

Power MOSFET

PRODUCT SUMMARY

V_{DS} (V)	650	
$R_{DS(on)}$ (Ω)	$V_{GS} = 10\text{ V}$	4.1
Q_g (Max.) (nC)	18	
Q_{gs} (nC)	3.0	
Q_{gd} (nC)	8.9	
Configuration	Single	

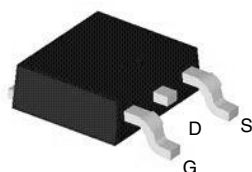
FEATURES

- Dynamic dV/dt Rating
- Repetitive Avalanche Rated
- Available in Tape and Reel
- Fast Switching
- Ease of Paralleling
- Compliant to RoHS Directive 2002/95/EC



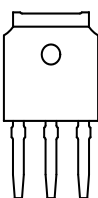
Available
RoHS*
 COMPLIANT

TO-252 Pin Configuration

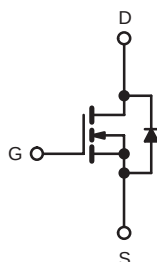


Top View

TO-251



G D S



N-Channel MOSFET

ABSOLUTE MAXIMUM RATINGS $T_C = 25\text{ }^\circ\text{C}$, unless otherwise noted

PARAMETER	SYMBOL	LIMIT	UNIT
Drain-Source Voltage	V_{DS}	650	V
Gate-Source Voltage	V_{GS}	± 20	
Continuous Drain Current	I_D	$T_C = 25\text{ }^\circ\text{C}$	A
		$T_C = 100\text{ }^\circ\text{C}$	
Pulsed Drain Current ^a	I_{DM}	8.0	W/ $^\circ\text{C}$
Linear Derating Factor		0.33	
Linear Derating Factor (PCB Mount) ^e		0.020	
Single Pulse Avalanche Energy ^b	E_{AS}	74	mJ
Repetitive Avalanche Current ^a	I_{AR}	2.0	A
Repetitive Avalanche Energy ^a	E_{AR}	4.2	mJ
Maximum Power Dissipation	P_D	$T_C = 25\text{ }^\circ\text{C}$	W
Maximum Power Dissipation (PCB Mount) ^e		$T_A = 25\text{ }^\circ\text{C}$	
Peak Diode Recovery dV/dt ^c	dV/dt	3.0	V/ns
Operating Junction and Storage Temperature Range	T_J, T_{stg}	- 55 to + 150	$^\circ\text{C}$
Soldering Recommendations (Peak Temperature)	for 10 s	260 ^d	

Notes

- Repetitive rating; pulse width limited by maximum junction temperature (see fig. 11).
- $V_{DD} = 50\text{ V}$, starting $T_J = 25\text{ }^\circ\text{C}$, $L = 37\text{ mH}$, $R_g = 25\text{ }\Omega$, $I_{AS} = 2.0\text{ A}$ (see fig. 12).
- $I_{SD} \leq 2.0\text{ A}$, $dI/dt \leq 40\text{ A}/\mu\text{s}$, $V_{DD} \leq V_{DS}$, $T_J \leq 150\text{ }^\circ\text{C}$.
- 1.6 mm from case.
- When mounted on 1" square PCB (FR-4 or G-10 material).

* Pb containing terminations are not RoHS compliant, exemptions may apply

THERMAL RESISTANCE RATINGS					
PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT
Maximum Junction-to-Ambient	R_{thJA}	-	-	110	°C/W
Maximum Junction-to-Ambient (PCB Mount) ^a	R_{thJA}	-	-	50	
Maximum Junction-to-Case (Drain)	R_{thJC}	-	-	3.0	

Note

a. When mounted on 1" square PCB (FR-4 or G-10 material).

