



# 深圳市富满电子集团股份有限公司

SHEN ZHEN FINE MADE ELECTRONICS GROUP CO., LTD.

**2060K.** (文件编号: S&CIC1874)

## N-Channel Trench Power MOSFET

### General Description

The 2060K.uses advanced trench technology to provide excellent  $R_{DS(ON)}$ , low gate charge and operation with gate voltages as low as 2.5V. This device is suitable for use as a wide variety of applications.

### Features

- $V_{DS}=20V$ ;  $I_D=60A$ ;  
 $R_{DS(ON)}<6.0m\Omega @ V_{GS}=4.5V$   
 $R_{DS(ON)}<8.2m\Omega @ V_{GS}=2.5V$
- High Power and current handing capability
- Lead free product is acquired
- Surface Mount Package

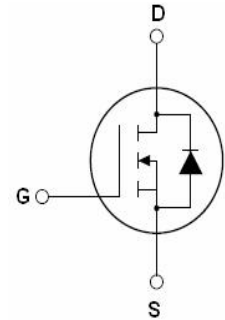
### Application

- Battery Protection
- Load switch
- Power management

**100% UIS TESTED!**  
**100%  $\Delta V_{ds}$  TESTED!**



TO-252(DPAK)  
Top View



Schematic Diagram



Marking and pin Assignment

### Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
2060K.	2060K.	TO-252	325mm	16mm	2500

**Table 1. Absolute Maximum Ratings (TA=25°C)**

Symbol	Parameter	Value	Unit
$V_{DS}$	Drain-Source Voltage ( $V_{GS}=0V$ )	20	V
$V_{GS}$	Gate-Source Voltage ( $V_{DS}=0V$ )	$\pm 12$	V
$I_D$	Drain Current-Continuous( $T_c=25^\circ C$ ) (Note 1)	60	A
	Drain Current-Continuous( $T_c=100^\circ C$ )	45	A
$I_{DM (pluse)}$	Drain Current-Continuous@ Current-Pulsed (Note 2)	220	A
$P_D$	Maximum Power Dissipation( $T_c=25^\circ C$ )	64	W
	Maximum Power Dissipation( $T_c=100^\circ C$ )	39	W
$E_{AS}$	Avalanche energy (Note 3)	256	mJ
$T_J, T_{STG}$	Operating Junction and Storage Temperature Range	-55 To 155	$^\circ C$

**Table 2. Thermal Characteristic**

Symbol	Parameter	Typ	Max	Unit
$R_{\theta JC}$	Thermal Resistance,Junction-to-Case	-	1.85	$^\circ C/W$



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**Table 3. Electrical Characteristics (TA=25°C unless otherwise noted)**

