

NCE N-Channel Enhancement Mode Power MOSFET

Description

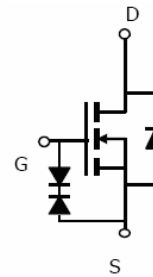
The NCE1012E uses advanced trench technology to provide excellent $R_{DS(ON)}$, low gate charge and operation with gate voltages as low as 1.8V. This device is suitable for use as a Battery protection or in other Switching application.

General Features

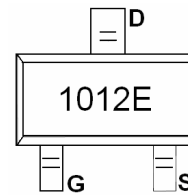
- $V_{DS} = 20V, I_D = 0.6A$
- $R_{DS(ON)} < 350m\Omega @ V_{GS} = 4.5V$
- $R_{DS(ON)} < 500m\Omega @ V_{GS} = 2.5V$
- High power and current handling capability
- Lead free product is acquired
- Gate-Source ESD protection

Application

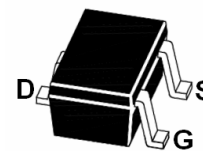
- Battery operated systems
- Load/ power switching cell phones pagers
- Power supply converter circuits



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
1012E	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}	1	A
Maximum Power Dissipation	P_D	150	mW
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-55 To 150	$^\circ C$

Thermal Characteristic

Thermal Resistance, Junction-to-Ambient ^(Note 2)	$R_{\theta JA}$	833	$^\circ C/W$
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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}	$V_{GS}=\pm 4.5V, V_{DS}=0V$	-	-	± 1	μA
On Characteristics (Note 3)						
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=250\mu A$	0.5	0.75	1.2	V
Drain-Source On-State Resistance	$R_{DS(on)}$	$V_{GS}=2.5V, I_D=0.5A$	-	310	500	m Ω
		$V_{GS}=4.5V, I_D=0.6A$	-	210	350	m Ω
Forward Transconductance	g_{FS}	$V_{DS}=10V, I_D=0.4A$	-	1	-	S
Dynamic Characteristics (Note 4)						
Input Capacitance	C_{iss}	$V_{GS} = 0 V, f = 1.0 MHz,$ $V_{DS} = 10 V$	-	60	-	pF
Output Capacitance	C_{oss}		-	15	-	pF
Reverse Transfer Capacitance	C_{rss}		-	5	-	pF
Switching Characteristics (Note 4)						
Turn-on Delay Time	$t_{d(on)}$	$V = 10 V, R = 47\Omega$ $I_D = 200 mA,$ $V_{GEN} = 4.5 V, R_G = 10\Omega$	-	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 FR4 Board, $t \leq 10$ sec.
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

