

SuperMOS –TO-252 40V BV_{DSS}, 4.2mΩ R_{DS(ON)}, N-channel MOSFET

1. Description

The ESE4060K 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 ESE4060K is Pb-free.

2. Features

- 40V, R_{DS(ON)}=4.2mΩ(Typ.) @V_{GS}=10V
R_{DS(ON)}=5.8mΩ(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

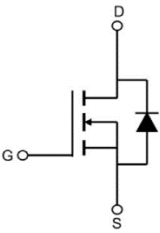
- PWM applications
- Load switch
- Power management in portable/desktop PCs
- DC/DC conversion

100% UIS TESTED

4. Ordering Information

Part Number	Package	Marking	Material	Packing	Quantity per Reel	Flammability Rating	Reel size
ESE4060K	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	Note b 	
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	$T_C=25^{\circ}\text{C}$	I_D	79.7	A
	$T_C=100^{\circ}\text{C}$		50.4	
Maximum Power Dissipation		P_D	59.5	W
Pulsed Drain Current		I_{DM}	319.1	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	$^{\circ}\text{C}$
Lead Temperature		T_L	260	$^{\circ}\text{C}$
Storage Temperature Range		T_{stg}	-55 to 150	$^{\circ}\text{C}$

Thermal resistance ratings

Single Operation				
Parameter	Symbol	Typical	Maximum	Unit
Junction-to-Case Thermal Resistance	$R_{\theta JC}$		2.1	$^{\circ}\text{C/W}$

Notes:

- EAS condition: Starting $T_J=25^{\circ}\text{C}$, $V_{DD}=20\text{V}$, $V_G=10\text{V}$, $R_G=25\Omega$, $L=0.5\text{mH}$.
- This diagram is only an electrical schematic, and the actual pin size is based on POD.

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 =250uA	40			V
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} =40V, V _{GS} =0V			1	uA
Gate-to-source Leakage Current	I _{GSS}	V _{DS} =0V, V _{GS} =±20V			±100	nA
ON CHARACTERISTICS						
Gate Threshold Voltage	V _{GS(TH)}	V _{GS} =V _{DS} , I _D =250uA	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	mΩ
		V _{GS} =4.5V, I _D =20A		5.8	10	
CHARGES, CAPACITANCES AND GATE RESISTANCE						
Input Capacitance	C _{ISS}	V _{GS} =0V, f=1MHz, V _{DS} =25V		3183		pF
Output Capacitance	C _{OSS}			225		
Reverse Transfer Capacitance	C _{RSS}			192		
Total Gate Charge	Q _{G(TOT)}	V _{GS} =0 to 10V, V _{DD} =20V, I _D =30A		59		nC
Gate-to-Source Charge	Q _{GS}			12		
Gate-to-Drain Charge	Q _{GD}			12		
SWITCHING CHARACTERISTICS						
Turn-On Delay Time	t _{d(ON)}	V _{GS} =10V, V _{DD} =20V, I _D =30A, R _G =3Ω		11		ns
Rise Time	t _r			32		
Turn-Off Delay Time	t _{d(OFF)}			52		
Fall Time	t _f			13		
BODY DIODE CHARACTERISTICS						
Forward Voltage	V _{SD}	V _{GS} =0V, I _S =30A			1.5	V

