

SM8A03NSW-VB Datasheet

N-Channel 850V (D-S) Super Junction Power MOSFET



PRODUCT SUMMARY		
V_{DS} (V) at T_J max.	850	
$R_{DS(on)}$ typ. (Ω) at 25 °C	$V_{GS} = 10$ V	0.40
Q_g max. (nC)	88	
Q_{gs} (nC)	9	
Q_{gd} (nC)	16	
Configuration	Single	

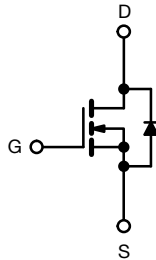
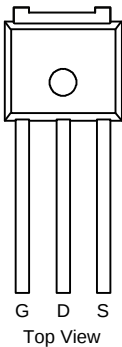
FEATURES

- Low figure-of-merit (FOM) $R_{on} \times Q_g$
- Low input capacitance (C_{iss})
- Reduced switching and conduction losses
- Ultra low gate charge (Q_g)
- Avalanche energy rated (UIS)

APPLICATIONS

- Server and telecom power supplies
- Switch mode power supplies (SMPS)
- Power factor correction power supplies (PFC)
- Lighting
 - High-intensity discharge (HID)
 - Fluorescent ballast lighting
- Industrial
 - Welding
 - Induction heating
 - Motor drives
 - Battery chargers
 - Renewable energy
 - Solar (PV inverters)

TO-251



N-Channel MOSFET

ABSOLUTE MAXIMUM RATINGS (T _C = 25 °C, unless otherwise noted)					
PARAMETER			SYMBOL	LIMIT	UNIT
Drain-source voltage			V _{DS}	800	V
Gate-source voltage			V _{GS}	± 30	
Continuous drain current (T _J = 150 °C)	V _{GS} at 10 V	T _C = 25 °C	I _D	11	A
		T _C = 100 °C		8	
Pulsed drain current ^a			I _{DM}	32	
Linear derating factor				1.4	W/°C
Single pulse avalanche energy ^b			E _{AS}	226	mJ
Maximum power dissipation			P _D	149	W
Operating junction and storage temperature range			T _J , T _{stg}	-55 to +150	°C
Drain-source voltage slope	T _J = 125 °C		dV/dt	70	V/ns
Reverse diode dV/dt ^d		4.3			
Soldering recommendations (peak temperature) ^c	For 10 s			300	°C

Notes

- Repetitive rating; pulse width limited by maximum junction temperature
- $V_{DD} = 140$ V, starting $T_J = 25$ °C, $L = 28.2$ mH, $R_g = 25$ Ω , $I_{AS} = 4.0$ A
- 1.6 mm from case
- $I_{SD} \leq I_D$, $dI/dt = 100$ A/ μ s, starting $T_J = 25$ °C

THERMAL RESISTANCE RATINGS

PARAMETER	SYMBOL	TYP.	MAX.	UNIT
Maximum junction-to-ambient	R_{thJA}	-	62	°C/W
Maximum junction-to-case (drain)	R_{thJC}	-	1.6	

SPECIFICATIONS ($T_J = 25\text{ }^{\circ}\text{C}$, unless otherwise noted)

