

Features

- 650V/12A,
 $R_{DS(ON)} = 0.67\Omega(\text{typ.}) @ V_{GS} = 10V$
 $V_{DS} @ T_j, \text{max} = 750V (\text{typ.})$
- 100% UIS + R_g Tested
- Reliable and Rugged
- Avalanche Rated
- Lead Free and Green Devices Available
(RoHS Compliant)

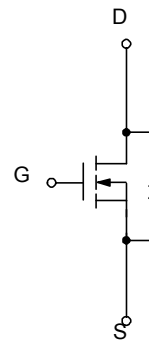
Applications

- AC/DC Power Conversion in Switched Mode Power Supplies (SMPS).
- Uninterruptible Power Supply (UPS),
- Adapter.

Pin Description



TO-220



N-Channel MOSFET

Absolute Maximum Ratings (T_A = 25°C Unless Otherwise Noted)

Symbol	Parameter		Rating	Unit
Common Ratings				
V _{DSS}	Drain-Source Voltage		650	V
V _{GSS}	Gate-Source Voltage		±30	
T _J	Maximum Junction Temperature		150	°C
T _{STG}	Storage Temperature Range		-55 to 150	
I _S	Diode Continuous Forward Current		6 ^a	A
I _{DP}	Pulse Drain Current Tested	T _C =25°C	15 ^b	
I _D	Continuous Drain Current	T _C =25°C	12 ^a	
		T _C =100°C	7.8 ^a	
P _D	Maximum Power Dissipation for TO-220/TO-252-2/TO-251	T _C =25°C	86	W
		T _C =100°C	34.4	
P _D	Maximum Power Dissipation for TO-220FP	T _C =25°C	27	
		T _C =100°C	10.8	
R _{θJC}	Thermal Resistance-Junction to Case for TO-220/TO-252-2/TO-251		1.45	°C/W
R _{θJC}	Thermal Resistance-Junction to Case for TO-220FP		4.6	
R _{θJA}	Thermal Resistance-Junction to Ambient		62.5	
Drain-Source Avalanche Ratings				
dv/dt ^c	MOSFET dv/dt ruggedness		50	V/ns
E _{AS} ^d	Avalanche Energy, Single Pulsed		52.6	mJ
I _{AR} ^e	Avalanche Current		0.9	A
E _{AR} ^e	Repetitive Avalanche Energy		0.12	mJ

Note a : limited by maximum junction temperature.

Note b : Bond wire current limit.

Note c : V_{DS}=520V, I_D=6A.

Note d : I_D=0.9A, V_{DD}=50V, T_J=25°C.

Note e : Repetitive Rating : Pulse width limited by maximum junction temperature.

