

**SuperMOS – TO-220 68V  $BV_{DSS}$ , 6.6m $\Omega$   $R_{DS(ON)}$ , N-channel MOSFET**

**1. Description**

The ESNU07R086 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 ESNU07R086 is Pb-free.

**2. Features**

- 68V,  $R_{DS(ON)}=6.6m\Omega(Typ.) @V_{GS}=10V$
- Use trench MOSFET technology
- High density cell design for low  $R_{DS(on)}$
- Material: Halogen free
- Reliable and rugged
- Avalanche Rated
- Low leakage current

**3. Applications**


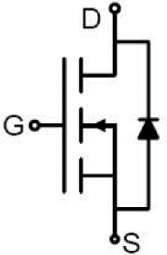
- PWM applications
- Load switch
- Power management in portable/desktop PCs
- DC/DC conversion

**100% UIS TESTED**

**4. Ordering Information**

Part Number	Package	Marking	Material	Packing	Quantity per Tube	Flammability Rating
ESNU07R086	TO-220	ESNU07R086/lot	Halogen free	Tube	50 PCS	UL 94V-0

**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	$BV_{DSS}$	68	V
Gate-Source Voltage	$V_{GS}$	$\pm 20$	V
Continuous Drain Current	$I_D$	$T_C=25^\circ\text{C}$	80
		$T_C=75^\circ\text{C}$	52
Maximum Power Dissipation	$P_D$	147	W
Pulsed Drain Current	$I_{DM}$	320	A
Avalanche Current, Single Pulsed <sup>a</sup>	$I_{AS}$	22	A
Avalanche Energy, Single Pulsed <sup>a</sup>	$E_{AS}$	121	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	$R_{\theta JC}$		0.85	°C/W

Note:

a:  $T_J=25^\circ\text{C}$ ,  $V_{DD}=35\text{V}$ ,  $V_G=10\text{V}$ ,  $L=0.5\text{mH}$ ,  $R_g=25\Omega$

