DESCRIPTION

The AM023NS10H is available in a TO-220, TO-247, TO-263-2, TO-263-7 and TOLL-8 packages.

Package	BVDSS	RDSON	ID
TO-220 TO-247 TO-263-2	100V	1.8mΩ	180A
TO-263-7	100V	1.6mΩ	300A
TOLL-8	100V	1.4mΩ	326A

ORDERING INFORMATION

Package Type	Part Number	
TO-220 SPQ: 50pcs/Tube	T3	AM023NS10HT3U
		AM023NS10HT3VU
TO-247 SPQ: 30pcs/Tube	TL3F	AM023NS10HTL3FU
		AM023NS10HTL3FVU
TO-263-2 SPQ: 800pcs/ Reel	S2	AM023NS10HS2R
		AM023NS10HS2VR
TO-263-7 SPQ: 800pcs/ Reel	S7	AM023NS10HS7R
		AM023NS10HS7VR
TOLL-8 SPQ:1,200pcs/Reel	PH8	AM023NS10HPH8R
		AM023NS10HPH8VR
Note	V: Halogen free Package R: Tape & R U: Tube	
AiT provides all RoHS products		

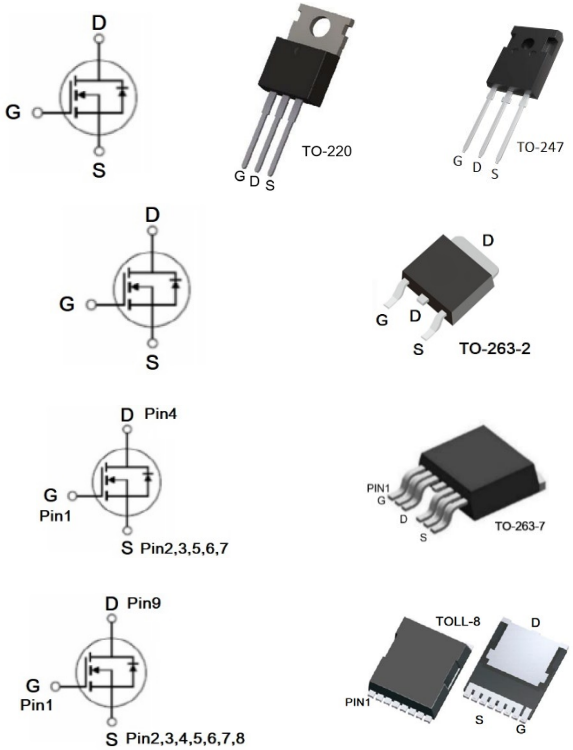
FEATURES

- Fast Switching
- Low On-Resistance
- Low Gate Charge
- Low Reverse transfer capacitances
- High avalanche ruggedness

APPLICATION

- BMS
- High Current Switching Applications

PIN DESCRIPTION



Pin #					Symbol	Functions
TO-220	TO-247	TO-263-2	TO-263-7	TOLL-8		
1	1	1	1	1	G	Gate
2	2	2,4	4	9	D	Drain
3	3	3	2,3,5,6,7	2,3,4,5,6,7,8	S	Source

ABSOLUTE MAXIMUM RATINGS

at T_C = 25°C, unless otherwise specified

V_{DSS}, Drain-Source Voltage			100V
I_D	Continuous Drain Current, Silicon Limited	TO-220, TO-263-2	305A
		TO-247	364A
		TO-263-7	320A
		TOLL-8	326A
	Continuous Drain Current, Package Limited	TO-220, TO-263-2 TO-247	180A
		TO-263-7	300A
		TOLL-8	360A
	Continuous Drain Current @T_C =100°C, Silicon Limited	TO-220, TO-263-2	192.9A
		TO-247	230.5A
		TO-263-7	202A
		TOLL-8	206A
I_{DM}, Pulsed Drain Current (1)		TO-220, TO-263-2 TO-247	720A
		TO-263-7	1200A
		TOLL-8	1304A
V_{GS}, Gate-Source Voltage			±20V
E_{AS}, Avalanche Energy (2)			1225mJ
P_D	Power Dissipation	TO-220, TO-263-2 TO-263-7, TOLL-8	416.6W
		TO-247	595.2W
	Derating Factor above 25°C	TO-220, TO-263-2 TO-263-7, TOLL-8	3.33W/℃
		TO-247	4.76 W/℃
T_J, Operating Junction Temperature Range			150℃
T_{STG}, Storage Temperature Range			-55℃~150℃
T_L, Maximum Temperature for Soldering			260℃

Stresses above may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these or any other conditions beyond those indicated in the Electrical Characteristics are not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

(1) Repetitive Rating：Pulse width limited by maximum junction temperature.

(2) L=0.5mH, Ias=70A, Start T_J =25℃

THERMAL CHARACTERISTICS

Parameter		Symbol	Max	Units
Thermal resistance, Junction-Ambient		$R_{\theta JA}$	62.5	℃/W
Thermal resistance, Junction-Case	TO-220, TO-263-2 TO-263-7, TOLL-8	$R_{\theta JC}$	0.30	℃/W
	TO-247		0.21	