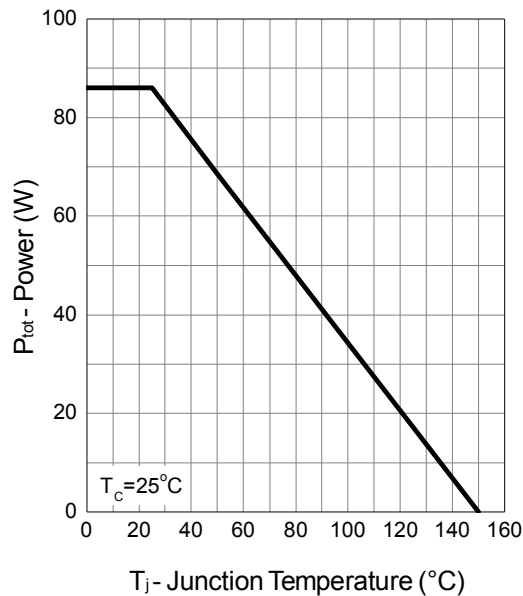
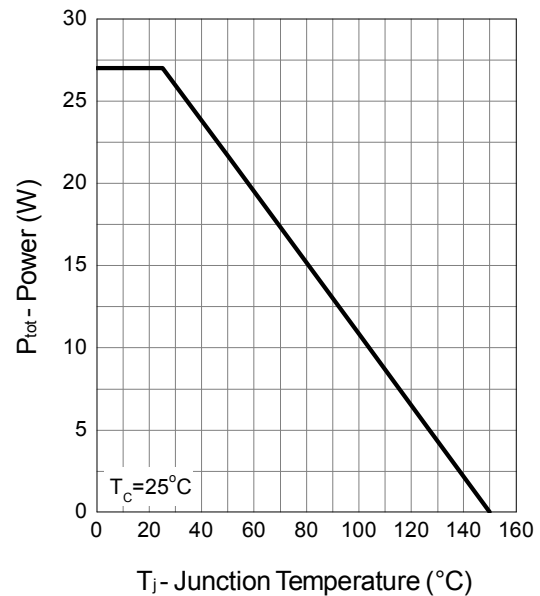
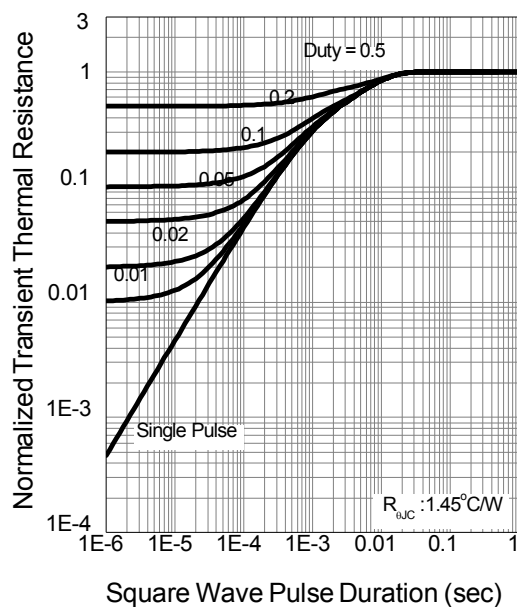
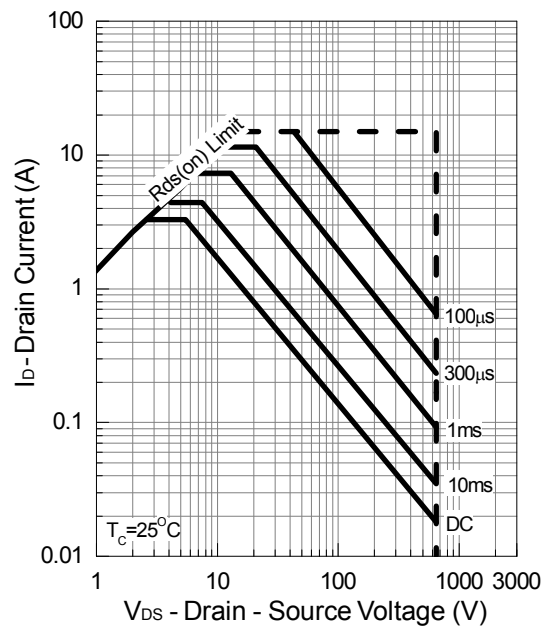
Electrical Characteristics (T_A = 25°C Unless Otherwise Noted)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
Static Characteristics						
BV _{DSS}	Drain-Source Breakdown Voltage	V _{GS} =0V, I _{DS} =250μA T _J =150°C	650 -	- 750	- -	V
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} =520V, V _{GS} =0V T _J =150°C	- -	- -	1 200	μA
V _{GS(th)}	Gate Threshold Voltage	V _{DS} =V _{GS} , I _{DS} =250μA	2.5	3.5	4.5	V
I _{GSS}	Gate Leakage Current	V _{GS} =±30V, V _{DS} =0V	-	-	±100	nA
R _{DS(ON)} ^f	Drain-Source On-state Resistance	V _{GS} =10V, I _{DS} =2A	-	0.67	0.8	Ω
Diode Characteristics						
V _{SD} ^f	Diode Forward Voltage	I _{SD} =6A, V _{GS} =0V	-	0.95	1.3	V
