

**SuperMOS - TO-252 -40V  $BV_{DSS}$ ,  $13m\Omega R_{DS(on)}$ , P-channel MOSFET**

**1. Description**

The NCE40P40K-ES is P-Channel enhancement MOS Field Effect Transistor. Uses advanced trench technology and design to provide excellent  $R_{DS(ON)}$  with low gate charge. Device is suitable for use in DC-DC conversion, power switch and charging circuit. Standard Product NCE40P40K-ES is Pb-free.

**2. Features**

- -40V,  $R_{DS(ON)}=13m\Omega(TYP.) @V_{GS}=-10V$
- $R_{DS(ON)}=17m\Omega(TYP.) @V_{GS}=-4.5V$
- Fast Switching
- High density cell design for low  $R_{DS(on)}$
- Material: Halogen free
- Reliable and rugged
- Avalanche Rated
- Low leakage current

**3. Applications**

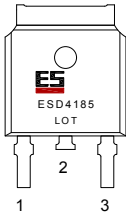
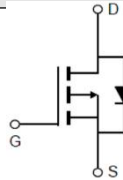
- PWM applications
- Load switch
- Power management in portable/desktop PCs
- DC/DC conversion

**100% UIS TESTED!**

**4. Ordering Information**

Part Number	Package	Marking	Material	Packing	Quantity per reel	Flammability Rating	Reel size
NCE40P40K-ES	TO-252	ESD4185/lot	Halogen free	Tape & Reel	2,500 PCS	UL 94V-0	13 inches

**5. Pin Configuration and Functions**

Pin	Function	Outline	Circuit Diagram
1	Gate		
3	Source		
2	Drain		

## 6. Specification

### Absolute Maximum Rating & Thermal Characteristics

Ratings at 25 °C ambient temperature unless otherwise specified.

Parameter	Symbol	Limit	Unit	
Drain-Source Voltage	$BV_{DSS}$	-40	V	
Gate-Source Voltage	$V_{GS}$	±25	V	
Continuous Drain Current	$I_D$	$T_C=25^{\circ}C$	-45	A
		$T_C=75^{\circ}C$	-34	
Maximum Power Dissipation	$P_D$	$T_C=25^{\circ}C$	52	W
		$T_C=75^{\circ}C$	32	
Pulsed Drain Current <sup>a</sup>	$I_{DM}$	-180	A	
Avalanche Current, Single Pulsed <sup>b</sup>	$I_{AS}$	-33	A	
Avalanche Energy, Single Pulsed <sup>b</sup>	$E_{AS}$	163	mJ	
Operating Junction Temperature	$T_J$	150	°C	
Storage Temperature Range	$T_{stg}$	-55 to +150	°C	

#### Thermal resistance ratings

Single Operation					
Parameter		Symbol	Typ	Max	Unit
Junction-to-Ambient Thermal Resistance	$t \leq 10$ s	$R_{\theta JA}$	15	20	°C/W
Junction-to-Case Thermal Resistance	Steady State	$R_{\theta JC}$	2	2.4	

Note:

a: Repetitive rating, pulse width limited by junction temperature,  $t_p=10\mu s$ , Duty Cycle=1%

b: EAS condition:  $T_J=25^{\circ}C$ ,  $V_{DD}=-30V$ ,  $V_G=-10V$ ,  $L=0.3mH$ ,  $R_g=25\Omega$

## Electrical Characteristics

At TA = 25°C unless otherwise specified

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
<b>OFF CHARACTERISTICS</b>						
Drain-to-Source Breakdown Voltage	$BV_{DSS}$	$V_{GS}=0V, I_D=-250\mu A$	-40			V
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{GS}=0V, V_{DS}=-40V$			-1	$\mu A$
Gate-to-source Leakage Current	$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0V$			$\pm 100$	nA
<b>ON CHARACTERISTICS</b>						
Gate Threshold Voltage	$V_{GS(TH)}$	$V_{GS}=V_{DS}, I_D=-250\mu A$	-1.0	-1.6	-2.0	V
Drain-to-source On-resistance	$R_{DS(on)}$	$V_{GS}=-10V, I_D=-20A$		13	16	m $\Omega$
		$V_{GS}=-4.5V, I_D=-15A$		17	20	
<b>CHARGES, CAPACITANCES AND GATE RESISTANCE</b>						
Input Capacitance	$C_{ISS}$	$V_{GS}=0V, V_{DS}=-15V,$ $f=1MHz$		2500		pF
Output Capacitance	$C_{OSS}$			260		
Reverse Transfer Capacitance	$C_{RSS}$			180		
Total Gate Charge	$Q_{G(TOT)}$	$V_{GS}=-10V, V_{DS}=-15V,$ $I_D=-20A$		42		nC
Gate-to-Source Charge	$Q_{GS}$			7		
Gate-to-Drain Charge	$Q_{GD}$			8.8		
<b>SWITCHING CHARACTERISTICS</b>						
Turn-On Delay Time	$t_{d(ON)}$	$V_{GS}=-10V, V_{DS}=-15V,$ $R_L=1\Omega, R_G=3\Omega$		10		ns
Rise Time	$t_r$			20		
Turn-Off Delay Time	$t_{d(OFF)}$			55		
Fall Time	$t_f$			30		
<b>BODY DIODE CHARACTERISTICS</b>						
Forward Voltage	$V_{SD}$	$V_{GS}=0V, I_{SD}=-1A$		-0.7	-1.5	V

