

## NCE N-Channel Super Trench Power MOSFET

### Description

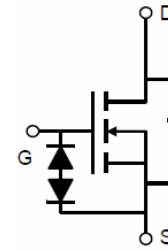
The NCEP4085EG uses **Super Trench** technology that is uniquely optimized to provide the most efficient high frequency switching performance. Both conduction and switching power losses are minimized due to an extremely low combination of  $R_{DS(ON)}$  and  $Q_g$ . This device is ideal for high-frequency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

### General Features

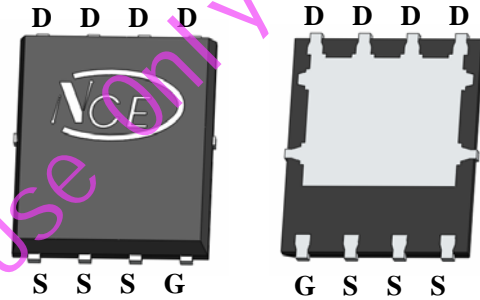
- $V_{DS} = 40V, I_D = 85A$   
 $R_{DS(ON)} = 3.0m\Omega$  (typical) @  $V_{GS} = 10V$   
 $R_{DS(ON)} = 4.0m\Omega$  (typical) @  $V_{GS} = 4.5V$
- Excellent gate charge x  $R_{DS(on)}$  product(FOM)
- Very low on-resistance  $R_{DS(on)}$
- 150 °C operating temperature
- Pb-free lead plating
- 100% 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 (Silicon Limited)	$I_D$	85	A
Drain Current-Continuous( $T_C = 100^\circ C$ )	$I_D(100^\circ C)$	60	A
Pulsed Drain Current (Package Limited)	$I_{DM}$	260	A
Maximum Power Dissipation	$P_D$	65	W
Derating factor		0.52	W/°C
Single pulse avalanche energy (Note 5)	$E_{AS}$	288	mJ
Operating Junction and Storage Temperature Range	$T_J, T_{STG}$	-55 To 150	°C

### Thermal Characteristic

Thermal Resistance, Junction-to-Case (Note 2)	$R_{\theta JC}$	1.92	°C/W
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**Electrical Characteristics (T<sub>C</sub>=25 °C unless otherwise noted)**

Parameter	Symbol	Condition	Min	Typ	Max	Unit
<b>Off Characteristics</b>						
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	V <sub>GS</sub> =0V, I <sub>D</sub> =250μA	40		-	V
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>DS</sub> =40V, V <sub>GS</sub> =0V	-	-	1	μA
Gate-Body Leakage Current	I <sub>GSS</sub>	V <sub>GS</sub> =±20V, V <sub>DS</sub> =0V	-	-	±10	μA
<b>On Characteristics</b> (Note 3)						
Gate Threshold Voltage	V <sub>GS(th)</sub>	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250μA	1.0	1.5	2.2	V
Drain-Source On-State Resistance	R <sub>DS(ON)</sub>	V <sub>GS</sub> =10V, I <sub>D</sub> =20A	-	3.0	3.3	mΩ
		V <sub>GS</sub> =4.5V, I <sub>D</sub> =20A	-	4.0	4.3	mΩ
Forward Transconductance	g <sub>FS</sub>	V <sub>DS</sub> =5V, I <sub>D</sub> =20A		40	-	S
<b>Dynamic Characteristics</b> (Note 4)						
Input Capacitance	C <sub>iss</sub>	V <sub>DS</sub> =20V, V <sub>GS</sub> =0V, F=1.0MHz	-	2100	2600	PF
Output Capacitance	C <sub>oss</sub>		-	639	800	PF
Reverse Transfer Capacitance	C <sub>rss</sub>		-	23.6	29	PF
<b>Switching Characteristics</b> (Note 4)						
Turn-on Delay Time	t <sub>d(on)</sub>	V <sub>DD</sub> =20V, I <sub>D</sub> =20A V <sub>GS</sub> =10V, R <sub>G</sub> =1.6Ω	-	7.5	-	nS
Turn-on Rise Time	t <sub>r</sub>		-	4	-	nS
Turn-Off Delay Time	t <sub>d(off)</sub>		-	26	-	nS
Turn-Off Fall Time	t <sub>f</sub>		-	3.3	-	nS
Total Gate Charge	Q <sub>g</sub>	V <sub>DS</sub> =20V, I <sub>D</sub> =20A, V <sub>GS</sub> =10V	-	34.3	47	nC
Gate-Source Charge	Q <sub>gs</sub>		-	7.1		nC
Gate-Drain Charge	Q <sub>gd</sub>		-	3.5		nC
<b>Drain-Source Diode Characteristics</b>						
Diode Forward Voltage (Note 3)	V <sub>SD</sub>	V <sub>GS</sub> =0V, I <sub>S</sub> =85A	-		1.2	V
Diode Forward Current (Note 2)	I <sub>S</sub>		-	-	85	A
Reverse Recovery Time	t <sub>rr</sub>	T <sub>J</sub> = 25 °C, I <sub>F</sub> = I <sub>S</sub> di/dt = 500A/μs (Note 3)	-	19	-	nS
Reverse Recovery Charge	Q <sub>rr</sub>		-	40	-	nC