PARAMETER	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNIT
Static							
Drain-source breakdown voltage	V_{DS}	$V_{GS} = 0\text{ V}$, $I_D = 250\text{ }\mu\text{A}$		800	-	-	V
V_{DS} temperature coefficient	$\Delta V_{DS}/T_J$	Reference to $25\text{ }^\circ\text{C}$, $I_D = 1\text{ mA}$		-	1.1	-	V/ $^\circ\text{C}$
Gate-source threshold voltage (N)	$V_{GS(th)}$	$V_{DS} = V_{GS}$, $I_D = 250\text{ }\mu\text{A}$		2	-	4	V
Gate-source leakage	I_{GSS}	$V_{GS} = \pm 20\text{ V}$		-	-	± 100	nA
		$V_{GS} = \pm 30\text{ V}$		-	-	± 1	μA
Zero gate voltage drain current	I_{DSS}	$V_{DS} = 800\text{ V}$, $V_{GS} = 0\text{ V}$		-	-	1	μA
		$V_{DS} = 640\text{ V}$, $V_{GS} = 0\text{ V}$, $T_J = 125\text{ }^\circ\text{C}$		-	-	10	
Drain-source on-state resistance	$R_{DS(on)}$	$V_{GS} = 10\text{ V}$	$I_D = 5.5\text{ A}$	-	0.4	-	Ω
Forward transconductance	g_{fs}	$V_{DS} = 30\text{ V}$, $I_D = 5.5\text{ A}$		-	4.5	-	S
Dynamic							
Input capacitance	C_{iss}	$V_{GS} = 0\text{ V}$, $V_{DS} = 100\text{ V}$, $f = 1\text{ MHz}$		-	1670	-	pF
Output capacitance	C_{oss}			-	68	-	
Reverse transfer capacitance	C_{rss}			-	9	-	
Effective output capacitance, energy related ^a	$C_{o(er)}$	$V_{DS} = 0\text{ V to } 480\text{ V}$, $V_{GS} = 0\text{ V}$		-	43	-	pF
Effective output capacitance, time related ^b	$C_{o(tr)}$			-	212	-	
Total gate charge	Q_g	$V_{GS} = 10\text{ V}$	$I_D = 5.5\text{ A}$, $V_{DS} = 480\text{ V}$	-	44	88	nC
Gate-source charge	Q_{gs}			-	9	-	
Gate-drain charge	Q_{gd}			-	16	-	
Turn-on delay time	$t_{d(on)}$	$V_{DD} = 480\text{ V}$, $I_D = 5.5\text{ A}$, $V_{GS} = 10\text{ V}$, $R_g = 9.1\text{ }\Omega$		-	18	36	ns
Rise time	t_r			-	15	30	
Turn-off delay time	$t_{d(off)}$			-	55	110	
Fall time	t_f			-	18	36	
Gate input resistance	R_g	$f = 1\text{ MHz}$, open drain		0.4	0.9	1.8	Ω
Drain-Source Body Diode Characteristics							
Continuous source-drain diode current	I_S	MOSFET symbol showing the integral reverse p - n junction diode 		-	-	12	A
Pulsed diode forward current	I_{SM}			-	-	32	
Diode forward voltage	V_{SD}	$T_J = 25\text{ }^\circ\text{C}$, $I_S = 5.5\text{ A}$, $V_{GS} = 0\text{ V}$		-	-	1.2	V
Reverse recovery time	t_{rr}	$T_J = 25\text{ }^\circ\text{C}$, $I_F = I_S = 5.5\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$, $V_R = 25\text{ V}$		-	345	690	ns
Reverse recovery charge	Q_{rr}			-	4.2	8.4	μC
Reverse recovery current	I_{RRM}			-	21	-	A

Notes

- a. $C_{oss(er)}$ is a fixed capacitance that gives the same energy as C_{oss} while V_{DS} is rising from 0 % to 80 % V_{DSS}
 b. $C_{oss(tr)}$ is a fixed capacitance that gives the same charging time as C_{oss} while V_{DS} is rising from 0 % to 80 % V_{DSS}

TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)

