

SuperMOS –TO-252 40V V_{DSS} , 4.2m Ω $R_{DS(ON)}$, N-channel MOSFET

1. Description

The NCE4060K-ES is N-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 NCE4060K-ES is Pb-free.

2. Features

- 40V, $R_{DS(ON)}=4.2m\Omega(Typ.) @V_{GS}=10V$
- $R_{DS(ON)}=6.5m\Omega(Typ.) @V_{GS}=4.5V$
- High density cell design for low $R_{DS(on)}$
- Material: Halogen free
- Reliable and rugged
- Avalanche Rated
- Low leakage current

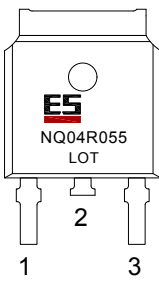
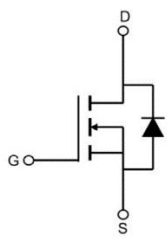
3. Applications

- PWM applications 100% UIS TESTED
- Load switch
- Power management in portable/desktop PCs
- DC/DC conversion

4. Ordering Information

Part Number	Package	Marking	Material	Packing	Quantity per Reel	Flammability Rating	Reel size
NCE4060K-ES	TO-252	NQ04R055/ 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}	± 20	V
Continuous Drain Current	I_D	$T_C=25^\circ\text{C}$	80
		$T_C=100^\circ\text{C}$	52
Maximum Power Dissipation	P_D	64	W
Pulsed Drain Current	I_{DM}	320	A
Single Pulse Avalanche Current ^a	I_{AS}	20.4	A
Single Pulse Avalanche Energy ^a	E_{AS}	104	mJ
Operating Junction Temperature	T_J	150	°C
Lead Temperature	T_L	260	°C
Storage Temperature Range	T_{stg}	-55 to 150	°C

Thermal resistance ratings

Single Operation				
Parameter	Symbol	Typical	Maximum	Unit
Junction-to-Case Thermal Resistance	$R_{\theta JC}$		1.95	°C/W

Notes:

- a. EAS condition: Starting $T_J=25^\circ\text{C}$, $V_{DD}=20\text{V}$, $V_G=10\text{V}$, $R_G=25\Omega$, $L=0.5\text{mH}$

Electrical Characteristics

At TA = 25°C unless otherwise specified

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
OFF CHARACTERISTICS						
Drain-to-Source Breakdown Voltage	BV_{DSS}	$V_{GS}=0V, I_D=250\mu A$	40			V
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS}=40V, V_{GS}=0V$			1	μA
Gate-to-source Leakage Current	I_{GSS}	$V_{DS}=0V, V_{GS}=\pm 20V$			± 100	nA
ON CHARACTERISTICS						
Gate Threshold Voltage	$V_{GS(TH)}$	$V_{GS}=V_{DS}, I_D=250\mu A$	1.0	1.5	2.5	V
Drain-to-source On-resistance	$R_{DS(on)}$	$V_{GS}=10V, I_D=30A$		4.2	5.5	m Ω
		$V_{GS}=4.5V, I_D=20A$		6.5	10	
CHARGES, CAPACITANCES AND GATE RESISTANCE						
Input Capacitance	C_{ISS}	$V_{GS}=0V, f=1MHz, V_{DS}=20V$		3800		pF
Output Capacitance	C_{OSS}			280		
Reverse Transfer Capacitance	C_{RSS}			230		
Total Gate Charge	$Q_{G(TOT)}$	$V_{GS}=10V, V_{DD}=20V, I_D=30A$		58		nC
Gate-to-Source Charge	Q_{GS}			10		
Gate-to-Drain Charge	Q_{GD}			11		
SWITCHING CHARACTERISTICS						
Turn-On Delay Time	$t_{d(ON)}$	$V_{GS}=10V, V_{DD}=20V, I_D=30A, R_G=3\Omega, R_L=1\Omega$		8		ns
Rise Time	t_r			18		
Turn-Off Delay Time	$t_{d(OFF)}$			24		
Fall Time	t_f			14		
BODY DIODE CHARACTERISTICS						
Forward Voltage	V_{SD}	$V_{GS}=0V, I_S=30A$			1.5	V