SPECIFICATIONS T _J = 25 °C, unless otherwise noted							
PARAMETER	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNIT
Static							
Drain-Source Breakdown Voltage	V _{DS}	V _{GS} = 0 V, I _D = 250 μA		650	-	-	V
V _{DS} Temperature Coefficient	ΔV _{DS} /T _J	Reference to 25 °C, I _D = 1 mA		-	0.89	-	V/°C
Gate-Source Threshold Voltage	V _{GS(th)}	V _{DS} = V _{GS} , I _D = 250 μA		2.0	-	4.0	V
Gate-Source Leakage	I _{GSS}	V _{GS} = ± 20 V		-	-	± 100	nA
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} = 650 V, V _{GS} = 0 V		-	-	100	μA
		V _{DS} = 480 V, V _{GS} = 0 V, T _J = 125 °C		-	-	500	
Drain-Source On-State Resistance	R _{DS(on)}	V _{GS} = 10 V	I _D = 1.2 A ^b	-	-	4.1	Ω
Forward Transconductance	g _{fs}	V _{DS} = 50 V, I _D = 1.2 A		1.4	-	-	S
Dynamic							
Input Capacitance	C _{iss}	V _{GS} = 0 V, V _{DS} = - 25 V, f = 1.0 MHz, see fig. 5		-	350	-	pF
Output Capacitance	C _{oss}			-	48	-	
Reverse Transfer Capacitance	C _{rss}			-	8.6	-	
Total Gate Charge	Q _g	V _{GS} = 10 V	I _D = 2.0 A, V _{DS} = 360 V, see fig. 6 and 13 ^b	-	-	18	nC
Gate-Source Charge	Q _{gs}			-	-	3.0	
Gate-Drain Charge	Q _{gd}			-	-	8.9	
Turn-On Delay Time	t _{d(on)}	V _{DD} = 300 V, I _D = 2.0 A, R _g = 18 Ω, R _D = 135 Ω, see fig. 10 ^b		-	10	-	ns
Rise Time	t _r			-	23	-	
Turn-Off Delay Time	t _{d(off)}			-	30	-	
Fall Time	t _f			-	25	-	
Internal Drain Inductance	L _D	Between lead, 6 mm (0.25") from package and center of die contact		-	4.5	-	nH
Internal Source Inductance	L _S			-	7.5	-	
Drain-Source Body Diode Characteristics							
Continuous Source-Drain Diode Current	I _S	MOSFET symbol showing the integral reverse p - n junction diode		-	-	2.0	A
Pulsed Diode Forward Current ^a	I _{SM}			-	-	8.0	
Body Diode Voltage	V _{SD}	T _J = 25 °C, I _S = 2.0 A, V _{GS} = 0 V ^b		-	-	1.6	V
Body Diode Reverse Recovery Time	t _{rr}	T _J = 25 °C, I _F = 2.0 A, dI/dt = 100 A/μs ^b		-	290	580	ns
Body Diode Reverse Recovery Charge	Q _{rr}			-	0.67	1.3	μC
Forward Turn-On Time	t _{on}	Intrinsic turn-on time is negligible (turn-on is dominated by L _S and L _D)					

Notes

- a. Repetitive rating; pulse width limited by maximum junction temperature (see fig. 11).
 b. Pulse width $\leq 300\text{ }\mu\text{s}$; duty cycle $\leq 2\%$.

TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted

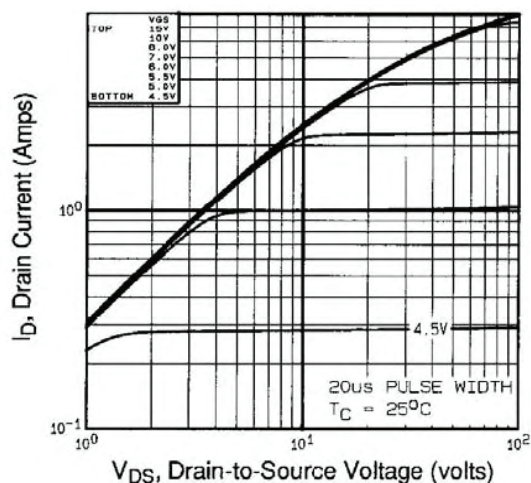


Fig. 1 - Typical Output Characteristics, $T_C = 25^\circ\text{C}$

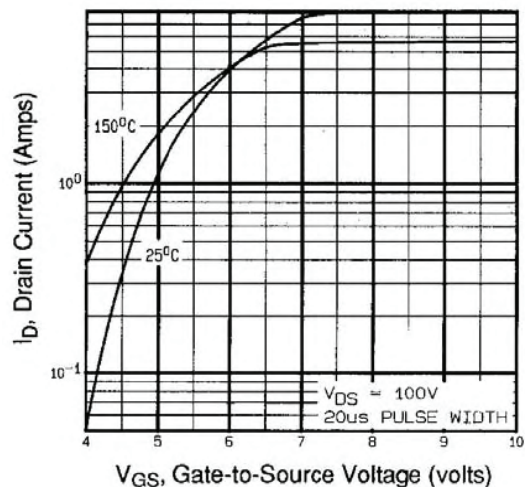


Fig. 3 - Typical Transfer Characteristics

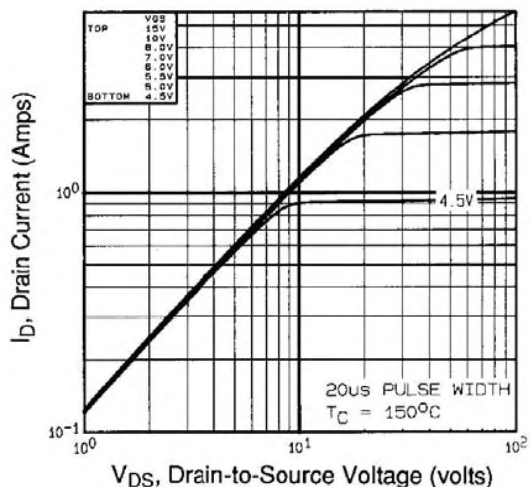


Fig. 2 - Typical Output Characteristics, $T_C = 150^\circ\text{C}$

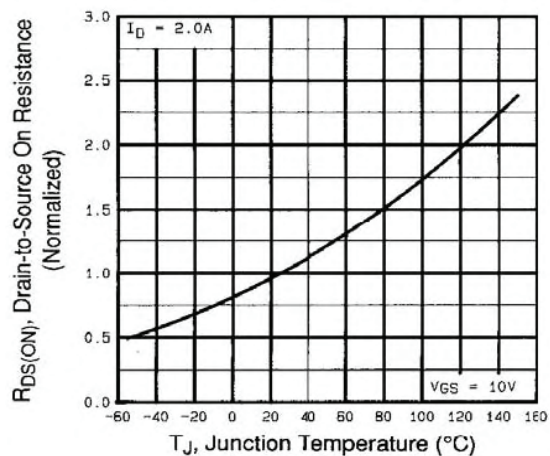