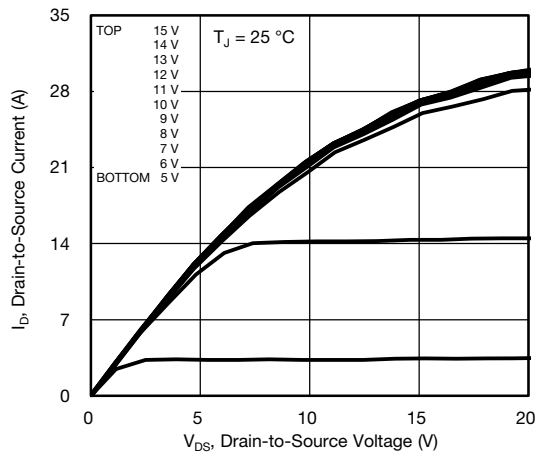


Fig. 1 - Typical Output Characteristics

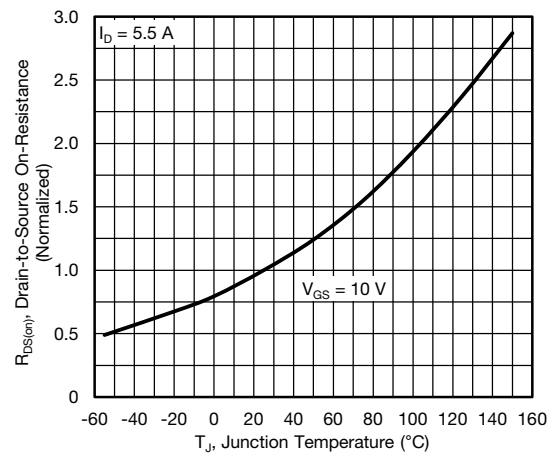


Fig. 4 - Normalized On-Resistance vs. Temperature

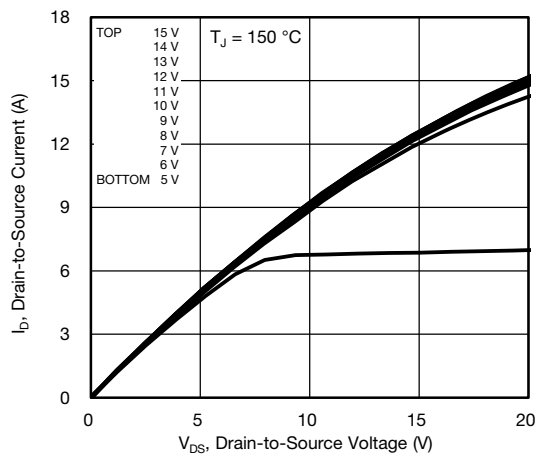


Fig. 2 - Typical Output Characteristics

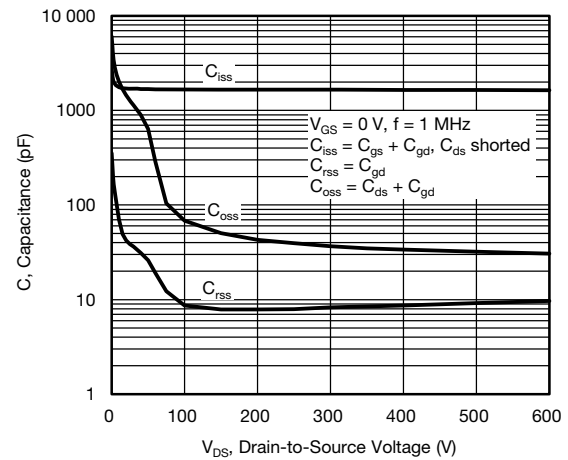


Fig. 5 - Typical Capacitance vs. Drain-to-Source Voltage

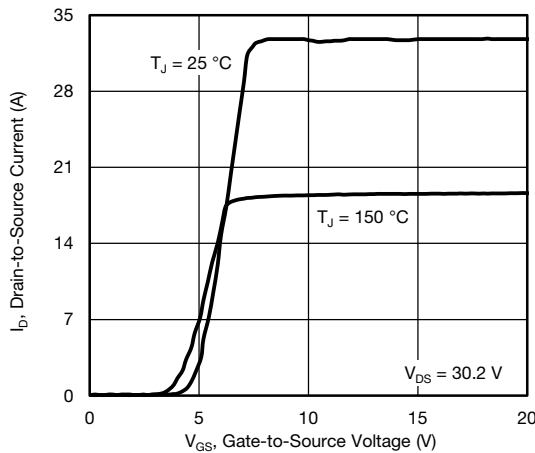


Fig. 3 - Typical Transfer Characteristics