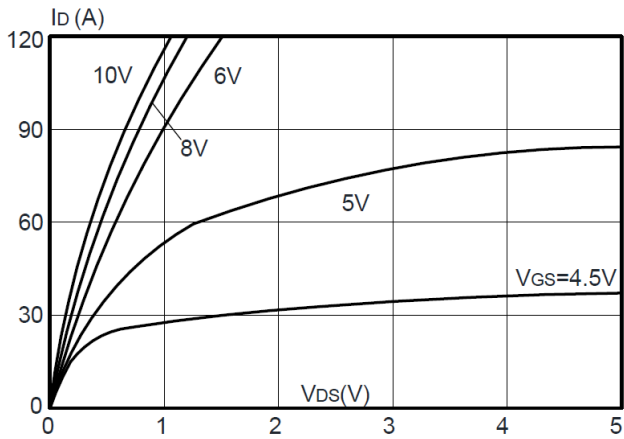
## Electrical Characteristics

At TA = 25°C unless otherwise specified

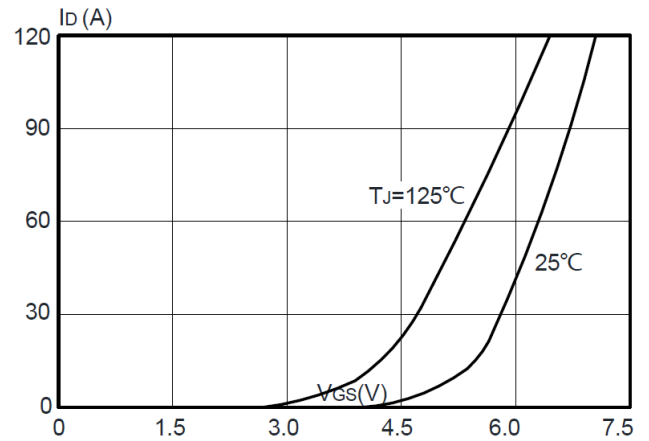
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
<b>OFF CHARACTERISTICS</b>						
Drain-to-Source Breakdown Voltage	$BV_{DSS}$	$V_{GS}=0V, I_D=250\mu A$	68			V
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS}=68V, V_{GS}=0V$			1	$\mu A$
Gate-to-source Leakage Current	$I_{GSS}$	$V_{DS}=0V, V_{GS}=\pm 20V$			$\pm 100$	nA
<b>ON CHARACTERISTICS</b>						
Gate Threshold Voltage	$V_{GS(TH)}$	$V_{GS}=V_{DS}, I_D=250\mu A$	1.5	2.5	3.5	V
Drain-to-source On-resistance	$R_{DS(on)}$	$V_{GS}=10V, I_D=30A$		6.6	8.6	m $\Omega$
Forward transconductance	$g_{fs}$	$V_{DS}=5V, I_D=30A$			150	S
<b>CHARGES, CAPACITANCES AND GATE RESISTANCE</b>						
Input Capacitance	$C_{ISS}$	$V_{GS}=0V, f=1MHz, V_{DS}=25V$		4065		pF
Output Capacitance	$C_{OSS}$			266		
Reverse Transfer Capacitance	$C_{RSS}$			230		
Total Gate Charge	$Q_{G(TOT)}$	$V_{GS}=10V, V_{DS}=30V, I_D=20A$		35		nC
Gate-to-Source Charge	$Q_{GS}$			11		
Gate-to-Drain Charge	$Q_{GD}$			9		
<b>SWITCHING CHARACTERISTICS</b>						
Turn-On Delay Time	$t_{d(ON)}$	$V_{GS}=10V, V_{DS}=30V, I_D=20A, R_G=3\Omega$		15		ns
Rise Time	$t_r$			95		
Turn-Off Delay Time	$t_{d(OFF)}$			48		
Fall Time	$t_f$			33		
<b>BODY DIODE CHARACTERISTICS</b>						
Forward Voltage	$V_{SD}$	$V_{GS}=0V, I_S=30A$			1.5	V

## 7. Typical Characteristic

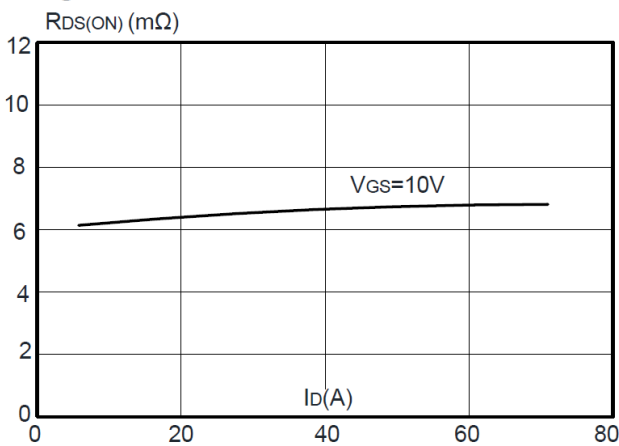
**Figure 1: Output Characteristics**



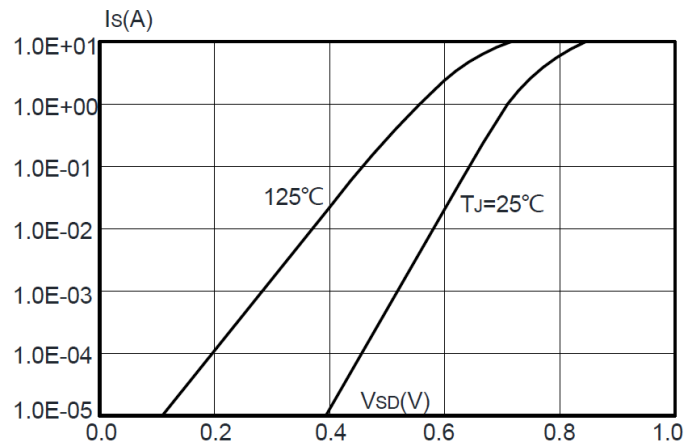
**Figure 2: Typical Transfer Characteristics**



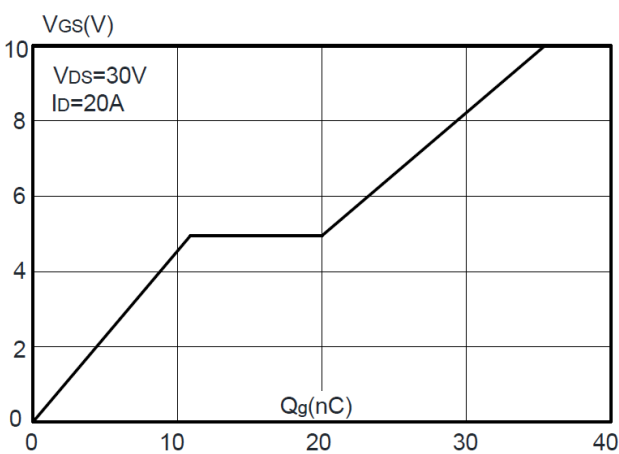
**Figure 3: On-resistance vs. Drain Current**



