HSU90N02

N-Ch 20V Fast Switching MOSFETs

Description

The HSU90N02 is the high cell density trenched N-ch MOSFETs, which provide excellent RDSON and gate charge for most of the synchronous buck converter applications.

The HSU90N02 meet the RoHS and Green Product requirement, 100% EAS guaranteed with full function reliability approved.

- 100% EAS Guaranteed
- Green Device Available
- Super Low Gate Charge
- Battery protection
- Power management

Product Summary

V_{DS}	20	V
$R_{DS(ON),typ}$	2.7	mΩ
I_D	90	A

TO252 Pin Configuration
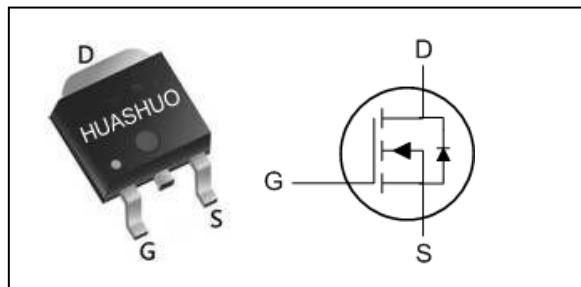
Absolute Maximum Ratings

Symbol	Parameter	Rating	Units
V_{DS}	Drain-Source Voltage	20	V
V_{GS}	Gate-Source Voltage	±12	V
I_D@T_C=25℃	Continuous Drain Current, V_{GS} @ 10V[1]	90	A
I_D@T_C=100℃	Continuous Drain Current, V_{GS} @ 10V[1]	59	A
I_{DM}	Pulsed Drain Current[2]	350	A
EAS	Single Pulse Avalanche Energy[3]	108	mJ
P_D@T_C=25℃	Total Power Dissipation[4]	82	W
T_{STG}	Storage Temperature Range	-55 to 175	℃
T_J	Operating Junction Temperature Range	-55 to 175	℃

Thermal Data

Symbol	Parameter	Typ.	Max.	Unit
$R_{\theta JA}$	Thermal Resistance Junction-ambient (Steady State)[1]	---	50	℃/W
$R_{\theta JA}$	Thermal Resistance Junction-Ambient [1] (t ≤10s)	---	25	℃/W
$R_{\theta JC}$	Thermal Resistance Junction-Case[1]	---	1.92	℃/W

Electrical Characteristics (T$_J$=25 ℃, unless otherwise noted)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
BV$_{DSS}$	Drain-Source Breakdown Voltage	V$_{GS}$=0V , I$_D$=250uA	20	---	---	V
△BV$_{DSS}$/△T$_J$	BVDSS Temperature Coefficient	Reference to 25℃ , I$_D$=1mA	---	0.028	---	V/℃
R$_{DS(ON)}$	Static Drain-Source On-Resistance2	V$_{GS}$=4.5V , I$_D$=30A	---	2.7	4	mΩ
		V$_{GS}$=2.5V , I$_D$=20A	---	4.1	6	
V$_{GS(th)}$	Gate Threshold Voltage	V$_{GS}$=V$_{DS}$, I$_D$ =250uA	0.4	0.7	1.1	V
△V$_{GS(th)}$	V$_{GS(th)}$ Temperature Coefficient		---	-6.16	---	mV/℃
I$_{DSS}$	Drain-Source Leakage Current	V$_{DS}$=20V , V$_{GS}$=0V , T$_J$=25℃	---	---	1	uA
		V$_{DS}$=20V , V$_{GS}$=0V , T$_J$=55℃	---	---	5	
I$_{GSS}$	Gate-Source Leakage Current	V$_{GS}$=±12V , V$_{DS}$=0V	---	---	±100	nA
Q$_g$	Total Gate Charge (4.5V)	V$_{DS}$=15V , V$_{GS}$=4.5V , I$_D$=18A	---	50	---	nC
Q$_{gs}$	Gate-Source Charge		---	3.9	---	
Q$_{gd}$	Gate-Drain Charge		---	22	---	
T$_{d(on)}$	Turn-On Delay Time	V$_{DD}$=15V , V$_{GS}$=4.5V , R$_G$=1.8Ω I$_D$=15A	---	10	---	ns
T$_r$	Rise Time		---	33	---	
T$_{d(off)}$	Turn-Off Delay Time		---	68	---	
T$_f$	Fall Time		---	52	---	
C$_{iss}$	Input Capacitance	V$_{DS}$=15V , V$_{GS}$=0V , f=1MHz	---	3200	---	pF
C$_{oss}$	Output Capacitance		---	430	---	
C$_{rss}$	Reverse Transfer Capacitance		---	414	---	