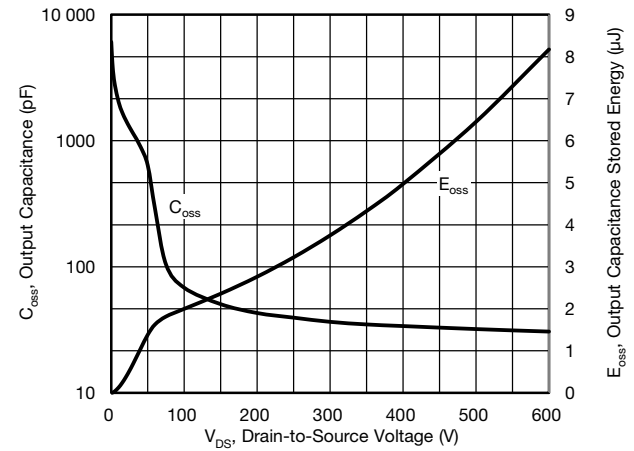


Fig. 6 - C_{oss} and E_{oss} vs. V_{DS}

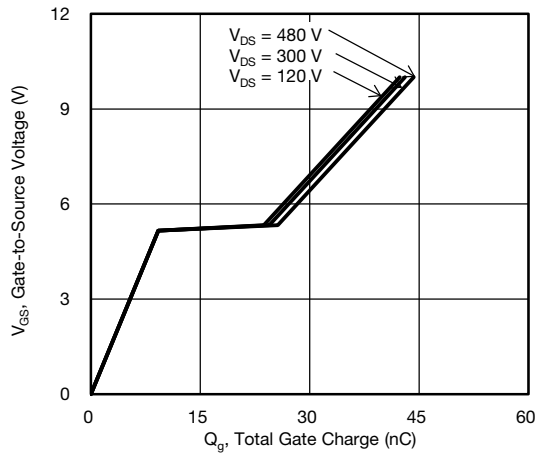


Fig. 7 - Typical Gate Charge vs. Gate-to-Source Voltage

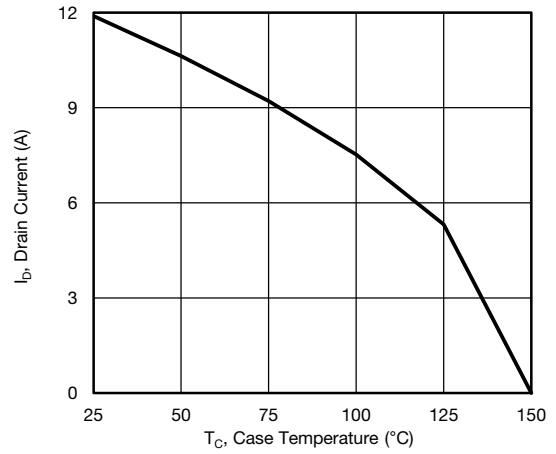


Fig. 10 - Maximum Drain Current vs. Case Temperature

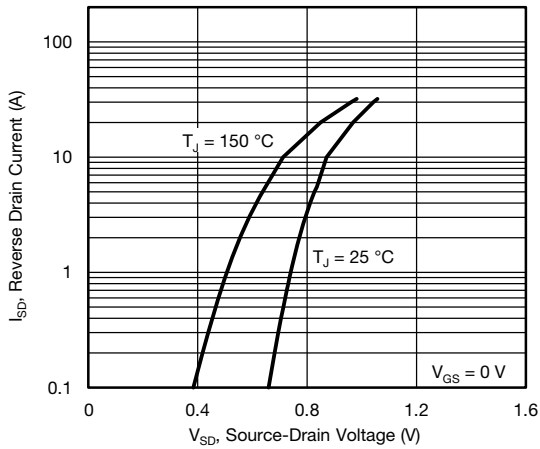


Fig. 8 - Typical Source-Drain Diode Forward Voltage

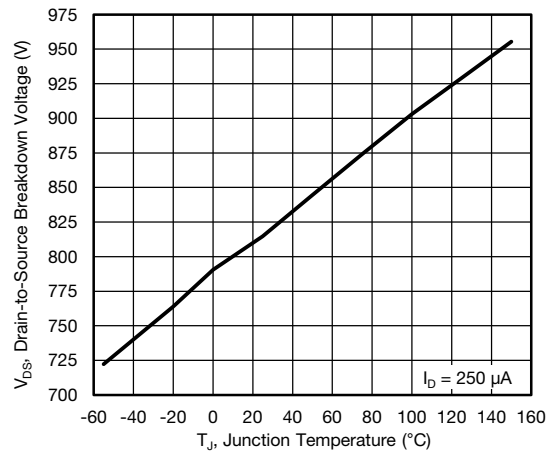


Fig. 11 - Temperature vs. Drain-to-Source Voltage