7. Typical Characteristics

Figure 1: Output Characteristics

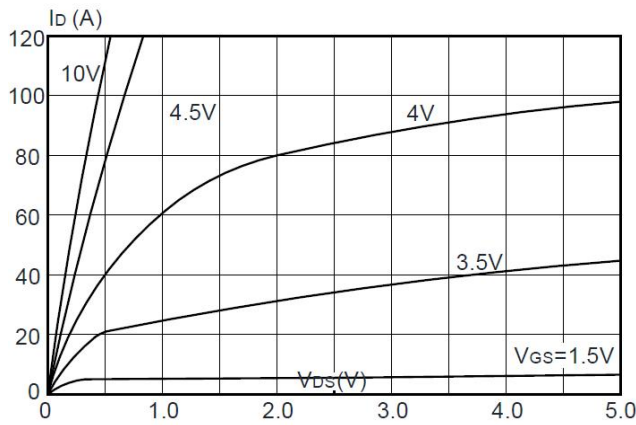


Figure 2: Typical Transfer Characteristics

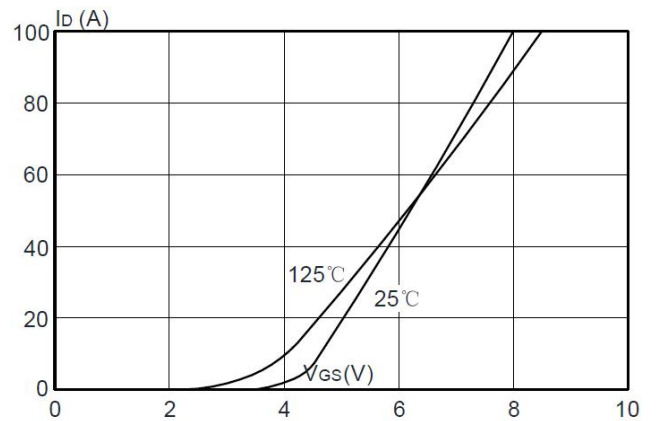


Figure 3: On-resistance vs. Drain Current

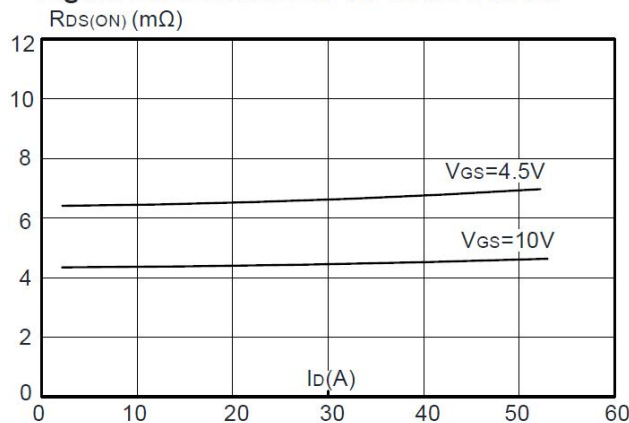


Figure 4: Body Diode Characteristics

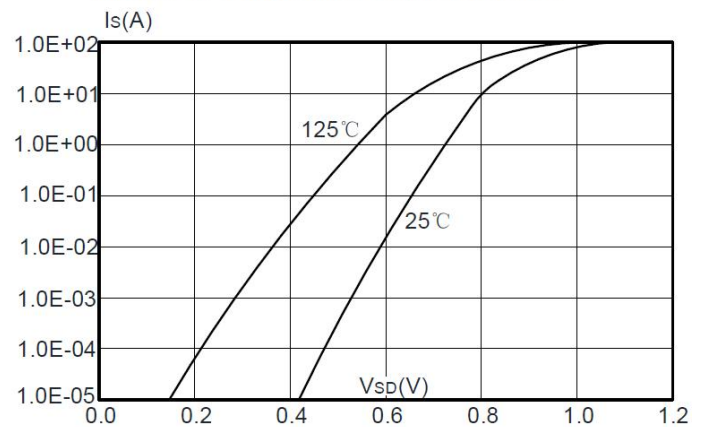


Figure 5: Gate Charge Characteristics