Fig. 4 - Normalized On-Resistance vs. Temperature

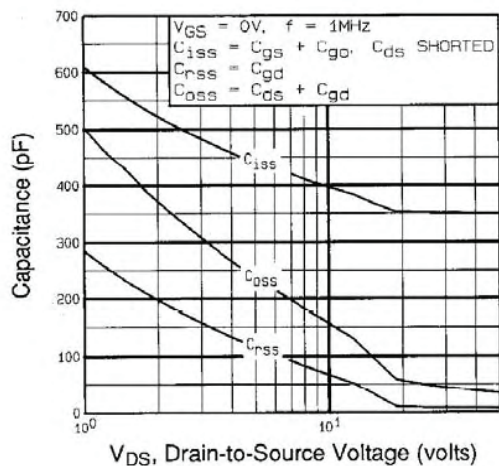


Fig. 5 - Typical Capacitance vs. Drain-to-Source Voltage

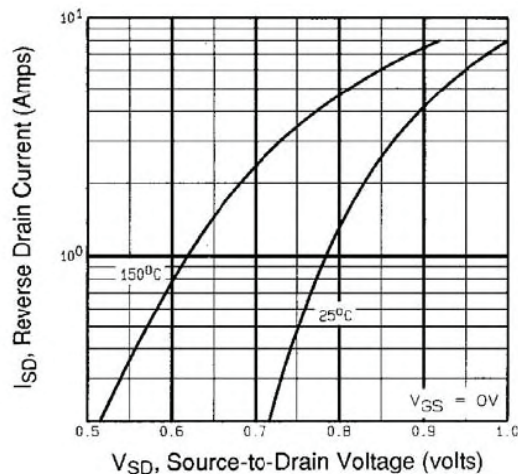


Fig. 7 - Typical Source-Drain Diode Forward Voltage

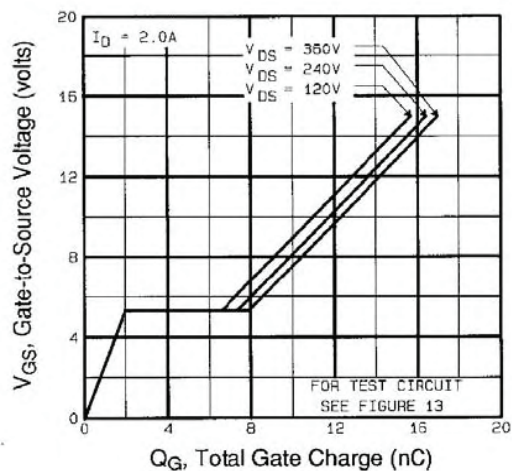


Fig. 6 - Typical Gate Charge vs. Gate-to-Source Voltage

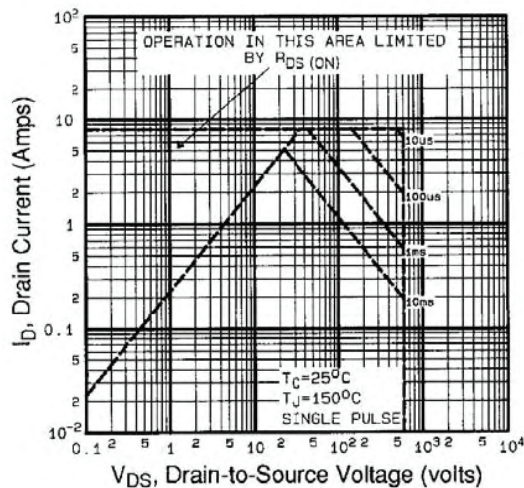


Fig. 8 - Maximum Safe Operating Area

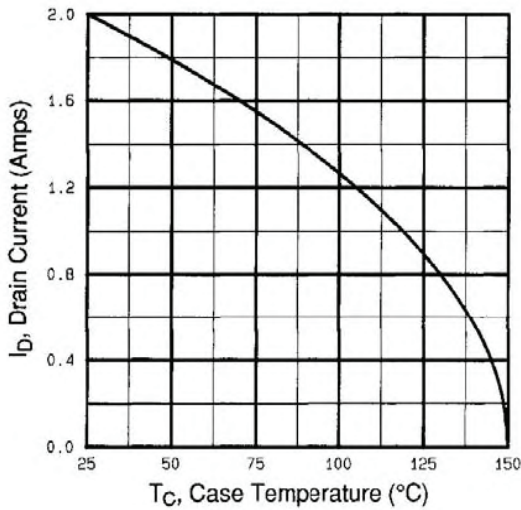