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>On/Off States</b>						
BV <sub>DSS</sub>	Drain-Source Breakdown Voltage	V <sub>GS</sub> =0V I <sub>D</sub> =250μA	20			V
I <sub>DSS</sub>	Zero Gate Voltage Drain Current	V <sub>DS</sub> =20V, V <sub>GS</sub> =0V			1	μA
I <sub>GSS</sub>	Gate-Body Leakage Current	V <sub>GS</sub> =±12V, V <sub>DS</sub> =0V			±100	nA
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250μA	0.45	0.7	1.0	V
g <sub>FS</sub>	Forward Transconductance	V <sub>DS</sub> =5V, I <sub>D</sub> =15A		35		S
R <sub>DS(ON)</sub>	Drain-Source On-State Resistance	V <sub>GS</sub> =4.5V, I <sub>D</sub> =20A (T <sub>c</sub> =25°C)		4.2	6.0	mΩ
		V <sub>GS</sub> =4.5V, I <sub>D</sub> =20A (T <sub>c</sub> =125°C)		6.0	10	mΩ
		V <sub>GS</sub> =2.5V, I <sub>D</sub> =15A		5.2	8.2	mΩ
<b>Dynamic Characteristics</b>						
C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> =15V, V <sub>GS</sub> =0V, f=1.0MHz		2850		pF
C <sub>oss</sub>	Output Capacitance			365		pF
C <sub>rss</sub>	Reverse Transfer Capacitance			285		pF
R <sub>g</sub>	Gate resistance	V <sub>GS</sub> =0V, V <sub>DS</sub> =0V, f=1.0MHz		1.2		Ω
<b>Switching Times</b>						
t <sub>d(on)</sub>	Turn-on Delay Time	V <sub>GS</sub> =4.5V, V <sub>DS</sub> =15V, R <sub>L</sub> =0.75Ω, R <sub>GEN</sub> =3Ω		18		nS
t <sub>r</sub>	Turn-on Rise Time			52		nS
t <sub>d(off)</sub>	Turn-Off Delay Time			76		nS
t <sub>f</sub>	Turn-Off Fall Time			26		nS
Q <sub>g</sub>	Total Gate Charge	V <sub>GS</sub> =4.5V, V <sub>DS</sub> =10V, I <sub>D</sub> =12A		34		nC
Q <sub>gs</sub>	Gate-Source Charge			4		nC
Q <sub>gd</sub>	Gate-Drain Charge			13		nC
<b>Source-Drain Diode Characteristics</b>						
I <sub>SD</sub>	Source-Drain Current(Body Diode)				60	A
V <sub>SD</sub>	Forward on Voltage	V <sub>GS</sub> =0V, I <sub>S</sub> =20A			1.2	V
t <sub>rr</sub>	Body Diode Reverse Recovery Time	I <sub>F</sub> =20A, dI/dt=100A/μs		24		ns
Q <sub>rr</sub>	Body Diode Reverse Recovery Charge	I <sub>F</sub> =20A, dI/dt=100A/μs		11		nC

Notes 1.The maximum current rating is package limited.

Notes 2.Repetitive Rating: Pulse width limited by maximum junction temperature

Notes 3.EAS condition: T<sub>J</sub>=25°C, V<sub>DD</sub>=30V, V<sub>G</sub>=4.5V, R<sub>G</sub>=25Ω,



