

## NCE N-Channel Super Trench Power MOSFET

### Description

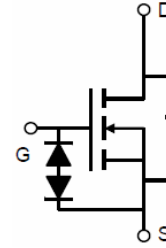
The NCEP4085EG uses **Super Trench** technology that is uniquely optimized to provide the most efficient high frequency switching performance. Both conduction and switching power losses are minimized due to an extremely low combination of  $R_{DS(ON)}$  and  $Q_g$ . This device is ideal for high-frequency switching and synchronous rectification. It is ESD protected.

### General Features

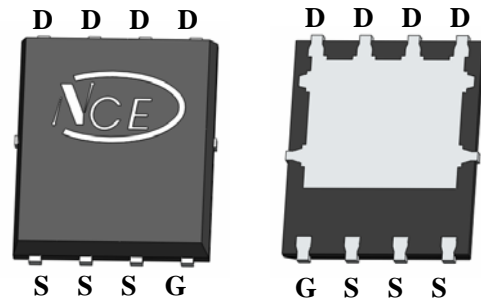
- $V_{DS} = 40V, I_D = 85A$   
 $R_{DS(ON)} = 3.7m\Omega$  (typical) @  $V_{GS} = 10V$   
 $R_{DS(ON)} = 5.0m\Omega$  (typical) @  $V_{GS} = 4.5V$
- Excellent gate charge x  $R_{DS(on)}$  product(FOM)
- Very low on-resistance  $R_{DS(on)}$
- 150 °C operating temperature
- Pb-free lead plating
- 100% UIS tested
- ESD protection : HBM Class 2

### Application

- DC/DC Converter
- Ideal for high-frequency switching and synchronous rectification



Schematic Diagram



Top View

Bottom View

**100% UIS TESTED!**  
**100% ΔVds TESTED!**

### Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
NCEP4085EG	NCEP4085EG	DFN5X6-8L	-	-	-

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

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	$V_{DS}$	40	V
Gate-Source Voltage	$V_{GS}$	$\pm 20$	V
Drain Current-Continuous ( <b>Silicon Limited</b> )	$I_D$	85	A
Drain Current-Continuous( $T_C = 100^\circ C$ )	$I_D(100^\circ C)$	59.5	A
Pulsed Drain Current ( <b>Package Limited</b> )	$I_{DM}$	260	A
Maximum Power Dissipation	$P_D$	65	W
Derating factor		0.52	W/°C
Single pulse avalanche energy <sup>(Note 5)</sup>	$E_{AS}$	288	mJ
Operating Junction and Storage Temperature Range	$T_J, T_{STG}$	-55 To 150	°C

### Thermal Characteristic

Thermal Resistance, Junction-to-Case <sup>(Note 2)</sup>	$R_{\theta JC}$	1.92	°C/W
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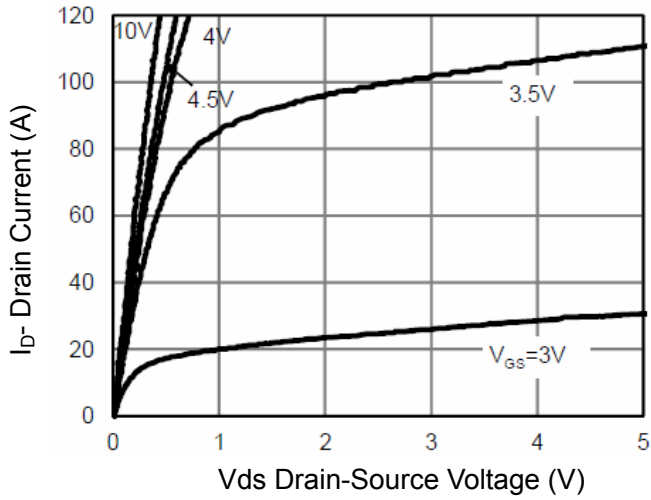
## Electrical Characteristics ( $T_C=25^\circ\text{C}$ unless otherwise noted)