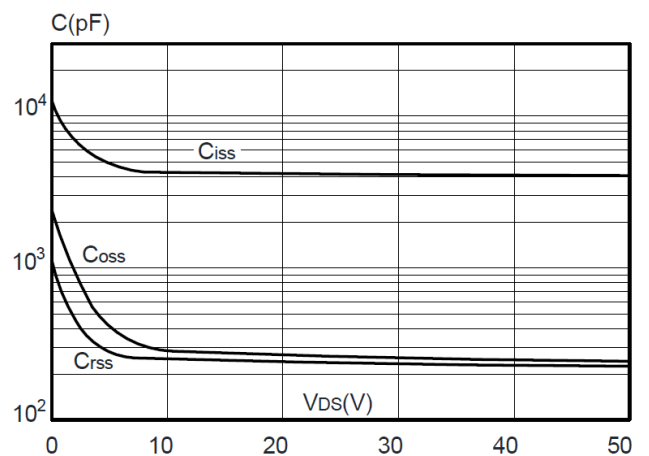
**Figure 4: Body Diode Characteristics**



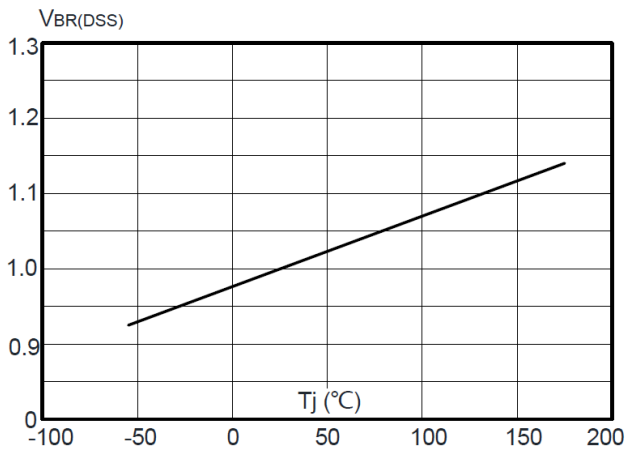
**Figure 5: Gate Charge Characteristics**



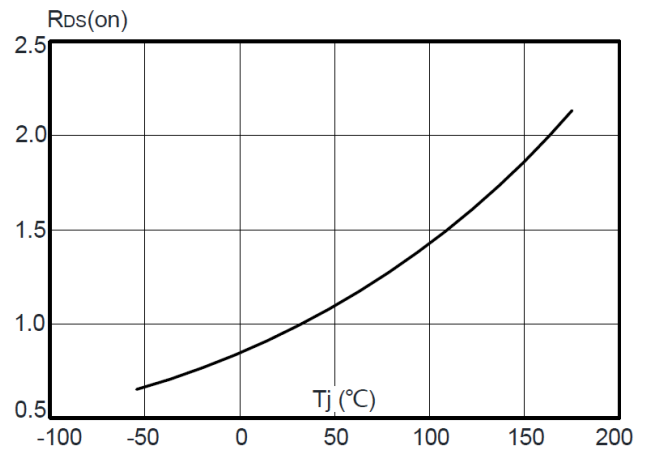
**Figure 6: Capacitance Characteristics**



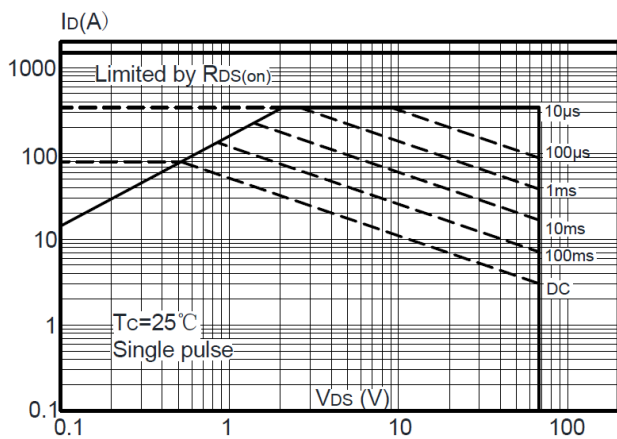
**Figure 7:** Normalized Breakdown Voltage vs. Junction Temperature



