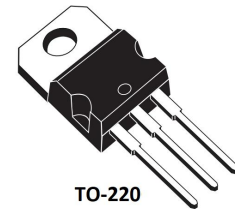
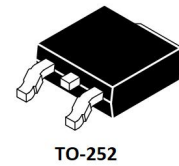


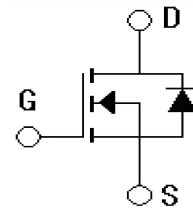
Features

- Low gate charge
- Low Crss (typical 71pF)
- Fast switching
- 100% avalanche tested
- Improved dv/dt capability
- RoHS Compliant



Applications

- High efficiency switch mode Power supplies
- Electronic lamp ballasts based on half bridge
- UPS



Absolute Ratings (Tc=25°C)

Parameter	Symbol	Value	Unit
Drain-Source Voltage	V _{DSS}	100	V
Drain Current -continuous	I _D , T=25°C T=100°C	33*	A
		23	A
Drain Current - pulse (note 1)	I _{DM}	132	A
Gate-Source Voltage	V _{GSS}	±30	V
Single Pulsed Avalanche Energy (note 2)	E _{AS}	800	mJ
Avalanche Current (note 1)	I _{AR}	33	A
Repetitive Avalanche Current (note 1)	E _{AR}	13	mJ
Peak Diode Recovery dv/dt (note 3)	dv/dt	5.9	V/ns
Power Dissipation (TO-220)	PD TC=25°C -Derate above 25°C	130	W
		1.04	W/°C
Power Dissipation(TO-252)	PD TC=25°C -Derate above 25°C	51	W
		0.39	W/°C
Operating and Storage Temperature Range	T _J , T _{STG}	-55~+150	°C
Maximum Lead Temperature for	T _L	300	°C

Soldering Purposes		
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*Drain current limited by maximum junction temperature

Electrical Characteristics($T_{CASE}=25^{\circ}C$ unless otherwise specified)

Parameter	Symbol	Tests conditions	Min	Type	Max	Units
Off-Characteristics						
Drain-Source Voltage	BV_{DSS}	$I_D=250\mu A, V_{GS}=0V$	100	-	-	V
Breakdown Voltage Temperature Coefficient	$\Delta BV_{DSS} / \Delta T_J$	$I_D=250\mu A$, referenced to $25^{\circ}C$	-	0.11	-	V/ $^{\circ}C$
Drain cut-off current	I_{DSS}	$V_{DS}=100V, V_{GS}=0V$ $T_j=25^{\circ}C$	-	-	1	μA
		$V_{DS}=80V, T_j=125^{\circ}C$	-	-	10	
Gate-body leakage current, forward	I_{GSSF}	$V_{DS}=0V, V_{GS}=30V$	-	-	100	nA
Gate-body leakage current, reverse	I_{GSSR}	$V_{DS}=0V, V_{GS}=-30V$	-	-	-100	nA
On-Characteristics						
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=250\mu A$	2.0	-	4.0	V
Static Drain-Source On-Resistance	$R_{DS(ON)}$	$V_{GS}=10V, I_D=12A$ (note 3)	-	34	44	m Ω
Gate Resistance	R_G	F=1.0MHz, open drain	-	1.8	-	Ω
Forward Transconductance	g_{fs}	$V_{DS}=40V, I_D=16.0A$ (note 3)	-	19.8	-	S
Dynamic Characteristics						
Input capacitance	C_{iss}	$V_{DS}=25V,$ $V_{GS}=0V,$ $f=1.0MHZ$	-	3200	-	pF
Output capacitance	C_{oss}		-	305	405	pF
Reverse transfer capacitance	C_{rss}		-	71	90	pF

Switching Characteristics						
Turn-On delay time	$t_{d(on)}$	$V_{DD}=50V, I_D=33A,$ $R_G=25\Omega,$ $V_{GS}=10V$ (note 4,5)	-	18	46	ns
Turn-On rise time	t_r		-	475	955	ns
Turn-Off delay time	$T_{d(off)}$		-	69	149	ns
Turn-Off Fall time	t_f		-	122	252	ns
Total Gate Charge	Q_g	$V_{DS}=80V,$ $I_D=33A,$ $V_{GS}=10V$ (note4,5)	-	37.0	47.0	nC
Gate-Source charge	Q_{gs}		-	6.6	-	nC
Gate-Drain charge	Q_{gd}		-	20.0	-	nC