Parameter	Symbol	Condition	Min	Typ	Max	Unit
<b>Off Characteristics</b>						
Drain-Source Breakdown Voltage	$BV_{DSS}$	$V_{GS}=0V, I_D=250\mu A$	40		-	V
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS}=40V, V_{GS}=0V$	-	-	1	$\mu A$
Gate-Body Leakage Current	$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	$\pm 10$	$\mu A$
<b>On Characteristics</b> (Note 3)						
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=250\mu A$	1.0	1.5	2.2	V
Drain-Source On-State Resistance	$R_{DS(on)}$	$V_{GS}=10V, I_D=20A$	-	3.7	4.0	$m\Omega$
		$V_{GS}=4.5V, I_D=20A$	-	5.0	5.5	$m\Omega$
Forward Transconductance	$g_{FS}$	$V_{DS}=5V, I_D=20A$		40	-	S
<b>Dynamic Characteristics</b> (Note 4)						
Input Capacitance	$C_{iss}$	$V_{DS}=20V, V_{GS}=0V,$ $F=1.0MHz$	-	2100	2600	PF
Output Capacitance	$C_{oss}$		-	639	800	PF
Reverse Transfer Capacitance	$C_{rss}$		-	23.6	29	PF
<b>Switching Characteristics</b> (Note 4)						
Turn-on Delay Time	$t_{d(on)}$	$V_{DD}=20V, I_D=20A$ $V_{GS}=10V, R_G=1.6\Omega$	-	7.5	-	nS
Turn-on Rise Time	$t_r$		-	4	-	nS
Turn-Off Delay Time	$t_{d(off)}$		-	26	-	nS
Turn-Off Fall Time	$t_f$		-	3.3	-	nS
Total Gate Charge	$Q_g$	$V_{DS}=20V, I_D=20A,$ $V_{GS}=10V$	-	34.3	47	nC
Gate-Source Charge	$Q_{gs}$		-	7.1		nC
Gate-Drain Charge	$Q_{gd}$		-	3.5		nC
<b>Drain-Source Diode Characteristics</b>						
Diode Forward Voltage (Note 3)	$V_{SD}$	$V_{GS}=0V, I_S=85A$	-		1.2	V
Diode Forward Current (Note 2)	$I_S$		-	-	85	A
Reverse Recovery Time	$t_{rr}$	$T_J = 25^\circ\text{C}, I_F = I_S$ $di/dt = 500A/\mu s$ (Note 3)	-	19	-	nS
Reverse Recovery Charge	$Q_{rr}$		-	40	-	nC

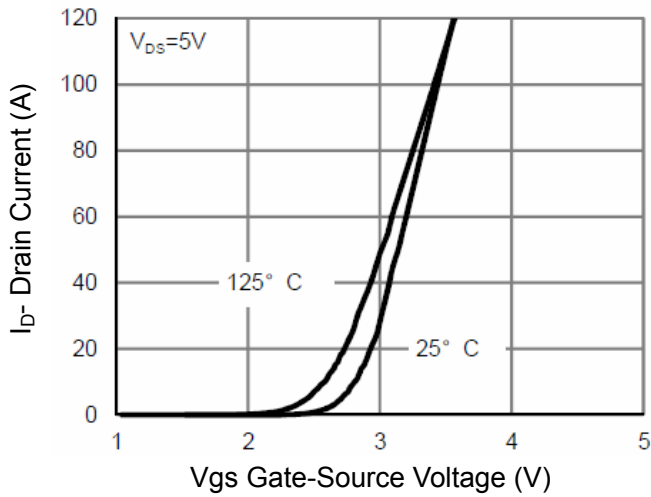
### Notes:

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 :  $T_J=25^\circ\text{C}, V_{DD}=20V, V_G=10V, L=0.5mH, R_g=25\Omega$

