

**Semiconductor Co., Ltd.**

SE2N65

**N-Channel Enhancement-Mode MOSFET**

Revision: A

**General Description**

This series is a high voltage power MOSFET and is designed to have better characteristics, such as fast switching time, low gate charge, low on-state resistance and have a high rugged avalanche characteristics

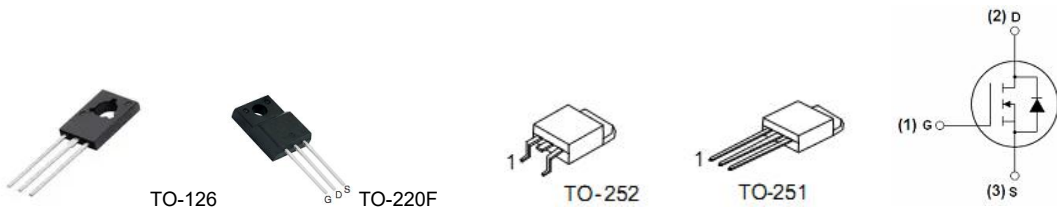
**Features**

For a single MOSFET

- $V_{DS} = 650V$
- $R_{DS(ON)} = 3.5\Omega @ V_{GS}=10V$

**Pin configurations**

See Diagram below



**Absolute Maximum Ratings**

Parameter	Symbol	Rating	Units
Drain-Source Voltage	$V_{DS}$	650	V
Gate-Source Voltage	$V_{GS}$	$\pm 30$	V
Drain Current	$I_D$	Continuous	2
		Pulsed	8
Avalanche Energy Single Pulsed <sup>3</sup>	$E_{AS}$	180	mJ
Peak Diode Recovery $dv/dt^4$	$Dv/dt$	4.5	V/ns
Power Dissipation	$P_D$	33	W
Operating Junction Temperature Range	$T_J$	-55 to 150	$^{\circ}C$

**Thermal Resistance**

Symbol	Parameter	Typ.	Max.	Units
$R_{\theta JA}$	Junction to Ambient ( $t \leq 10s$ )		62.5	$^{\circ}C/W$

## SE2N65

Electrical Characteristics (T <sub>J</sub> =25°C unless otherwise noted)						
Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
<b>OFF CHARACTERISTICS (Note 2)</b>						
B <sub>V</sub> DSS	Drain-Source Breakdown Voltage	V <sub>GS</sub> =0 V, I <sub>D</sub> =250μA,	650			V
I <sub>DSS</sub>	Drain to Source Leakage Current	V <sub>DS</sub> =650V, V <sub>GS</sub> =0V			1	μA
I <sub>GSS</sub>	Gate-Body Leakage Current	V <sub>GS</sub> =30V			100	nA
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> =250μA	2.5		4.5	V
R <sub>DS(ON)</sub>	Static Drain-Source On-Resistance <sup>2</sup>	V <sub>GS</sub> =10V, I <sub>D</sub> =1A		3.5	4.5	Ω
<b>DYNAMIC PARAMETERS</b>						
C <sub>iss</sub>	Input Capacitance	V <sub>GS</sub> =0V, V <sub>DS</sub> =25V, f=1MHz		520	680	pF
C <sub>oss</sub>	Output Capacitance			60	80	pF
C <sub>rss</sub>	Reverse Transfer Capacitance			8	10.5	pF
<b>SWITCHING PARAMETERS</b>						
Q <sub>g</sub>	Total Gate Charge <sup>2</sup>	V <sub>GS</sub> =10V, V <sub>DS</sub> =520V, I <sub>D</sub> =2A		10.5	13.5	nC
Q <sub>gs</sub>	Gate Source Charge			2.5		nC
Q <sub>gd</sub>	Gate Drain Charge			4.0		nC
t <sub>d(on)</sub>	Turn-On Delay Time	V <sub>DS</sub> =325V, R <sub>GEN</sub> =25Ω I <sub>D</sub> =2A		11	33	ns
t <sub>d(off)</sub>	Turn-Off Delay Time			45	90	ns
t <sub>d(r)</sub>	Turn-On Rise Time			40	88	ns
t <sub>d(f)</sub>	Turn-Off Fall Time			48	100	ns
<b>Source-Drain Diode Characteristics</b>						
V <sub>SD</sub>	Drain-Source Diode Forward Voltage	V <sub>GS</sub> =0V, I <sub>S</sub> =2A			1.4	V
I <sub>S</sub>	Max Drain-Source Diode Current				2	A
I <sub>SM</sub>	Max Pulse Drain-Source Current				8	A
t <sub>rr</sub>	Reverse Recovery Time	V <sub>GS</sub> =0V, I <sub>S</sub> =2A		300		ns
Q <sub>RR</sub>	Reverse Recovery Charge	dI <sub>F</sub> /dt=100A/μs <sup>1</sup>		2.2		μC