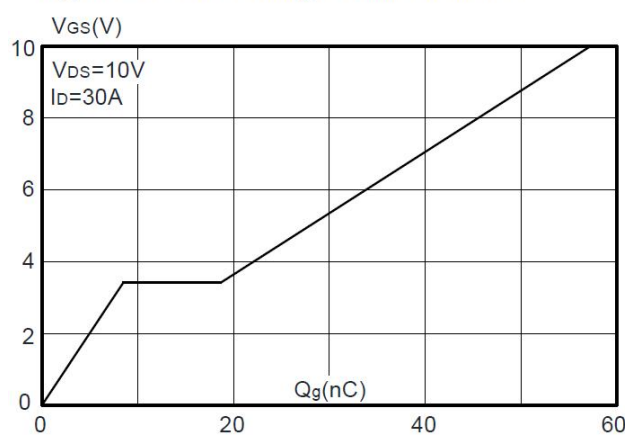


Figure 6: Capacitance Characteristics

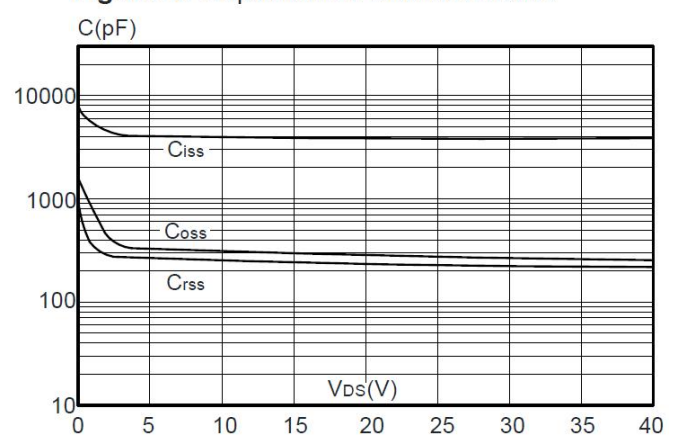


Figure 7: Normalized Breakdown Voltage vs. Junction Temperature

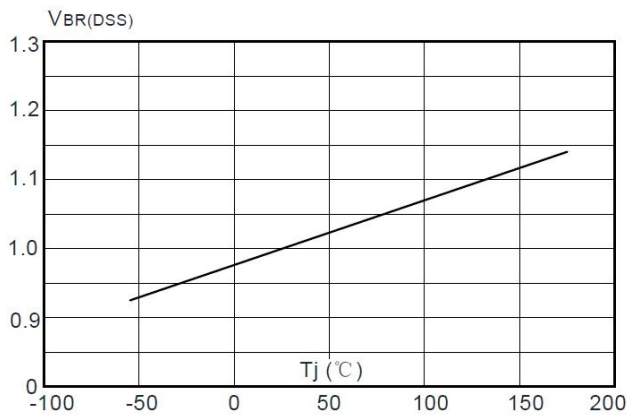


Figure 8: Normalized on Resistance vs. Junction Temperature

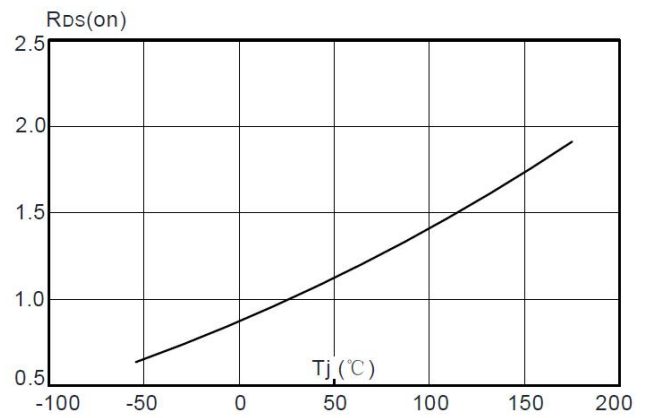


Figure 9: Maximum Safe Operating Area