Fig. 9 - Maximum Drain Current vs. Case Temperature

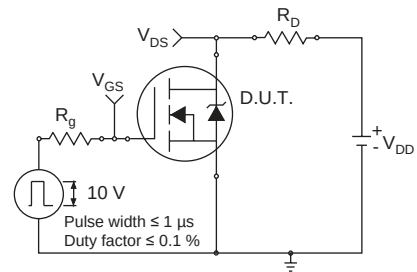


Fig. 10a - Switching Time Test Circuit

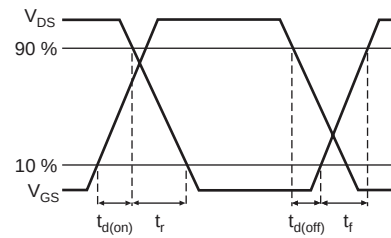


Fig. 10b - Switching Time Waveforms

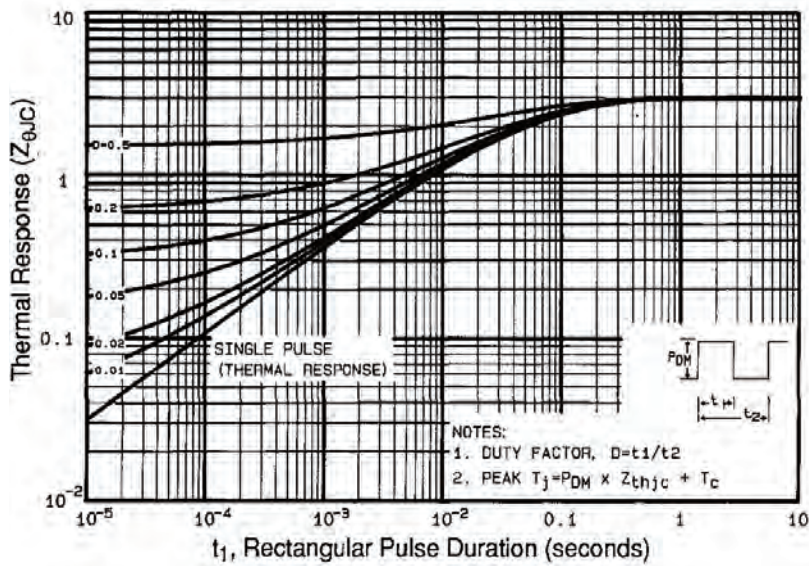


Fig. 11 - Maximum Effective Transient Thermal Impedance, Junction-to-Case

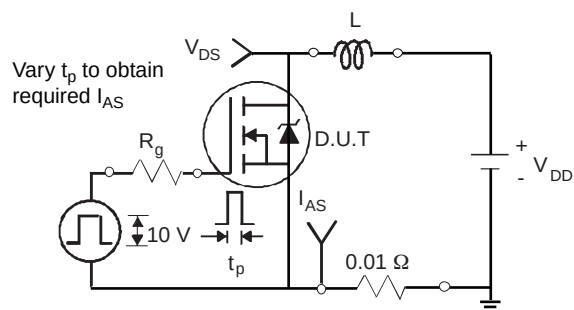


Fig. 12a - Unclamped Inductive Test Circuit