Typical Characteristics

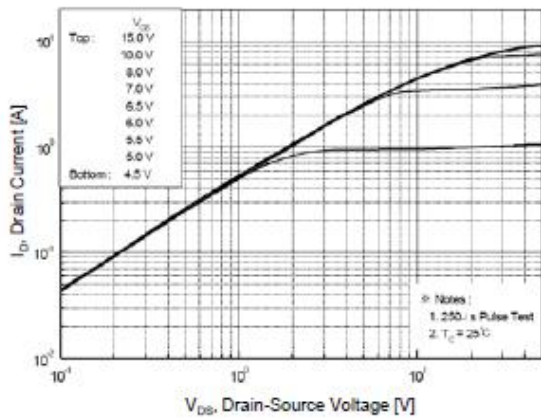


Figure 1. On Region Characteristics

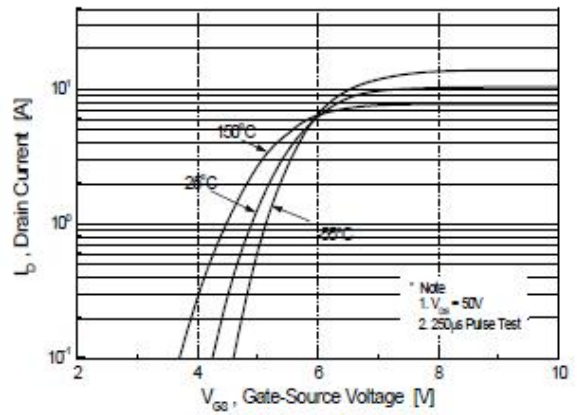


Figure 2. Transfer Characteristics

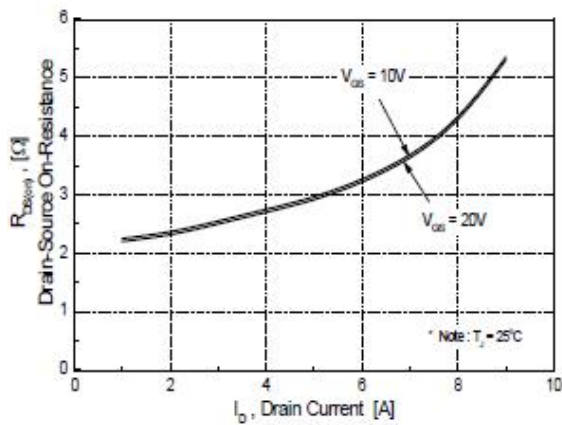


Figure 3. On Resistance Variation vs Drain Current and Gate Voltage

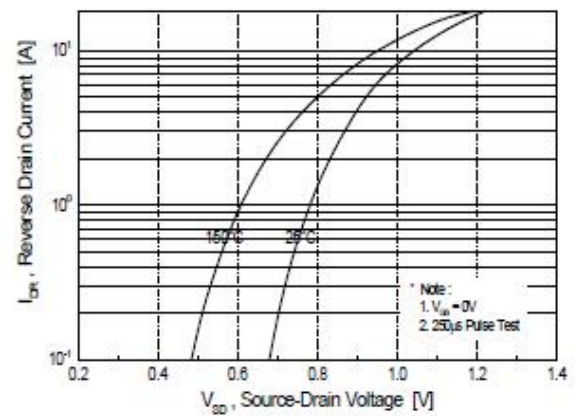


Figure 4. Body Diode Forward Voltage Variation with Source Current and Temperature