7. Typical Characteristic

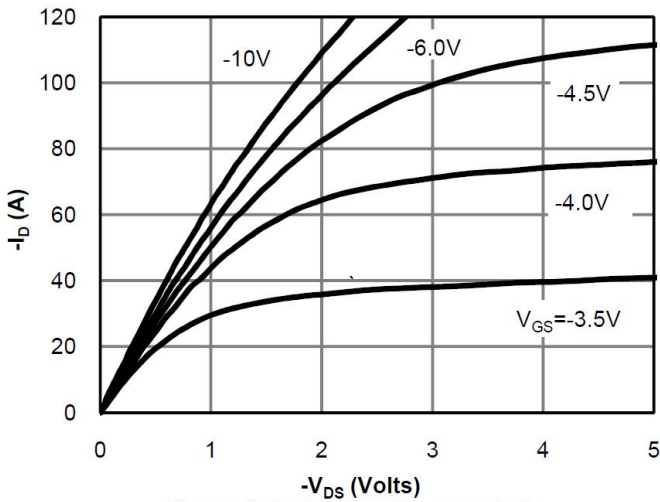


Figure 1: On-Region Characteristics

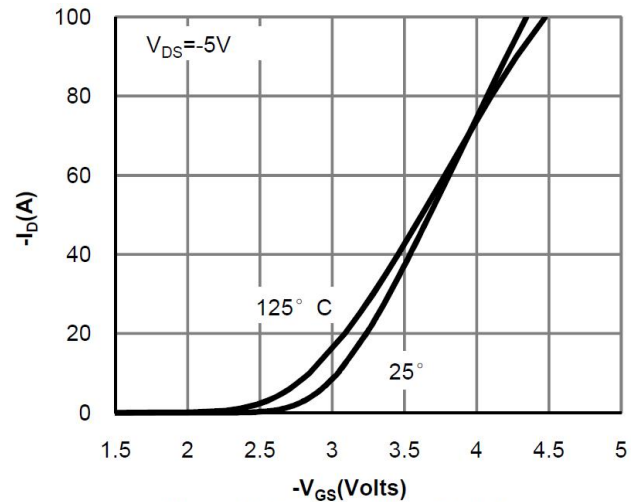


Figure 2: Transfer Characteristics

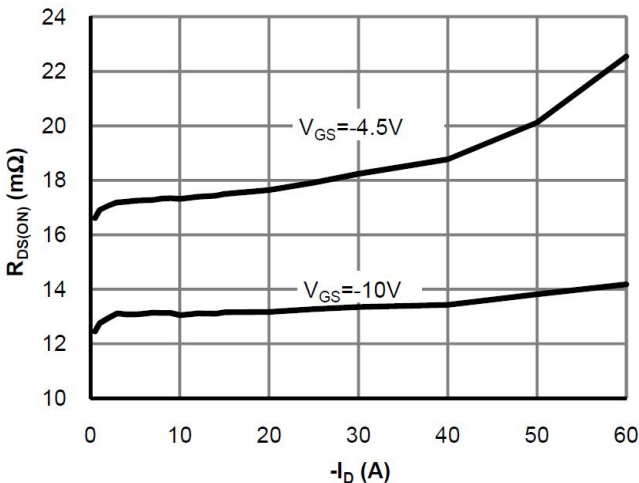


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

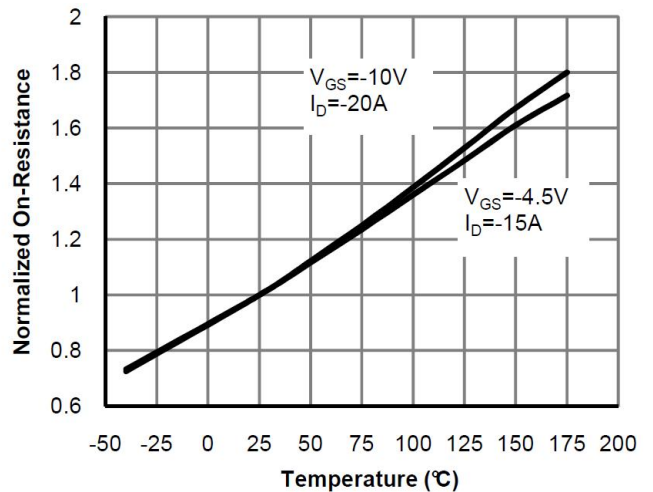


Figure 4: On-Resistance vs. Junction Temperature