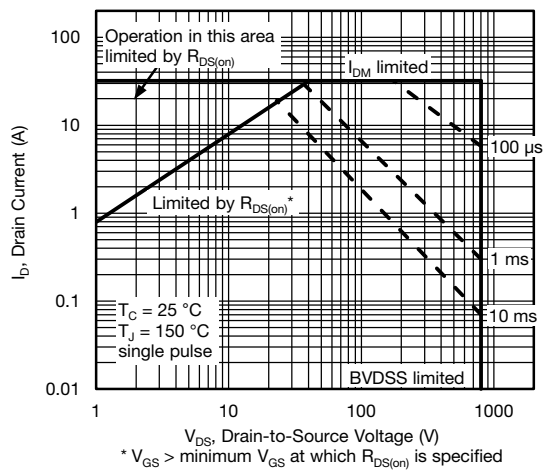


Fig. 9 - Maximum Safe Operating Area

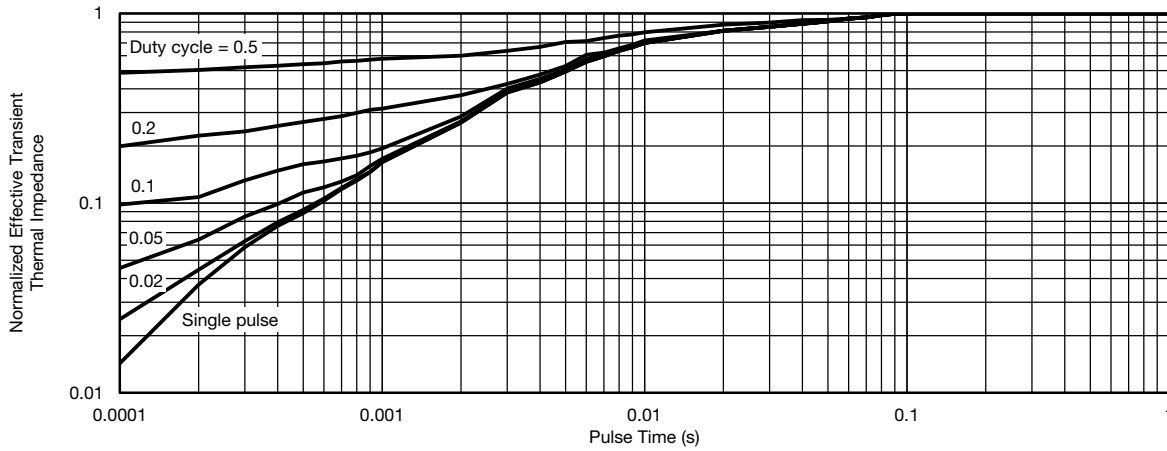


Fig. 12 - Normalized Thermal Transient Impedance, Junction-to-Case

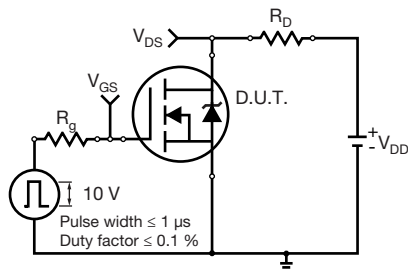


Fig. 13 - Switching Time Test Circuit

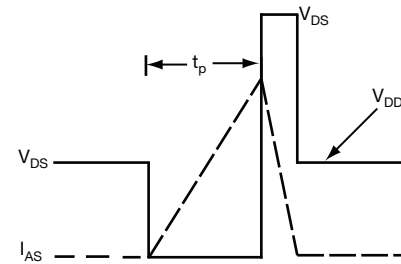


Fig. 16 - Unclamped Inductive Waveforms

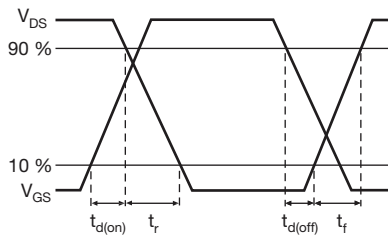


Fig. 14 - Switching Time Waveforms