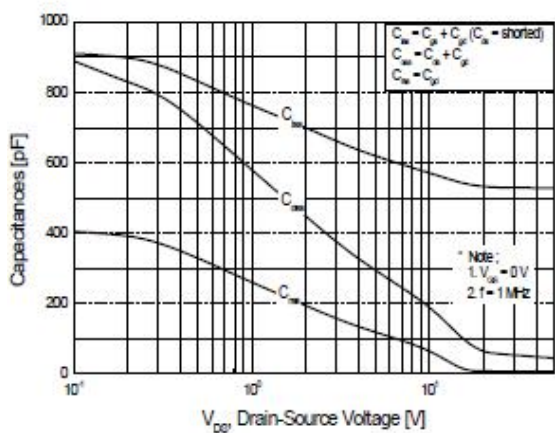


Figure 5. Capacitance Characteristics

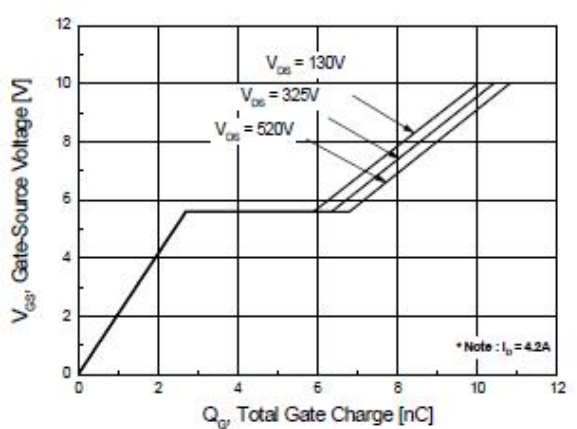


Figure 6. Gate Charge Characteristics

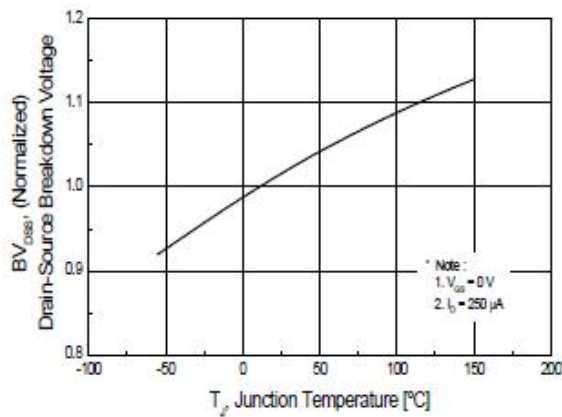


Figure 7. Breakdown Voltage Variation vs Temperature

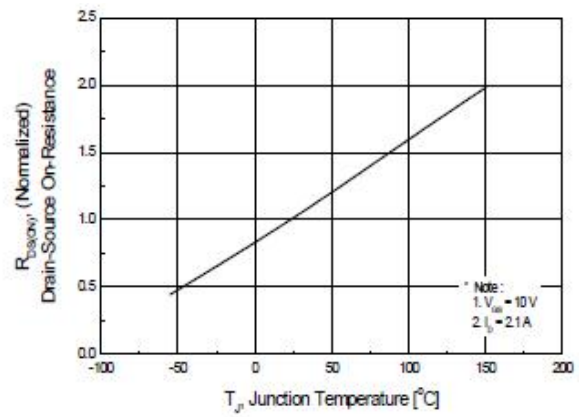


Figure 8. On-Resistance Variation vs Temperature

