

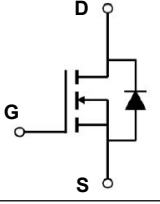

**Features**

- $V_{DS}=60V, I_D=60A$   
 $R_{ds(on)}(typ)=10.5m\Omega@V_{gs}=4.5V$   
 $R_{ds(on)}(typ)=8.5m\Omega@V_{gs}=10V$
- 100% Avalanche Tested
- 100% Rg Tested
- Lead-Free (RoHS Compliant)

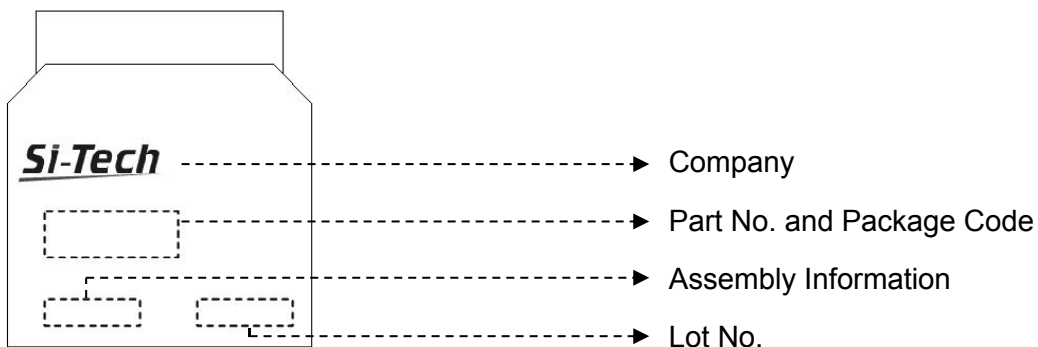
**Applications**

- DC Motor Control
- DC-DC Converters
- BMS
- SMPS
- Automotive Environment

**Internal Circuit and Pin Description**

	
Package	TO-252
Package Code	M

**Package Marking**



**Absolute Maximum Ratings**( $T_C=25^{\circ}C$  unless otherwise noted)

Symbol	Parameter	Value	Units
$V_{DSS}$	Drain-Source Voltage	60	V
$I_D$	Continuous Drain Current ( $T_C=25^{\circ}C$ )	60	A
	Continuous Drain Current ( $T_C=100^{\circ}C$ )	38	A
$I_{DM}$	Pulsed Drain Current (Note 1)	240	A
$V_{GS}$	Gate-Source Voltage	$\pm 20$	V
$E_{AS}$	Single Pulsed Avalanche Energy (Note 2)	140	mJ
$P_D$	Maximum Power Dissipation ( $T_C=25^{\circ}C$ )	73	W
	Derating Factor above $25^{\circ}C$	0.57	W/ $^{\circ}C$
$T_J$	Operating Junction Temperature Range	-55 to +150	$^{\circ}C$
$T_{STG}$	Storage Temperature Range	-55 to +150	$^{\circ}C$

**Thermal Characteristics**

Symbol	Parameter	Value	Units
$R_{th\ j-c}$	Thermal Resistance, Junction to case	1.69	$^{\circ}C/W$

**Electrical Characteristics** ( $T_C=25^{\circ}C$  unless otherwise noted)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$BV_{DSS}$	Drain-Source Breakdown Voltage	$V_{GS}=0V, I_D=250\mu A$	60	-	-	V
$I_{DSS}$	Drain-Source Leakage Current	$V_{DS}=57V, V_{GS}=0V$	-	-	1	$\mu A$
$I_{GSS}$	Gate Leakage Current, Forward	$V_{GS}=20V, V_{DS}=0V$	-	-	100	nA
	Gate Leakage Current, Reverse	$V_{GS}=-20V, V_{DS}=0V$	-	-	-100	nA
$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS}=V_{DS}, I_D=250\mu A$	1.3	1.8	2.5	V
$R_{DS(on)}$	Drain-Source On-State Resistance	$V_{GS}=4.5V, I_D=40A$	8.5	10.5	12.5	$m\Omega$
		$V_{GS}=10V, I_D=40A$	6.8	8.5	10	$m\Omega$
$Q_g$	Total Gate Charge	$V_{DD}=48V$	-	50	-	nC
$Q_{gs}$	Gate-Source Charge	$V_{GS}=4.5V$	-	11	-	nC
$Q_{gd}$	Gate-Drain Charge	$I_D=40A$ (Note 3)	-	16	-	nC
$t_{d(on)}$	Turn-on Delay Time	$V_{DD}=30V, V_{GS}=10V$	-	15	-	ns
$t_r$	Turn-on Rise Time	$I_D=40A, R_G=4.7\Omega$	-	14	-	ns
$t_{d(off)}$	Turn-off Delay Time	$T_C=25^{\circ}C$	-	22	-	ns
$t_f$	Turn-off Fall Time	(Note 3)	-	9	-	ns
$R_g$	Gate Resistance	$V_{DS}=0V, V_{GS}=0V, f=1MHz$	-	1.5	-	$\Omega$
$C_{iss}$	Input Capacitance	$V_{DS}=25V$	-	2029	-	pF
$C_{oss}$	Output Capacitance	$V_{GS}=0V$	-	700	-	pF
$C_{rss}$	Reverse Transfer Capacitance	$f = 1MHz$	-	330	-	pF