Drain-Source Diode Characteristics and Maximum Ratings						
Drain-Source Diode Forward Voltage	V_{SD}	$V_{GS}=0V, I_S=33A$ (note 3)	-	-	1.4	V
Maximum Continuous Drain-Source Diode Forward Current	I_S		-	-	33	A
Maximum Pulsed Drain-Source Diode Forward Current	I_{SM}		-	-	132	A
Reverse recovery time	t_{rr}	$V_{GS}=0V, I_F=33A$ $dI_F/dt=100A/\mu s$ (note 3)	-	85	-	ns
Reverse recovery charge	Q_{rr}		-	250	-	μC

Thermal Characteristic(TO-220)

Parameter	Symbol	Value	Unit
Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	0.96	$^{\circ}C/W$
Thermal Resistance, Junction-to-Ambient	$R_{\theta JA}$	62.5	$^{\circ}C/W$

Thermal Characteristic(TO-252)

Parameter	Symbol	Value	Unit
Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	2.5	$^{\circ}C/W$
Thermal Resistance, Junction-to-Ambient	$R_{\theta JA}$	83	$^{\circ}C/W$

Notes:

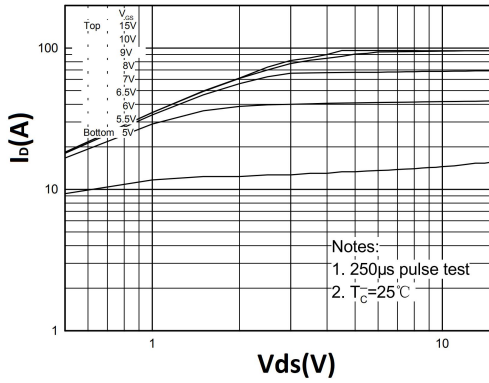
- 1: Pulse width limited by maximum junction temperature
- 2: $L=0.6mH, I_{AS}=33A, V_{DD}=50V, R_G=25 \Omega$, Starting $T_J=25^{\circ}C$
- 3: $I_{SD} \leq 33A, di/dt \leq 300A/\mu s, V_{DD} \leq BVDSS$, Starting $T_J=25^{\circ}C$
- 4: Pulse Test: Pulse Width $\leq 300\mu s$, Duty Cycle $\leq 2\%$
- 5: Essentially independent of operating temperature

Order Message

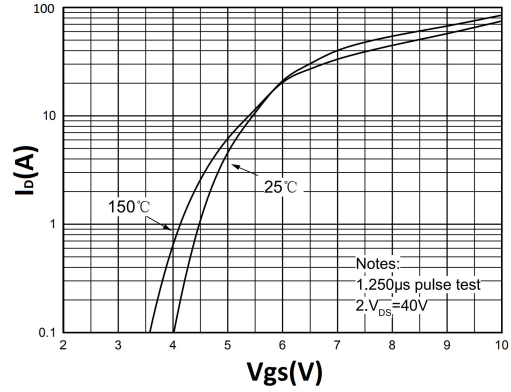
Order codes	Package	Packaging
MS33N10FT	TO-220	Tube
MS33N10FD	TO-252	Tube

Electrical Characteristics

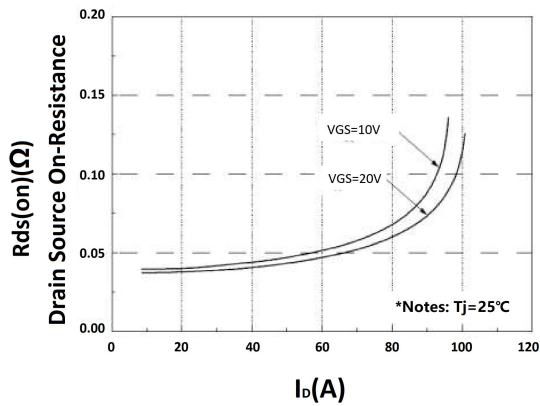
On-Region Characteristics



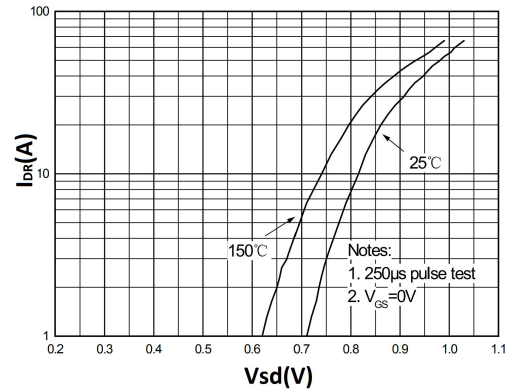
Transfer Characteristics



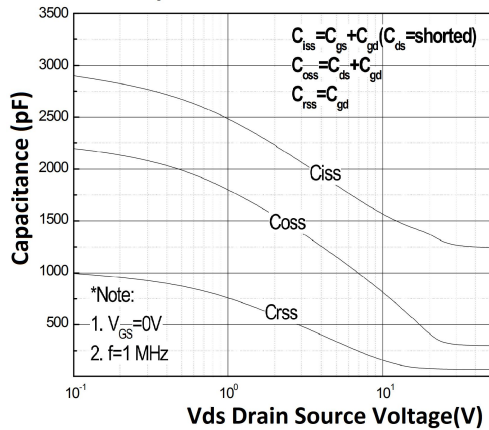
On-Resistance Variation vs. Drain Current and Gate Voltage