ELECTRICAL CHARACTERISTICS

at T_C = 25°C, unless otherwise specified

Parameter	Symbol	Conditions		Min	Typ.	Max	Units
OFF Characteristics							
Drain-Source Breakdown Voltage	V_{DSS}	V_{GS}=0V, I_D=250μA,		100	110	-	V
Drain-Source Leakage Current	I_{DSS}	V_{DS}=100V, V_{GS}=0V		-	-	1	μA
		V_{DS}=80V, V_{GS}=0V, @ T_C=125℃		-	-	100	μA
Gate-Source Forward Leakage	$I_{GSS(F)}$	V_{GS}=+20V		-	-	100	nA
Gate-Source Reverse Leakage	$I_{GSS(R)}$	V_{GS}=-20V		-	-	-100	nA
ON Characteristics							
Drain-Source On-Resistance	$R_{DS(ON)}$	V_{GS}=10V, I_D=50A.	TO-220 TO-263-2 TO-247	-	1.8	2.3	mΩ
			TO-263-7	-	1.6	2.0	
			TOLL-8	-	1.4	1.8	
Gate Threshold Voltage	$V_{GS(th)}$	V_{DS}= V_{GS}, I_D=250μA		2	3	4	V
Pulse width tp≤300μs, δ≤2%							
Dynamic Characteristics							
Input Capacitance	C_{iss}	V_{DS}=50V, V_{GS}=0, f=1MHz	TO-220 TO-263-2 TO-247 TOLL-8	-	11260	-	pF
			TO-263-7	-	11113	-	
Output Capacitance	C_{oss}	V_{DS}=50V, V_{GS}=0, f=1MHz		-	1715	-	pF

Parameter	Symbol	Conditions		Min	Typ.	Max	Units
Reverse Transfer Capacitance	C_{rss}	V_{DS}=50V, V_{GS}=0, f=1MHz		-	328	-	pF
Total Gate Charge	Q_g	V_{DD}=50V, I_D=100A, V_{GS}=10V		-	224	-	nC
Gate-Source charge	Q_{gs}			-	80	-	
Gate-Drain charge	Q_{gd}			-	38	-	
Gate Resistance	R_G	V_{GS}=0, V_{DS}=0		-	3.6	-	Ω
Switching Characteristics							
Turn-On Delay Time	$t_{d(ON)}$	V_{DD}=50V, I_D=10A, V_{GS}=10V,R_G = 3Ω Resistive Load		-	34	-	ns
Rise Time	t_r			-	26	-	
Turn-Off Delay Time	$t_{d(OFF)}$			-	78	-	
Fall Time	t_f			-	30	-	
Source-Drain Diode Characteristics							
Continuous Source Current	I_S		TO-220 TO-263-2 TO-247	-	-	180	A
			TO-263-7	-	-	300	
			TOLL-8	-	-	326	
Maximum Pulsed Current	I_{SM}		TO-220 TO-263-2 TO-247	-	-	720	A
			TO-263-7	-	-	1200	
			TOLL-8	-	-	1304	
Diode Forward Voltage	V_{SD}	V_{GS}=0V, I_S=50A		-	-	1.2	V
Reverse Recovery Time	T_{rr}	I_S=100A, V_{GS}=0, di/dt=100A/us		-	100	-	ns
Reverse Recovery Charge	Q_{rr}			-	280	-	nC

TYPICAL PERFORMANCE CHARACTERISTICS

Fig.1 Safe Operating Area (TO-220, TO-263-2)

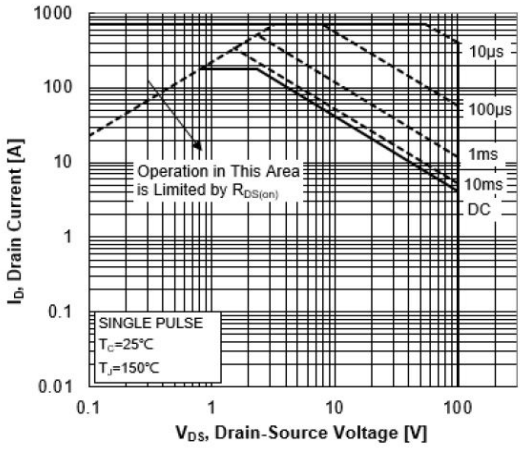


Fig.2 Safe Operating Area (TO-247)

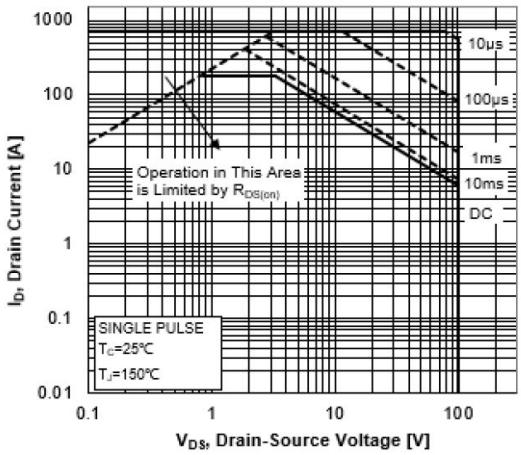


Fig.3 Safe Operating Area (TO-263-7)

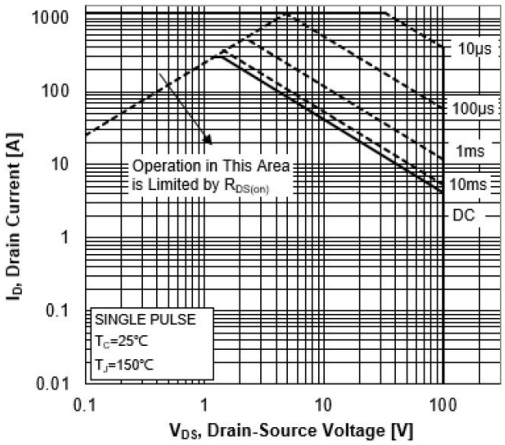


Fig.4 Safe Operating Area (TOLL-8)

