

N-Channel 800V (D-S) Super Junction Power MOSFET



RoHS
COMPLIANT
HALOGEN
FREE

PRODUCT SUMMARY

V_{DS}	800	
$R_{DS(on)}$ typ. (Ω) at 25 °C	$V_{GS} = 10\text{ V}$	2.38
Q_g max. (nC)	90	
Q_{gs} (nC)	11	
Q_{gd} (nC)	19	
Configuration	Single	

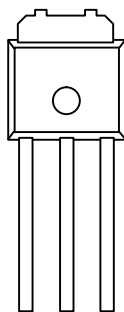
FEATURES

- 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

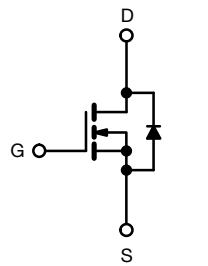
- Server and telecom power supplies
- Switch mode power supplies (SMPS)
- Power factor correction power supplies (PFC)
- Lighting
 - High-intensity discharge (HID)
 - Fluorescent ballast lighting
- Industrial
 - Welding
 - Induction heating
 - Motor drives
 - Battery chargers
 - Renewable energy
 - Solar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

TO-251



G D S
Top View

Drain Connected to
Drain-Tab



N-Channel MOSFET

ABSOLUTE MAXIMUM RATINGS ($T_C = 25\text{ °C}$, 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	2.8	A
		T _C = 100 °C		1.8	
Pulsed drain current ^a			I _{DM}	5	
Linear derating factor				0.5	W/°C
Single pulse avalanche energy ^b			E _{AS}	14	mJ
Maximum power dissipation			P _D	62.5	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		0.13			
Soldering recommendations (peak temperature) ^c	For 10 s			300	°C

Notes

- Repetitive rating; pulse width limited by maximum junction temperature
- $V_{DD} = 140\text{ V}$, starting $T_J = 25\text{ °C}$, $L = 28.2\text{ mH}$, $R_g = 25\text{ }\Omega$, $I_{AS} = 0.9\text{ A}$
- 1.6 mm from case
- $I_{SD} \leq I_D$, $dI/dt = 100\text{ A}/\mu\text{s}$, starting $T_J = 25\text{ °C}$

THERMAL RESISTANCE RATINGS

PARAMETER	SYMBOL	TYP.	MAX.	UNIT
Maximum junction-to-ambient	R_{thJA}	-	62	°C/W
Maximum junction-to-case (drain)	R_{thJC}	-	2.0	

SPECIFICATIONS ($T_J = 25\text{ °C}$, 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		800	-	-	V
V _{DS} temperature coefficient	ΔV _{DS} /T _J	Reference to 25 °C, I _D = 1 mA		-	1.0	-	V/°C
Gate-source threshold Voltage (N)	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
		V _{GS} = ± 30 V		-	-	± 1	μA
Zero gate voltage drain current	I _{DSS}	V _{DS} = 800 V, V _{GS} = 0 V		-	-	1	μA
		V _{DS} = 640 V, V _{GS} = 0 V, T _J = 125 °C		-	-	10	
Drain-source on-state resistance	R _{DS(on)}	V _{GS} = 10 V	I _D = 1.0 A	-	2.38	-	Ω
Forward transconductance	g _{fs}	V _{DS} = 30 V, I _D = 1.0 A		-	1.0	-	S
Dynamic							
Input capacitance	C _{iss}	V _{GS} = 0 V, V _{DS} = 100 V, f = 1 MHz		-	315	-	pF
Output capacitance	C _{Oss}			-	20	-	
Reverse transfer capacitance	C _{rss}			-	6	-	
Effective output capacitance, energy related ^a	C _{O(er)}	V _{DS} = 0 V to 480 V, V _{GS} = 0 V		-	13	-	
Effective output capacitance, time related ^b	C _{O(tr)}			-	45	-	
Total gate charge	Q _g	V _{GS} = 10 V	I _D = 1.0 A, V _{DS} = 480 V	-	9.8	19.6	nC
Gate-source charge	Q _{gs}			-	2.4	-	
Gate-drain charge	Q _{gd}			-	3.9	-	
Turn-on delay time	t _{d(on)}	V _{DD} = 480 V, I _D = 1.0 A, V _{GS} = 10 V, R _g = 9.1 Ω		-	11	22	ns
Rise time	t _r			-	7	14	
Turn-off delay time	t _{d(off)}			-	19	38	
Fall time	t _f			-	27	54	
Gate input resistance	R _g	f = 1 MHz, open drain		1.8	3.6	7.2	Ω
Drain-Source Body Diode Characteristics							
Continuous source-drain diode current	I _S	MOSFET symbol showing the integral reverse p - n junction diode 		-	-	2.8	A
Pulsed diode forward current	I _{SM}			-	-	5	
Diode forward voltage	V _{SD}	T _J = 25 °C, I _S = 11 A, V _{GS} = 0 V		-	-	1.2	V
Reverse recovery time	t _{rr}	T _J = 25 °C, I _F = I _S = 1.0 A, dI/dt = 100 A/μs, V _R = 25 V		-	278	556	ns
Reverse recovery charge	Q _{rr}			-	0.9	1.8	μC
Reverse recovery current	I _{RRM}			-	5	-	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