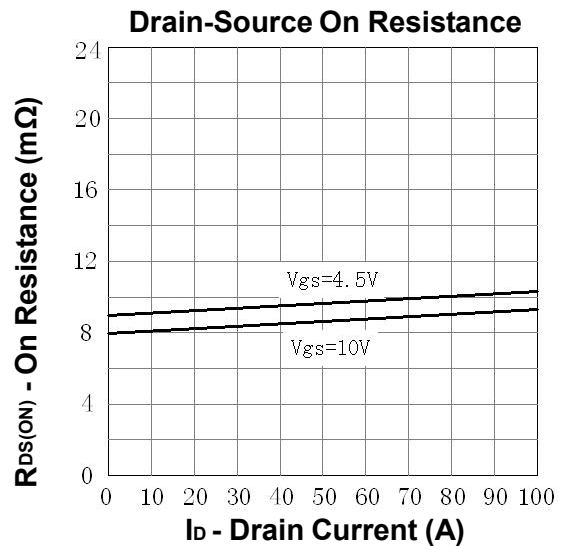
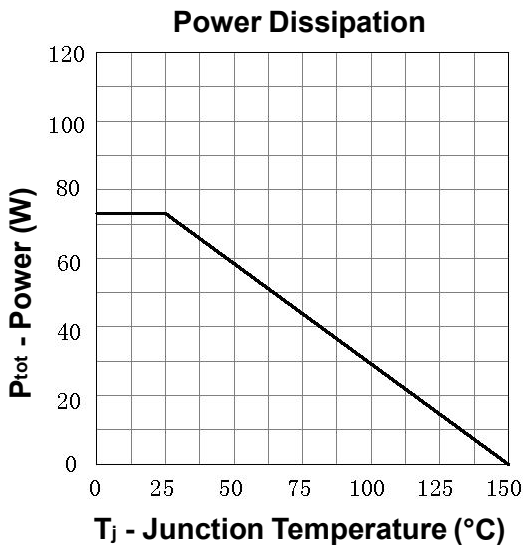
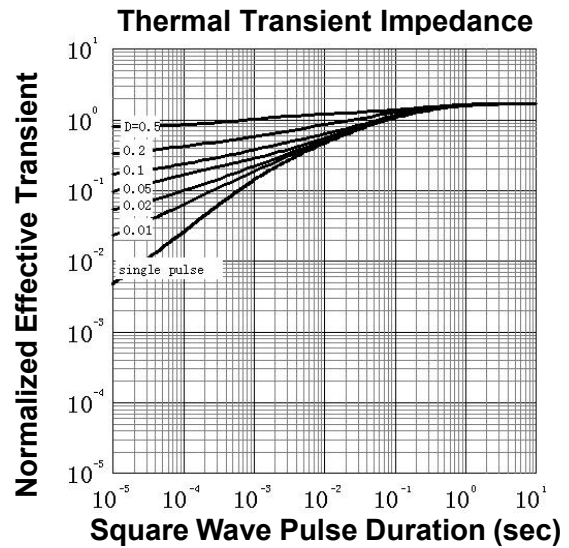
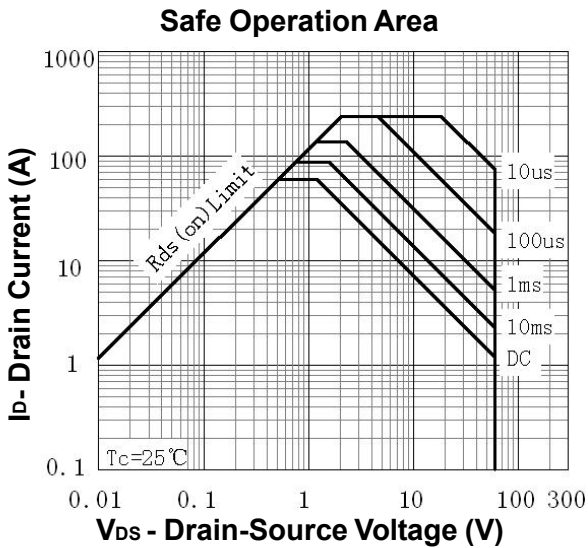
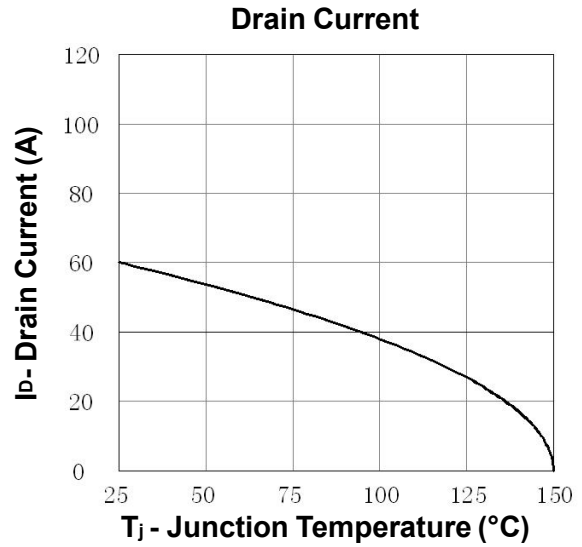
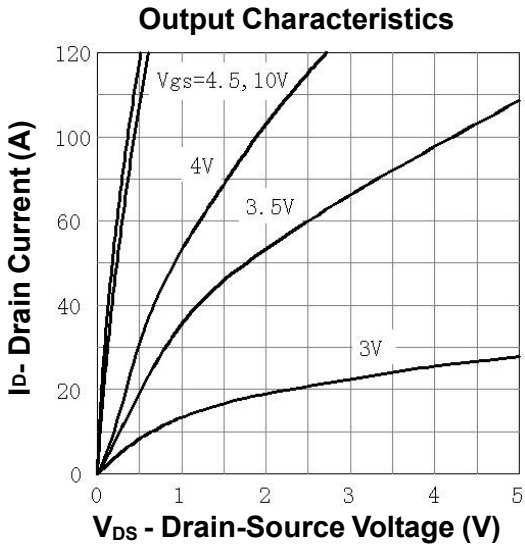
**Source-Drain Diode Characteristics** ( $T_C=25^{\circ}C$  unless otherwise noted)