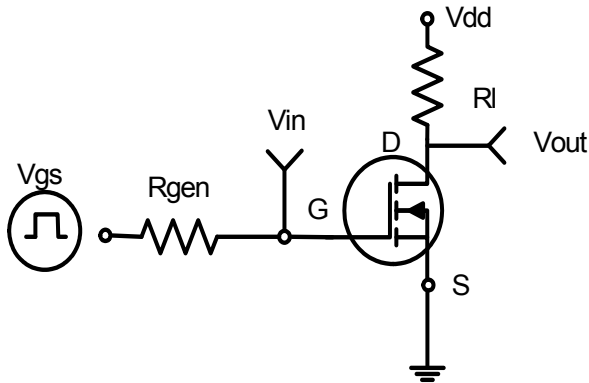


Figure 1: Switching Test Circuit

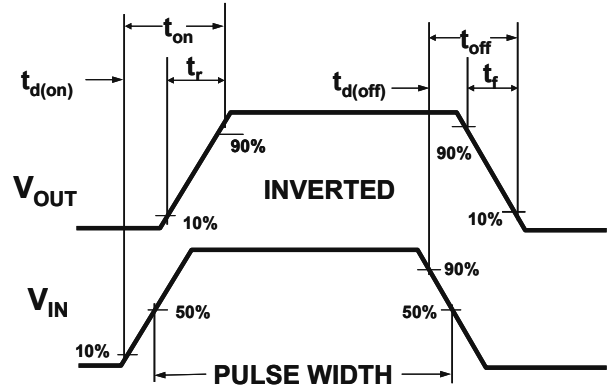


Figure 2: Switching Waveforms

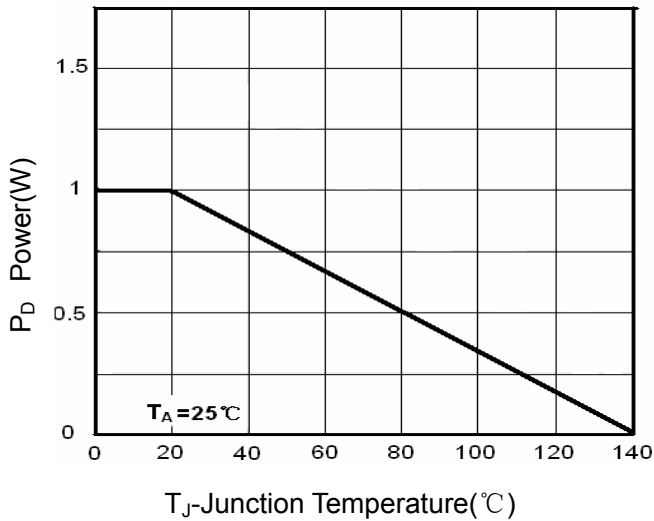


Figure 3 Power Dissipation

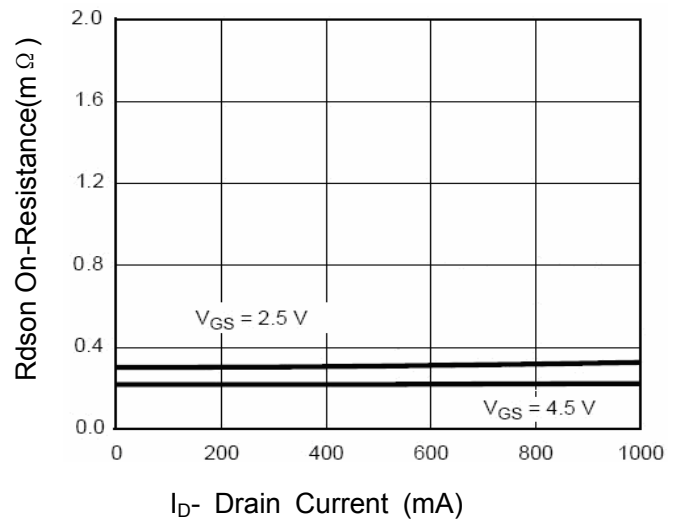