7. Typical Characteristics

Figure1: Output Characteristics

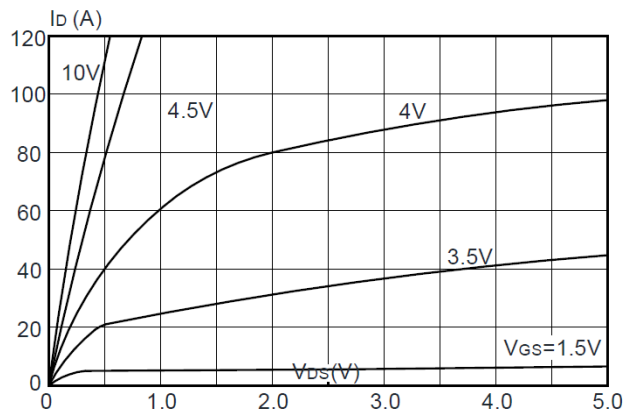


Figure 2: Typical Transfer Characteristics

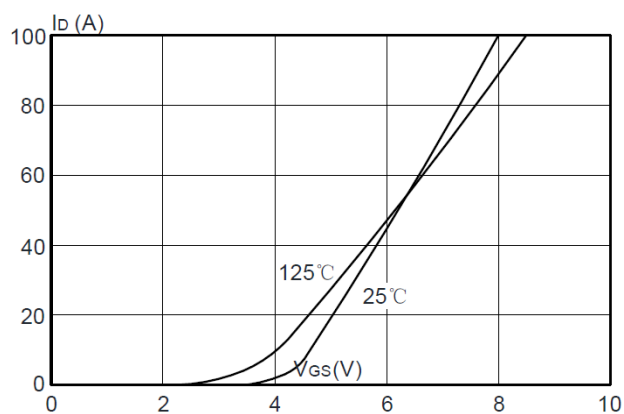


Figure3: on-Resistance vs. Drain Current

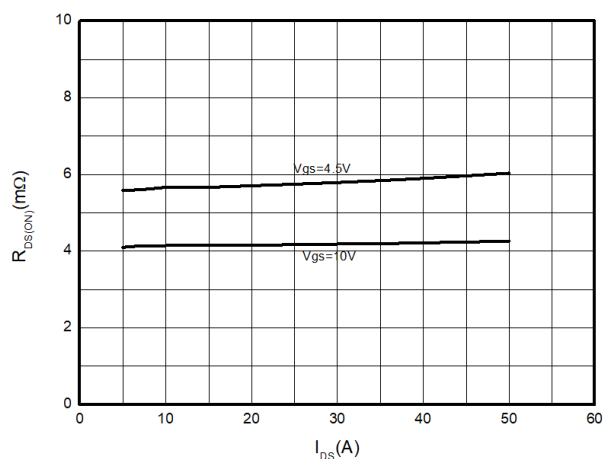


Figure 4: Body Diode Characteristics

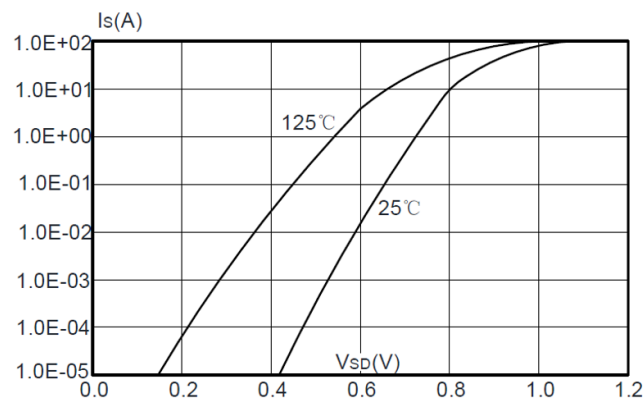