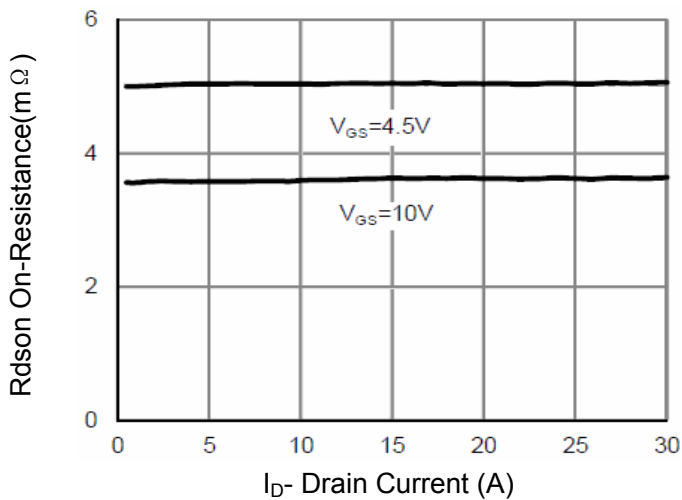
**Typical Electrical and Thermal Characteristics**



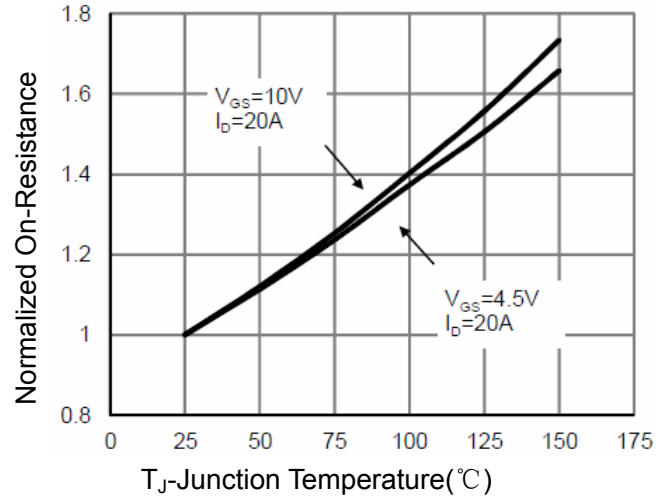
**Figure 1 Output Characteristics**



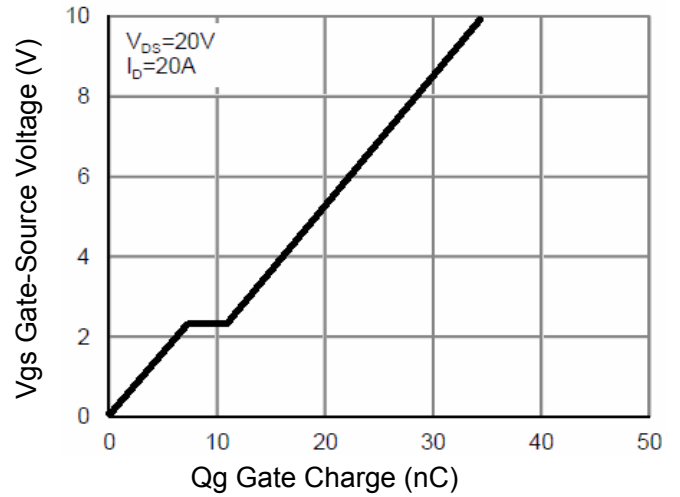
**Figure 2 Transfer Characteristics**



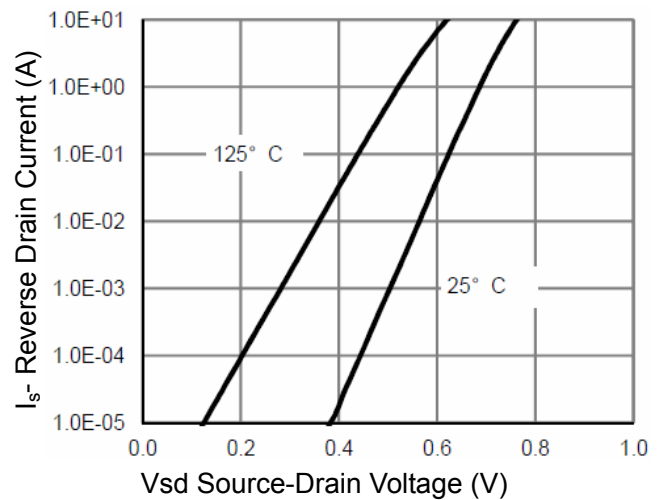
**Figure 3  $R_{DS(on)}$ - Drain Current**