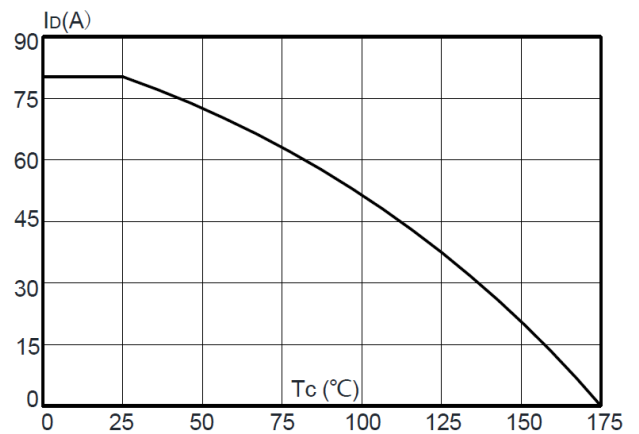
**Figure 8:** Normalized on Resistance vs. Junction Temperature



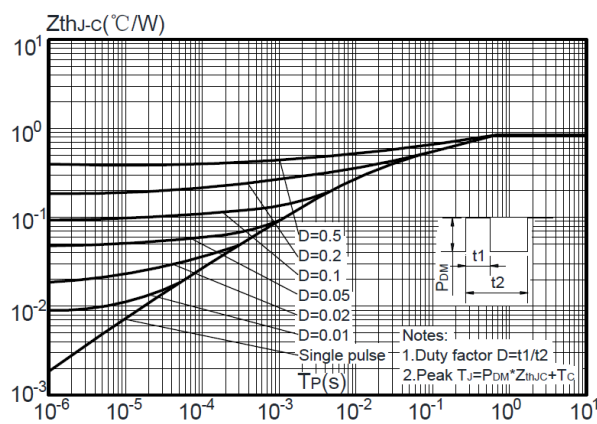
**Figure 9:** Maximum Safe Operating Area



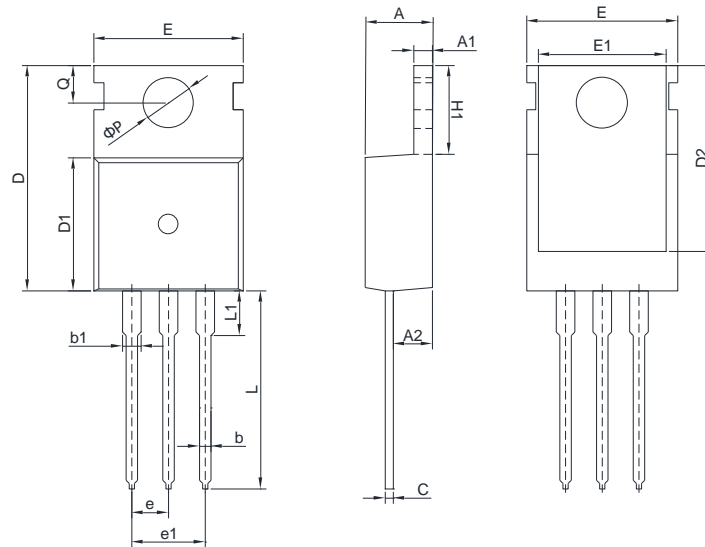
**Figure 10:** Maximum Continuous Drain Current vs. Case Temperature



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



8. Dimension (TO-220)



SYMBOLS	A	A1	A2	b	b1	c	D	D1	D2
MIN	4.25	1.25	2.35	0.7	1.15	0.45	14.35	8.80	13.05
MAX	4.65	1.35	2.55	0.9	1.75	0.60	15.95	9.50	13.65
SYMBOLS	E	E1	e	e1	H1	L	L1	Q	$\Phi P$
MIN	9.90	7.85	2.540	5.080	6.30	12.85	2.85	2.70	3.50
MAX	10.35	8.85	BSC	BSC	6.65	13.50	3.25	2.90	3.70

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