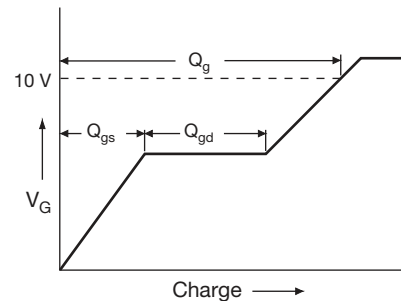


Fig. 17 - Basic Gate Charge Waveform

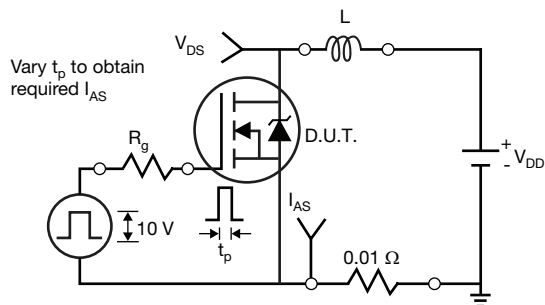


Fig. 15 - Unclamped Inductive Test Circuit

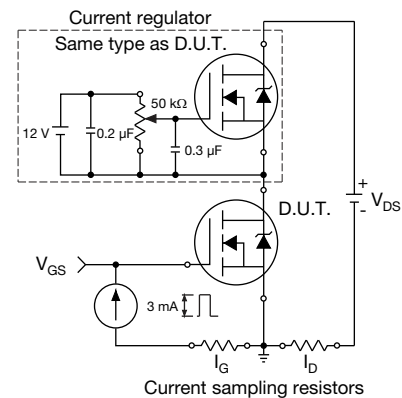


Fig. 18 - Gate Charge Test Circuit

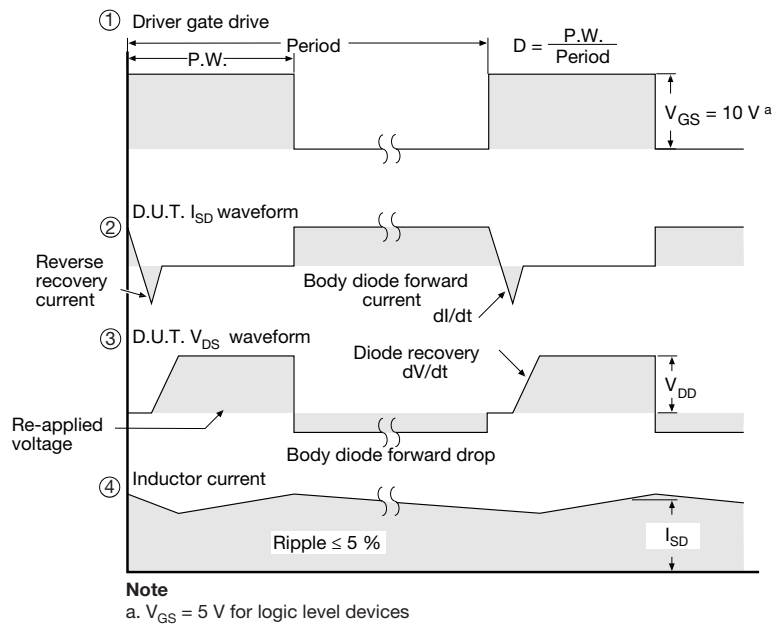
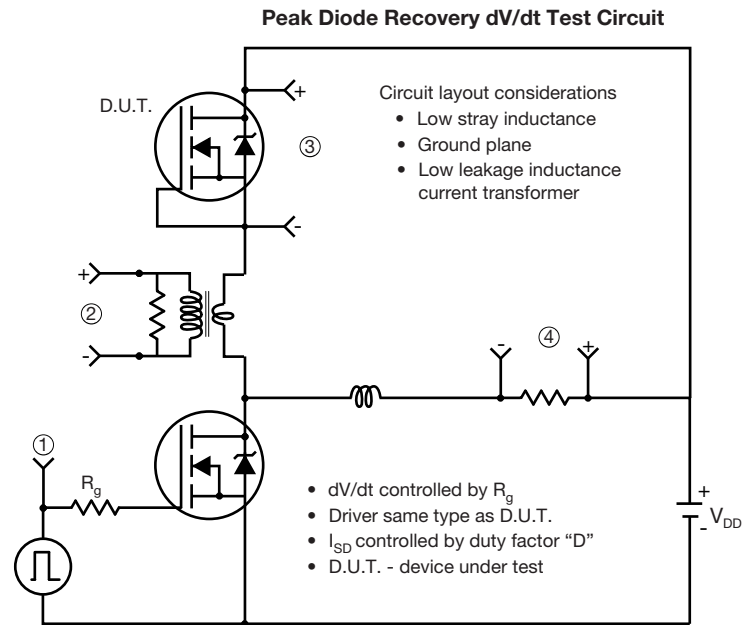
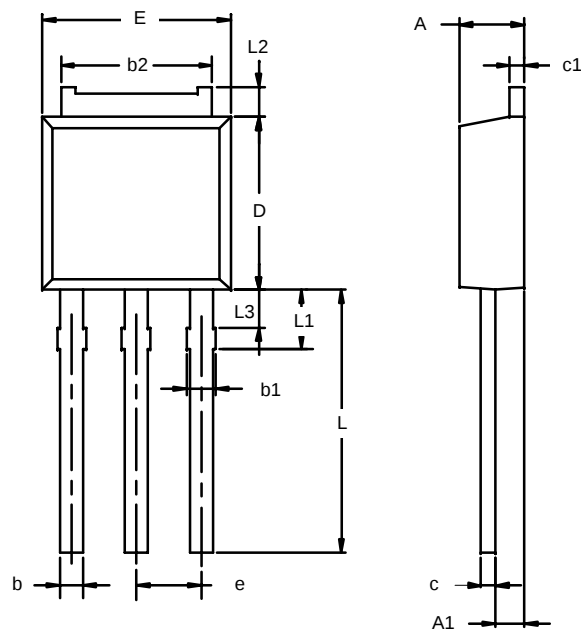


Fig. 19 - For N-Channel

TO-251AA



Note: Dimension L3 is for reference only.

Dim	MILLIMETERS		INCHES	
	Min	Max	Min	Max
A	2.21	2.38	0.087	0.094
A1	0.89	1.14	0.035	0.045
b	0.71	0.89	0.028	0.035
b1	0.76	1.14	0.030	0.045
b2	5.23	5.43	0.206	0.214
c	0.46	0.58	0.018	0.023
c1	0.46	0.58	0.018	0.023
D	5.97	6.22	0.235	0.245
E	6.48	6.73	0.255	0.265
e	2.28 BSC		0.090 BSC	
L	3.89	9.53	0.153	0.375
L1	1.91	2.28	0.075	0.090
L2	0.89	1.27	0.035	0.050
L3	1.15	1.52	0.045	0.060
ECN: S-03946—Rev. E, 09-Jul-01				
DWG: 5346				

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