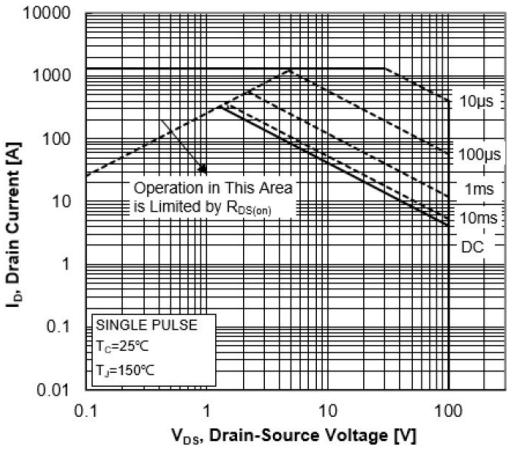


Fig.5 Maximum Power Dissipation vs. Case Temperature (TO-220, TO-263-2, TO-263-7, TOLL-8)

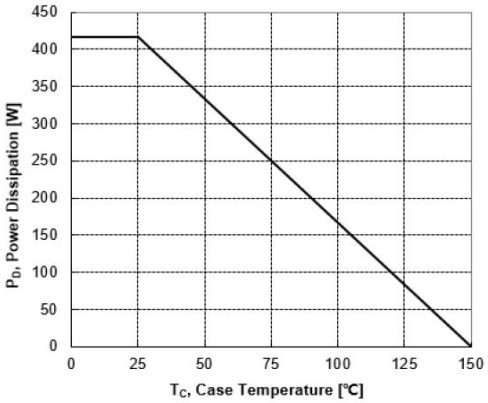


Fig.6 Maximum Power Dissipation vs. Case Temperature (TO-247)

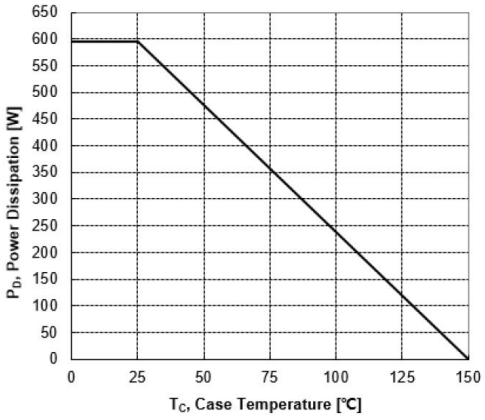


Fig.7 Maximum Continuous Drain Current vs. Case Temperature (TO-220, TO-263-2)

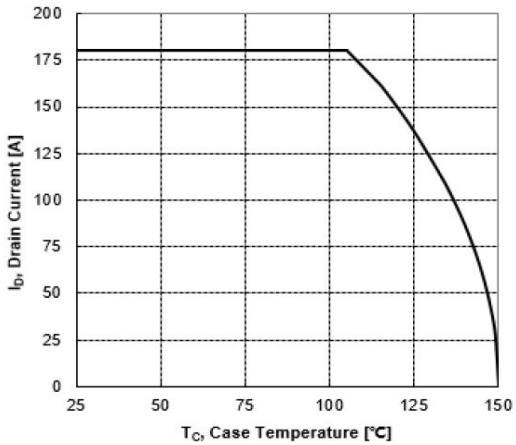


Fig.8 Maximum Continuous Drain Current vs. Case Temperature (TO-247)

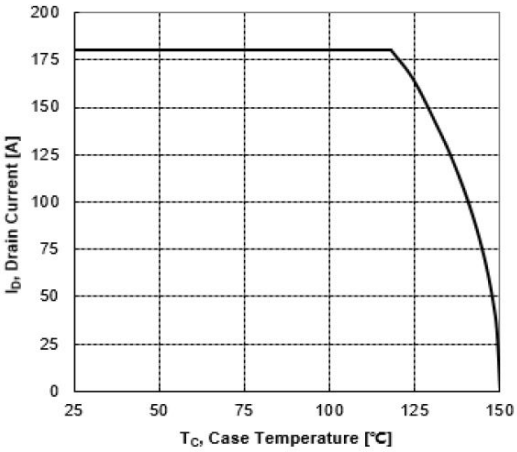


Fig.9 Maximum Continuous Drain Current vs. Case Temperature (TO-263-7)

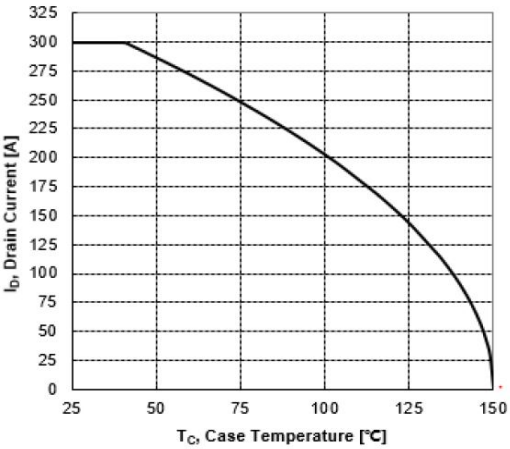


Fig.10 Maximum Continuous Drain Current vs. Case Temperature (TOLL-8)

