

## NCE N-Channel Enhancement Mode Power MOSFET

### Description

The NCE0125AI uses advanced trench technology and design to provide excellent  $R_{DS(ON)}$  with low gate charge. It can be used in a wide variety of applications.

### General Features

- $V_{DS} = 100V, I_D = 25A$   
 $R_{DS(ON)} < 36m\Omega @ V_{GS}=10V$  (Typ:31 m $\Omega$ )
- Special process technology for high ESD capability
- High density cell design for ultra low  $R_{dson}$
- Fully characterized avalanche voltage and current
- Good stability and uniformity with high  $E_{AS}$
- Excellent package for good heat dissipation

### Application

- Power switching application
- Hard switched and high frequency circuits
- Uninterruptible power supply

**100% UIS TESTED!**

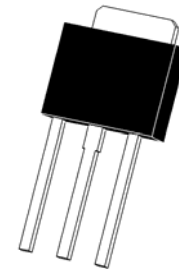
**100%  $\Delta V_d$ s TESTED!**



Schematic diagram



Marking and pin assignment



TO-251 top view

### Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
NCE0125AI	NCE0125AI	TO-251	-	-	-

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

Symbol	Parameter	Limit	Unit
$V_{DS}$	Drain-Source Voltage	100	V
$V_{GS}$	Gate-Source Voltage	$\pm 20$	V
$I_D$	Drain Current-Continuous	25	A
$I_D(100^\circ C)$	Drain Current-Continuous( $T_C=100^\circ C$ )	17.6	A
$I_{DM}$	Pulsed Drain Current	70	A
$P_D$	Maximum Power Dissipation	70	W
	Derating factor	0.5	W/ $^\circ C$
$E_{AS}$	Single pulse avalanche energy <sup>(Note 5)</sup>	110	mJ
$T_J, T_{STG}$	Operating Junction and Storage Temperature Range	-55 To 175	$^\circ C$

**Thermal Characteristic**

$R_{\theta JC}$	Thermal Resistance, Junction-to-Case <sup>(Note 2)</sup>	2	$^{\circ}C/W$
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**Electrical Characteristics ( $T_C=25^{\circ}C$  unless otherwise noted)**

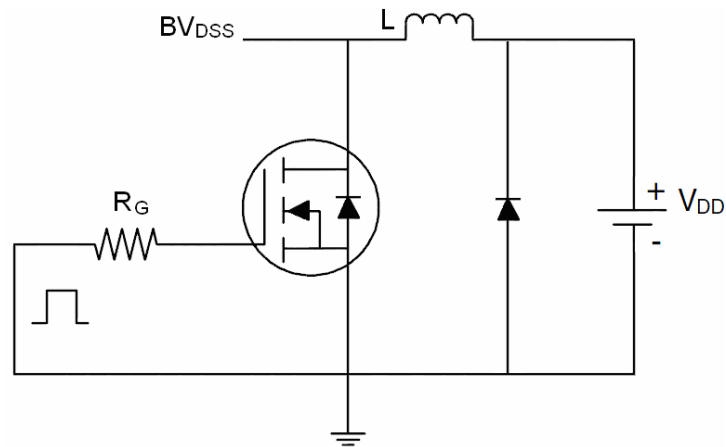
Symbol	Parameter	Condition	Min	Typ	Max	Unit
<b>Off Characteristics</b>						
$BV_{DSS}$	Drain-Source Breakdown Voltage	$V_{GS}=0V, I_D=250\mu A$	100	110	-	V
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS}=100V, V_{GS}=0V$	-	-	1	$\mu A$
$I_{GSS}$	Gate-Body Leakage Current	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	$\pm 100$	nA
<b>On Characteristics <sup>(Note 3)</sup></b>						
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_D=250\mu A$	1.0	1.6	2.2	V
$R_{DS(ON)}$	Drain-Source On-State Resistance	$V_{GS}=10V, I_D=15A$	-	31	36	m $\Omega$
$g_{FS}$	Forward Transconductance	$V_{DS}=5V, I_D=15A$	-	12	-	S
<b>Dynamic Characteristics <sup>(Note 4)</sup></b>						
$C_{iss}$	Input Capacitance	$V_{DS}=50V, V_{GS}=0V,$ $F=1.0MHz$	-	3000	-	PF
$C_{oss}$	Output Capacitance		-	92	-	PF
$C_{rSS}$	Reverse Transfer Capacitance		-	18.3	-	PF
<b>Switching Characteristics <sup>(Note 4)</sup></b>						
$t_{d(on)}$	Turn-on Delay Time	$V_{DD}=50V, R_L=5\Omega$ $V_{GS}=10V, R_{GEN}=3\Omega$	-	9	-	nS
$t_r$	Turn-on Rise Time		-	9	-	nS
$t_{d(off)}$	Turn-Off Delay Time		-	31	-	nS
$t_f$	Turn-Off Fall Time		-	9	-	nS
$Q_g$	Total Gate Charge	$V_{DS}=50V, I_D=25A,$ $V_{GS}=10V$	-	70.4	-	nC
$Q_{gs}$	Gate-Source Charge		-	9.0	-	nC
$Q_{gd}$	Gate-Drain Charge		-	15.3	-	nC
<b>Drain-Source Diode Characteristics</b>						
$V_{SD}$	Diode Forward Voltage <sup>(Note 3)</sup>	$V_{GS}=0V, I_S=25A$	-	-	1.2	V
$I_S$	Diode Forward Current <sup>(Note 2)</sup>	-	-	-	25	A
$t_{rr}$	Reverse Recovery Time	$T_J = 25^{\circ}C, I_F = 25A$ $di/dt = 100A/\mu s$ <sup>(Note 3)</sup>	-	34	-	nS
$Q_{rr}$	Reverse Recovery Charge		-	56	-	nC