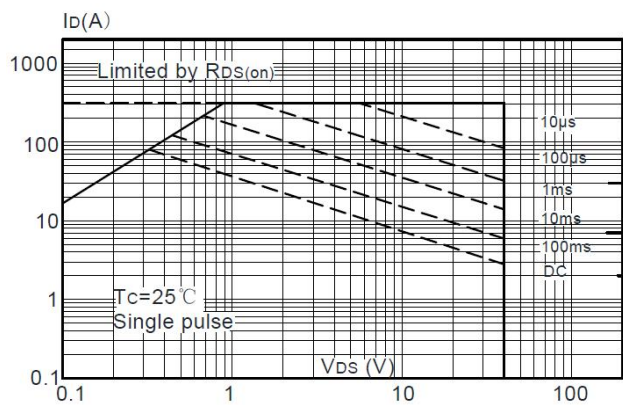


Figure 10: Maximum Continuous Drain Current vs. Case Temperature

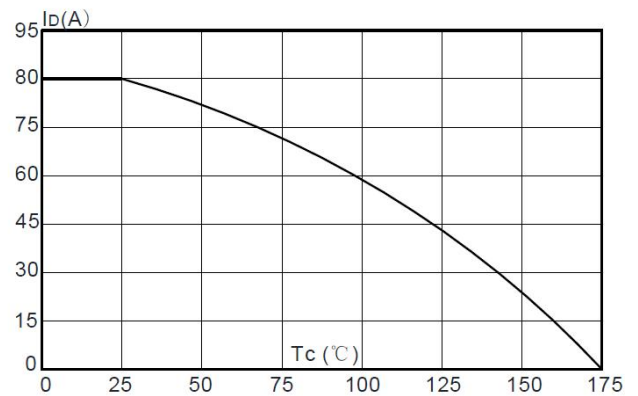
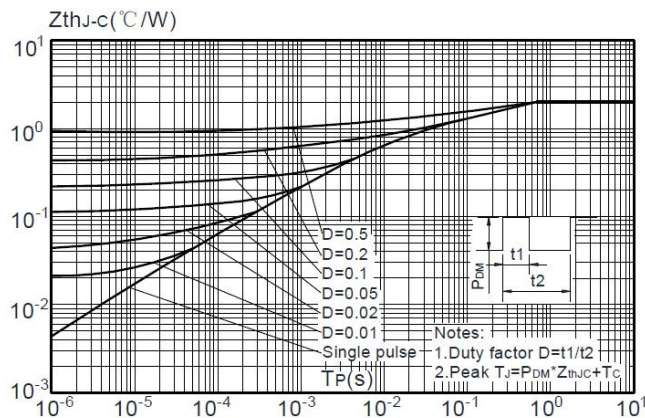
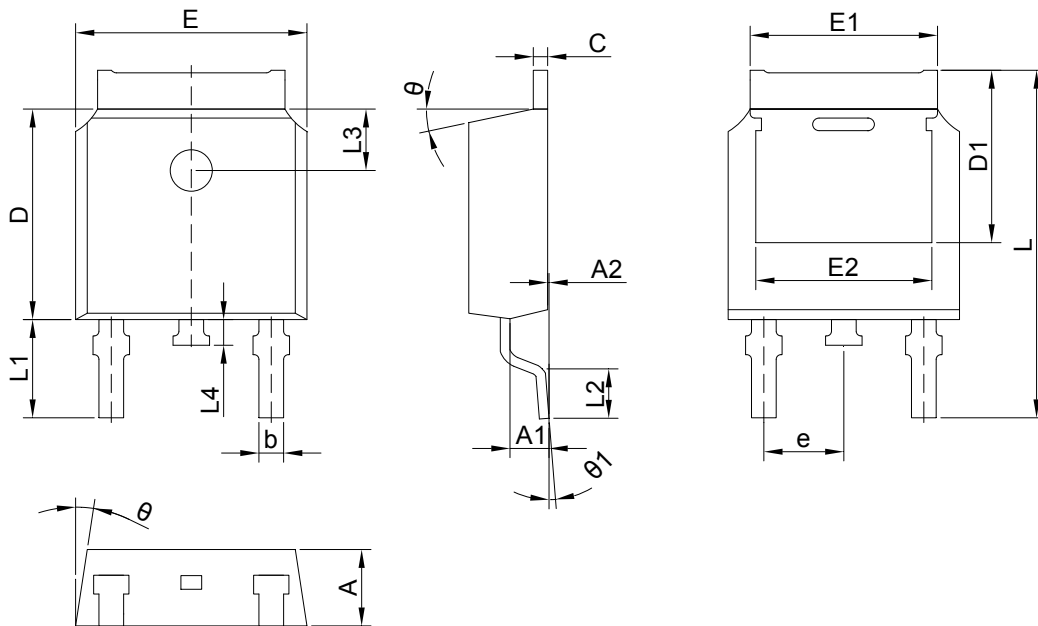


Figure.11: Maximum Effective Transient Thermal Impedance, Junction-to-Case



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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