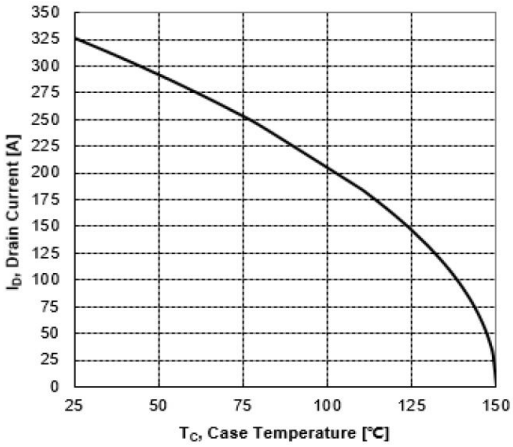


Fig.11 Typical Output Characteristics

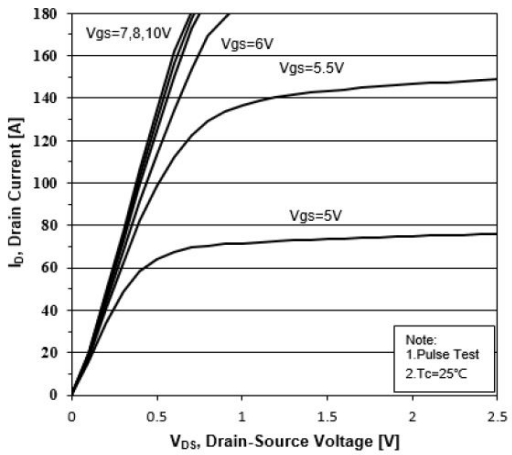


Fig.12 Typical Transfer Characteristics

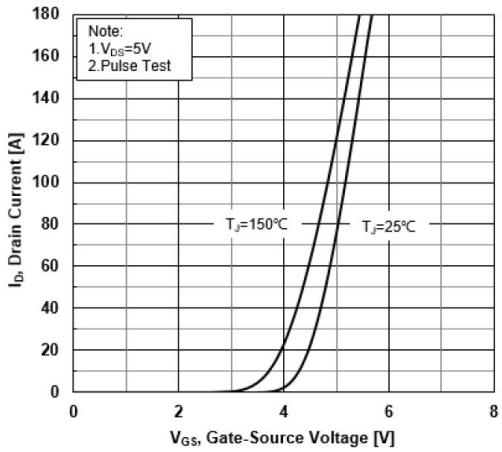


Fig.13 Transient Thermal Impedance

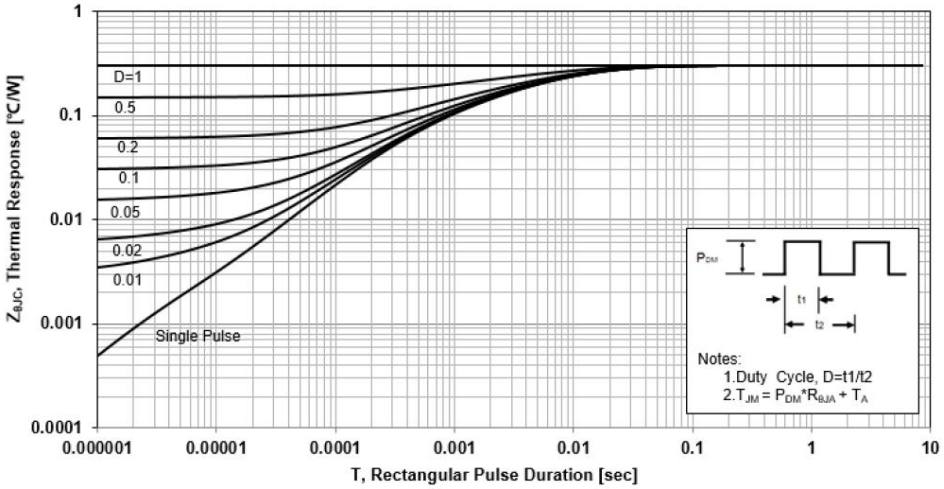


Fig.14 Source-Drain Diode Forward Characteristics

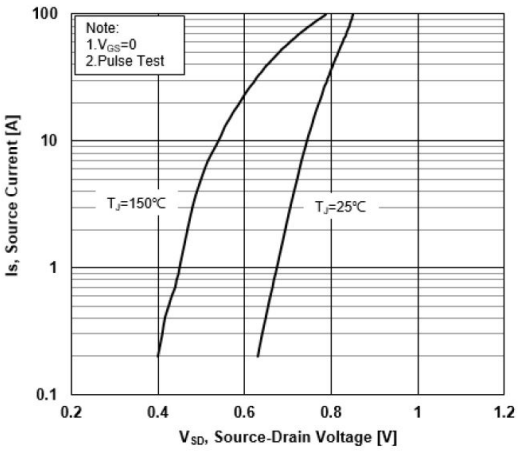


Fig.15 Drain-Source On-Resistance vs. Drain Current (TO-220, TO-263-2, TO-247)

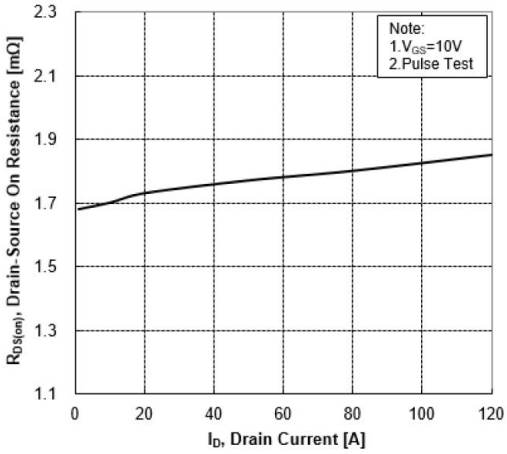


Fig.16 Drain-Source On-Resistance vs. Drain Current (TO-263-7)

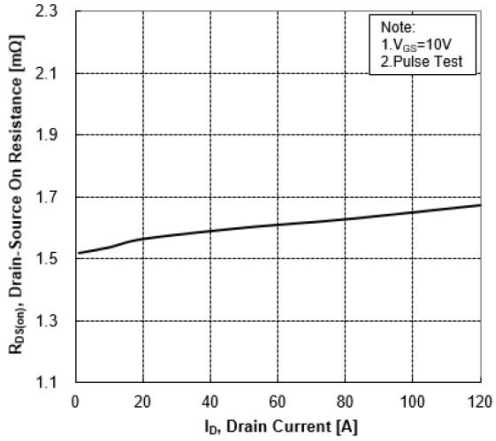


Fig.17 Drain-Source On-Resistance vs. Drain Current (TOLL-8)