**Notes:**

1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Surface Mounted on FR4 Board, t ≤ 10 sec.
3. Pulse Test: Pulse Width ≤ 300μs, Duty Cycle ≤ 2%.
4. Guaranteed by design, not subject to production
5. EAS condition : T<sub>J</sub>=25 °C, V<sub>DD</sub>=20V, V<sub>G</sub>=10V, L=0.5mH, R<sub>G</sub>=25Ω

Typical Electrical and Thermal Characteristics

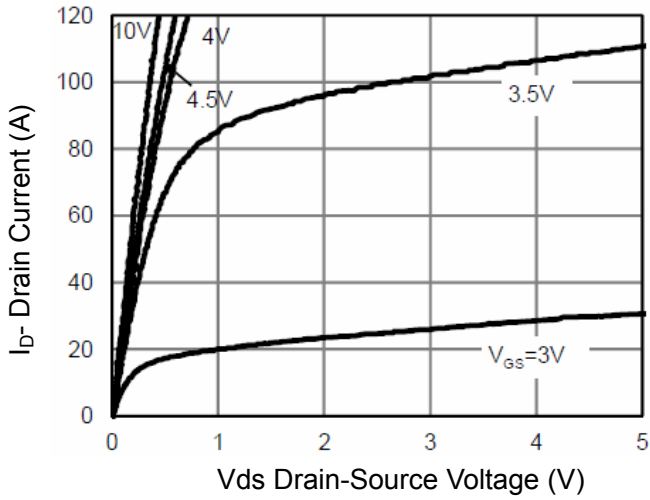


Figure 1 Output Characteristics

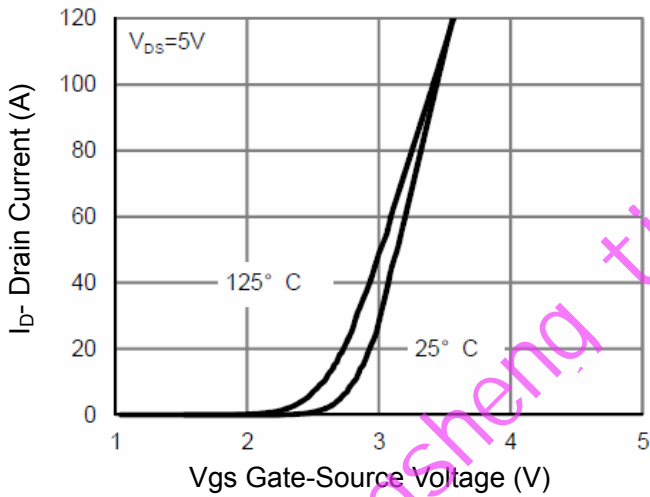


Figure 2 Transfer Characteristics

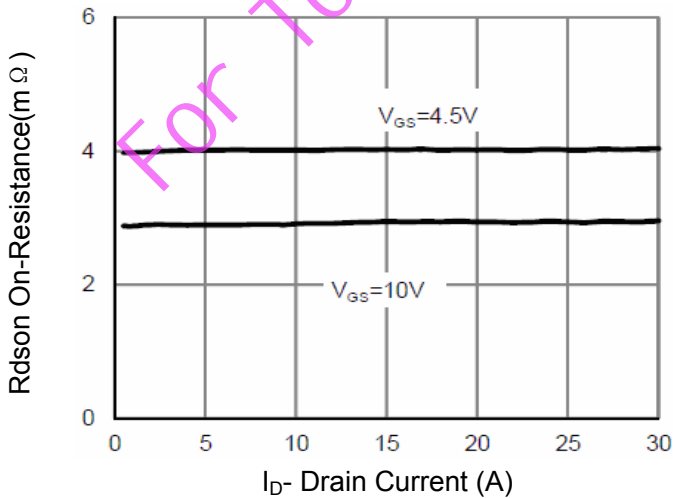


Figure 3  $R_{ds(on)}$ - Drain Current

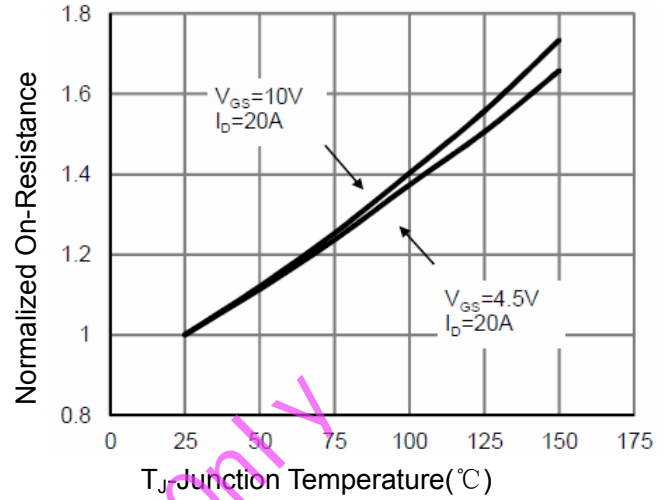


Figure 4  $R_{ds(on)}$ -Junction Temperature

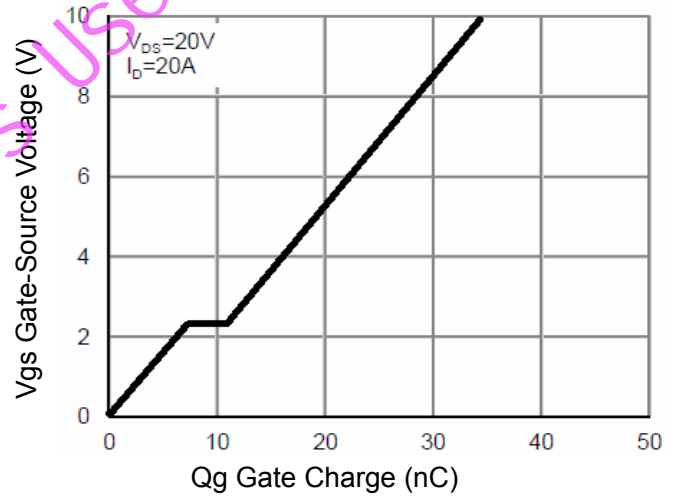