**Figure 4  $R_{DS(on)}$ -Junction Temperature**



**Figure 5 Gate Charge**



**Figure 6 Source- Drain Diode Forward**

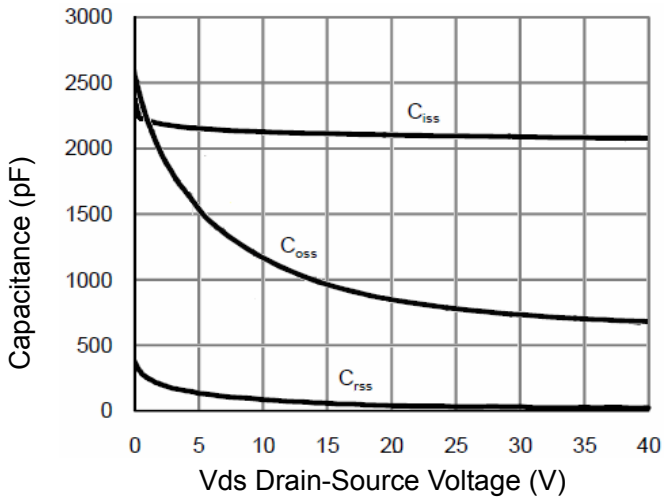


Figure 7 Capacitance vs Vds

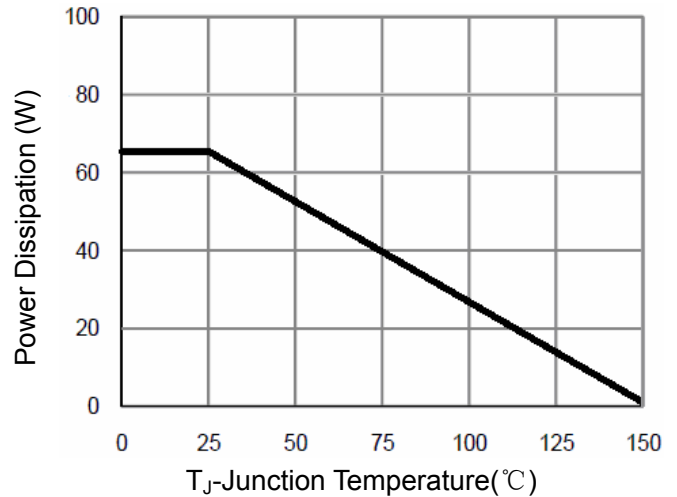


Figure 9 Power De-rating

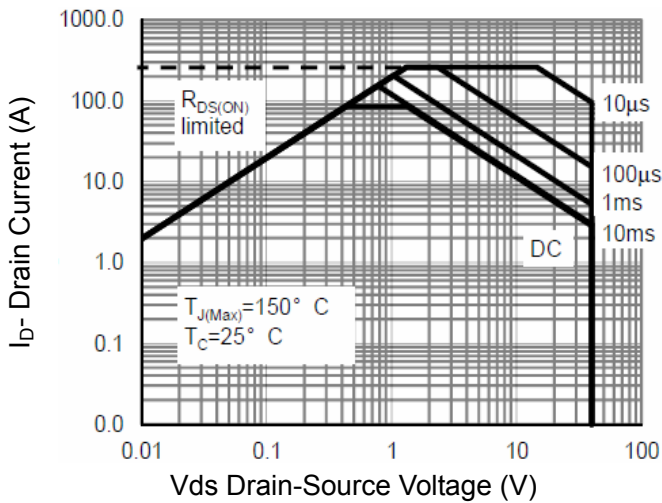