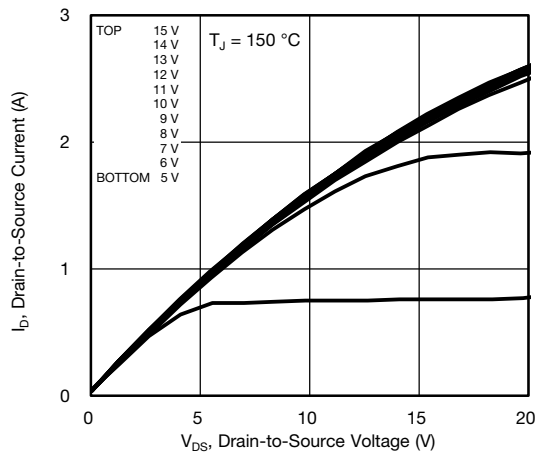


Fig. 2 - Typical Output Characteristics

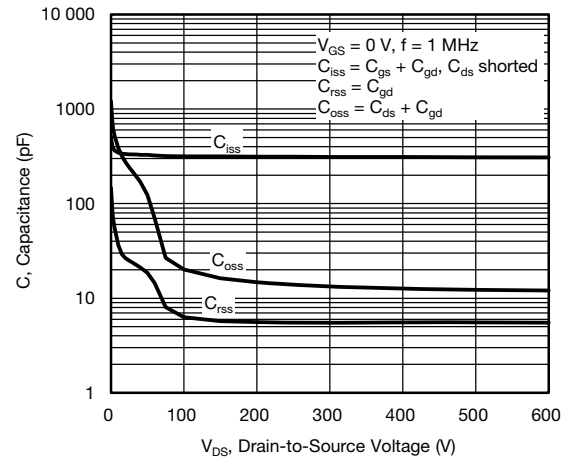


Fig. 5 - Typical Capacitance vs. Drain-to-Source Voltage

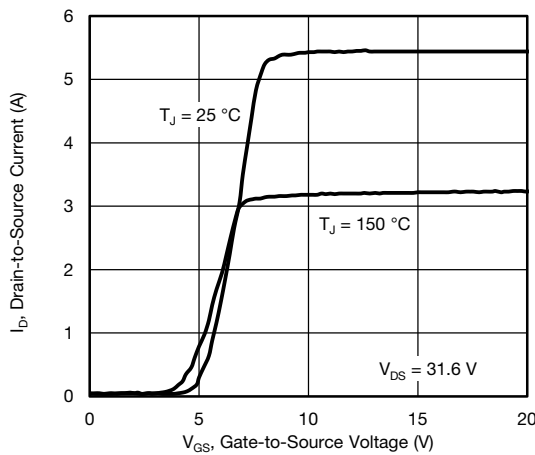


Fig. 3 - Typical Transfer Characteristics

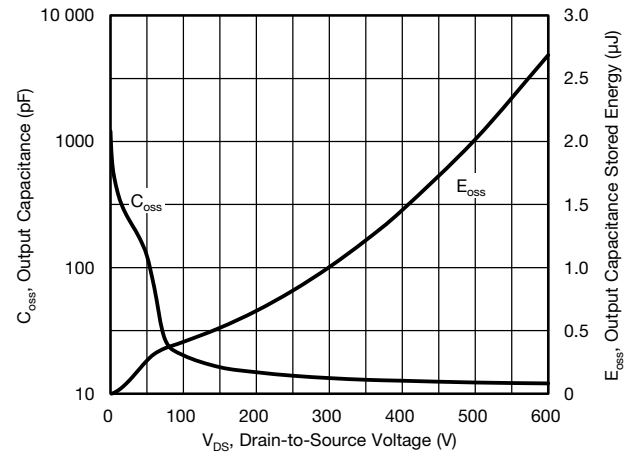


Fig. 6 - C_{oss} and E_{oss} vs. V_{DS}

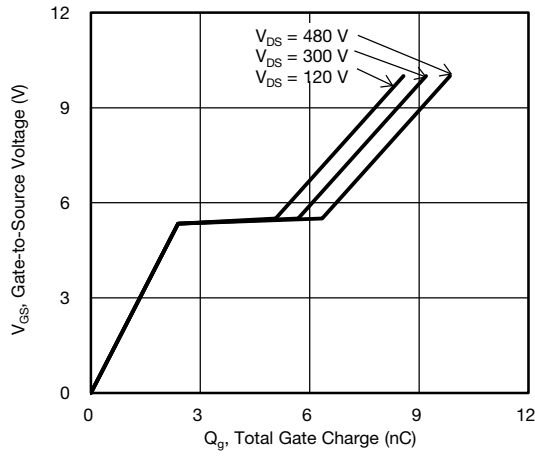