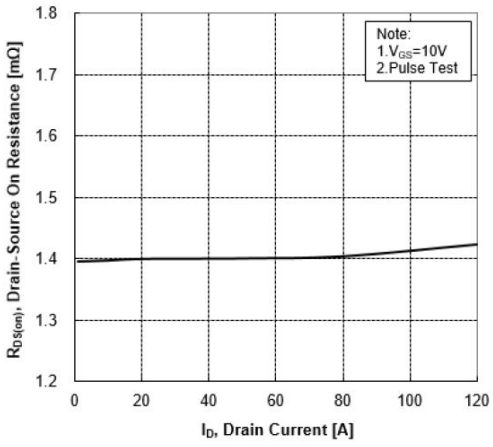


Fig.18 Normalized On-Resistance vs. Junction Temperature

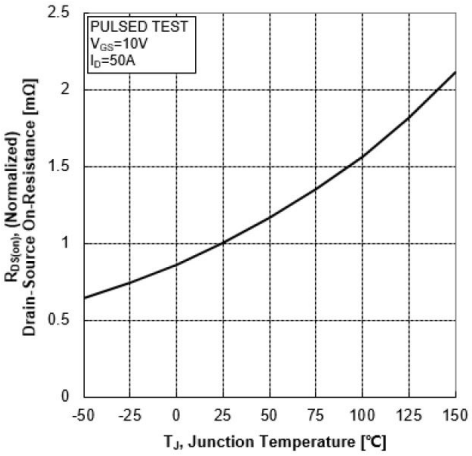


Fig.19 Normalized Threshold Voltage vs. Junction Temperature

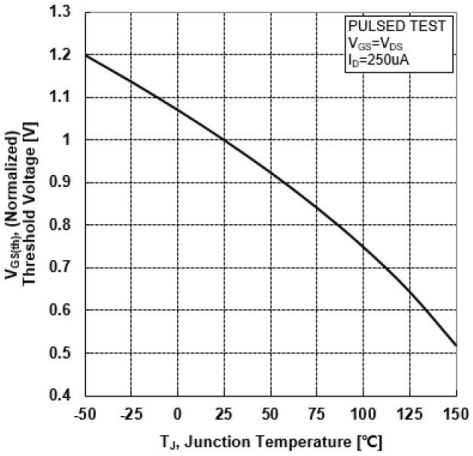


Fig.20 Normalized Breakdown Voltage vs. Junction Temperature

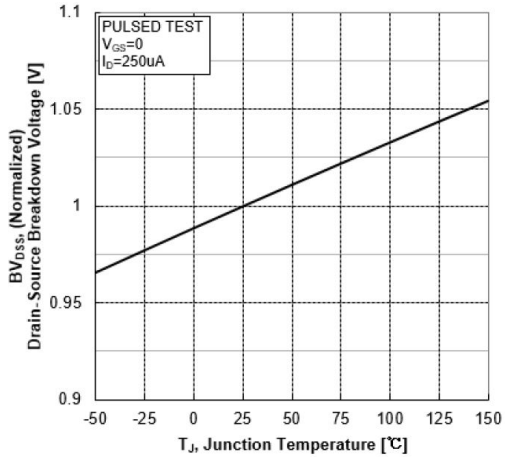


Fig.21 Capacitance Characteristics

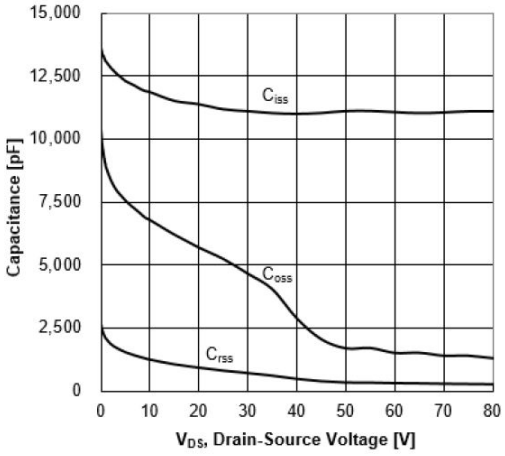


Fig.22 Typical Gate Charge vs. Gate-Source Voltage

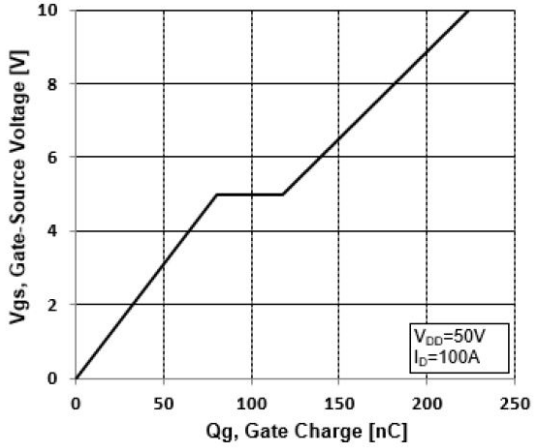


Fig.23 Resistive Switching Test Circuit