Diode Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
I$_S$	Continuous Source Current1,5	V$_G$=V$_D$=0V , Force Current	---	---	90	A
I$_{SM}$	Pulsed Source Current2,5		---	---	360	A
V$_{SD}$	Diode Forward Voltage2	V$_{GS}$=0V , I$_S$=30A , T$_J$=25℃	---	---	1.2	V
t$_{rr}$	Reverse Recovery Time	IF=30A , dI/dt=100A/μs , T$_J$=25℃	---	24	---	nS
Q$_{rr}$	Reverse Recovery Charge		---	12	---	nC

Note :
1.The data tested by surface mounted on a 1 inch2 FR-4 board with 2OZ copper.
2.The data tested by pulsed , pulse width ≦ 300us , duty cycle ≦ 2%
3.The EAS data shows Max. rating . The test condition is V$_{DD}$=15V,V$_{GS}$=4.5V,L=0.5mH,I$_{AS}$=22A
4.The power dissipation is limited by 175℃ junction temperature
5.The data is theoretically the same as I$_D$ and I$_{DM}$, in real applications , should be limited by total power dissipation.

Typical Characteristics
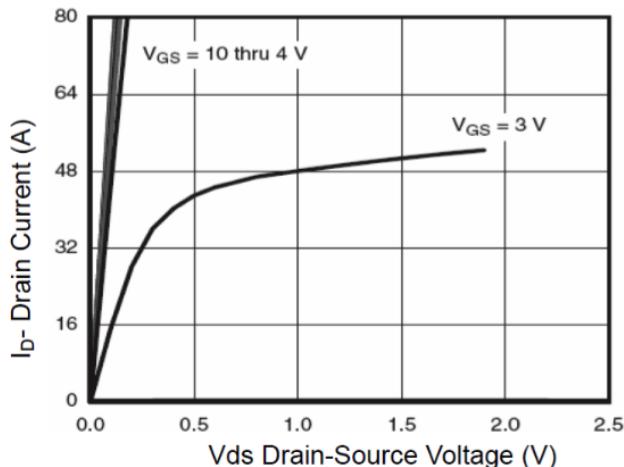

Figure 1 Output Characteristics
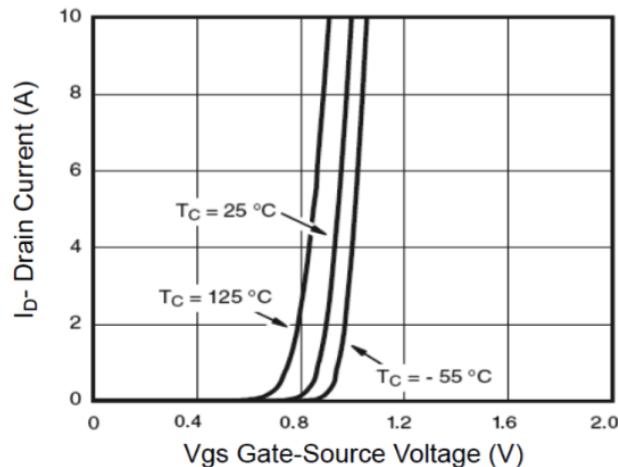

Figure 2 Transfer Characteristics
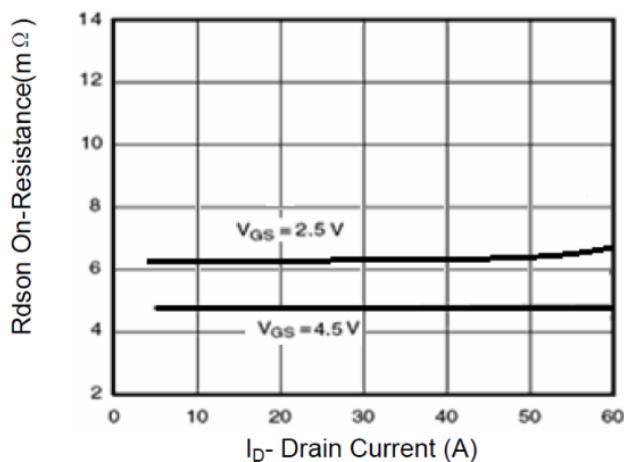
Figure 3 Rdson- Drain Current
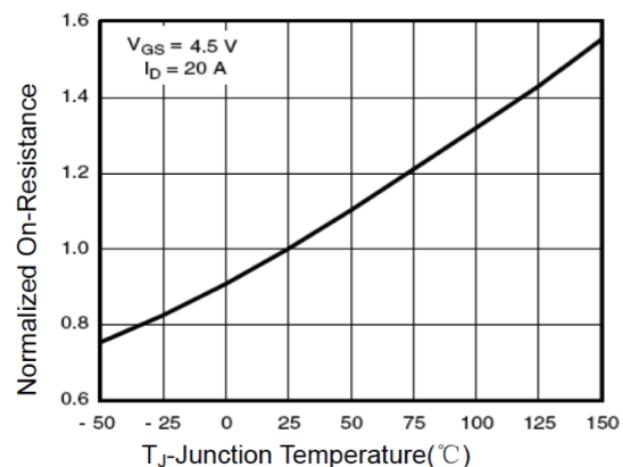
Figure 4 Rdson-JunctionTemperature
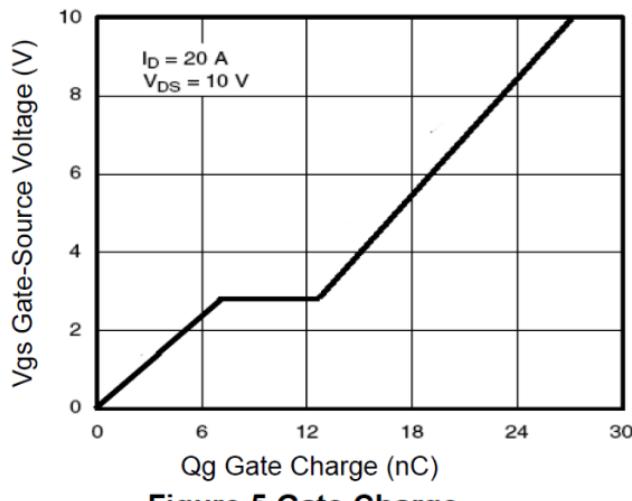
Figure 5 Gate Charge
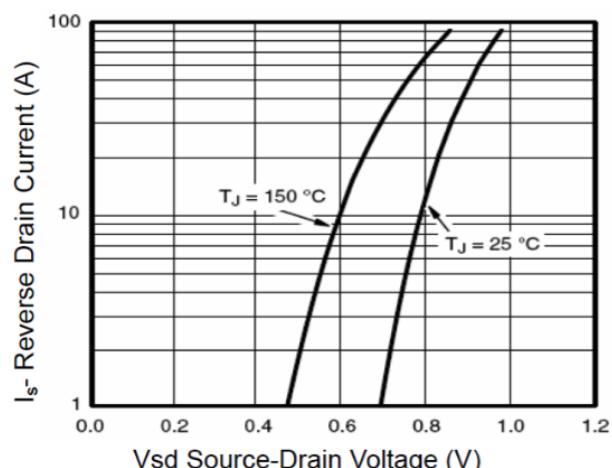
**Figure 6 Source- Drain Diode Forward**
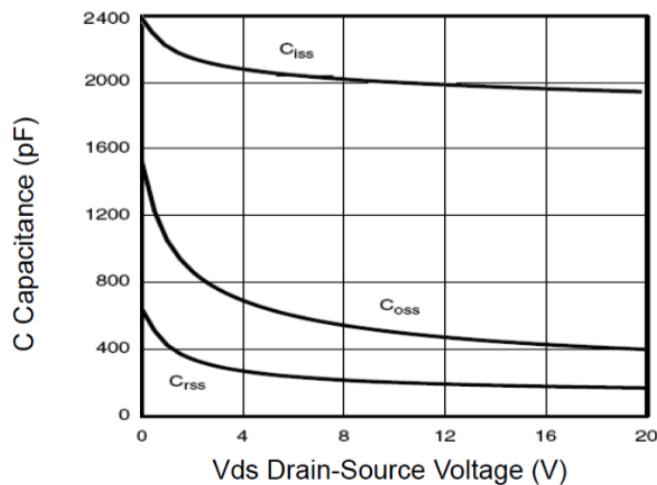
Figure 7 Capacitance vs Vds
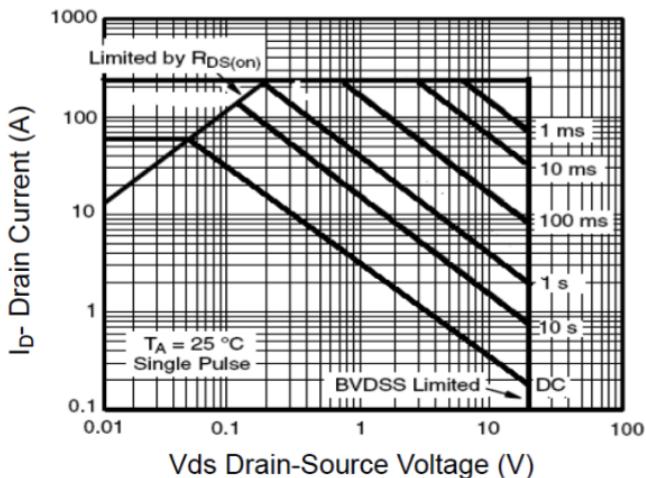

