

NCE N-Channel Enhancement Mode Power MOSFET

Description

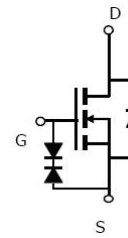
The NCE1012E uses advanced trench technology to provide excellent $R_{DS(ON)}$, low gate charge and operation with gate voltages as low as 1.8V. This device is suitable for use as a Battery protection or in other Switching application.

General Features

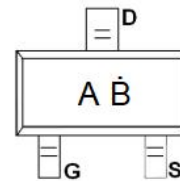
- $V_{DS} = 20V, I_D = 0.6A$
- $R_{DS(ON)} < 210m\Omega @ V_{GS}=4.5V$
- $R_{DS(ON)} < 350m\Omega @ V_{GS}=2.5V$
- $R_{DS(ON)} < 700m\Omega @ V_{GS}=1.8V$
- $R_{DS(ON)} < 1500m\Omega @ V_{GS}=1.5V$
- ESD Rating : HBM 2000V
- High power and current handling capability
- Lead free product is acquired
- Gate-Source ESD protection

Application

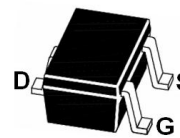
- Battery operated systems
- Load/ power switching cell phones pagers
- Power supply converter circuits



Schematic diagram



Marking and pin assignment



SOT-523 top view

Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
A B	NCE1012E	SOT-523	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}	± 10	V
Drain Current-Continuous	I_D	0.6	A
Drain Current-Pulsed (Note 1)	I_{DM}	4	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	22	-	V

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} =16V,V _{GS} =0V	-	0.3	100	nA
Gate-Body Leakage Current	I _{GSS}	V _{GS} =±4.5V,V _{DS} =0V	-	-	±1	μA
On Characteristics (Note 3)						
Gate Threshold Voltage	V _{GS(th)}	V _{DS} =V _{GS} ,I _D =250μA	0.5	0.75	1.0	V
Drain-Source On-State Resistance	R _{DS(ON)}	V _{GS} =4.5V, I _D =0.6A	-	167	210	mΩ
		V _{GS} =2.5V, I _D =0.5A	-	221	350	mΩ
		V _{GS} =1.8V, I _D =0.35A	-	320	700	mΩ
		V _{GS} =1.5V, I _D =0.1A	-	460	1500	mΩ
Forward Transconductance	g _{FS}	V _{DS} =10V,I _D =0.5A	-	1	-	S
Dynamic Characteristics (Note4)						
Input Capacitance	C _{ISS}	V _{DS} = 10 V ,V _{GS} = 0 V, F= 1.0 MHz,	-	60	-	pF
Output Capacitance	C _{OSS}		-	15	-	pF
Reverse Transfer Capacitance	C _{rSS}		-	5	-	pF
Switching Characteristics (Note 4)						
Turn-on Delay Time	t _{d(on)}	V _{DD} = 10 V, R _L = 47Ω V _G = 4.5 V, R _G = 10Ω	-	5	-	nS
Turn-on Rise Time	t _r		-	5	-	nS
Turn-Off Delay Time	t _{d(off)}		-	25	-	nS
Turn-Off Fall Time	t _f		-	11	-	nS
Total Gate Charge	Q _g	V _{DS} = 10 V, V _{GS} = 4.5 V, I _D = 250 mA	-	750	-	pC
Gate-Source Charge	Q _{gs}		-	75	-	pC
Gate-Drain Charge	Q _{gd}		-	225	-	pC
Drain-Source Diode Characteristics						
Diode Forward Voltage (Note 3)	V _{SD}	V _{GS} =0V,I _S =0.6A	-	0.75	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