t _{rr}	Reverse Recovery Time	I _{SD} =6A, V _R =390V dI _{SD} /dt= 100A/μs	-	190	-	ns
Q _{rr}	Reverse Recovery Charge		-	1.6	-	μC
I _{rm}	Peak Reverse Recovery Current		-	14.5	-	A
Dynamic Characteristics ^g						
R _G	Gate Resistance	V _{GS} =0V, V _{DS} =0V, F=1MHz	-	2.7	-	Ω
C _{iss}	Input Capacitance	V _{GS} =0V, V _{DS} =25V, Frequency=1.0MHz	-	365	475	pF
C _{oss}	Output Capacitance		-	370	-	
C _{rss}	Reverse Transfer Capacitance		-	7	-	
t _{d(ON)}	Turn-on Delay Time	V _{DD} =400V, I _{DS} =6A, V _{GEN} =10V, R _G =6Ω	-	9.5	-	ns
T _r	Turn-on Rise Time		-	5.5	-	
t _{d(OFF)}	Turn-off Delay Time		-	14	-	
T _f	Turn-off Fall Time		-	3.5	-	
Gate Charge Characteristics ^g						
Q _g	Total Gate Charge	V _{DS} =520V, V _{GS} =10V, I _{DS} =2A	-	14	18.2	nC
Q _{gs}	Gate-Source Charge		-	3.3	-	
Q _{gd}	Gate-Drain Charge		-	6.5	-	