Figure 8 Safe Operation Area
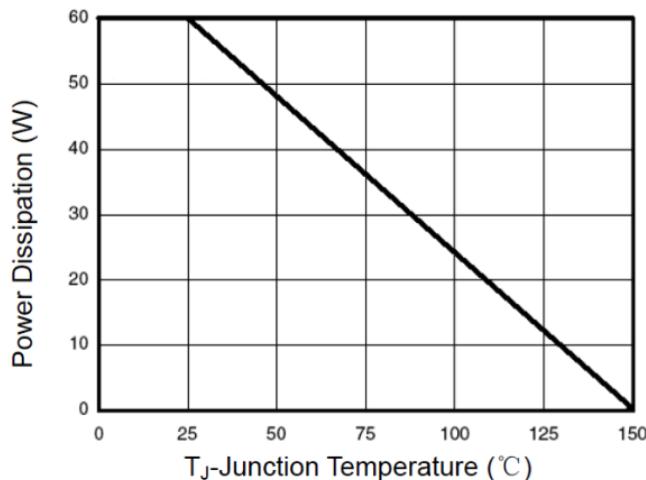
Figure 9 Power De-rating
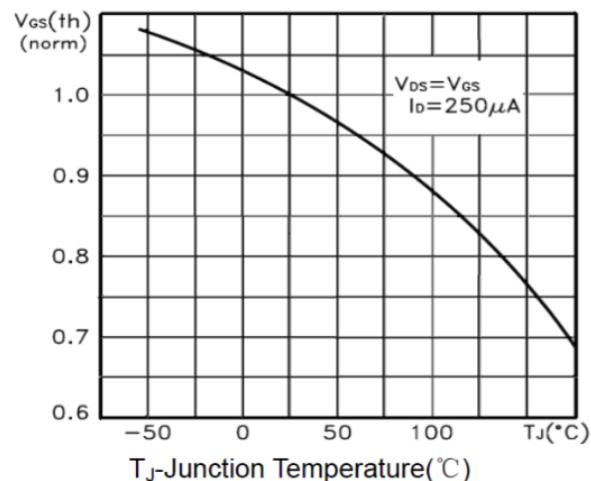
Figure 10 $V_{GS(th)}$ vs Junction Temperature