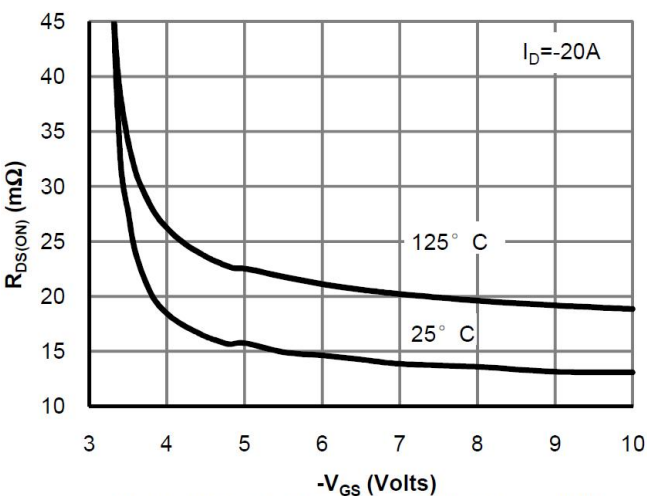


Figure 5: On-Resistance vs. Gate-Source Voltage

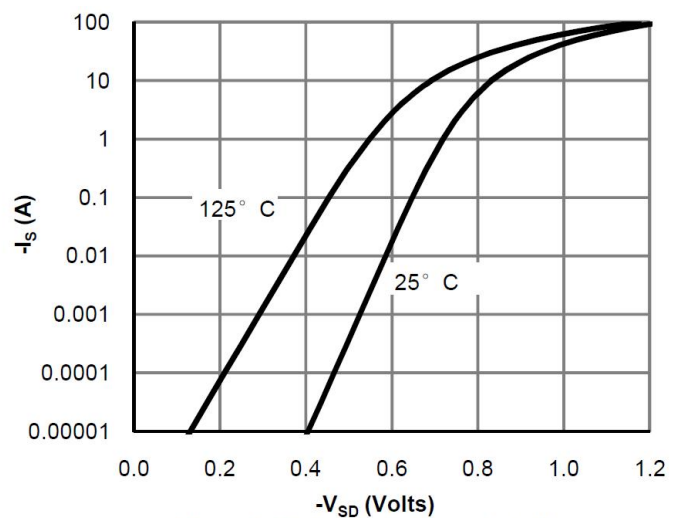


Figure 6: Body-Diode Characteristics

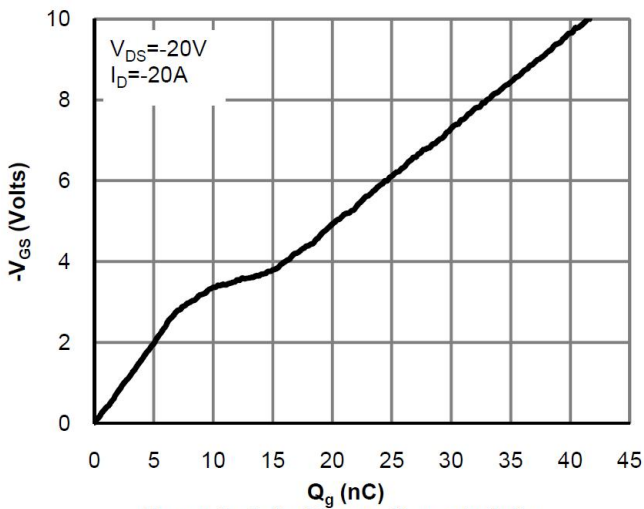


Figure 7: Gate-Charge Characteristics

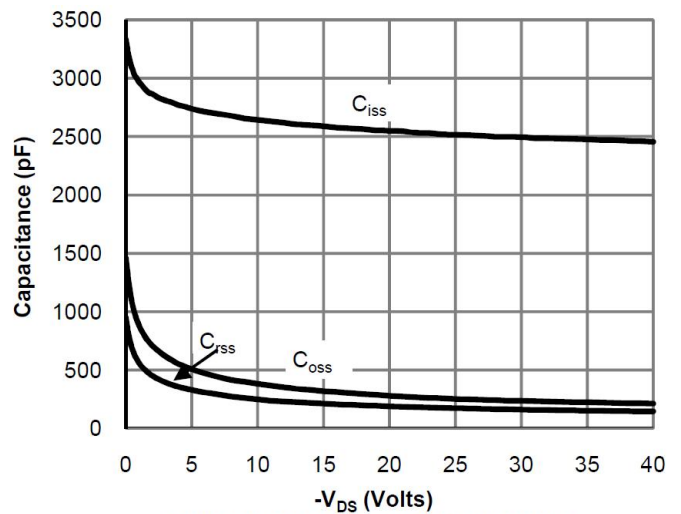


Figure 8: Capacitance Characteristics

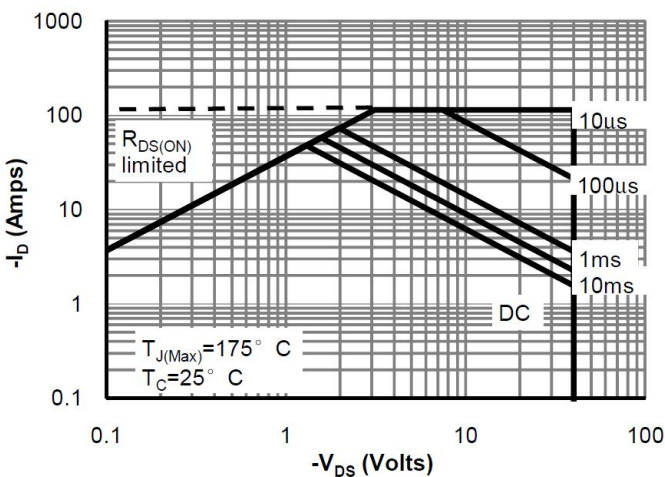