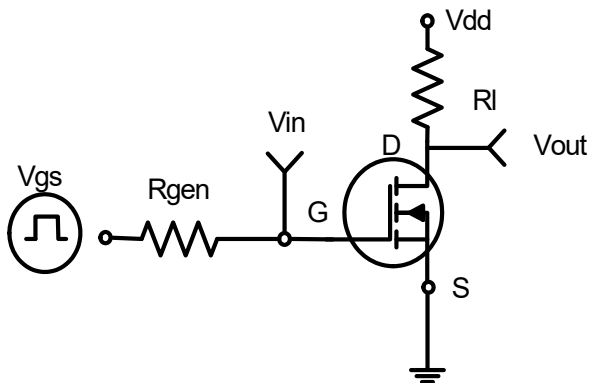


Figure 1: Switching Test Circuit

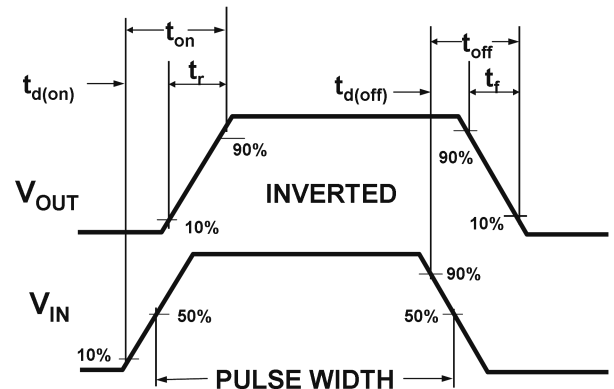


Figure 2: Switching Waveforms

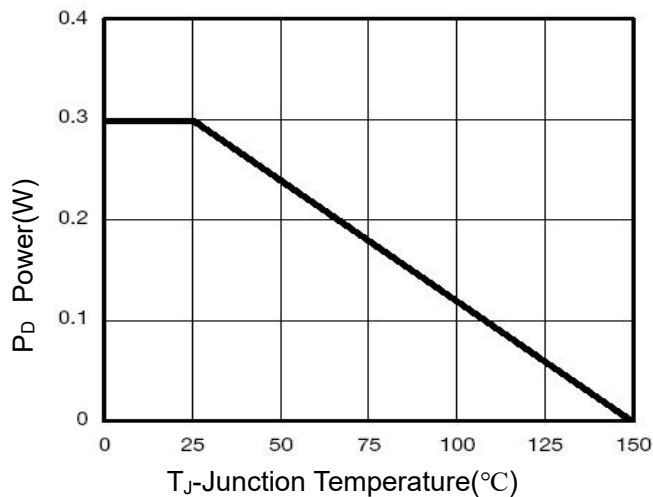


Figure 3 Power Dissipation

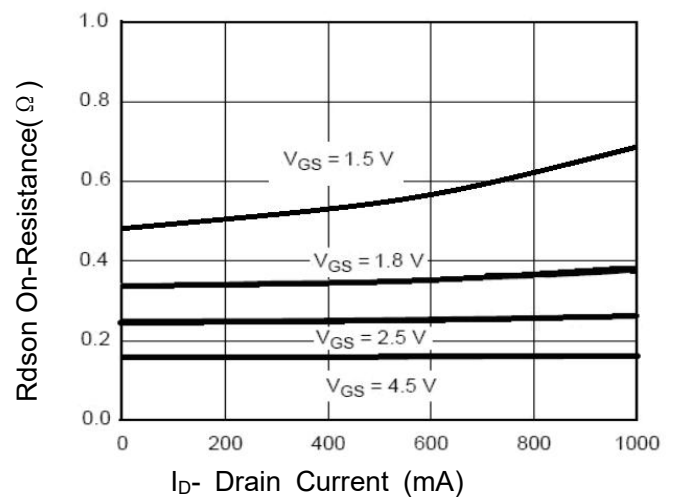