Notes:

1. Duty Cycle, $D = \dfrac{t_1}{t_2}$
2. Per Unit Base = $R_{thJC} = 2.1°C/W$
3. $T_{JM} - T_C = P_{DM}Z_{thJC}^{(t)}$
4. Surface Mounted

Square Wave Pluse Duration(sec)
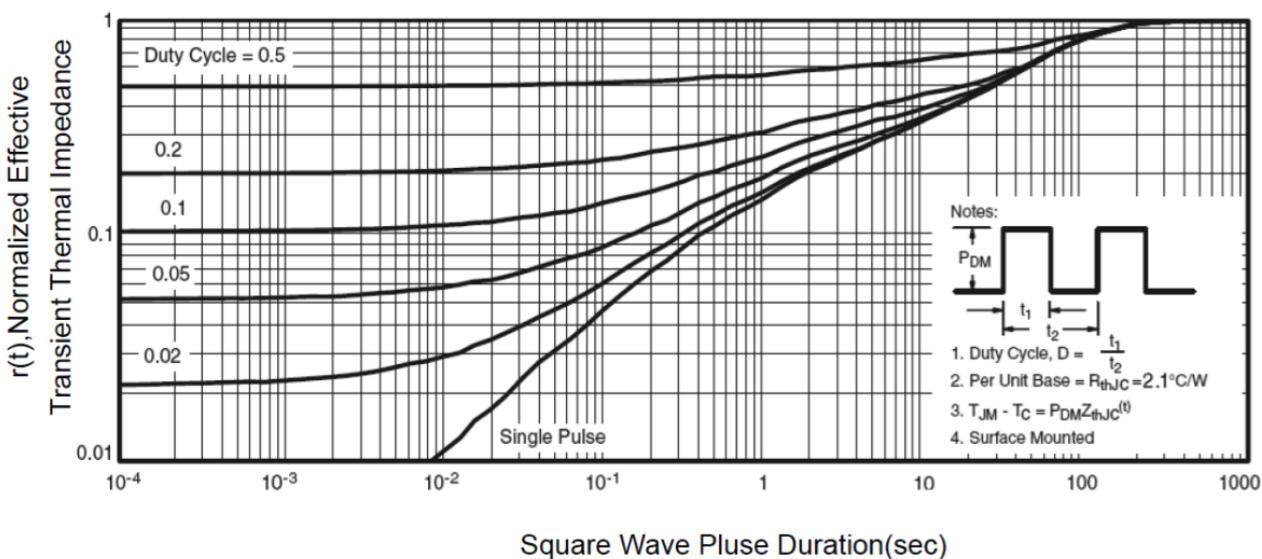
**Figure 11 Normalized Maximum Transient Thermal Impedance**