Fig. 7 - Typical Gate Charge vs. Gate-to-Source Voltage



Fig. 10 - Maximum Drain Current vs. Case Temperature

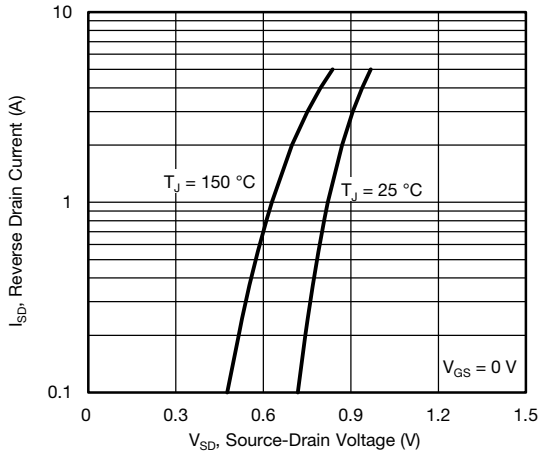


Fig. 8 - Typical Source-Drain Diode Forward Voltage



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

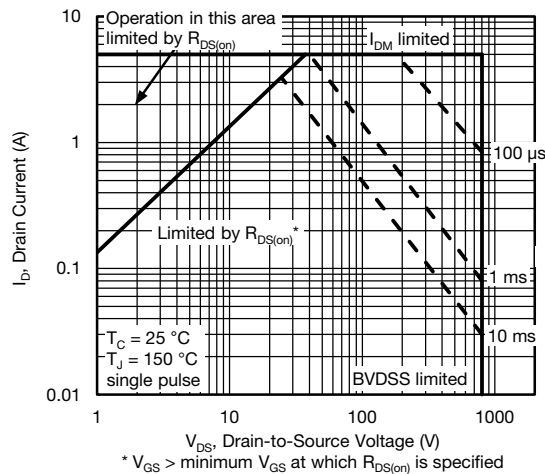


Fig. 9 - Maximum Safe Operating Area

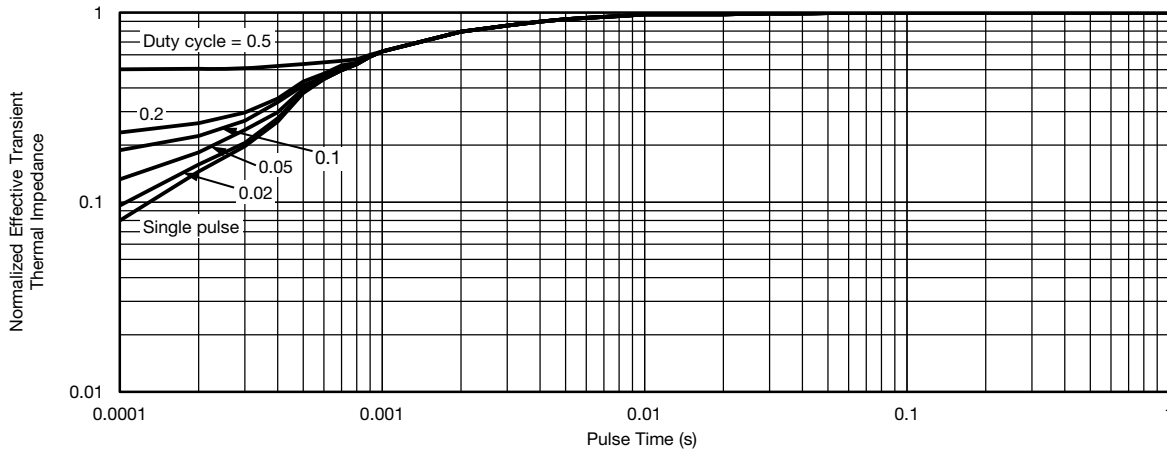