Figure 5 Gate Charge

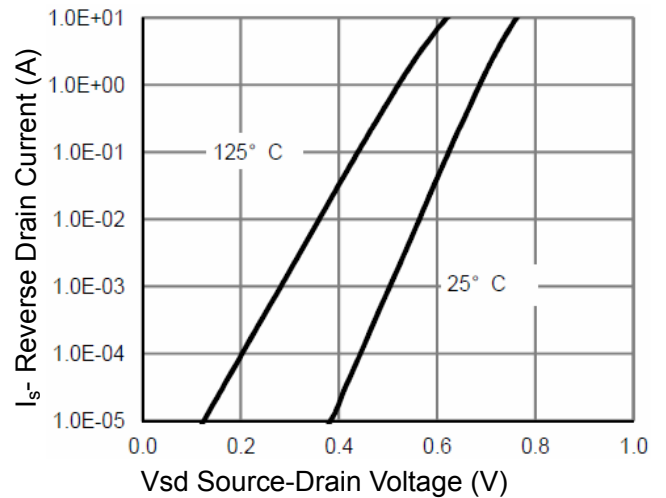


Figure 6 Source- Drain Diode Forward

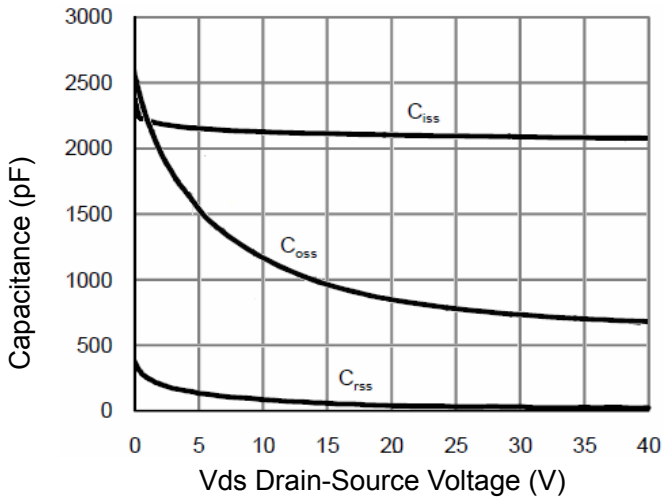


Figure 7 Capacitance vs Vds

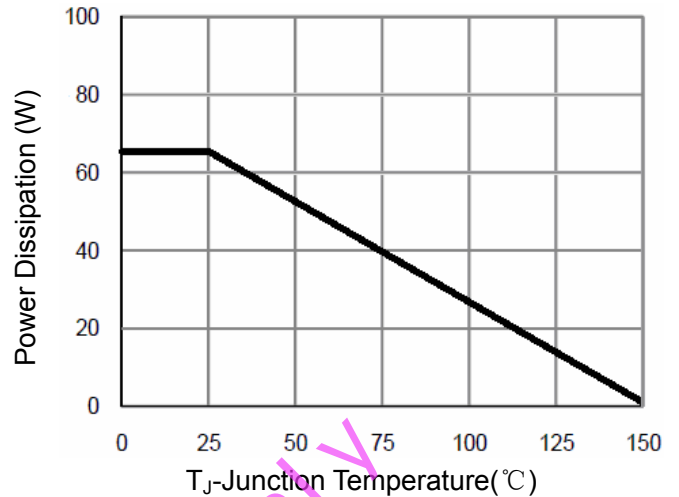


Figure 9 Power De-rating

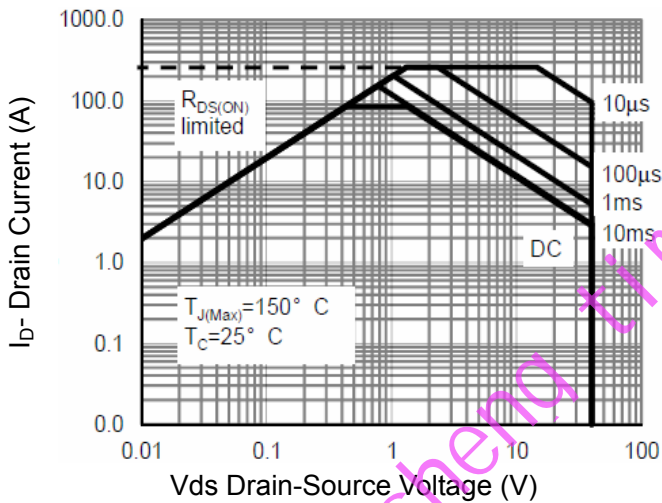


Figure 8 Safe Operation Area

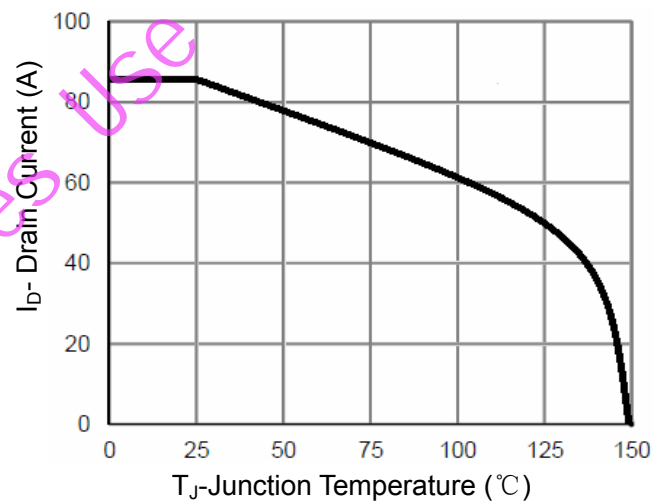