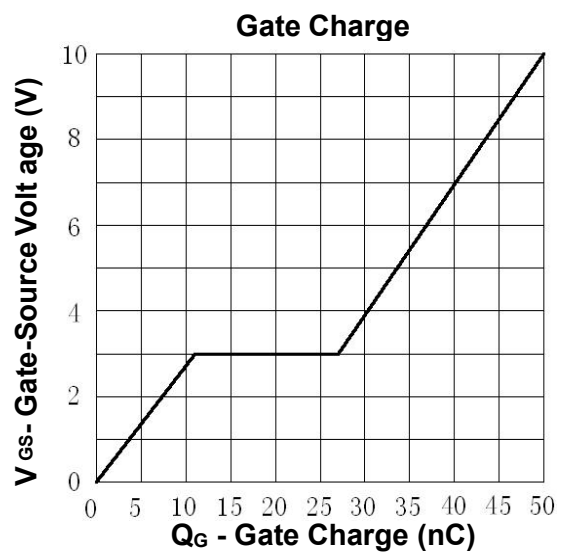
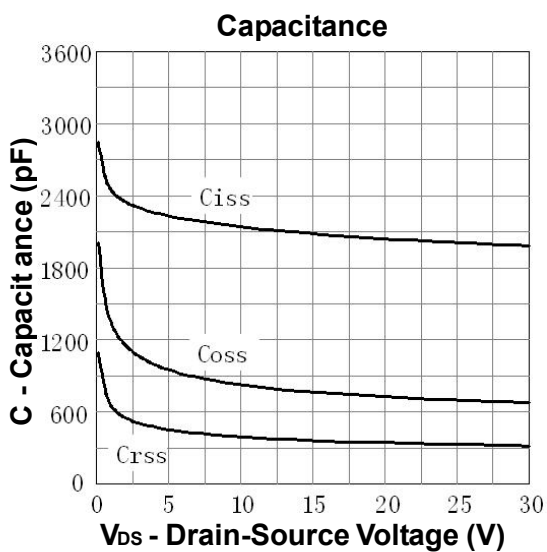
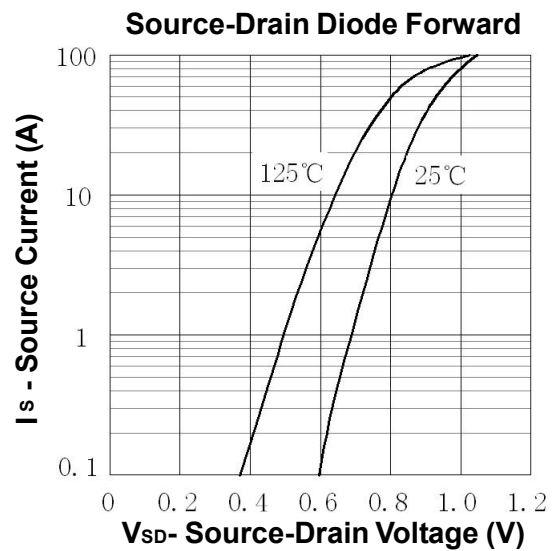
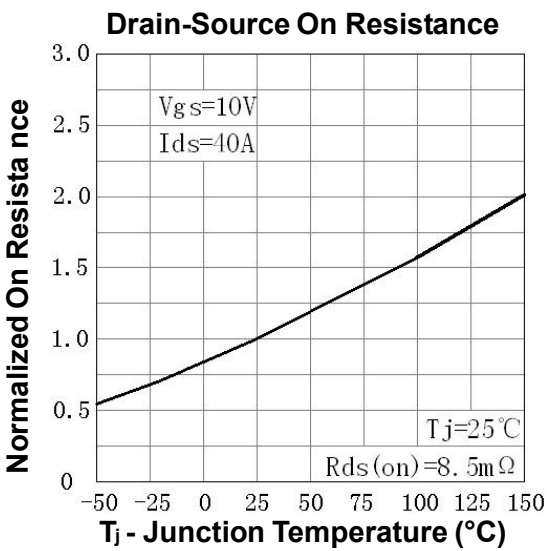
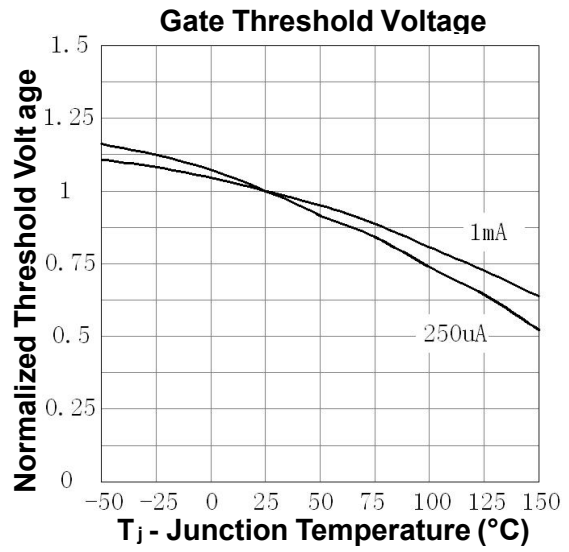
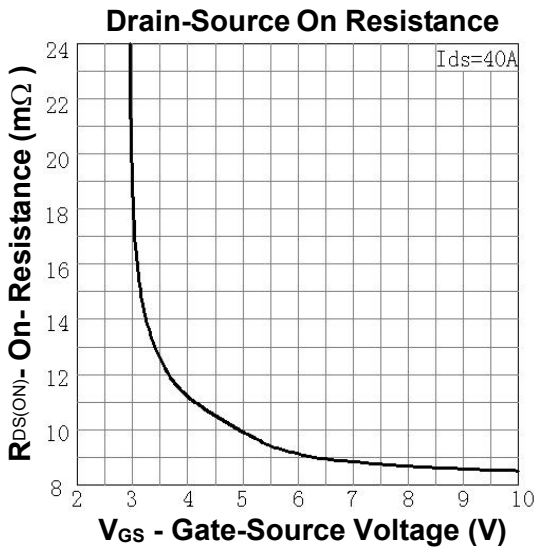
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$I_S$	Continuous Source Diode Forward Current		-	-	60	A
$I_{SM}$	Pulsed Source Diode Forward Current (Note 1)		-	-	240	A
$V_{SD}$	Forward On Voltage	$V_{GS}=0V, I_S=45A$	-	0.9	1	V
$t_{rr}$	Reverse Recovery Time	$V_{GS}=0V, I_S=45A$	-	35	-	ns
$Q_{rr}$	Reverse Recovery Charge	$dI_F/dt = 100A/\mu s$	-	62	-	nC