Figure 5: Capacitance Characteristics

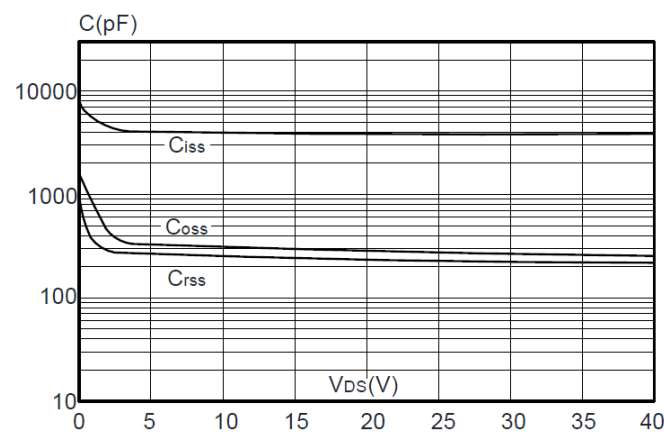


Figure 6: Normalized on Resistance vs. Junction Temperature

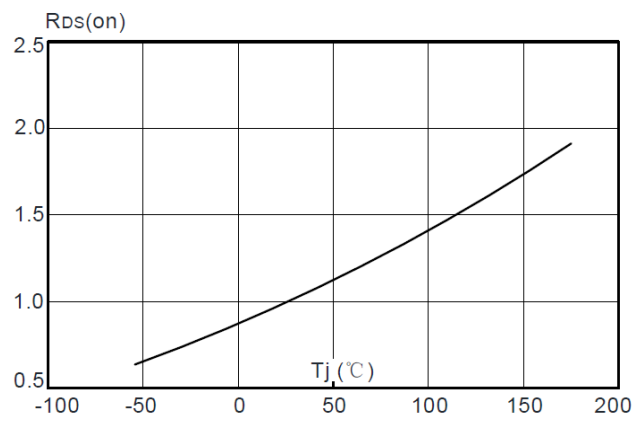
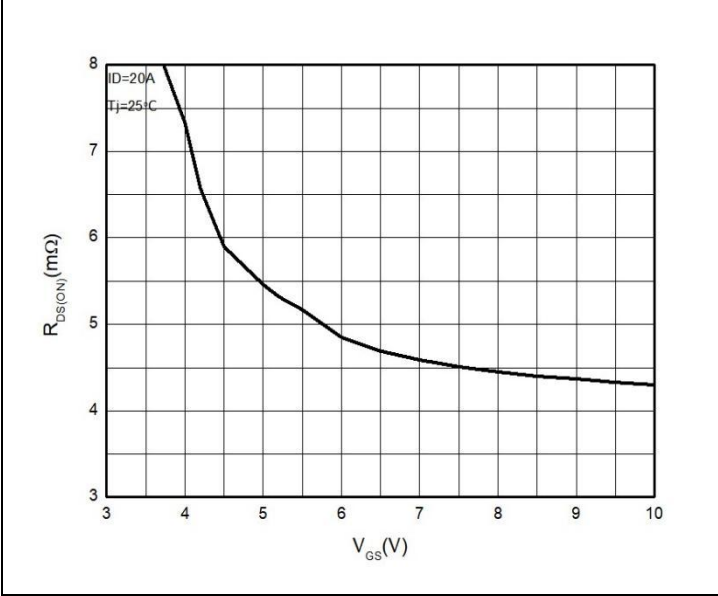
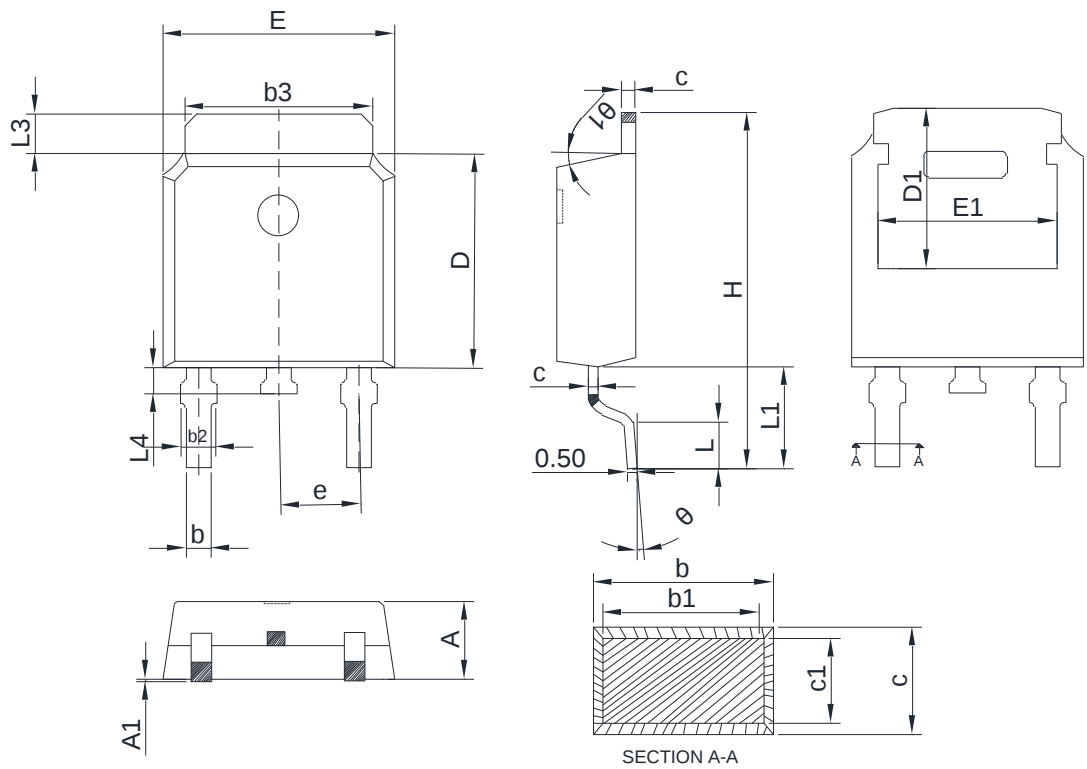


Figure12: on-Resistance vs. Gate to Source



8. Dimension (TO-252)

POD A(Q)