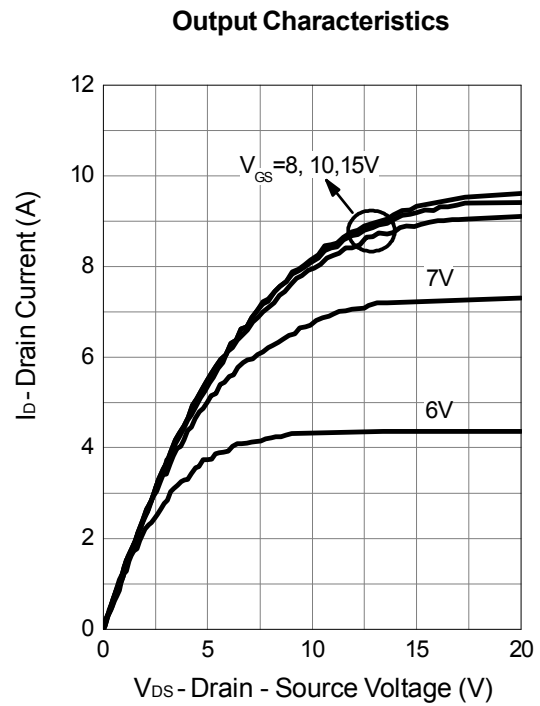
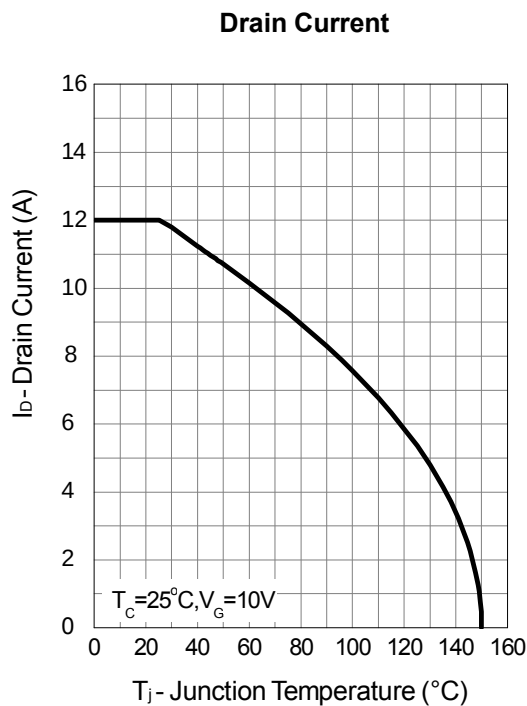
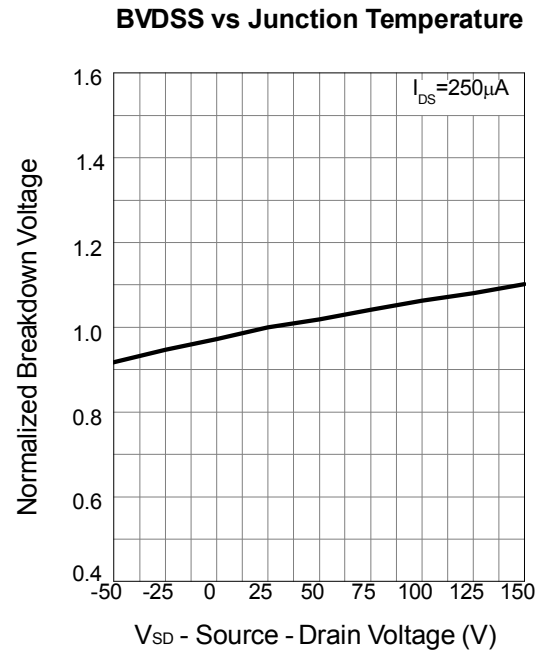
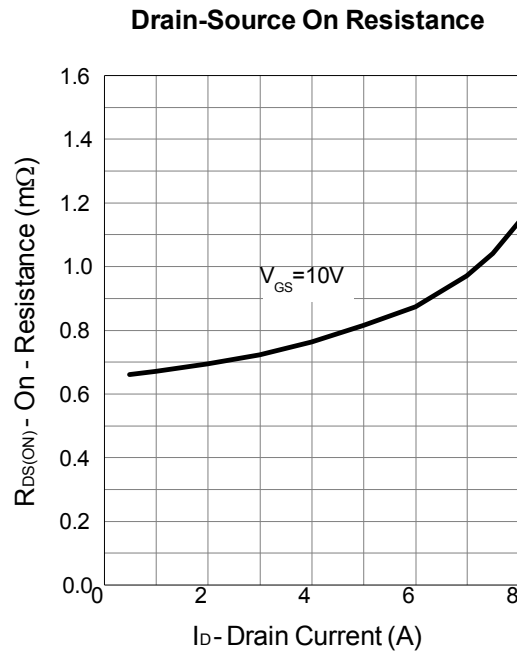
Note f : Pulse test ; pulse width≤300μs, duty cycle≤2%.