Fig. 12 - Normalized Thermal Transient Impedance, Junction-to-Case

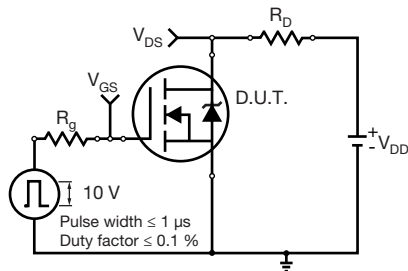


Fig. 13 - Switching Time Test Circuit

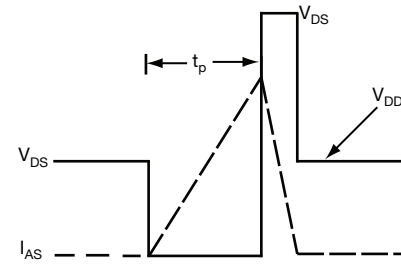


Fig. 16 - Unclamped Inductive Waveforms

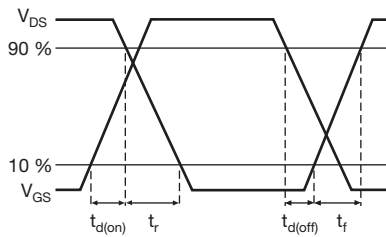


Fig. 14 - Switching Time Waveforms

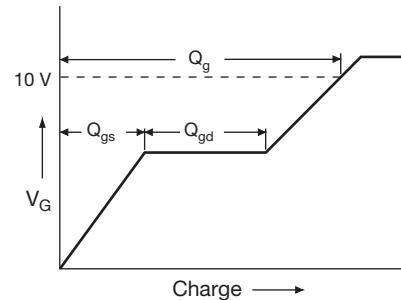


Fig. 17 - Basic Gate Charge Waveform