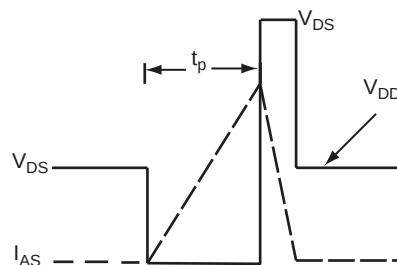


Fig. 12b - Unclamped Inductive Waveforms

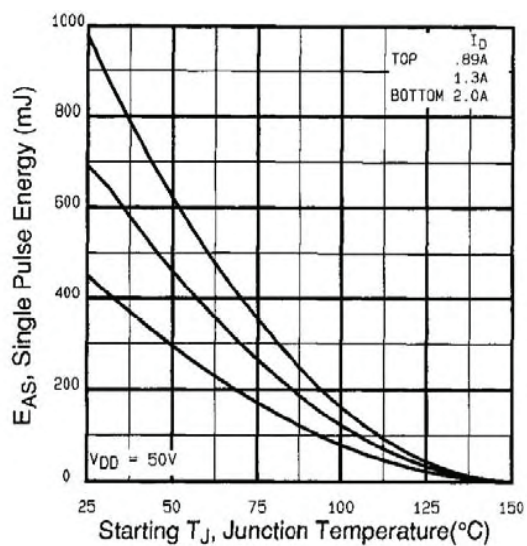


Fig. 12c - Maximum Avalanche Energy vs. Drain Current

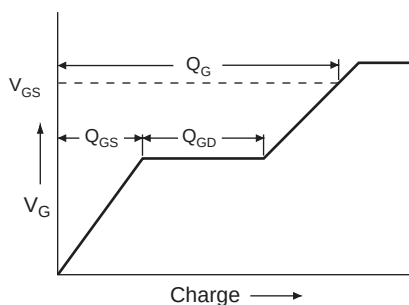


Fig. 13a - Basic Gate Charge Waveform

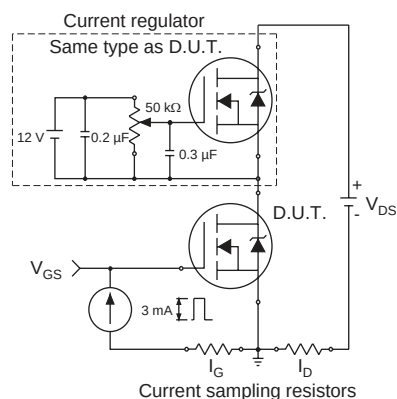


Fig. 13b - Gate Charge Test Circuit

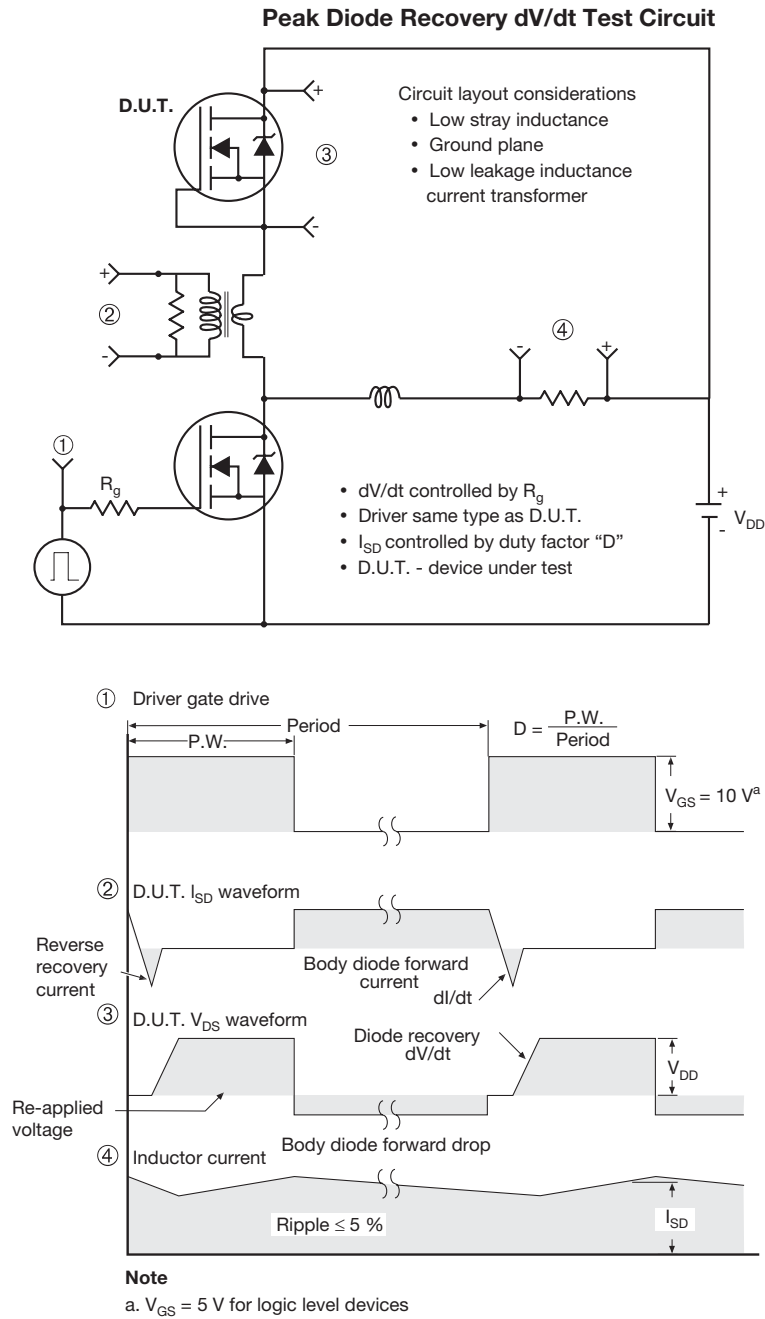
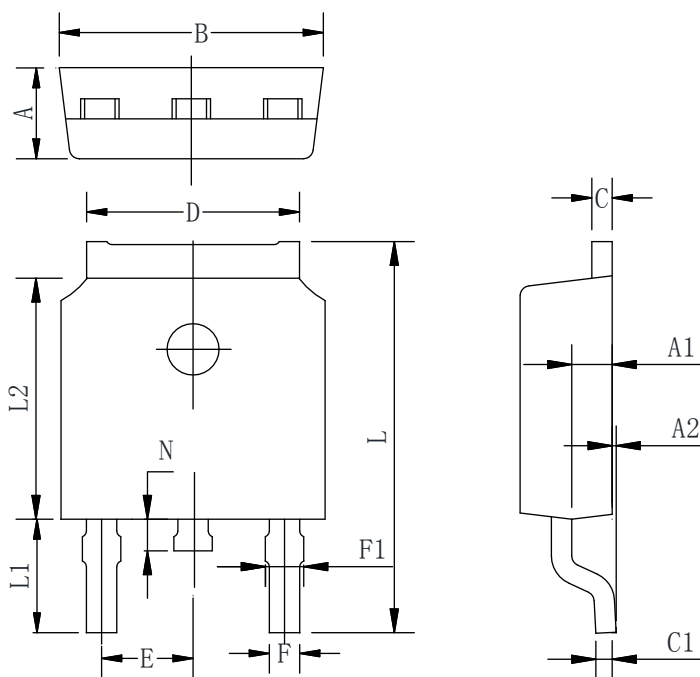