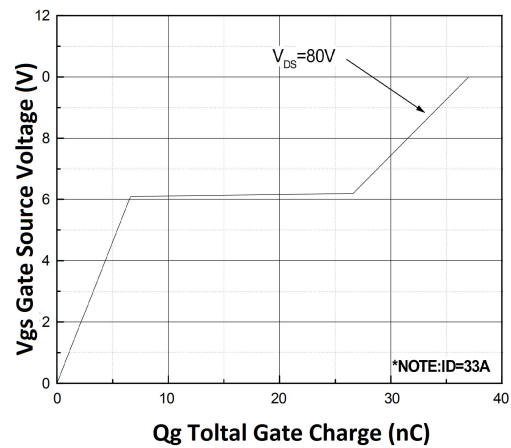
Body Diode Forward Voltage Variation vs. Source Current and Temperature



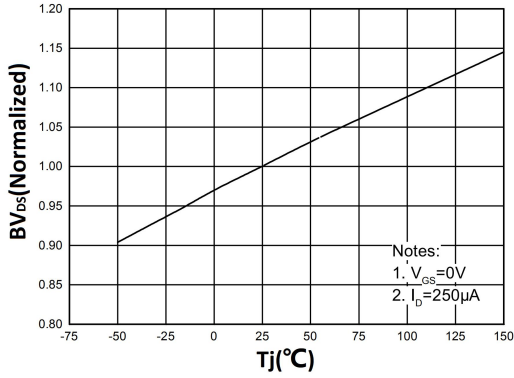
Capacitance Characteristics



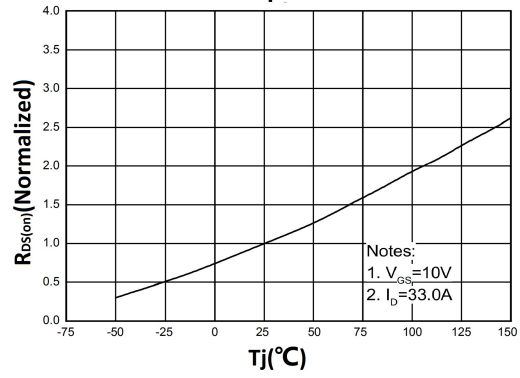
Gate charge Characteristics



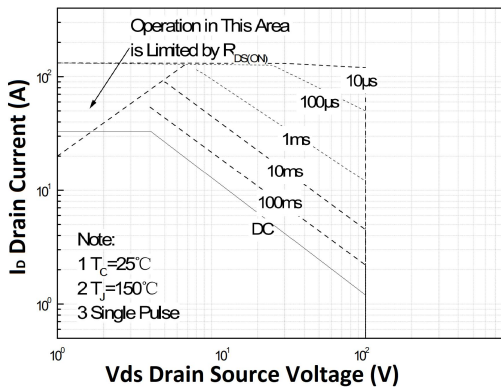
Breakdown Voltage Variation vs. Temperature