Note g : Guaranteed by design, not subject to production testing.

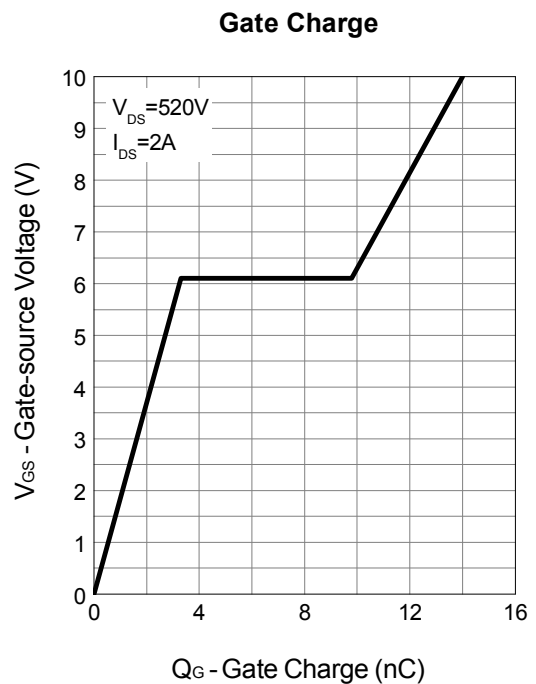
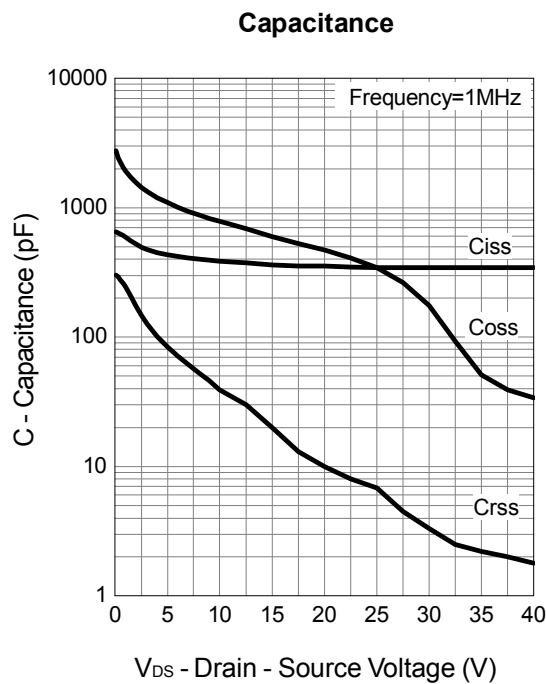
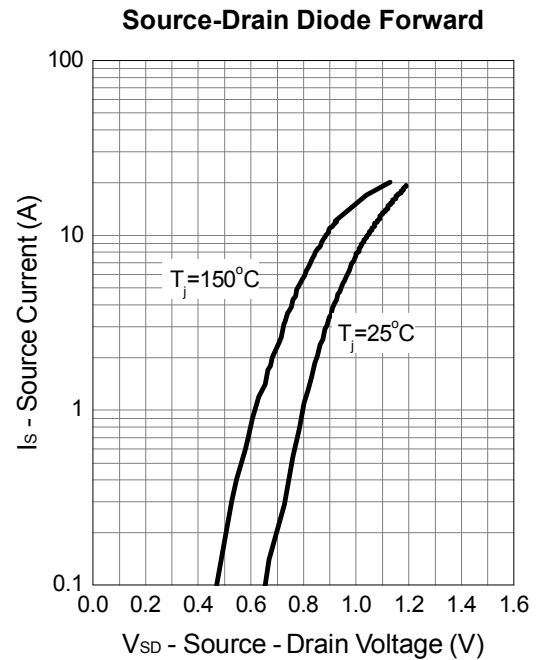
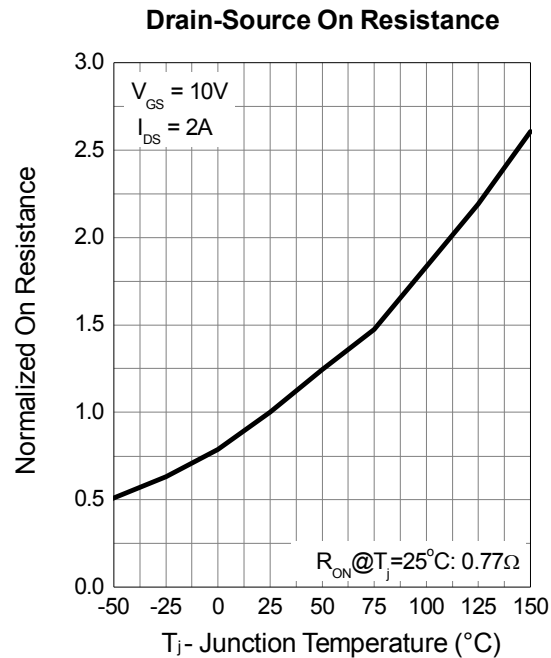
Typical Operating Characteristics

Power Dissipation

Power Dissipation

Thermal Transient Impedance

Safe Operation Area


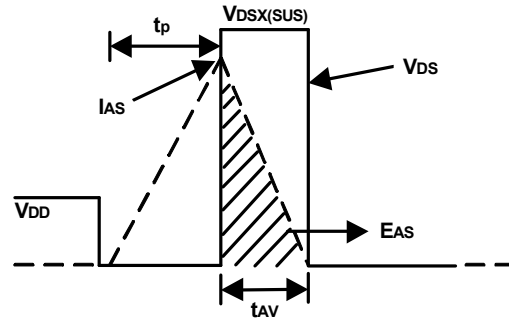
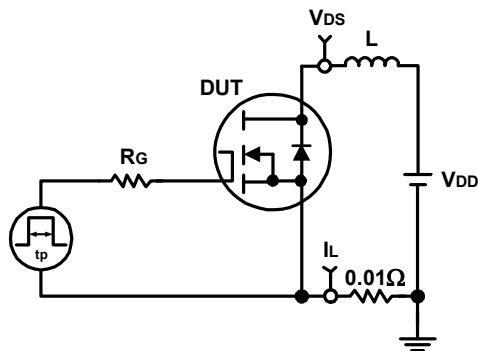
Typical Operating Characteristics (Cont.)