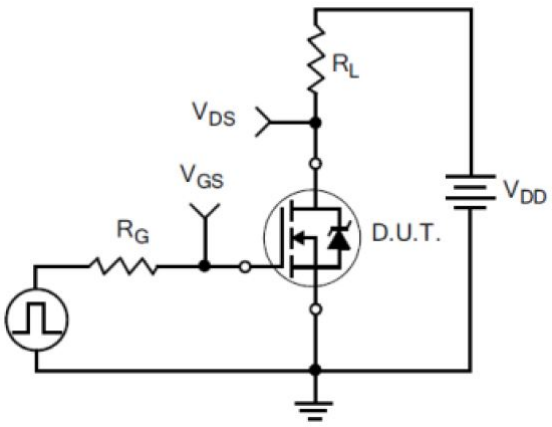


Fig.24 Resistive Switching Waveforms

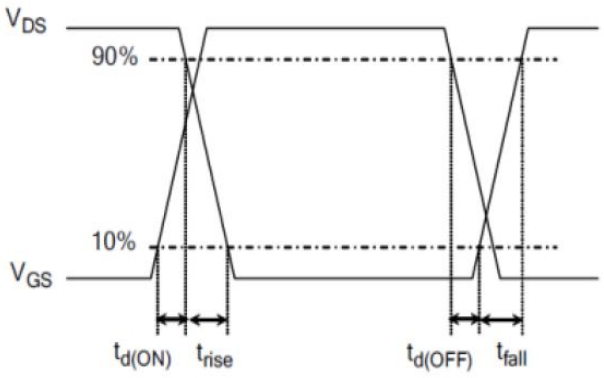


Fig.25 Gate Charge Test Circuit

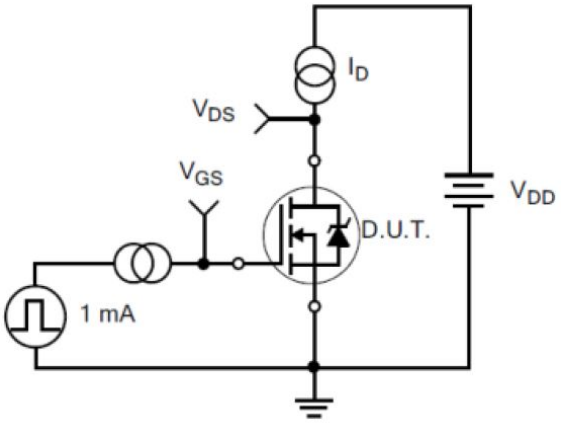


Fig.26 Gate Charge Waveforms

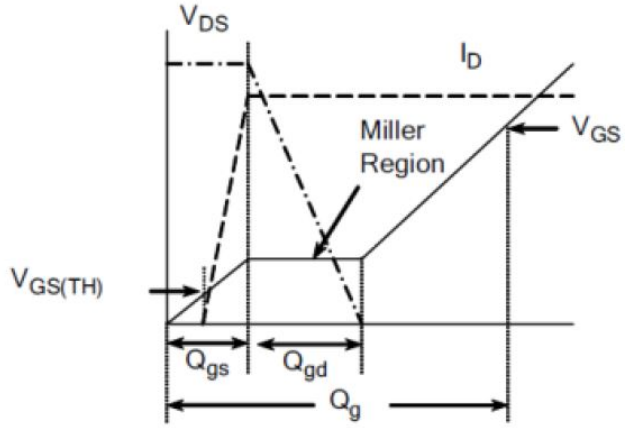


Fig.27 Diode Reverse Recovery Test Circuit

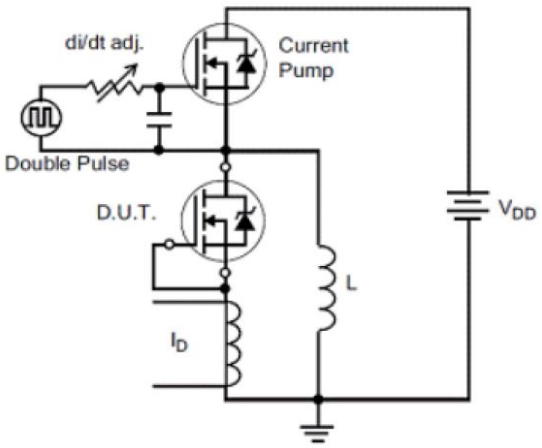


Fig.28 Diode Reverse Recovery Waveforms

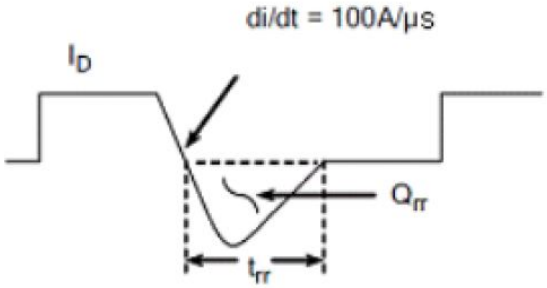


Fig.29 Unclamped Inductive Switching Test Circuit

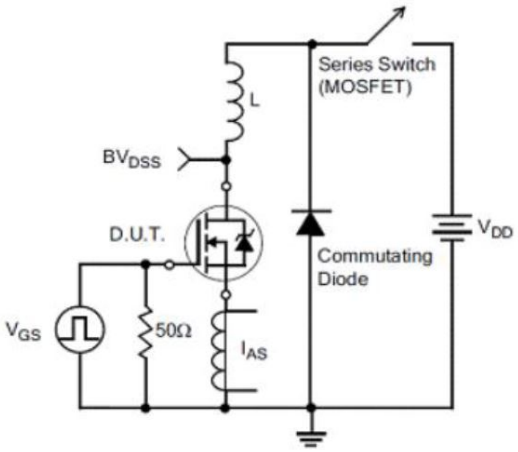
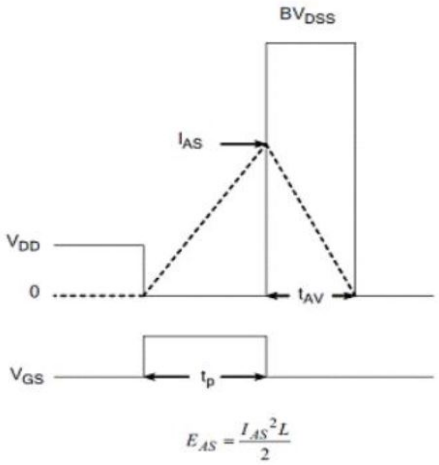