Figure 6 Drain-Source On-Resistance

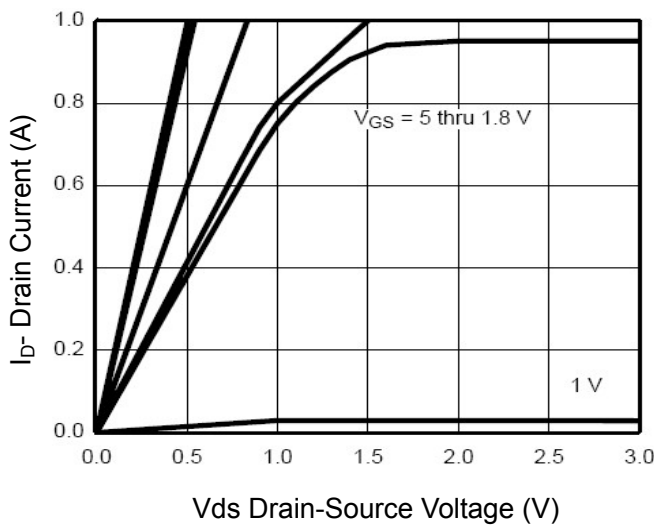


Figure 5 Output Characteristics

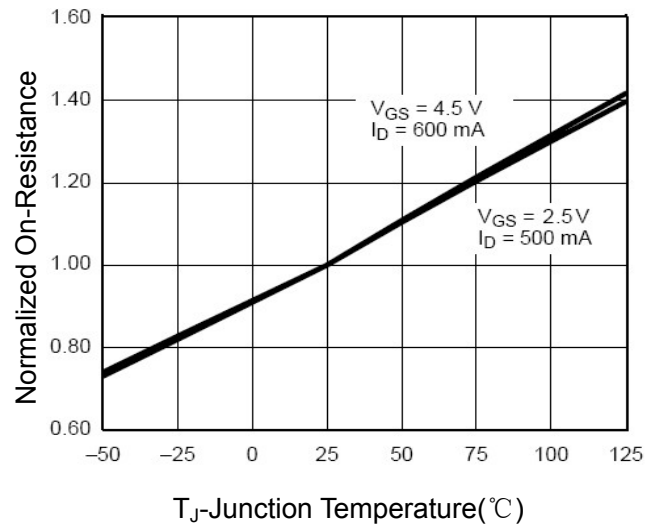
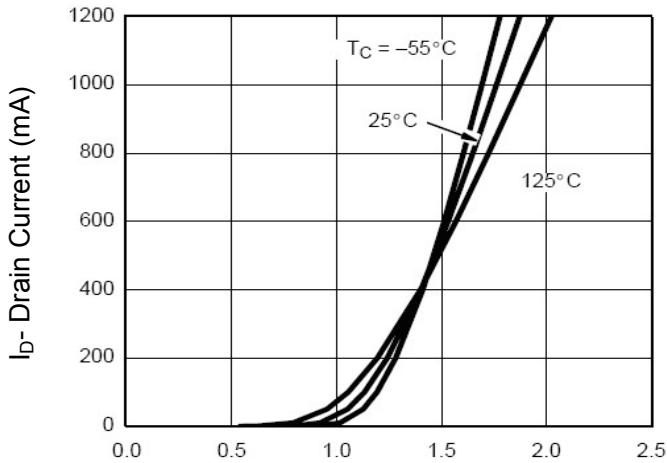
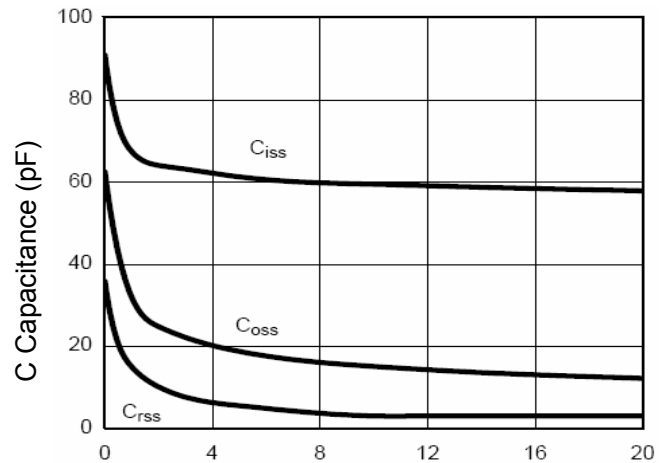