Figure 8 Safe Operation Area

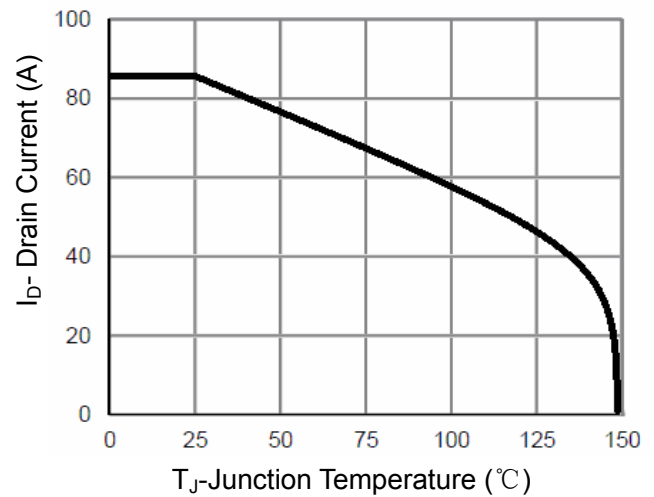


Figure 10 Current De-rating

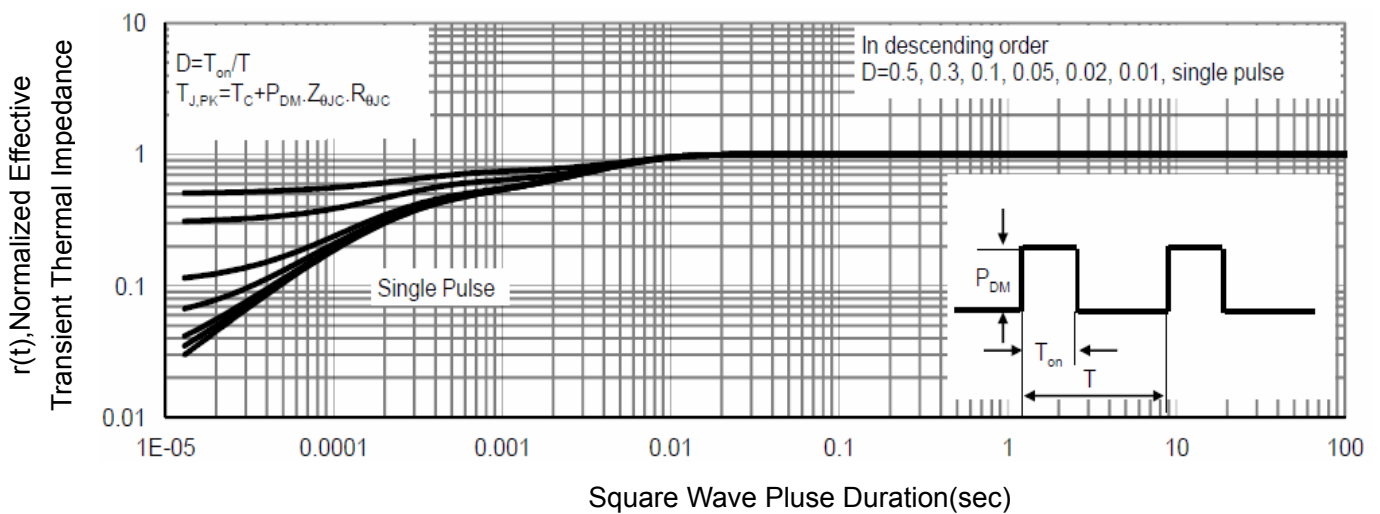
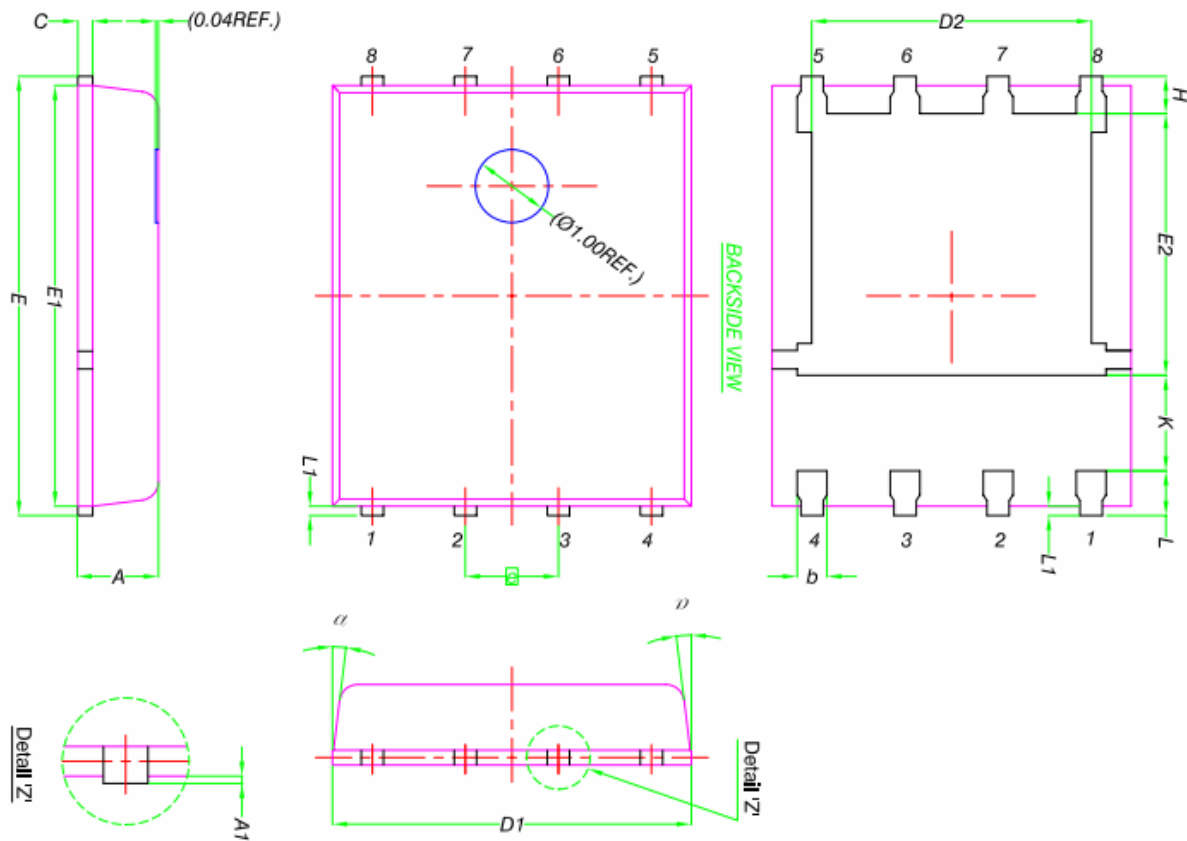
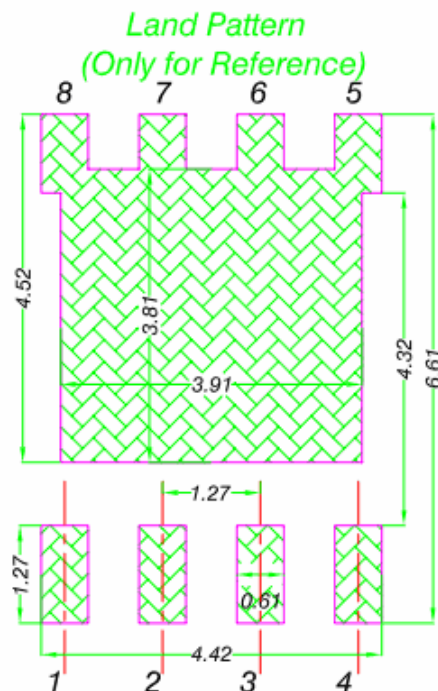


Figure 11 Normalized Maximum Transient Thermal Impedance

## DFN5X6-8L Package Information



DIM.	MILLIMETERS		
	MIN.	NOM.	MAX.
A	0.90	1.00	1.10
A1	0	-	0.05
b	0.33	0.41	0.51
C	0.20	0.25	0.30
D1	4.80	4.90	5.00
D2	3.61	3.81	3.96
E	5.90	6.00	6.10
E1	5.70	5.75	5.80
E2	3.38	3.58	3.78
e	1.27 BSC		
H	0.41	0.51	0.61
K	1.10	-	-
L	0.51	0.61	0.71
L1	0.06	0.13	0.20
α	0°	-	12°



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