Notes:

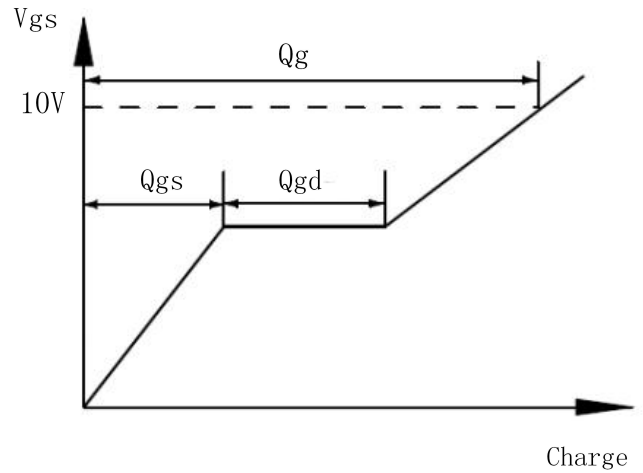
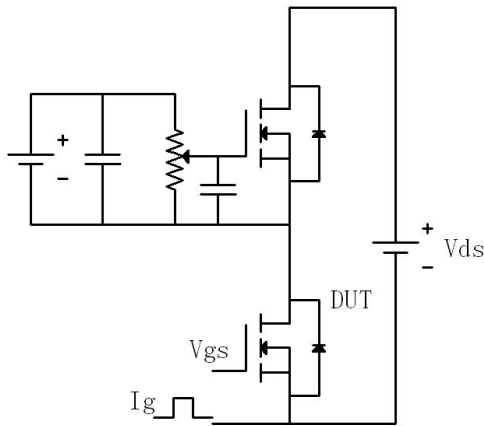
1. Repetitive Rating: Pulse width limited by maximum junction temperature
2.  $L=0.5mH, V_{DD}=48V, R_G=25\Omega$ , Starting  $T_J=25^{\circ}C$
3. Pulse Width  $\leq 300\ \mu s$ ; Duty Cycle  $\leq 2\%$

**Typical Characteristics**

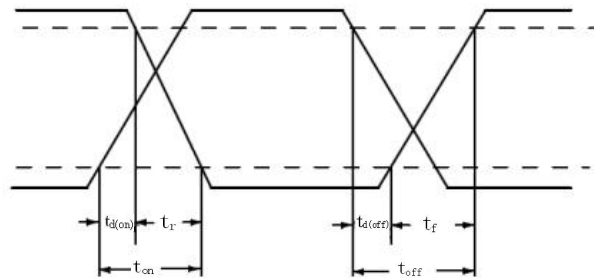
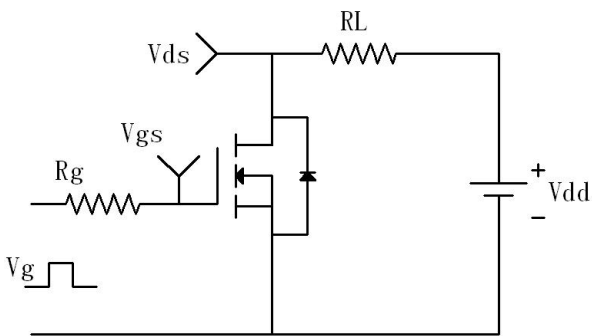