Test Circuit & Waveform

Gate Charge Test Circuit & Waveform
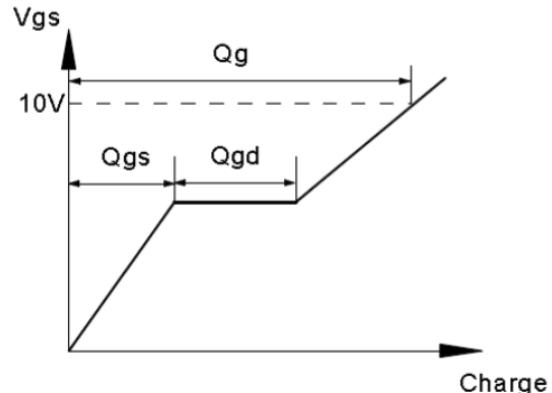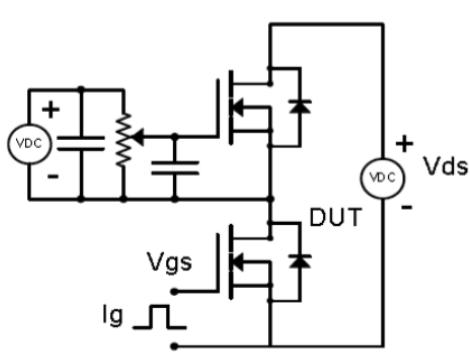
Resistive Switching Test Circuit & Waveforms
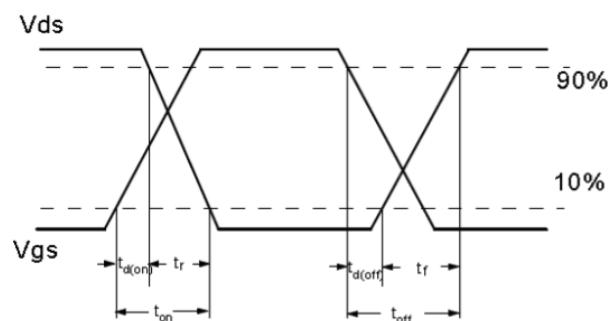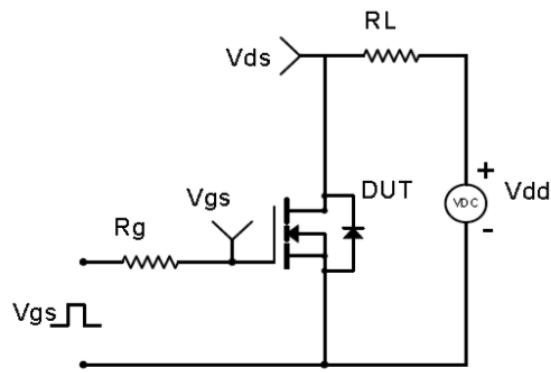
### Unclamped Inductive Switching (UIS) Test Circuit & Waveforms

$$E_{AR} = 1/2\, L I_{AR}^2$$
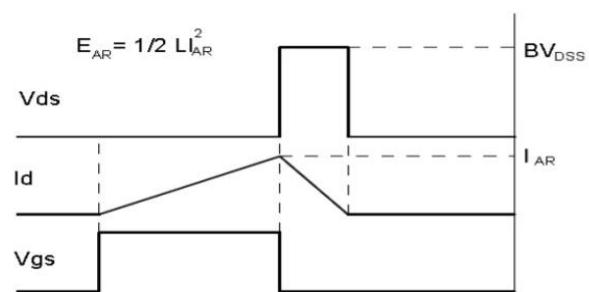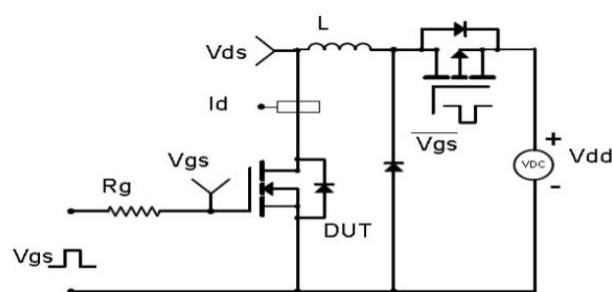
Diode Recovery Test Circuit & Waveforms