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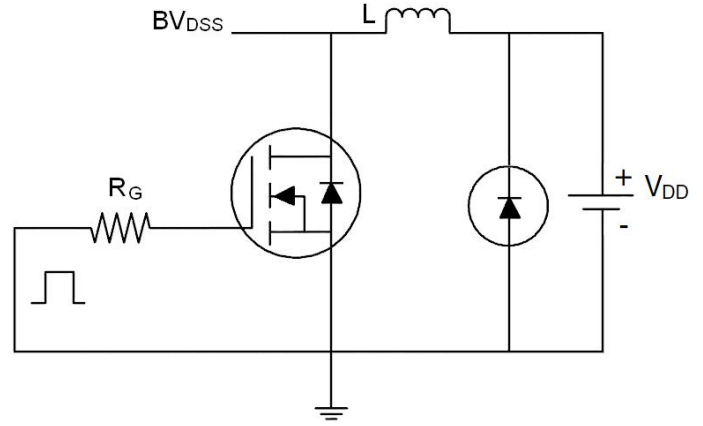
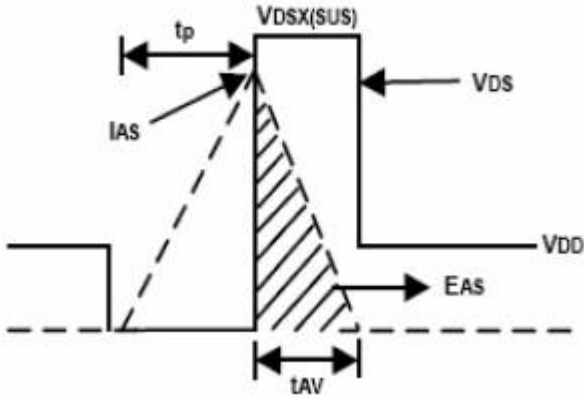
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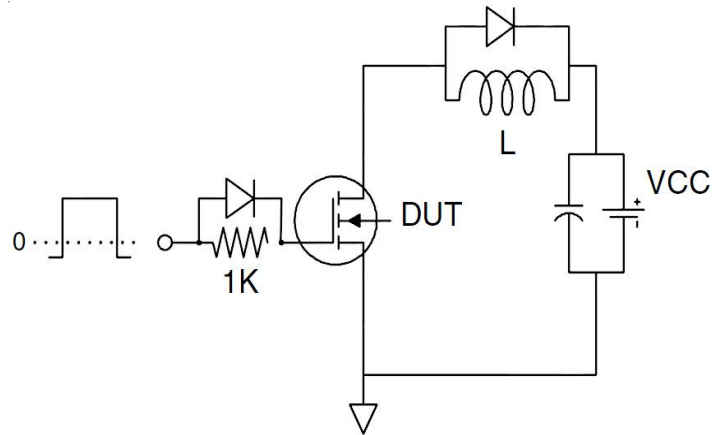
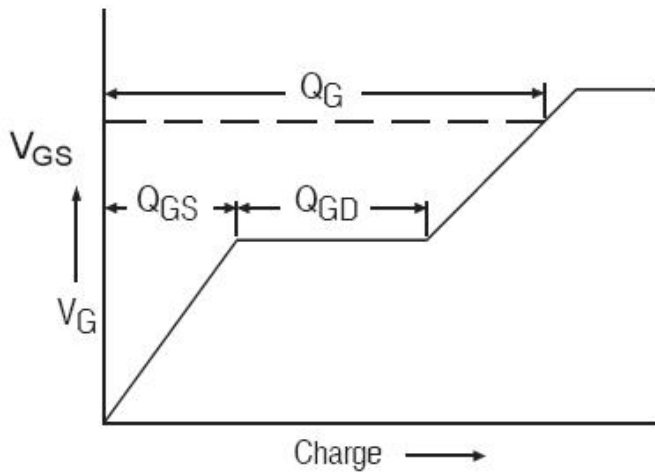
## N-Channel Trench Power MOSFET

### Test Circuit

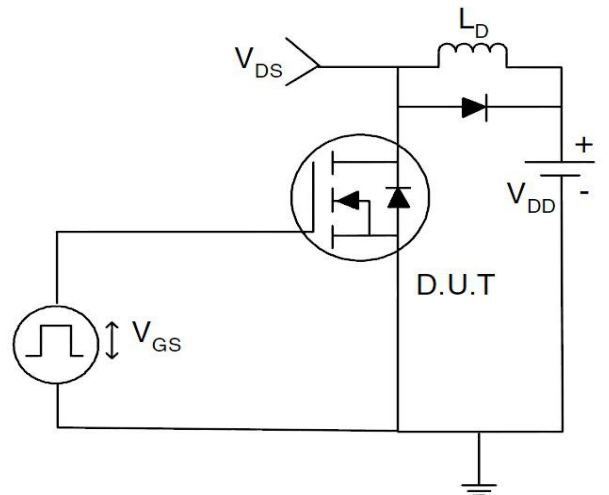
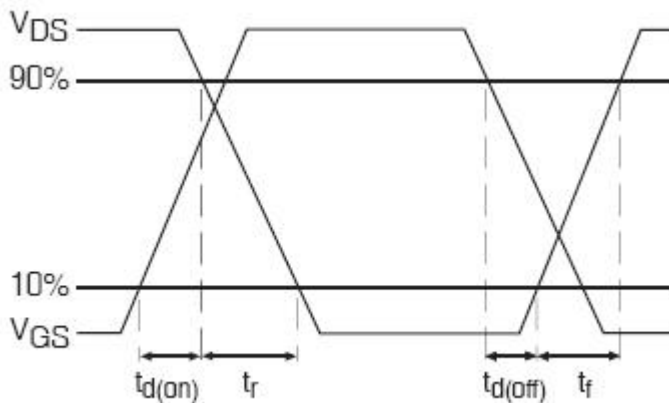
EAS Test Circuits:



Gate Charge Test Circuit:



Switch Time Test Circuit:





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## N-Channel Trench Power MOSFET

### TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS(Curves)

Figure 1. Output Characteristics

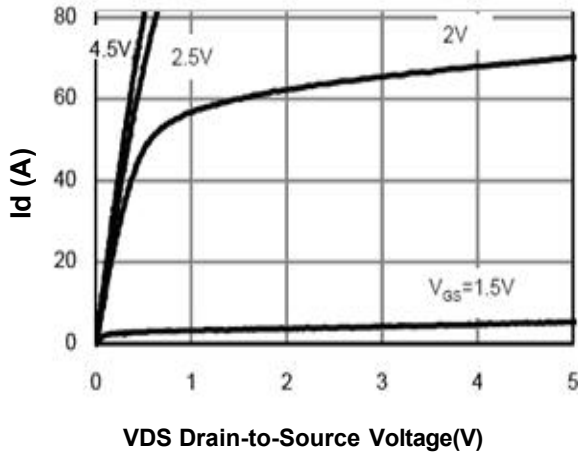


Figure 2. Transfer Characteristics

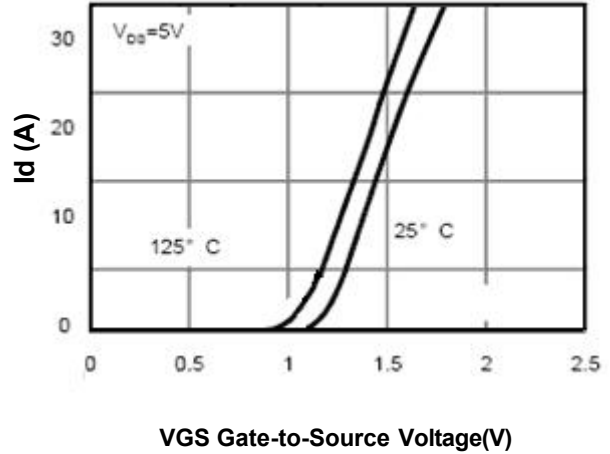


Figure 3. Max  $BV_{DSS}$  vs Junction Temperature

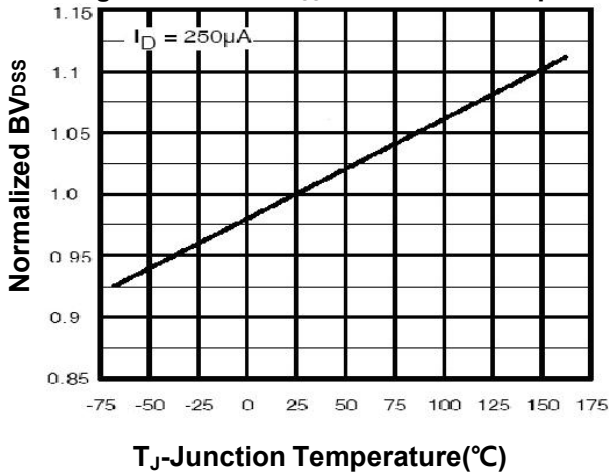


Figure 4. Drain Current

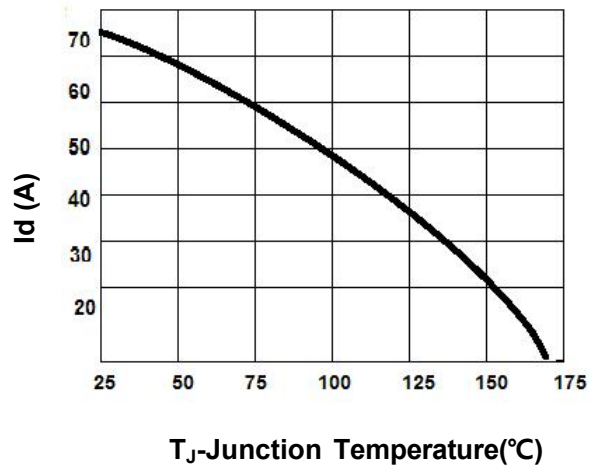


Figure 5.  $V_{GS(th)}$  vs Junction Temperature

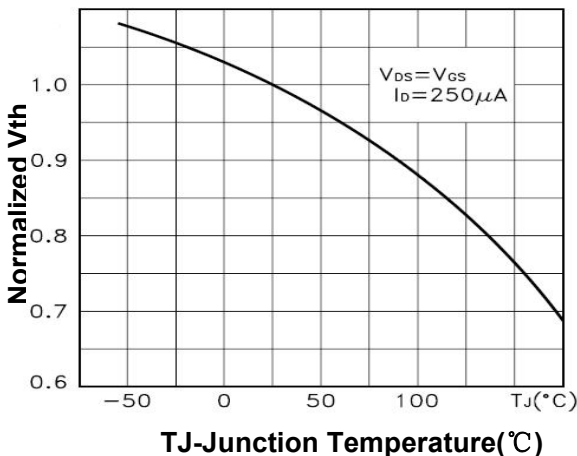
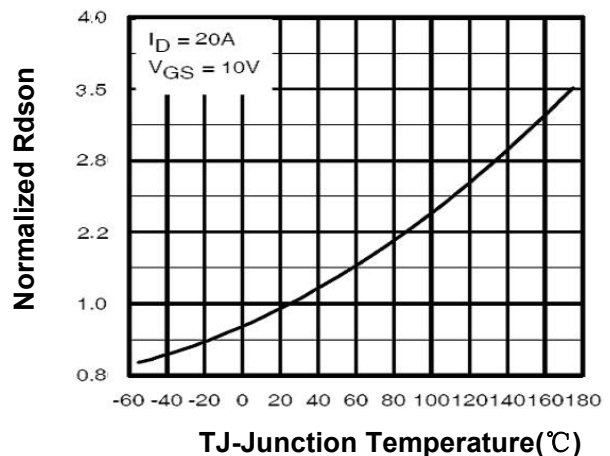


Figure 6.  $R_{DS(on)}$  vs Junction Temperature





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## N-Channel Trench Power MOSFET