**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
5. EAS Condition :  $T_J=25^{\circ}C, V_{DD}=50V, V_G=10V, L=0.5mH, R_g=25\Omega$

**Test Circuit**

**1) E<sub>AS</sub> Test Circuit**



**2) Gate Charge Test Circuit**



**3) Switch Time Test Circuit**



Typical Electrical and Thermal Characteristics (Curves)

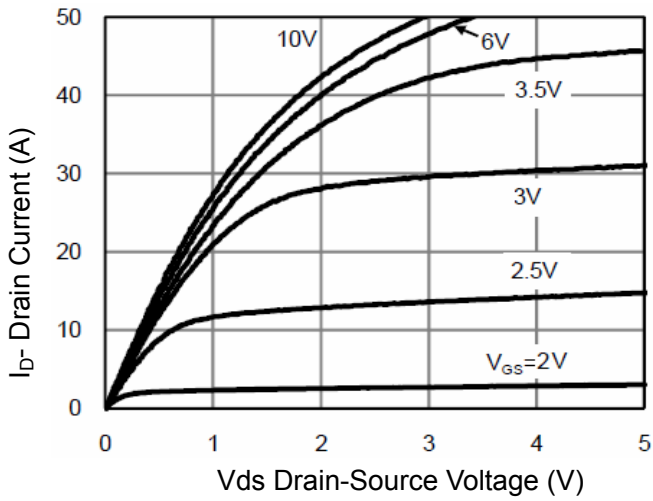


Figure 1 Output Characteristics

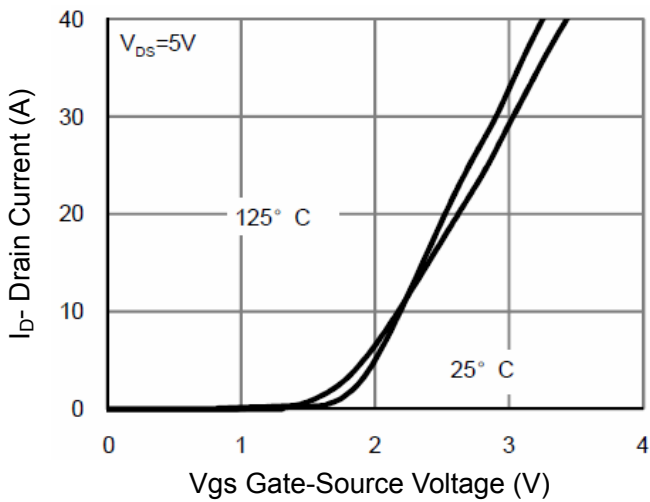