Figure 4 Drain-Source On-Resistance

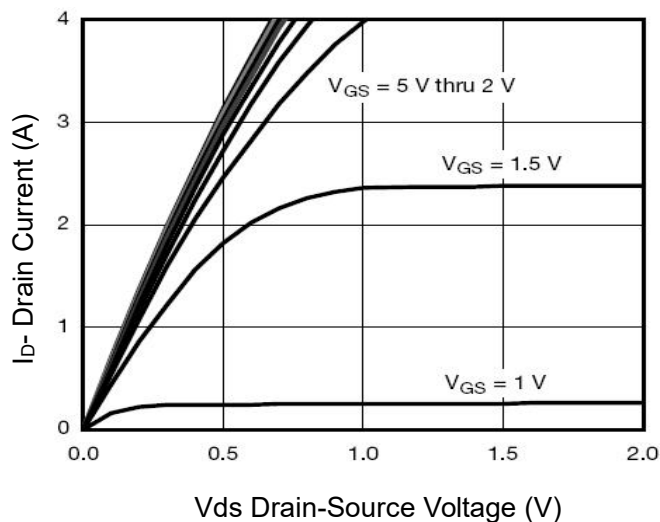


Figure 5 Output Characteristics

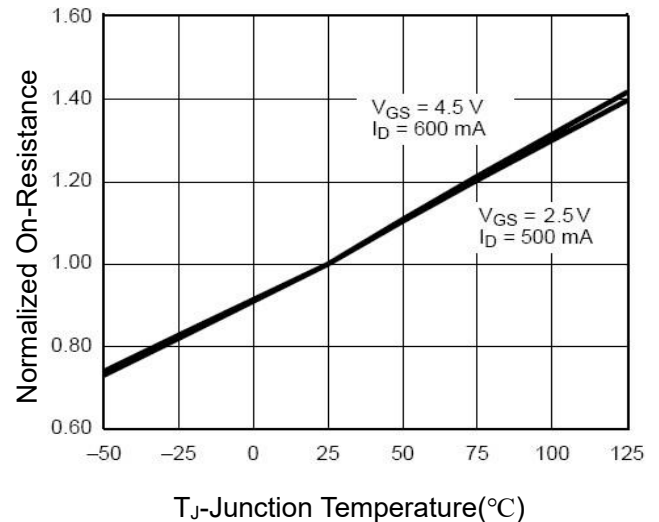
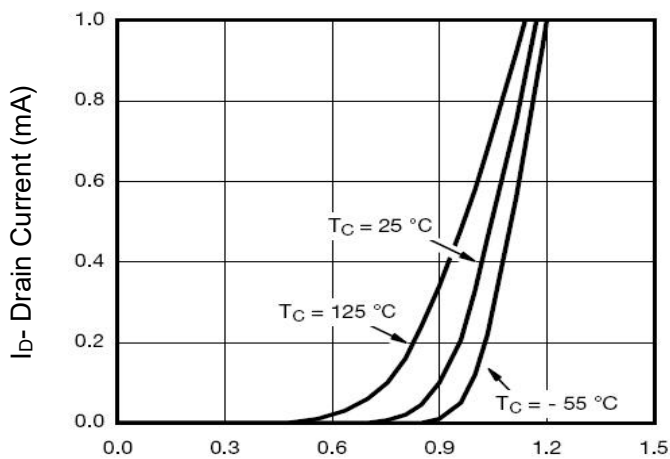
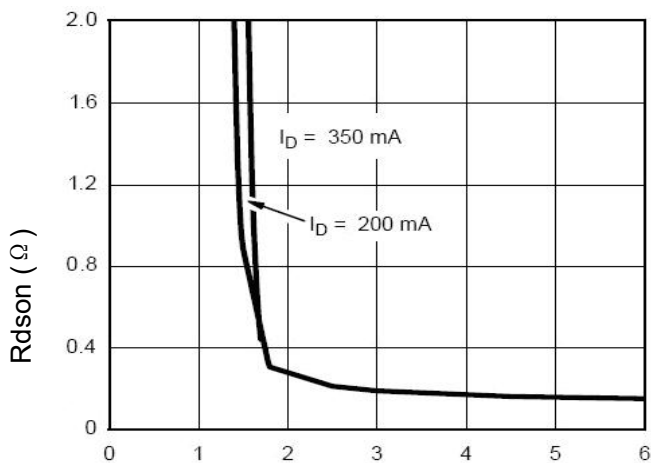