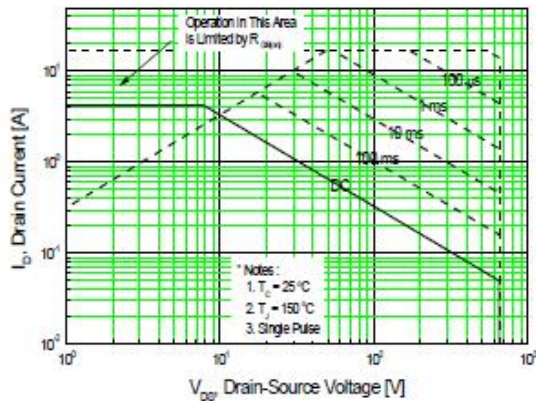


Figure 9. Maximum Safe Operating Area

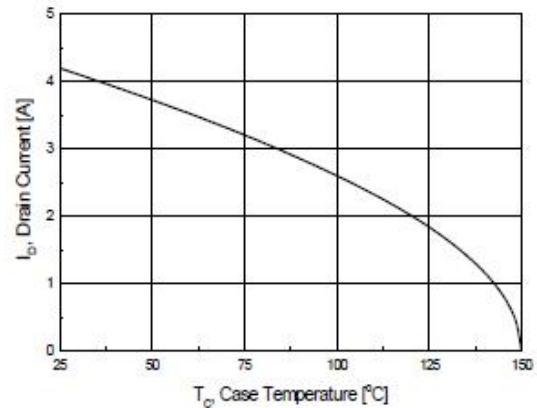


Figure 10. Maximum Drain Current vs Case Temperature

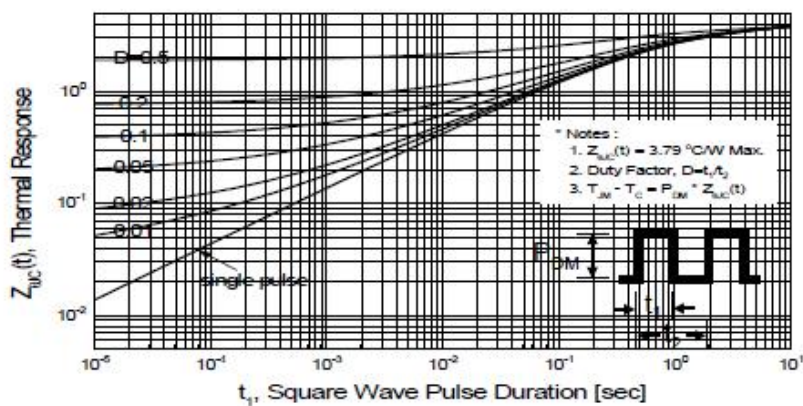
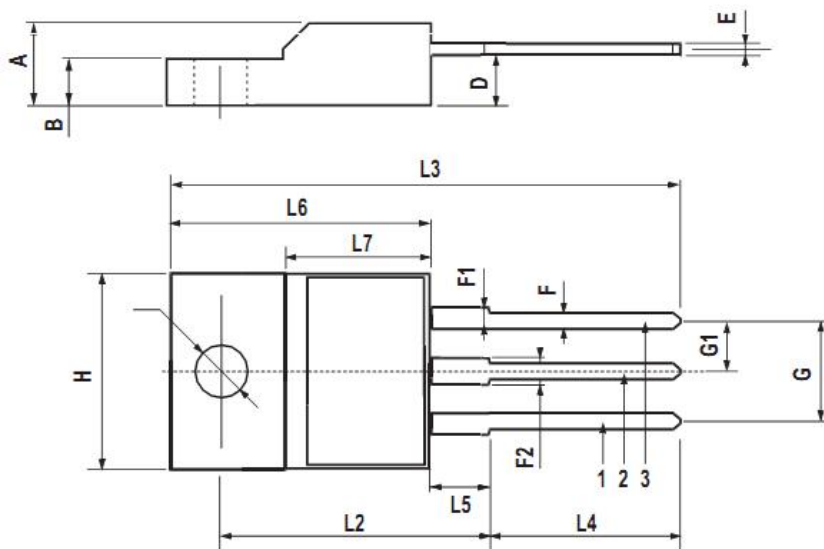


Figure 11. Transient Thermal Response Curve

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## Package Outline Dimension