Figure 7. Gate Charge Waveforms

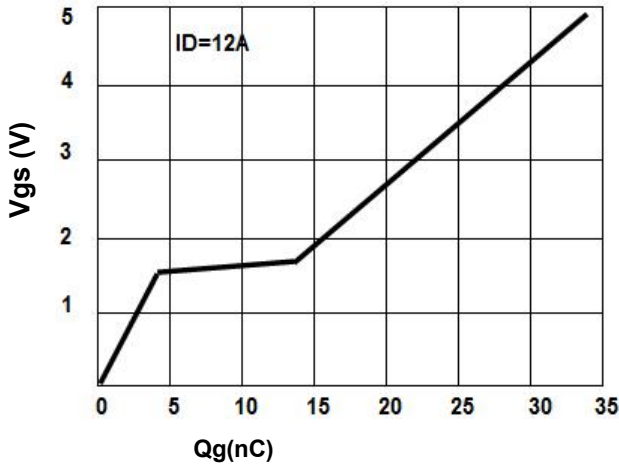


Figure 8. Capacitance

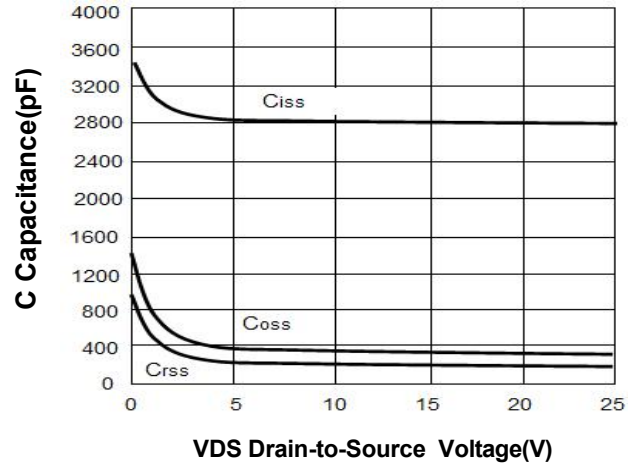


Figure 9. Body-Diode Characteristics