Fig. 14 - For N-Channel

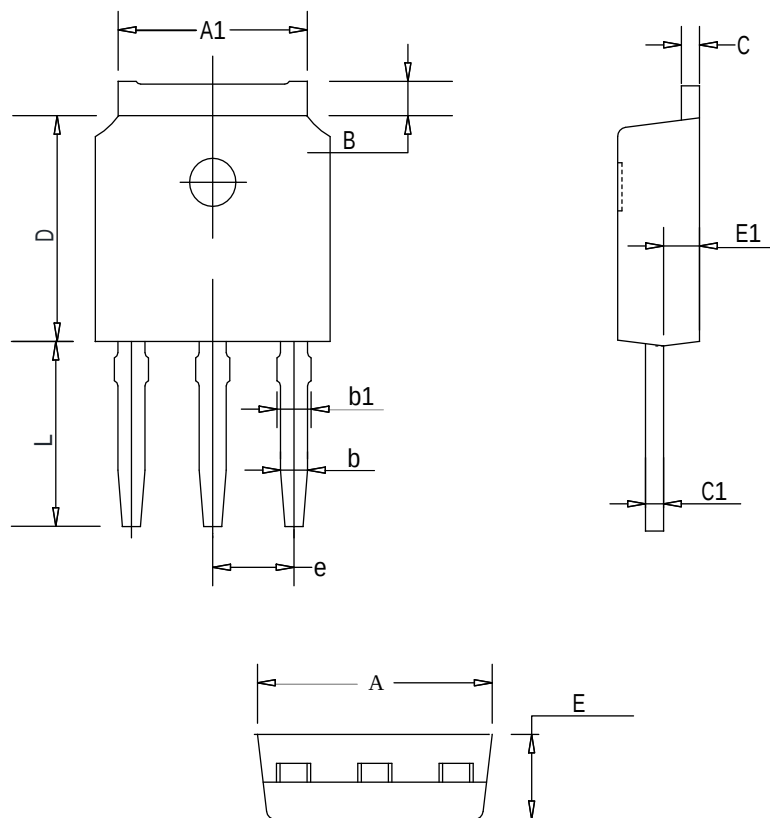
TO-252-2L PACKAGE OUTLINE



COMMON DIMENSIONS
(UNITS OF MEASURE=MILLIMETER)

Symbol	Min	Typ	Max
A	2.10	2.30	2.50
A1	0.88	1.01	1.16
A2	0.00	0.15	0.28
B	6.40	6.60	6.80
C	0.42	0.50	0.63
C1	0.42	0.50	0.63
D	5.08	5.32	5.65
E	2.286 TYP		
F	0.63	0.76	0.89
F1	0.64	0.86	1.08
L	9.30	9.90	10.80
L1	2.4	2.8	3.6
L2	5.90	6.10	6.55
N	0.57	0.80	1.05

TO-251 PACKAGE OUTLINE



COMMON DIMENSIONS
(UNITS OF MEASURE=MILLIMETER)

SYMBOL	MIN	TYP	MAX
A	6.30	6.60	6.90
A1	5.00	5.30	5.60
B	0.80	1.00	1.20
C	0.40	0.50	0.60
C1	0.40	0.50	0.60
D	5.80	6.10	6.40
E	2.10	2.30	2.50
E1	0.80	1.00	1.20
L	4.50	5.00	5.50
e	2.10	2.30	2.50
b	0.66	0.76	0.86
b1	0.66	0.86	1.06

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