Figure 2 Transfer Characteristics

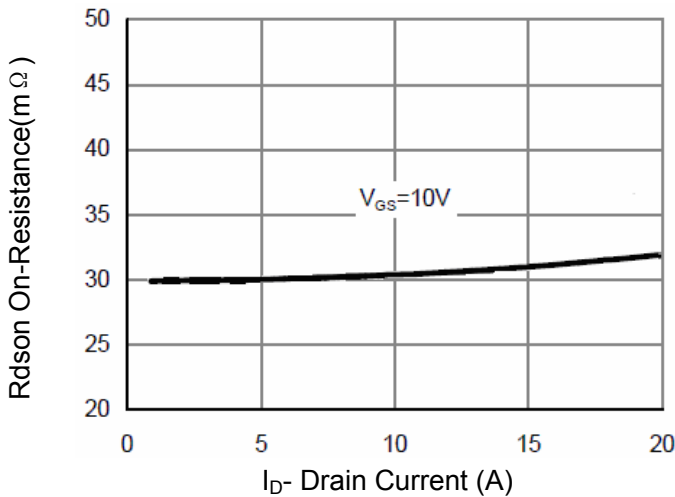


Figure 3 Rdson- Drain Current

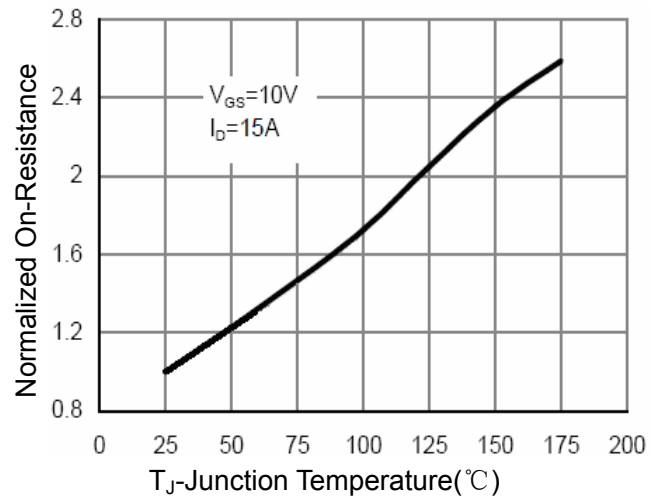


Figure 4 Rdson-Junction Temperature

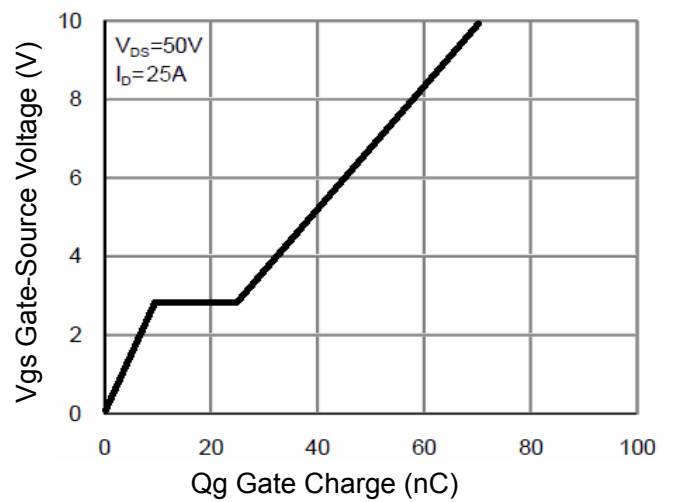


Figure 5 Gate Charge

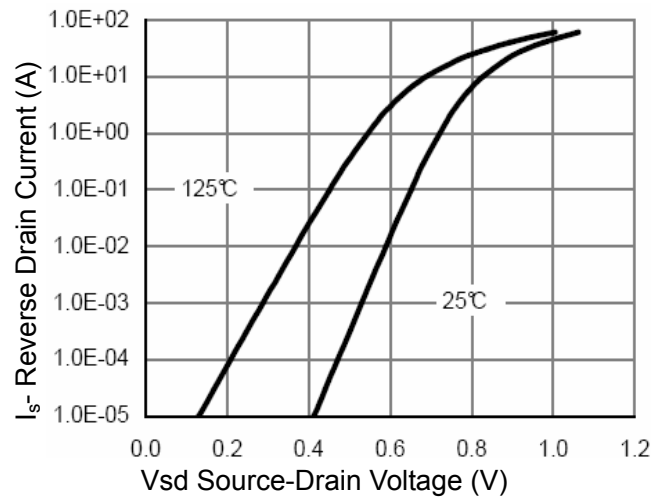


Figure 6 Source- Drain Diode Forward

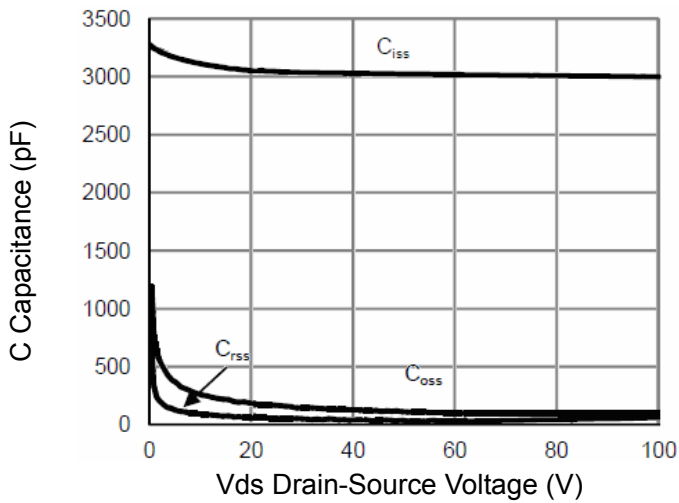


Figure 7 Capacitance vs Vds