Figure 6 Drain-Source On-Resistance



V_{GS} Gate-Source Voltage (V)
Figure 7 Transfer Characteristics



V_{GS} Gate-Source Voltage (V)
Figure 9 Rdson vs Vgs

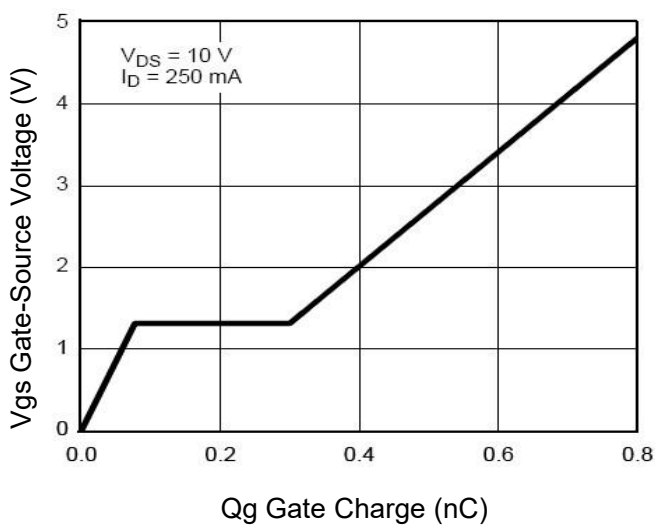
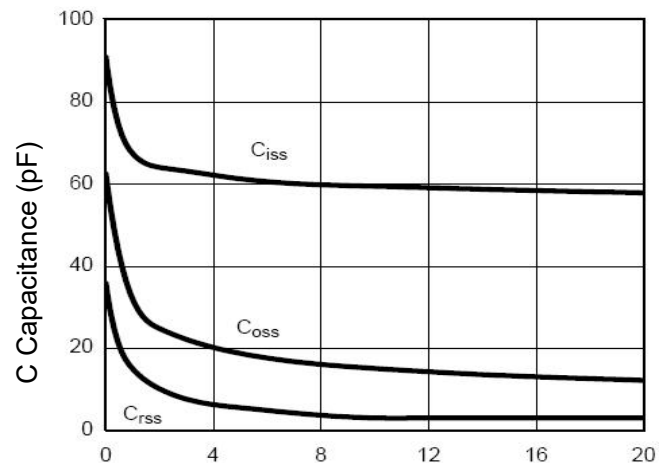
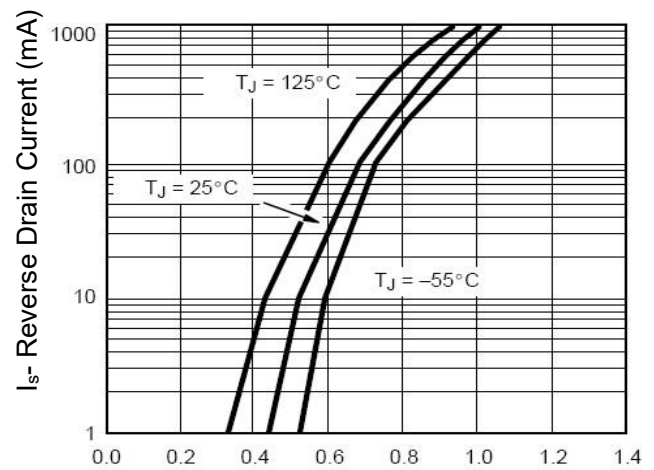