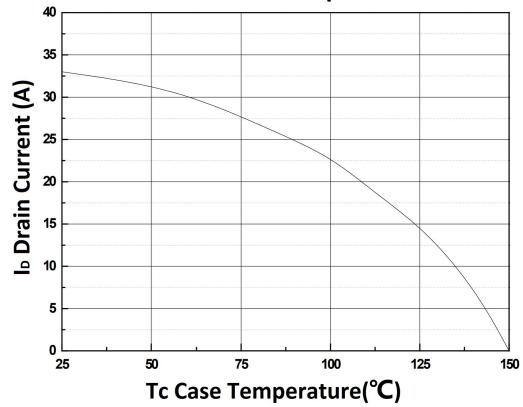
On-Resistance Variation vs. Temperature



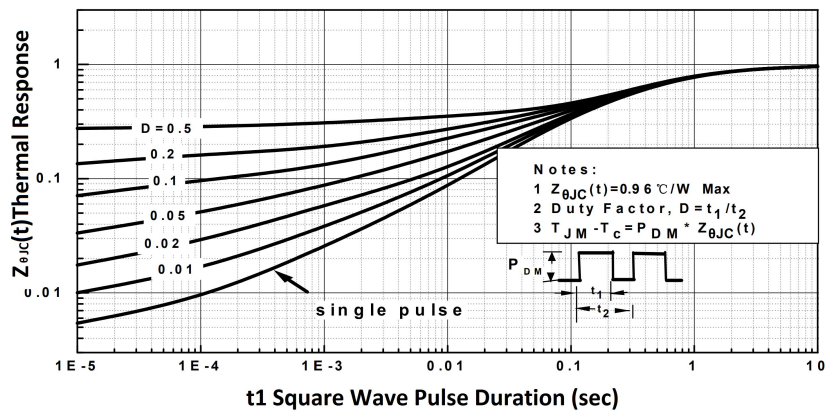
Maximum Safe Operating Area



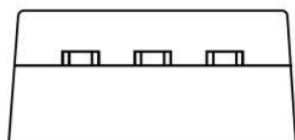
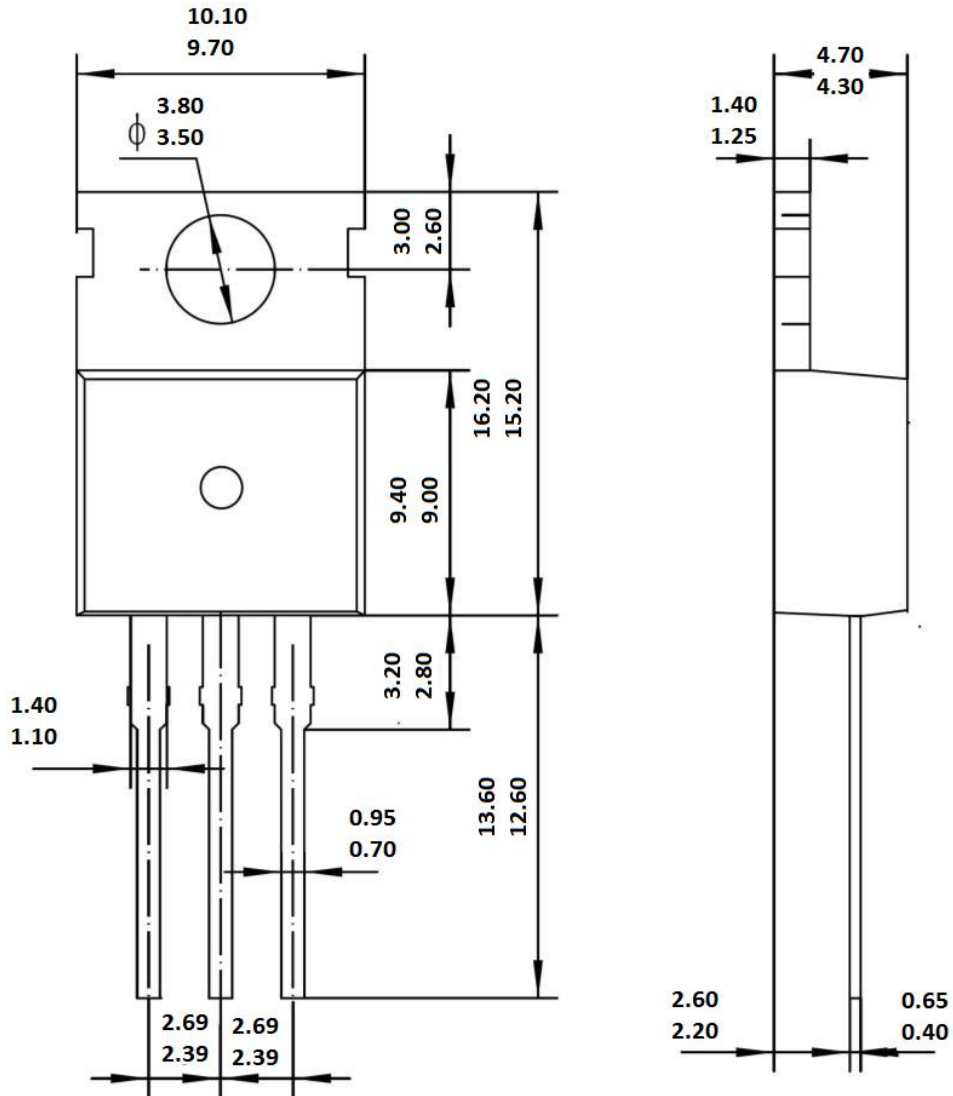
Maximum Drain Current vs. Case Temperature



Transient Thermal Response Curve



Package Mechanical DATA



TO-220

Unit: mm