Fig. 15 - Unclamped Inductive Test Circuit

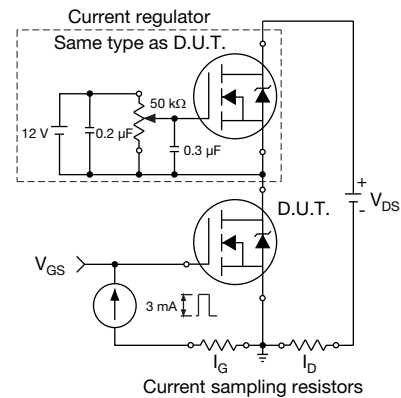


Fig. 18 - Gate Charge Test Circuit

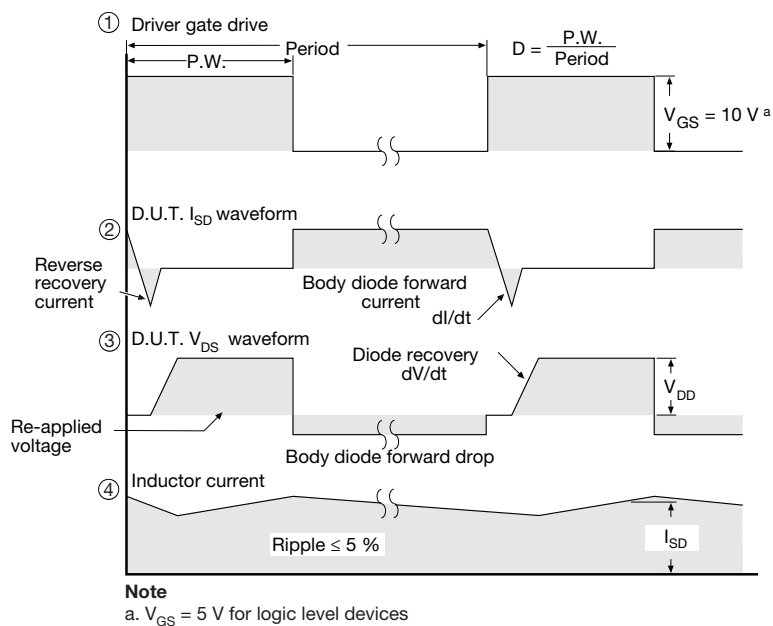
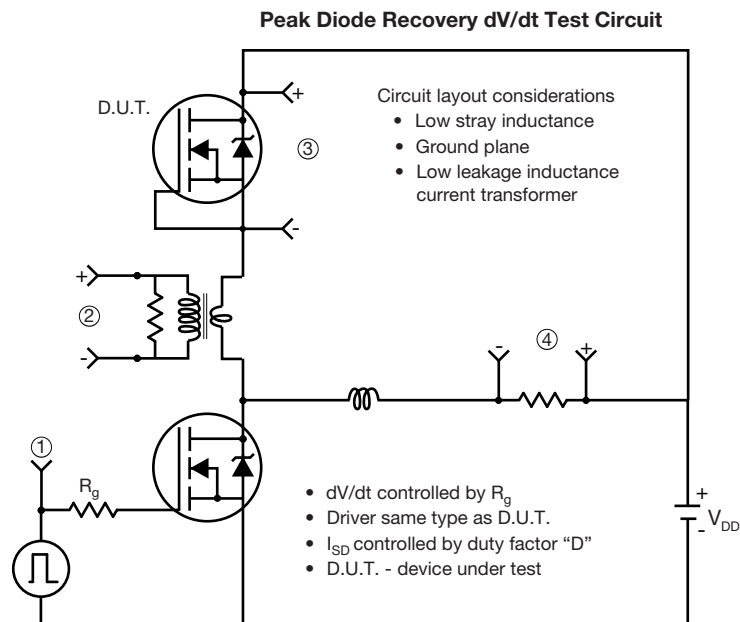
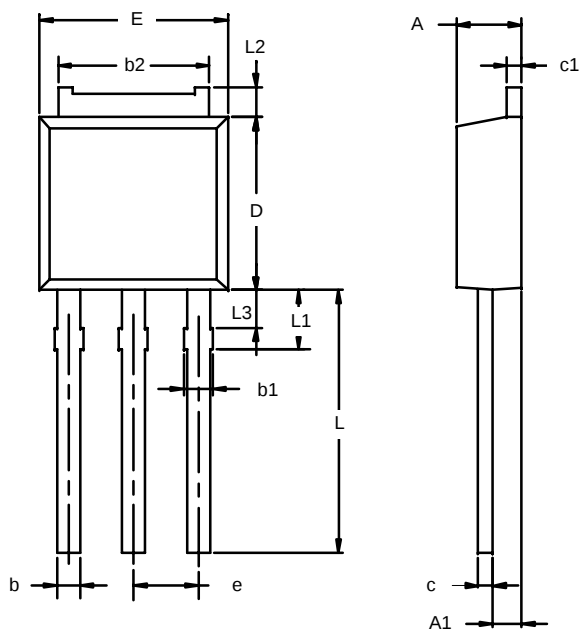


Fig. 19 - For N-Channel

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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