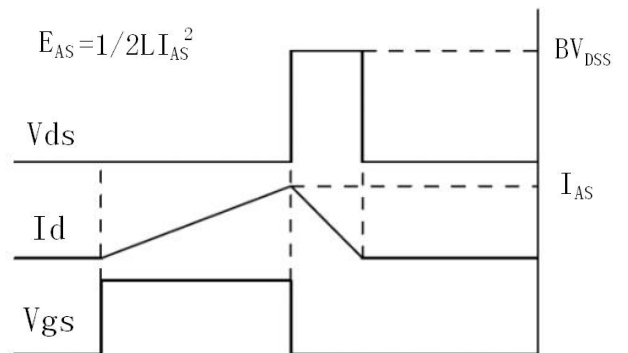
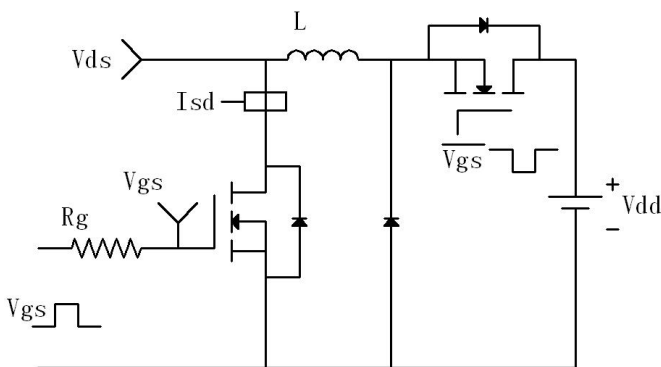
**Gate Charge Test Circuit and Waveforms**



**Switching Time Test Circuit & Waveforms**

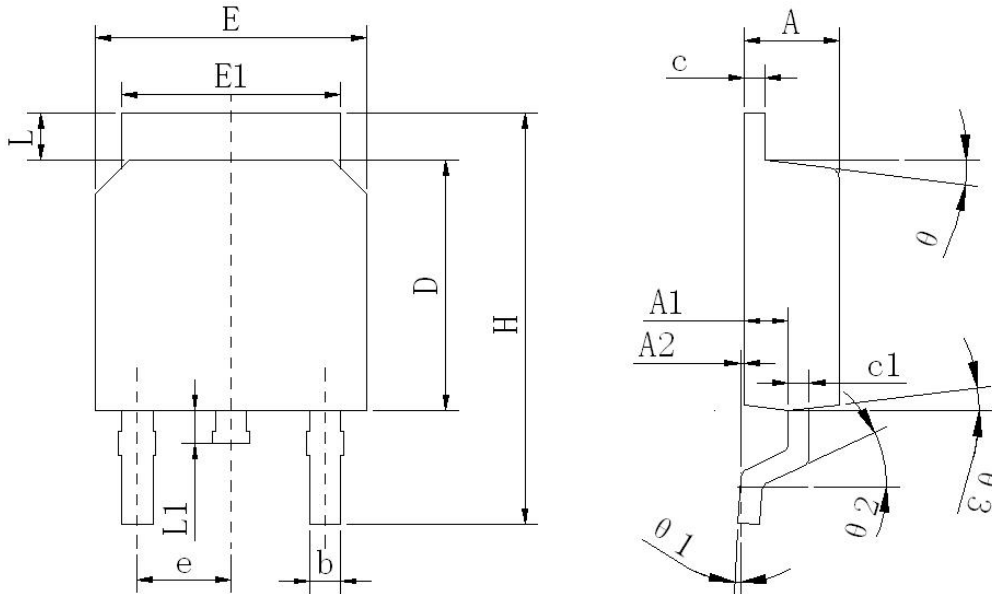


**Avalanche Test Circuit & Waveforms**

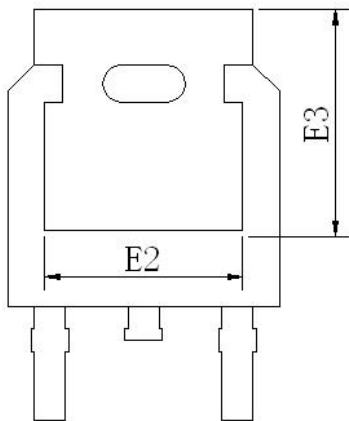


Package Outline

TO252



UNIT:mm



SYMBOL	MIN	NOM	MAX
A	2.25	2.30	2.35
A1	1.02	1.07	1.12
A2	0.05	0.1	0.15
b	0.71	0.76	0.81
c	0.46	0.51	0.56
c1	0.46	0.51	0.56
D	6.05	6.10	6.15
E	6.55	6.60	6.65
E1	5.23	5.33	5.43
E2	4.73	4.83	4.93
E3	5.30	5.40	5.50
e	2.286 BSC		
H	9.82	10.02	10.22
L	0.96	1.01	1.06
L1	0.7	0.8	0.9
$\theta$	5°	7°	9°
$\theta_1$	1°	3°	5°
$\theta_2$	23°	25°	27°
$\theta_3$	5°	7°	9°