### TO-220F

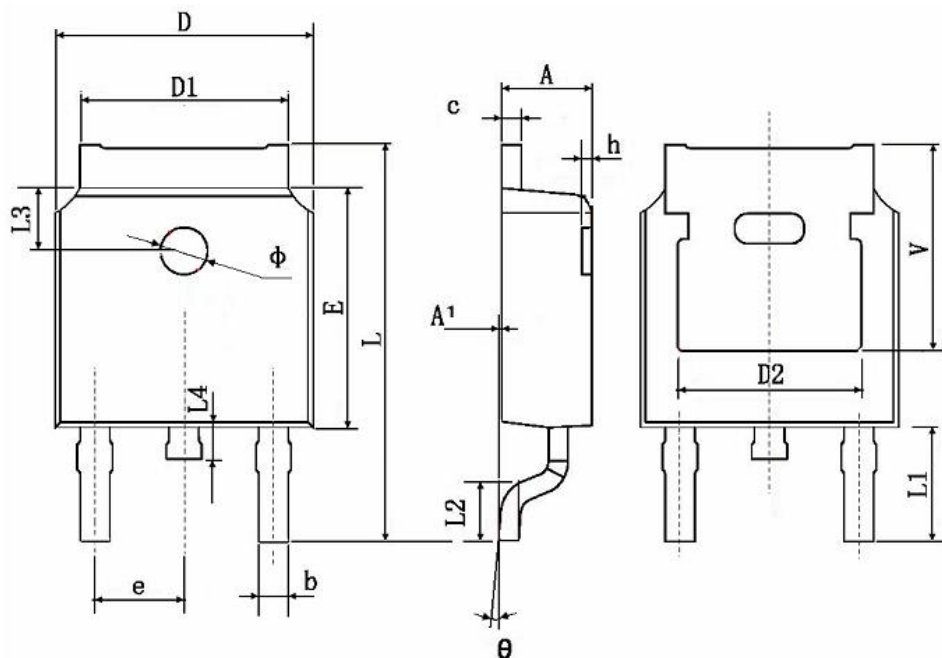


DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A	4.4		4.6	0.173		0.181
B	2.5		2.7	0.098		0.106
D	2.5		2.75	0.098		0.108
E	0.45		0.7	0.017		0.027
F	0.75		1	0.030		0.039
F1	1.15		1.5	0.045		0.067
F2	1.15		1.5	0.045		0.067
G	4.95		5.2	0.195		0.204
G1	2.4		2.7	0.094		0.106
H	10		10.4	0.393		0.409
L2		16			0.630	
L3	28.6		30.6	1.126		1.204
L4	9.8		10.6	.0385		0.417
L5	2.9		3.6	0.114		0.141
L6	15.9		16.4	0.626		0.645
L7	9		9.3	0.354		0.366
∅	3		3.2	0.118		0.126

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## Package Outline Dimension

### TO-252



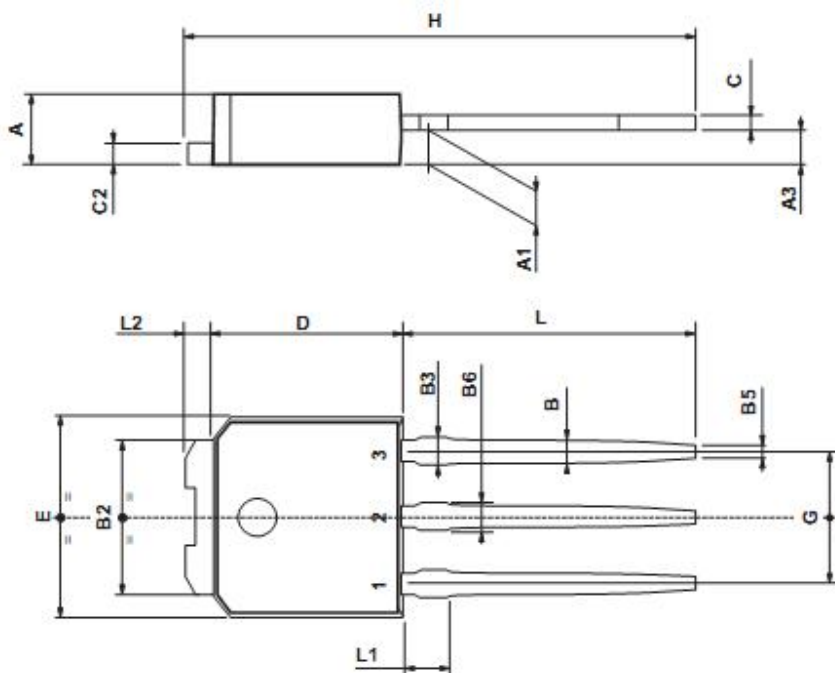
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	2.200	2.400	0.087	0.094
A1	0.000	0.127	0.000	0.005
b	0.660	0.860	0.026	0.034
c	0.460	0.580	0.018	0.023
D	6.500	6.700	0.256	0.264
D1	5.100	5.460	0.201	0.215
D2	0.483 TYP.		0.190 TYP.	
E	6.000	6.200	0.236	0.244
e	2.186	2.386	0.086	0.094
L	9.800	10.400	0.386	0.409
L1	2.900 TYP.		0.114 TYP.	
L2	1.400	1.700	0.055	0.067
L3	1.600 TYP.		0.063 TYP.	
L4	0.600	1.000	0.024	0.039
Φ	1.100	1.300	0.043	0.051
θ	0°	8°	0°	8°
h	0.000	0.300	0.000	0.012
V	5.350 TYP.		0.211 TYP.	