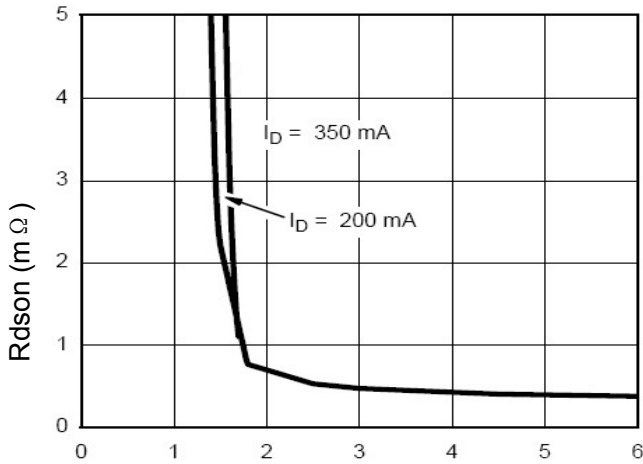
Figure 8 Drain-Source On-Resistance



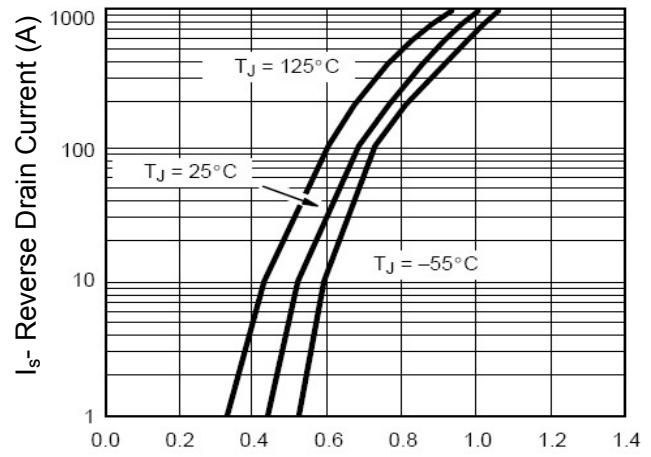
Vgs Gate-Source Voltage (V)
Figure 7 Transfer Characteristics



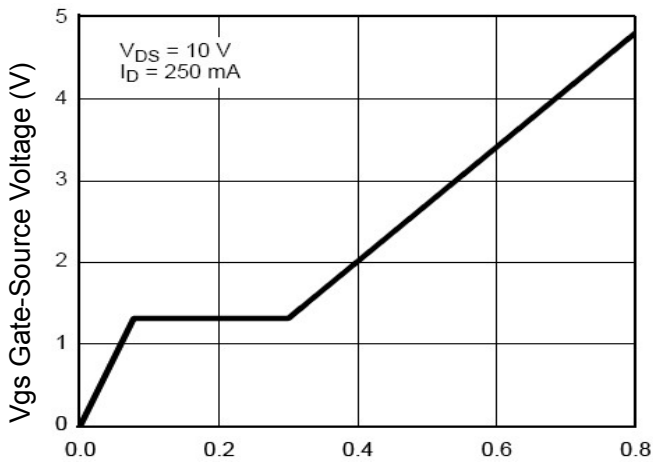
Vds Drain-Source Voltage (V)
Figure 8 Capacitance vs Vds



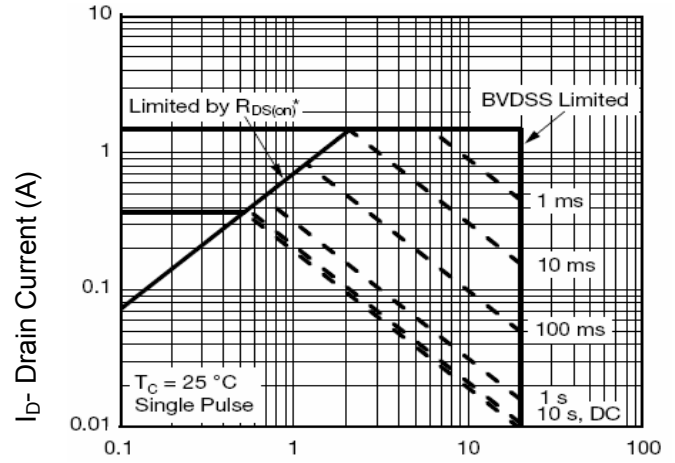
Vgs Gate-Source Voltage (V)
Figure 9 Rdson vs Vgs