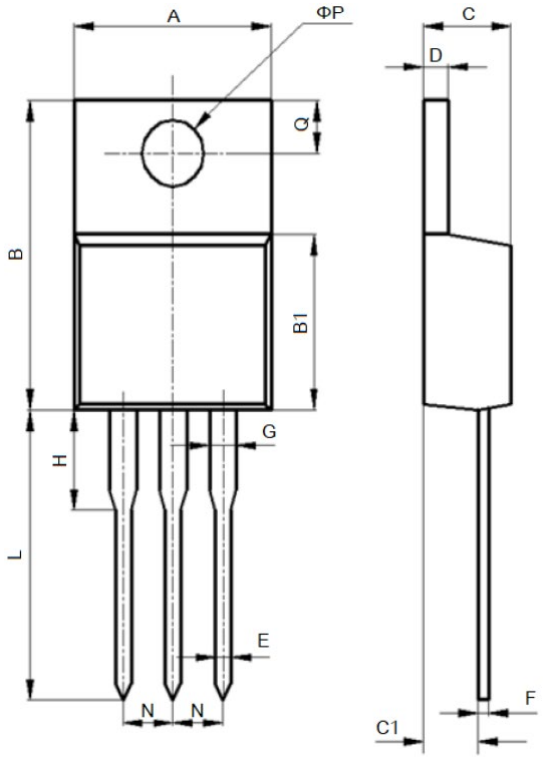
Fig.30 Unclamped Inductive Switching Waveform



$$E_{AS} = \frac{I_{AS}^2 L}{2}$$

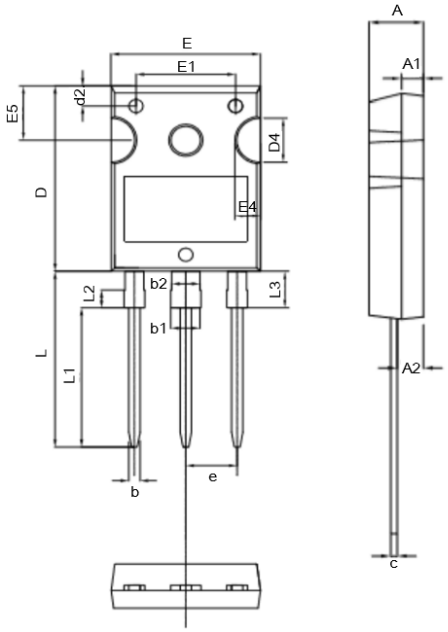
PACKAGE INFORMATION

Dimension in TO-220 (Unit: mm)

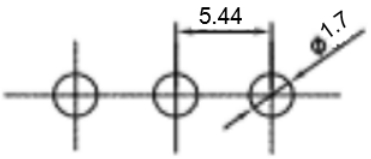


Symbol	Min.	Max.
A	9.600	10.600
B	15.000	16.000
B1	8.900	9.500
C	4.300	4.800
C1	2.300	3.100
D	1.200	1.400
E	0.700	0.900
F	0.300	0.600
G	1.170	1.370
H	2.700	3.800
L	12.600	14.800
N	2.340	2.740
Q	2.400	3.000
ΦP	3.500	3.900

Dimension in TO-247 (Unit: mm)