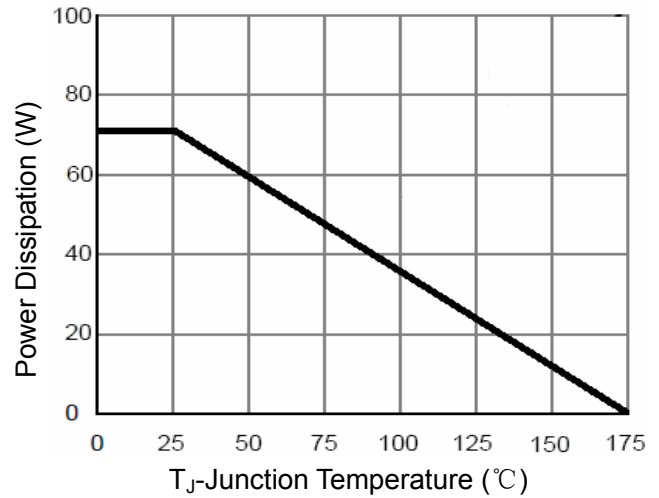


Figure 9 Power De-rating

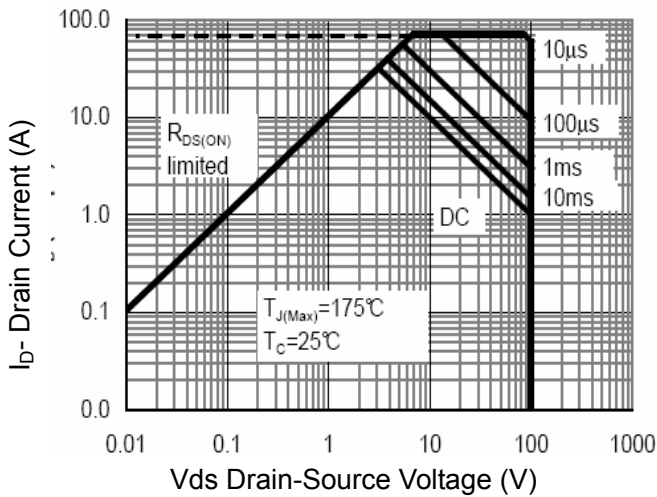


Figure 8 Safe Operation Area

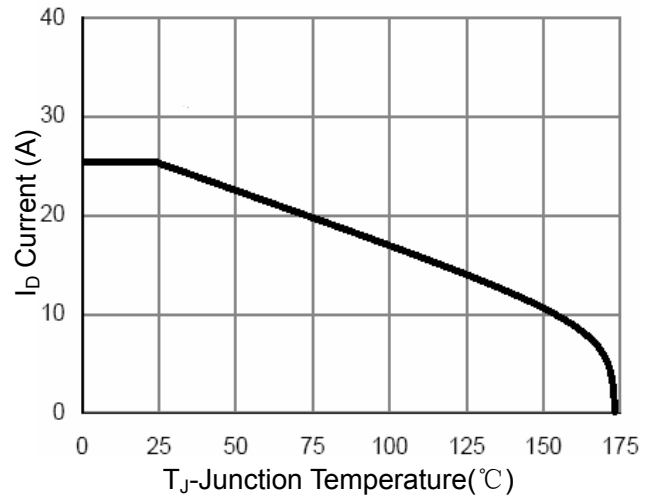


Figure 10 ID Current- Junction Temperature

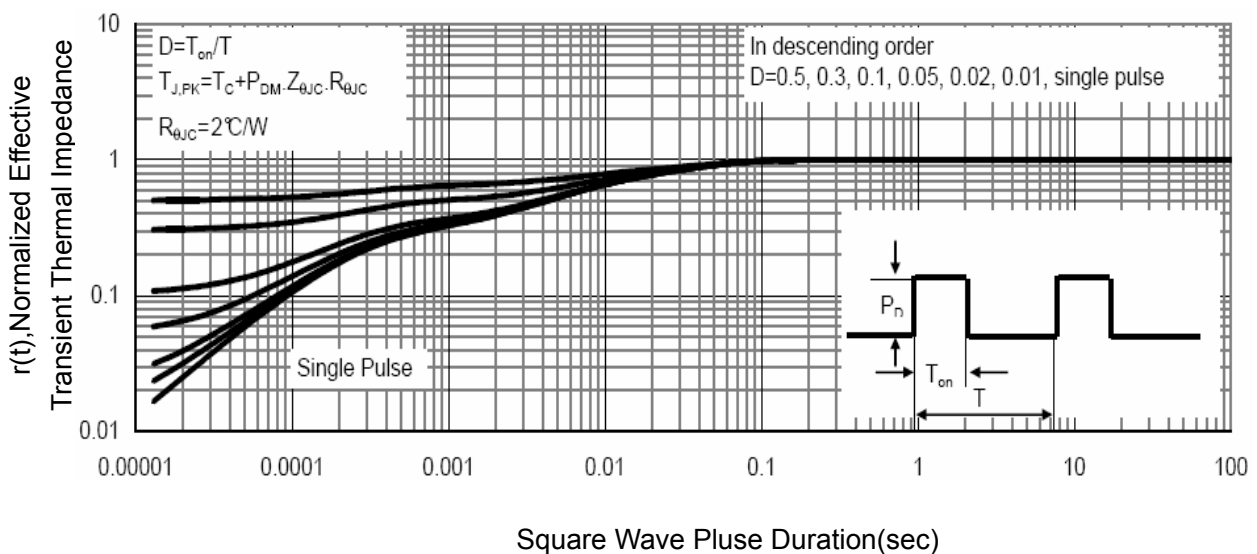
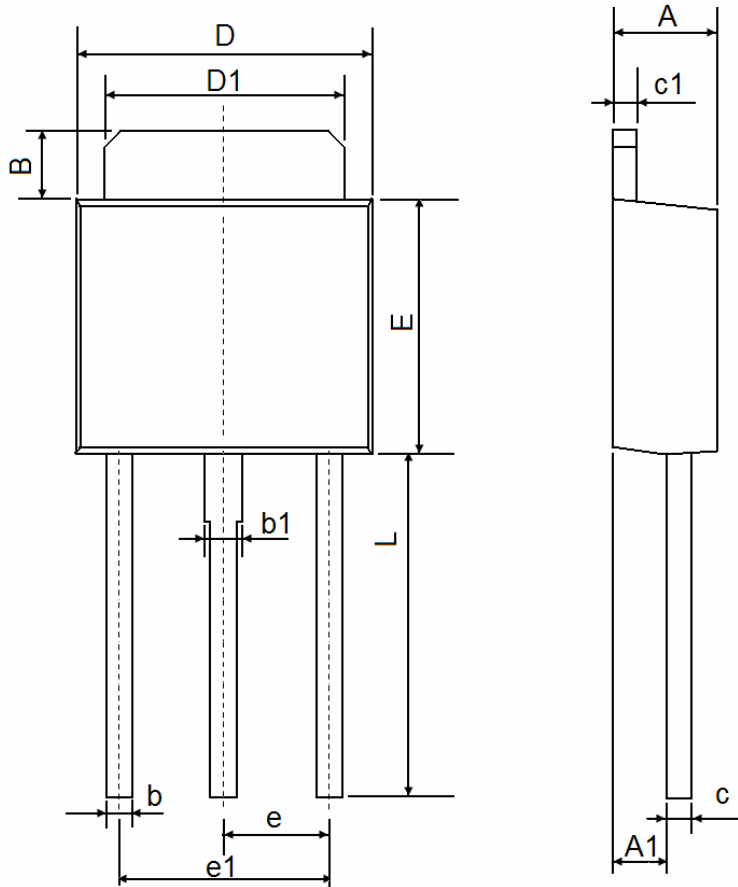


Figure 11 Normalized Maximum Transient Thermal Impedance

## TO-251 Package Information



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	2.200	2.400	0.087	0.094
A1	1.050	1.350	0.042	0.054
B	1.350	1.650	0.053	0.065
b	0.500	0.700	0.020	0.028
b1	0.700	0.900	0.028	0.035
c	0.430	0.580	0.017	0.023
c1	0.430	0.580	0.017	0.023
D	6.350	6.650	0.250	0.262
D1	5.200	5.400	0.205	0.213
E	5.400	5.700	0.213	0.224
e	2.300 TYP		0.091 TYP	
e1	4.500	4.700	0.177	0.185
L	7.500	7.900	0.295	0.311

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