Vds Drain-Source Voltage (V)
Figure 10 Capacitance vs Vds



Qg Gate Charge (nC)
Figure 11 Gate Charge



Vds Drain-Source Voltage (V)
Figure 13 Safe Operation Area

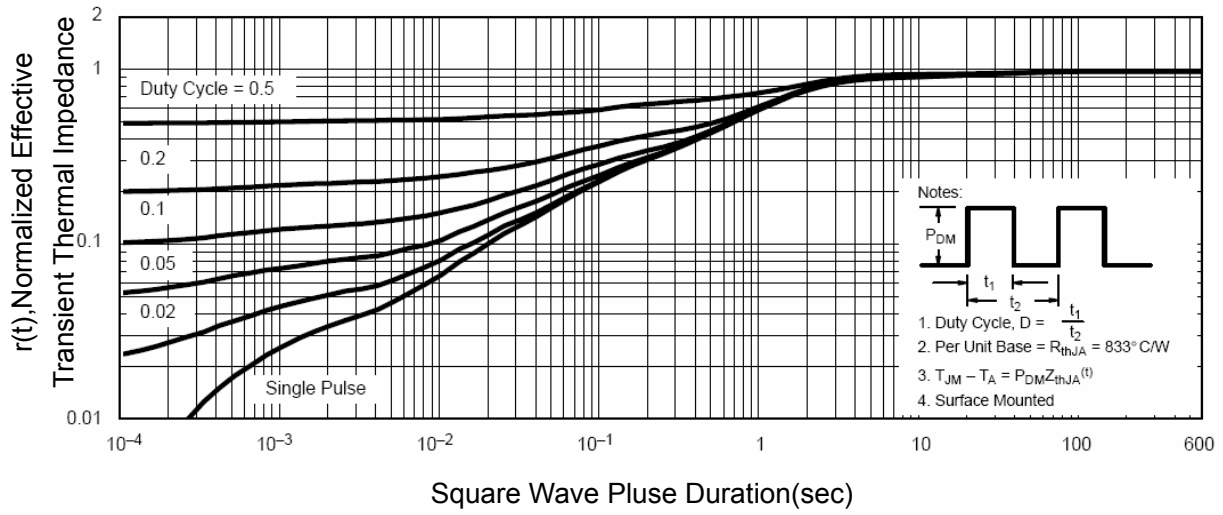
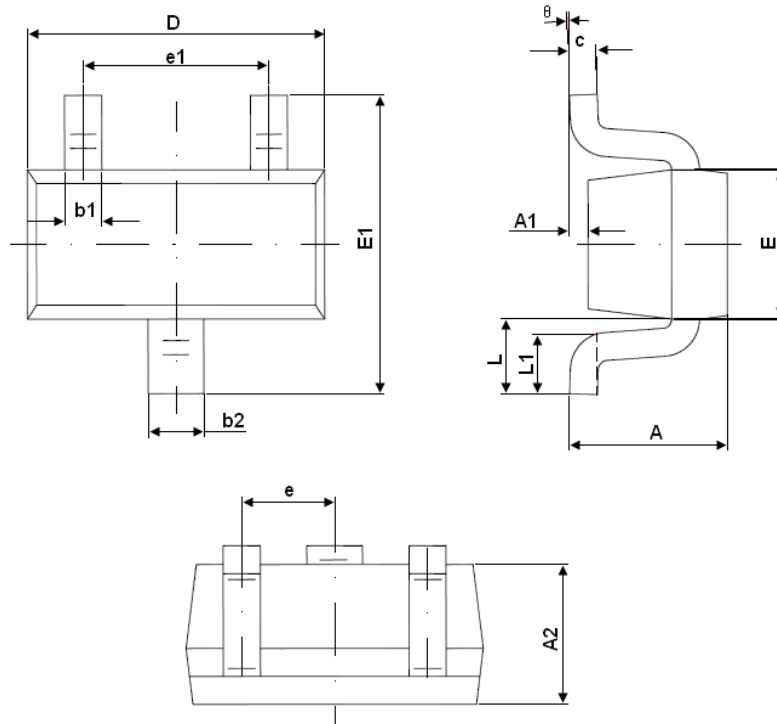


Figure 14 Normalized Maximum Transient Thermal Impedance

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
e	0.500 TYP.		0.020 TYP.	
e1	0.900	1.100	0.035	0.043
L	0.400REF.		0.016REF.	
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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