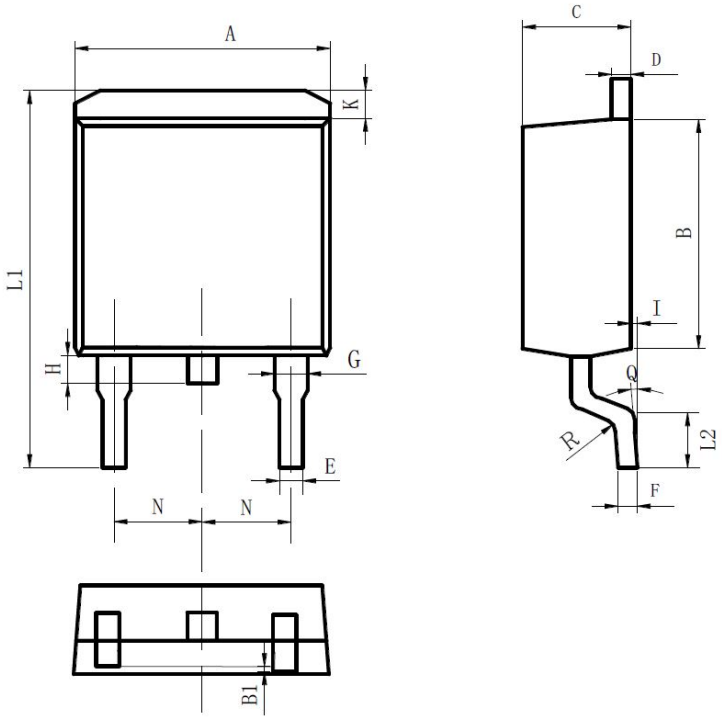


RECOMMENDED LAND PATTERN



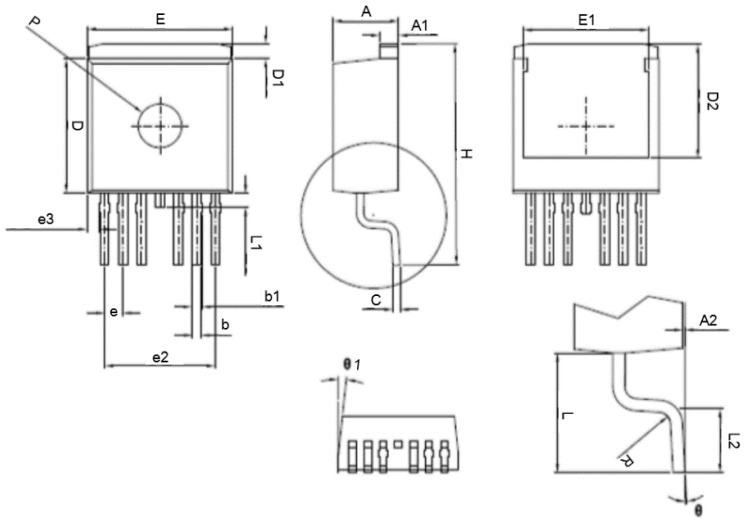
Symbol	Min.	Max.	Symbol	Min.	Max.
A	4.850	5.150	d2	2.200	2.400
A1	1.900	2.100	E	15.700	16.000
A2	2.270	2.540	E1	10.500	
b	1.100	1.300	E2	14.020	
b1	2.900	3.200	E3	13.500	
b2	2.900	3.100	E4	2.200	2.600
b3	1.900	2.100	E5	5.490	6.000
b4	2.000	2.200	e	5.340	5.540
c	0.550	0.680	L	19.720	20.120
D	20.800	21.100	L1	15.790	
D1	8.230		L2	1.980	
D2	8.320		L3	4.000	4.470
D3	1.170		Ø1	7.100	7.300
D4	3.680	5.100	Ø2	3.500	3.700
d1	6.040	6.300			

Dimension in TO-263-2 (Unit: mm)

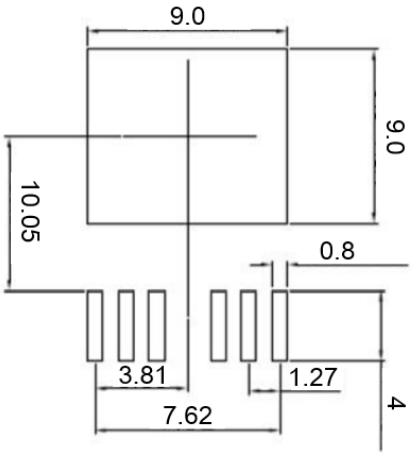


Symbol	Min.	Max.
A	9.800	10.400
B	8.900	9.500
B1	0.000	0.100
C	4.400	4.800
D	1.160	1.370
E	0.700	0.950
F	0.300	0.600
G	1.070	1.470
H	1.300	1.800
K	0.950	1.370
L1	14.500	16.500
L2	1.600	2.300
I	0.000	0.200
Q	0°	8°
R	0.400	0.400
N	2.390	2.690

Dimension in TO-263-7 (Unit: mm)

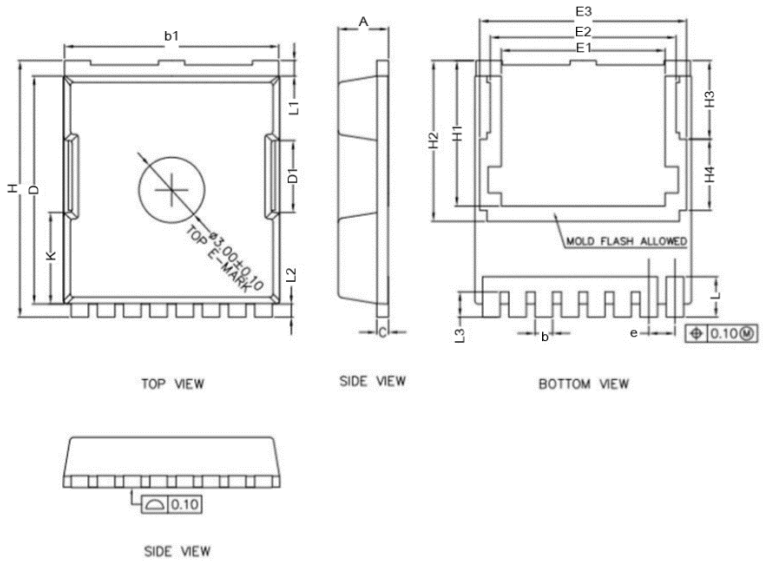


RECOMMENDED LAND PATTERN



Symbol	Min.	Max.
A	4.300	4.700
A1	1.200	1.400
A2	0.050	0.300
b	0.500	0.700
b1	0.500	0.900
c	0.400	0.600
D	9.050	9.450
D1	0.700	1.300
D2	7.350	8.350
E	9.800	10.200
E1	8.100	9.100
e	1.070	1.470
e2	7.320	7.920
e3	0.640	1.040
H	14.650	15.650
L	4.470	5.470
L1	0.900	1.500
L2	2.200	2.800
θ	0°	8°
θ1	0°	10°
ΦP	2.700	3.300

Dimension in TOLL-8 (Unit: mm)



Symbol	Min.	Max.
A	2.200	2.400
b	0.700	0.900
b1	9.700	9.900
c	0.400	0.600
D	10.280	10.580
D1	3.150	3.450
E	9.700	10.100
E1	7.350	7.650
E2	8.350	8.650
E3	9.310	9.610
e	1.100	1.300
H	11.480	11.880
H1	6.550	6.750
H2	7.200	7.500
H3	3.440	3.740
H4	3.110	3.410
K	4.030	4.330
L	1.600	2.100
L1	0.550	0.850
L2	0.450	0.750
L3	1.000	1.300

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