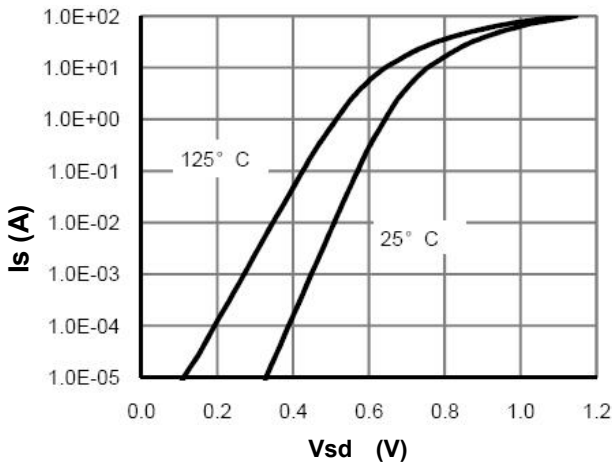


Figure 10. Maximum Safe Operating Area

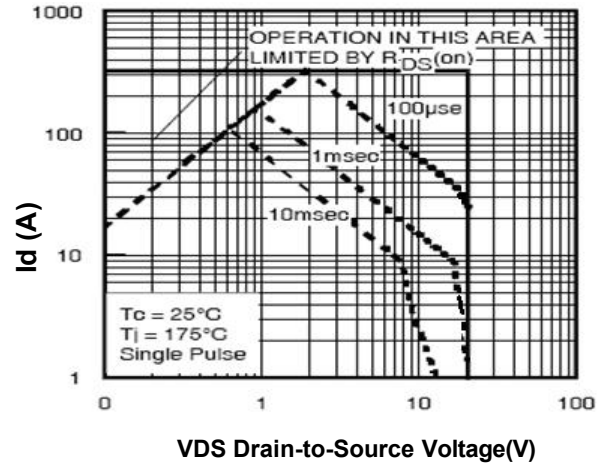
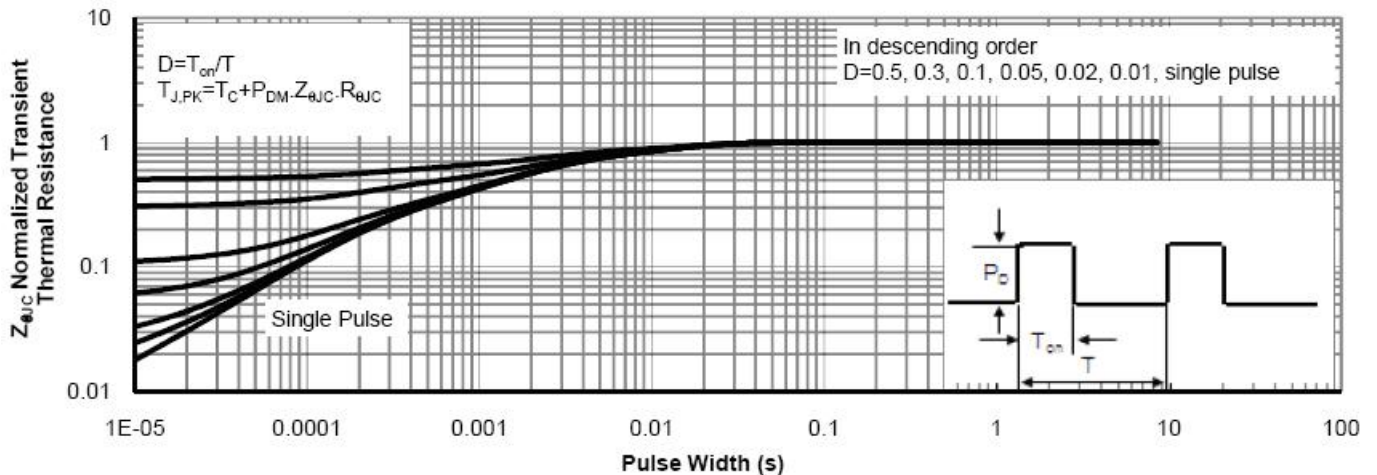