# SE2N65

## Package Outline Dimension

### TO-251

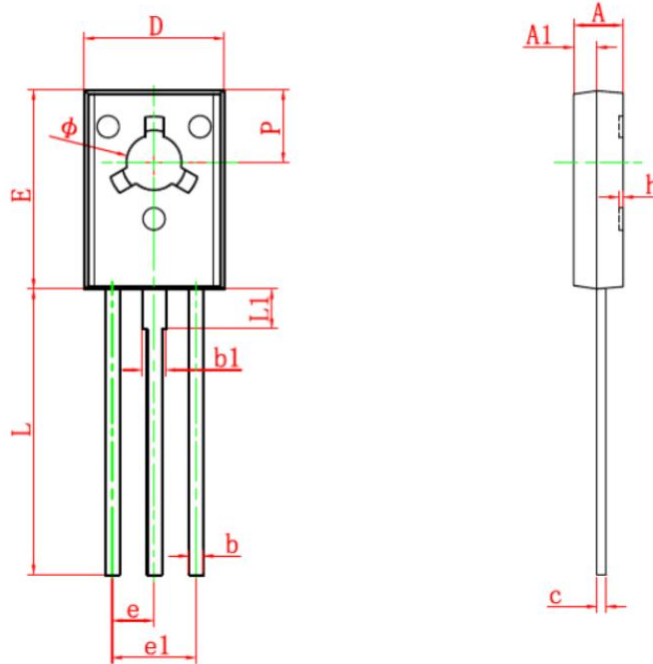


DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	2.2		2.4	0.086		0.094
A1	0.9		1.1	0.035		0.043
A3	0.7		1.3	0.027		0.051
B	0.64		0.9	0.025		0.031
B2	5.2		5.4	0.204		0.212
B3			0.85			0.033
B5		0.3			0.012	
B6			0.95			0.037
C	0.45		0.6	0.017		0.023
C2	0.48		0.6	0.019		0.023
D	6		6.2	0.236		0.244
E	6.4		6.6	0.252		0.260
G	4.4		4.6	0.173		0.181
H	15.9		16.3	0.626		0.641
L	9		9.4	0.354		0.370
L1	0.8		1.2	0.031		0.047
L2		0.8	1		0.031	0.039

# SE2N65

## Package Outline Dimension

TO-126



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	2.500	2.900	0.098	0.114
A1	1.100	1.500	0.043	0.059
b	0.660	0.860	0.026	0.034
b1	1.170	1.370	0.046	0.054
c	0.450	0.600	0.018	0.024
D	7.400	7.800	0.291	0.307
E	10.600	11.000	0.417	0.433
e	2.290 TYP		0.090 TYP	
e1	4.480	4.680	0.176	0.184
h	0.000	0.300	0.000	0.012
L	15.300	15.700	0.602	0.618
L1	2.100	2.300	0.083	0.091
P	3.900	4.100	0.154	0.161
$\Phi$	3.000	3.200	0.118	0.126