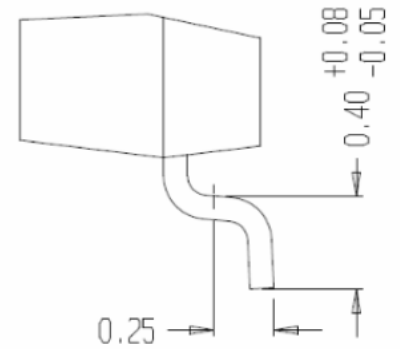
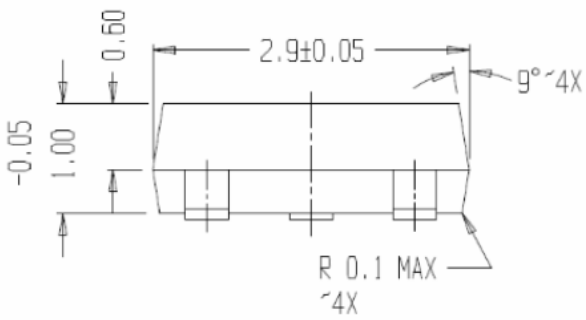
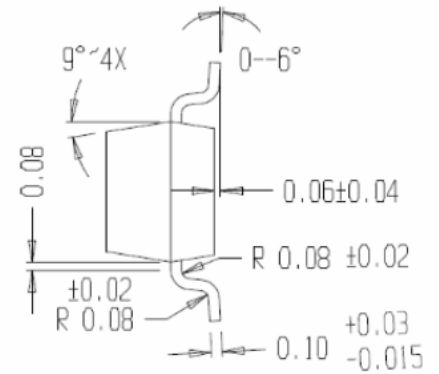
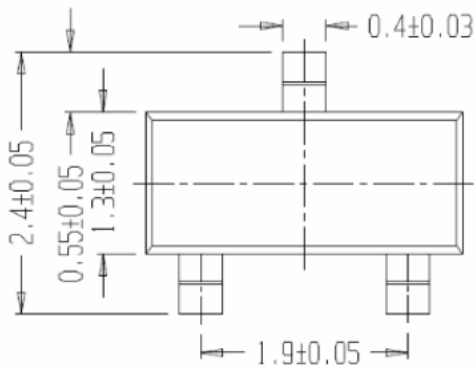


Figure 13 Normalized Maximum Transient Thermal Impedance

SOT-23 Package Information



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