Figure 11. Normalized Maximum Transient Thermal Impedance





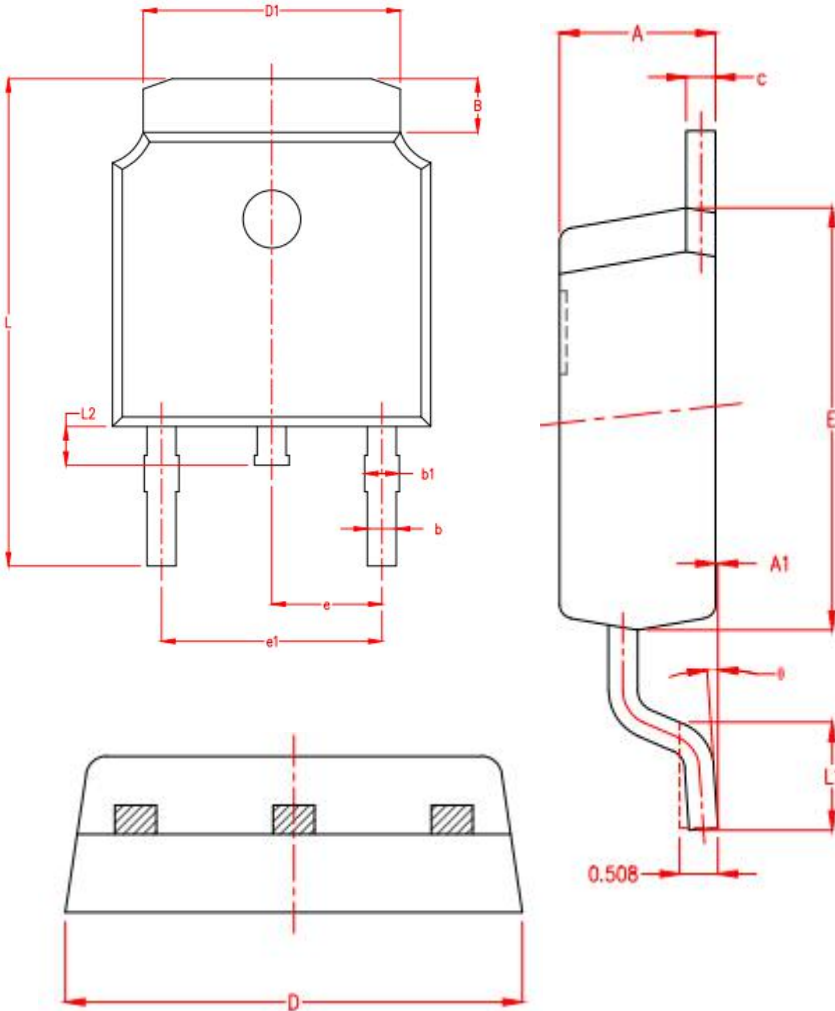
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### TO-252 Package Information



SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	2.15	2.25	2.35
A1	0.00	0.06	0.12
B	0.96	1.11	1.26
b	0.59	0.69	0.79
b1	0.69	0.81	0.93
c	0.34	0.42	0.50
D	6.45	6.60	6.75
D1	5.23	5.33	5.43
E	5.95	6.10	6.25
e	2.286TYP.		
e1	4.47	4.57	4.67
L	9.90	10.10	10.30
L1	1.40	1.55	1.70
L2	0.60	0.80	1.00
θ	0°	4°	8°

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