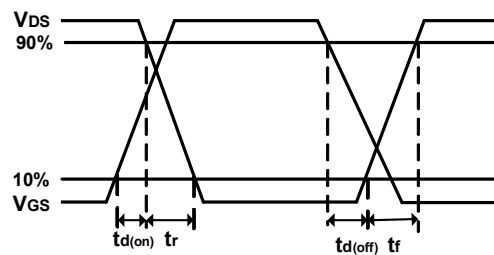
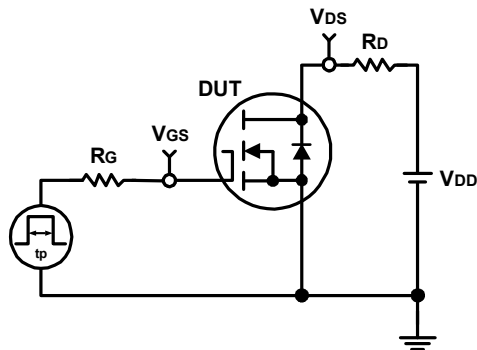
Typical Operating Characteristics (Cont.)



Avalanche Test Circuit and Waveforms

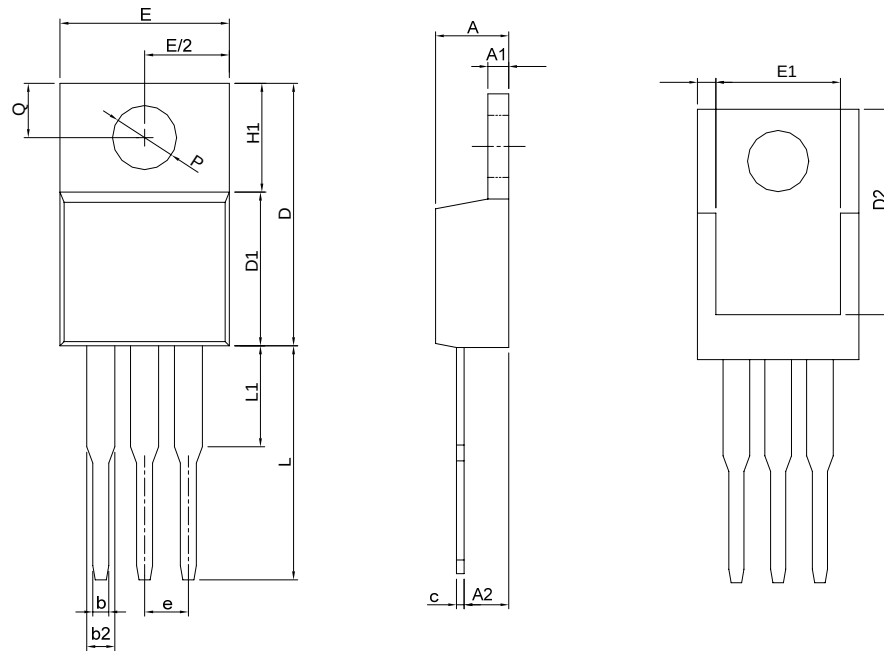


Switching Time Test Circuit and Waveforms



Package Information

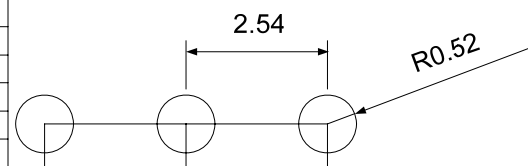
TO-220



SYMBOL	TO-220			
	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
A	3.56	4.83	0.140	0.190
A1	0.51	1.40	0.020	0.055
A2	2.03	2.92	0.080	0.115
b	0.38	1.02	0.015	0.040
b2	1.14	1.78	0.045	0.070
c	0.36	0.61	0.014	0.024
D	14.22	16.51	0.560	0.650
D1	8.38	9.30	0.330	0.366
D2	12.19	13.65	0.480	0.537
E	9.65	10.67	0.380	0.420
E1	6.86	8.89	0.270	0.350
e	2.54 BSC		0.100 BSC	
H1	5.84	6.86	0.230	0.270
L	12.70	14.73	0.500	0.580
L1	-	6.35	-	0.250
P	3.53	4.09	0.139	0.161
			0.100	

Note: Follow JFDEC TO-220 AR

RECOMMENDED LAND PATTERN



UNIT: mm