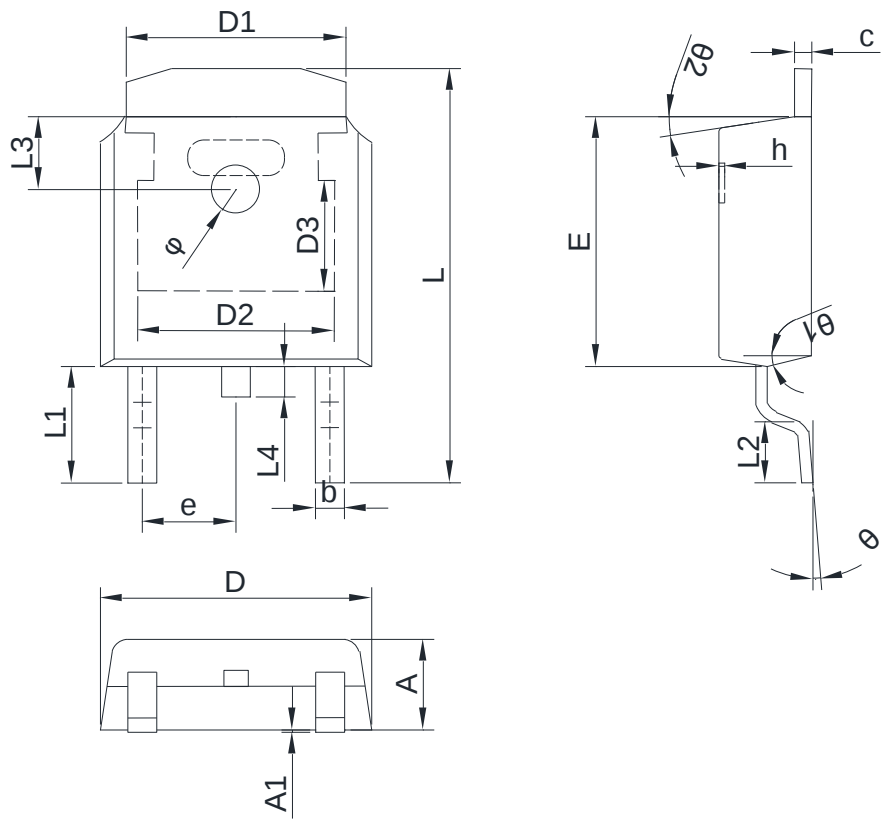


COMMON DIMENSIONS CUNITS MEASURE=MILLIMETER							
SYMBOL	MIN	TYP	MAX	SYMBOL	MIN	TYP	MAX
A	2.20	2.30	2.40	D1	5.21	-	-
A1	0.00	-	0.12	E	6.50	6.60	6.70
b	0.65	-	0.89	E1	4.32	-	-
b1	0.64	0.76	0.79	H	9.70	9.95	10.20
b2	0.76	0.86	1.10	L	1.40	1.50	1.60
b3	5.20	5.33	5.46	L1	2.84REF		
c	0.48	-	0.60	e	2.29BSC		
c1	0.47	0.51	0.55	θ	0°	-	10°
D	6.00	6.10	6.20	$\theta 1$	0°	-	15°
L3	0.90	-	1.27	L4	0.60	0.80	1.00