$$Q_{rr} = -\int I dt$$
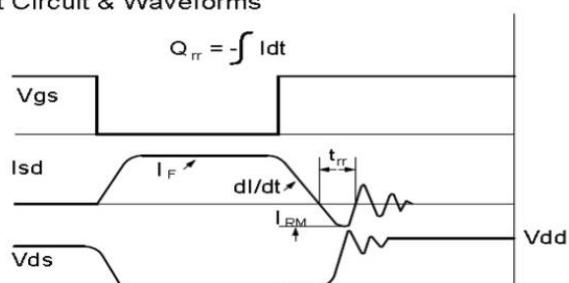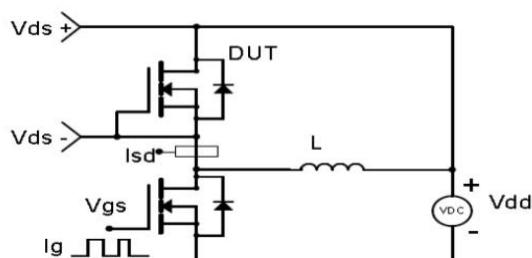
Ordering Information

Part Number	Package code	Packaging
HSU90N02	TO252-2	2500/Tape&Reel
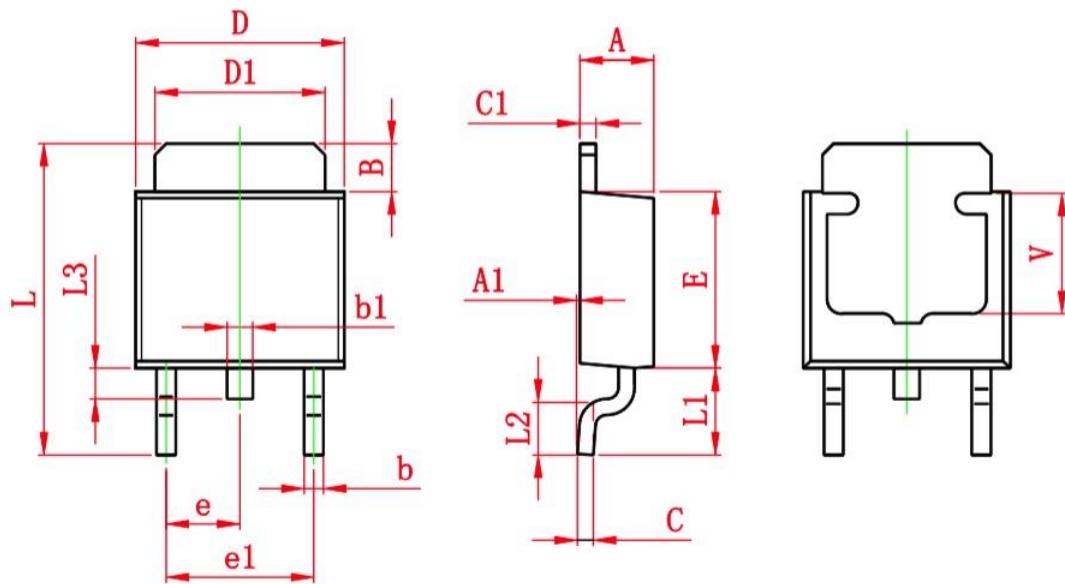
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	2.200	2.400	0.087	0.094
A1	0.000	0.127	0.000	0.005
B	1.350	1.650	0.053	0.065
b	0.500	0.700	0.020	0.028
b1	0.700	0.900	0.028	0.035
c	0.430	0.580	0.017	0.023
c1	0.430	0.580	0.017	0.023
D	6.350	6.650	0.250	0.262
D1	5.200	5.400	0.205	0.213
E	5.400	5.700	0.213	0.224
e	2.300 TYP.		0.091 TYP.	
e1	4.500	4.700	0.177	0.185
L	9.500	9.900	0.374	0.390
L1	2.550	2.900	0.100	0.114
L2	1.400	1.780	0.055	0.070
L3	0.600	0.900	0.024	0.035
V	3.800 REF.		0.150 REF.	

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