Figure 11 Gate Charge



V_{DS} Drain-Source Voltage (V)
Figure 8 Capacitance vs Vds



V_{DS} Drain-Source Voltage (V)
Figure 10 Source- Drain Diode Forward

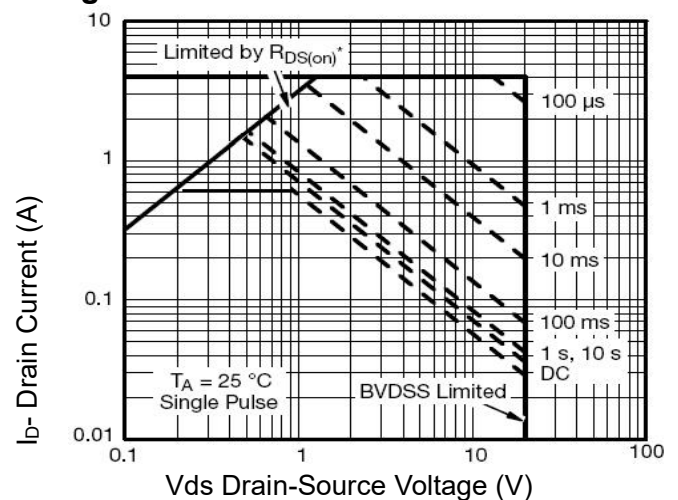


Figure 12 Safe Operation Area

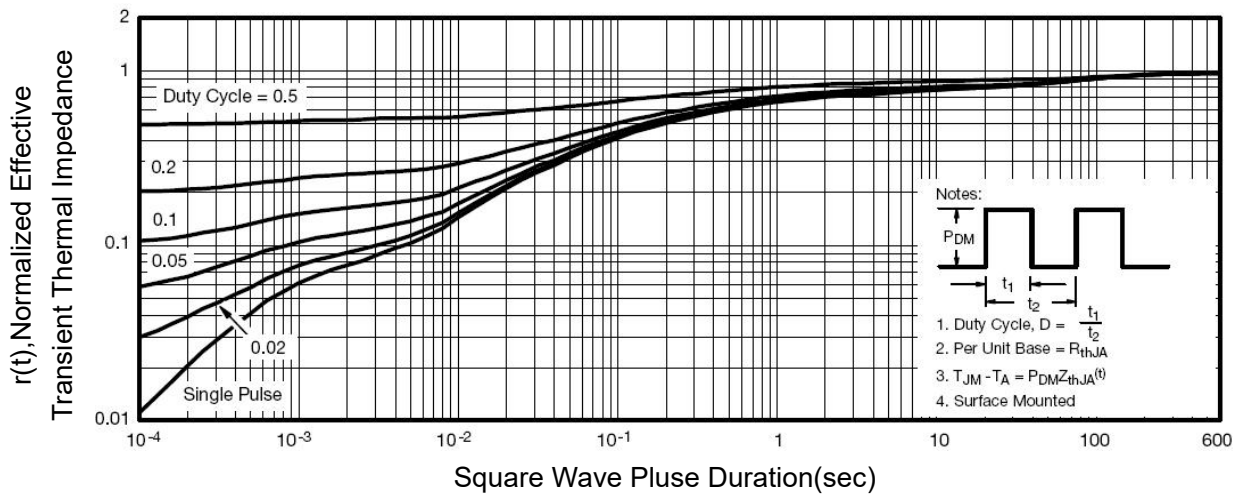
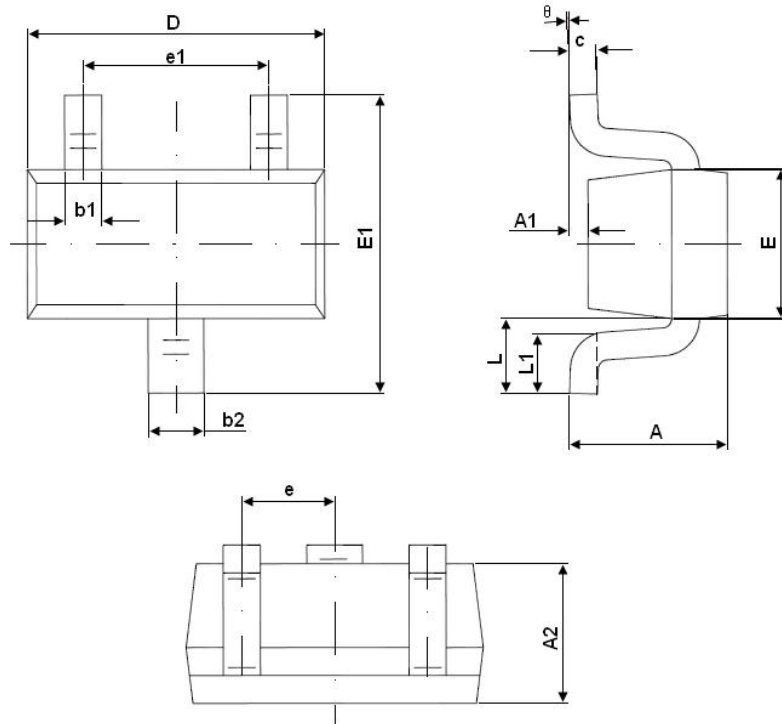


Figure 13 Normalized Maximum Transient Thermal Impedance

SOT-523 Package Information



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	0.700	0.900	0.028	0.035
A1	0.000	0.100	0.000	0.004
A2	0.700	0.800	0.028	0.031
b1	0.150	0.250	0.006	0.010
b2	0.250	0.350	0.010	0.014
c	0.100	0.200	0.004	0.008
D	1.500	1.700	0.059	0.067
E	0.700	0.900	0.028	0.035
E1	1.450	1.750	0.057	0.069
e	0.500 TYP.		0.020 TYP.	
e1	0.900	1.100	0.035	0.043
L	0.400 REF.		0.016 REF.	
L1	0.260	0.460	0.010	0.018
θ°	0°	8°	0°	8°

Notes

1. All dimensions are in millimeters.
2. Tolerance $\pm 0.10\text{mm}$ (4 mil) unless otherwise specified
3. Package body sizes exclude mold flash and gate burrs. Mold flash at the non-lead sides should be less than 5 mils.
4. Dimension L is measured in gauge plane.
5. Controlling dimension is millimeter, converted inch dimensions are not necessarily exact.

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