Figure 10 Current De-rating

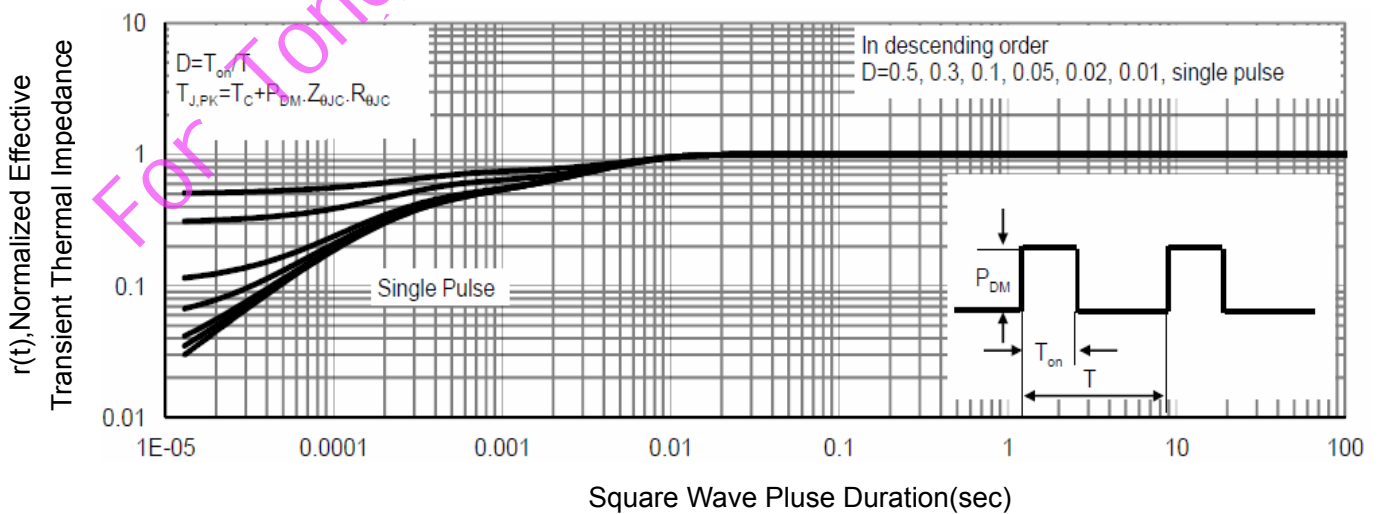
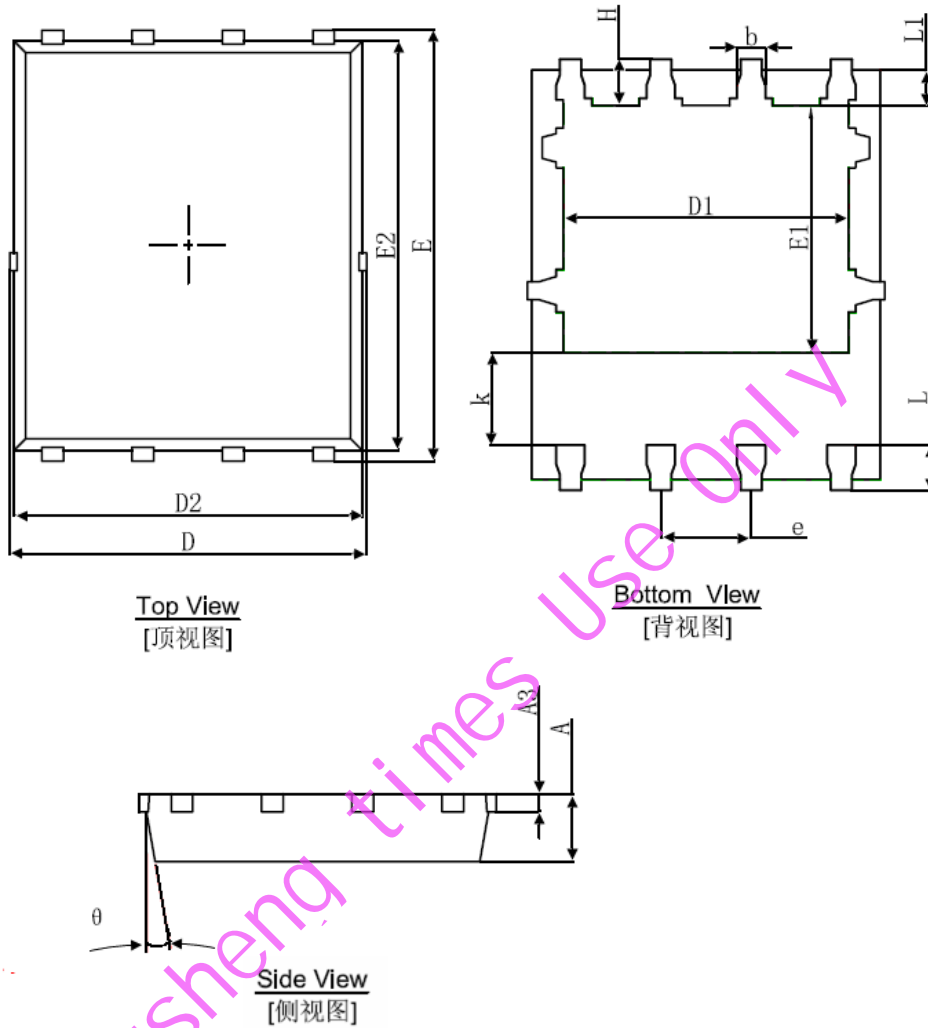


Figure 11 Normalized Maximum Transient Thermal Impedance

DFN5X6-8L Package Information



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	0.900	1.000	0.035	0.039
A3	0.254REF.		0.010REF.	
D	4.944	5.096	0.195	0.201
E	5.974	6.126	0.235	0.241
D1	3.910	4.110	0.154	0.162
E1	3.375	3.575	0.133	0.141
D2	4.824	4.976	0.190	0.196
E2	5.674	5.826	0.223	0.229
k	1.190	1.390	0.047	0.055
b	0.350	0.450	0.014	0.018
e	1.270TYP.		0.050TYP.	
L	0.559	0.711	0.022	0.028
L1	0.424	0.576	0.017	0.023
H	0.574	0.726	0.023	0.029
$\theta$	8°	12°	8°	12°

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