Figure 9: Maximum Forward Biased Safe Operating Area

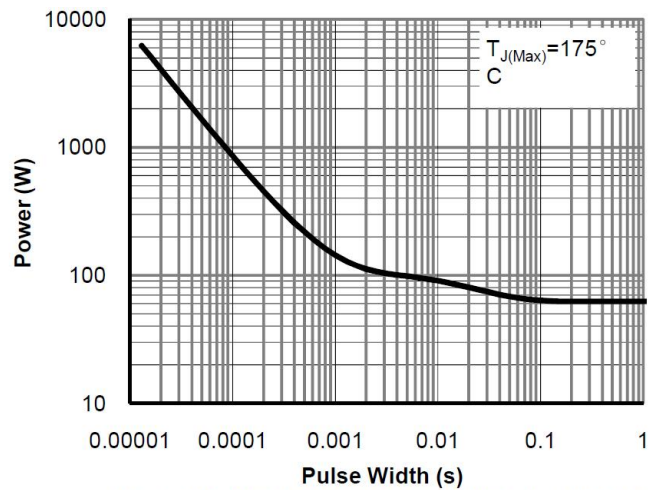


Figure 10: Single Pulse Power Rating Junction-to-Case

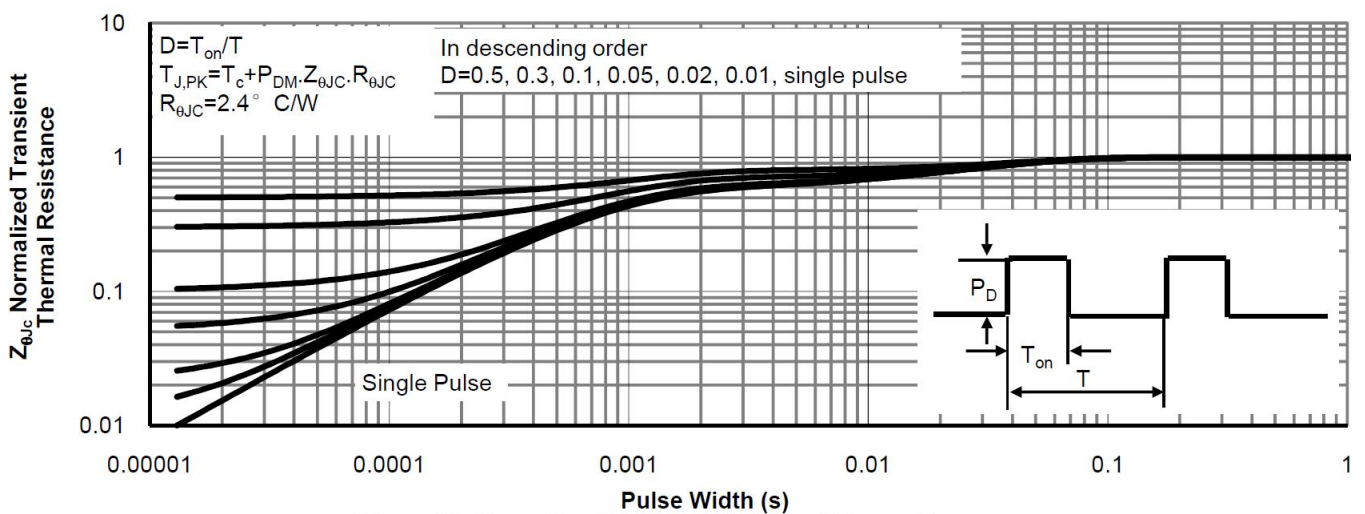
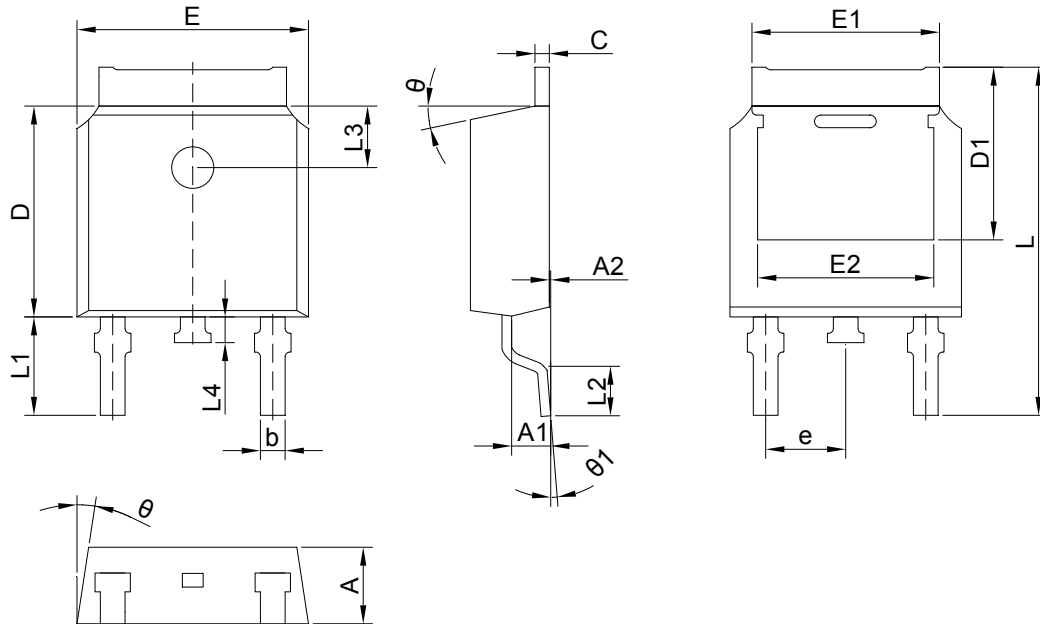


Figure 11: Normalized Maximum Transient Thermal Impedance

8. Dimension (TO-252)



COMMON DIMENSIONS CUNITS MEASURE=MILLIMETER							
SYMBOL	MIN	TYP	MAX	SYMBOL	MIN	TYP	MAX
A	2.10	2.30	2.50	E2	4.63	4.83	5.03
A1	0.97	1.07	1.17	L	9.90	10.10	10.30
A2	0.00	-	0.12	L1	2.74	2.94	3.14
b	0.66	0.76	0.86	L2	1.40	1.50	1.70
C	0.45	0.51	0.60	L3	1.65	1.80	1.95
D	5.90	6.10	6.30	L4	0.60	0.80	1.00
D1	5.10	5.30	5.45	e	2.286 BSC		
E	6.40	6.60	6.80	theta	5°	7°	10°
E1	5.10	5.33	5.45	theta1	0°	-	3°

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