ESE4060K

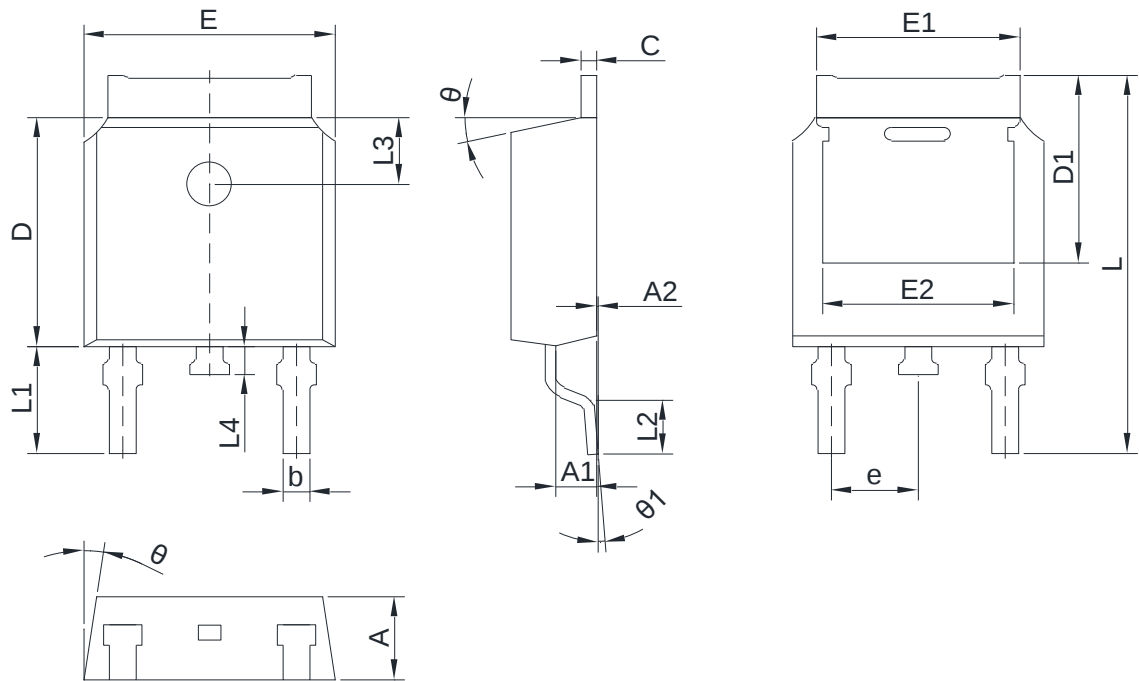
Rev-1.6

POD B(X)



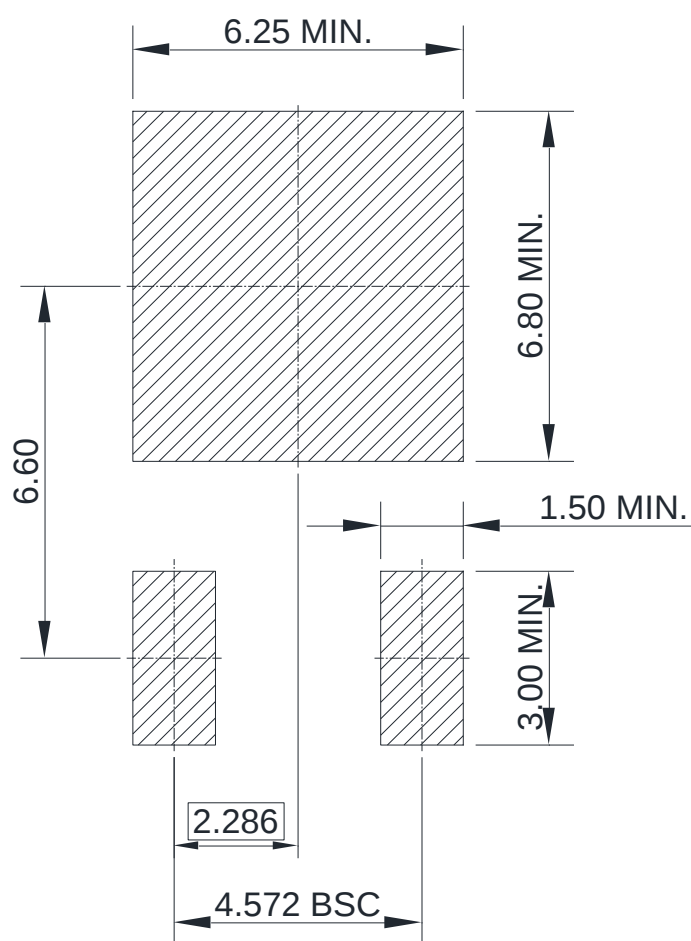
COMMON DIMENSIONS CUNITS MEASURE=MILLIMETER							
SYMBOL	MIN	TYP	MAX	SYMBOL	MIN	TYP	MAX
A	2.200	2.300	2.400	h	0.000	0.100	0.200
A1	0.000		0.127	L	9.900	10.100	10.300
b	0.640	0.690	0.740	L1	2.888 REF		
c(电镀后)	0.460	0.520	0.580	L2	1.400	1.550	1.700
D	6.500	6.600	6.700	L3	1.600 REF		
D1	5.334 REF			L4	0.600	0.800	1.000
D2	4.826 REF			φ	1.100	1.200	1.300
D3	3.166 REF			θ	0°		8°
E	6.000	6.100	6.200	θ1	9° TYP		
e	2.286 TYP			θ2	9° TYP		

POD C(J)



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°

9. Recommended Soldering Footprint



DIMENSIONS: MILLIMETERS

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