



HY4N65

N-CHANNEL POWER MOSFET

4A, 650V N-CHANNEL POWER MOSFET

DESCRIPTION

The HY4N65A is a high voltage power MOSFET designed to have better characteristics, such as fast switching time, low gate charge, low on-state resistance and have a high rugged avalanche characteristic. This power MOSFET is usually used in high speed switching applications including power supplies, PWM motor controls, high efficient AC to DC converters and bridge circuits.

FEATURES

- * $R_{DS(ON)} \leq 2.5 \Omega$ @ $V_{GS}=10V$, $I_D=2.2A$
- * Fast Switching Capability
- * Avalanche Energy Specified
- * Improved dv/dt Capability, High Ruggedness

MARKING

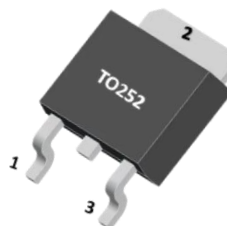


: HY LOGO

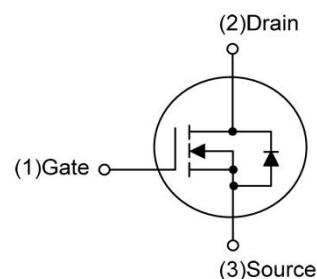
HY4N65A=Device Code

XXXX=Date Code

Solid Dot=Green molding compound



SYMBOL



ABSOLUTE MAXIMUM RATINGS($T_A=25^\circ C$, unless otherwise specified.)

SYMBOL	PARAMETER		VALUE	UNIT
V_{DS}	Drain-Source Voltage		650	V
V_{GS}	Gate Source Voltage		± 30	V
I_{AR}	Avalanche Current (Note 2)		4.4	A
I_D	Continuous Drain Current		4.0	A
I_{DM}	Pulsed Drain Current (Note 2)		16	A
E_{AS}	Avalanche Energy Single Pulsed (Note 3)		260	mJ
E_{AR}	Avalanche Energy Repetitive (Note2)		10.6	mJ
P_D	Power Dissipation (Note 1)	TO-220F	35	W
		TO-252	50	W
T_J	Junction Temperature		150	$^\circ C$
T_{STG}	Storage Temperature		-55 to 150	$^\circ C$
$R_{\theta JA}$	Thermal Resistance from Junction to Ambient (Note 6)	TO-220F	62.5	$^\circ C/W$
		TO-252	110	
$R_{\theta JC}$	Thermal Resistance From Junction To Case (Note 1)	TO-220F	3.5	$^\circ C/W$
		TO-252	2.5	

Note: 1. Absolute maximum ratings are those values beyond which the device could be permanently damaged.
Absolute maximum ratings are stress ratings only and functional device operation is not implied.



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2. Repetitive Rating: Pulse width limited by maximum junction temperature.
3. $L = 30\text{mH}$, $I_{AS} = 4\text{A}$, $V_{DD} = 50\text{V}$, $R_G = 25\ \Omega$, Starting $T_J = 25^\circ\text{C}$
4. $I_{SD} \leq 4.4\text{A}$, $di/dt \leq 200\text{A}/\mu\text{s}$, $V_{DD} \leq BV_{DSS}$, Starting $T_J = 25^\circ\text{C}$

■ ELECTRICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS						
Drain-Source Breakdown Voltage	V(BR)DSS	VGS=0V, ID=250μA	650			V
Drain-Source Leakage Current	IDSS	VDS=650V, VGS=0V			10	μA
		VDS=480V, Tc=125°C			100	μA
Gate-Source Leakage Current	IGSS	VGS = ± 30V, VDS=0V			±100	nA
Breakdown Voltage Temperature Coefficient	△BVDSS / △TJ	ID=250μA Referenced to 25°C		0.6		V/°C
ON CHARACTERISTICS						
Drain-source on-state resistance	RDS(ON)	VGS=10V, ID=2.2A		2.4	2.5	Ω
Gate Threshold Voltage	VGS(TH)	VGS=VDS,ID=250μA	2.0		4.0	V
DYNAMIC PARAMETERS						
Input Capacitance	CISS	VGS=0V,VDS=25V,f=1.0MHz		670	750	pF
Output Capacitance	COSS			70	90	
Reverse Transfer Capacitance	CRSS			23	26	
SWITCHING PARAMETERS						
Total gate charge	Qg	VDS=520V,VGS=10V,ID=4.0A (Note 1, 2)		100	120	nC
Gate-source charge	Qgs			17	19	
Gate-drain charge	Qgd			20	26	
Turn-On Delay Time	tD(on)	VDD=325V,RG=25Ω,ID=4.0A (Note 1, 2)		45	85	nS
Rise time	tr			100	140	
Turn-Off Delay Time	tD(off)			200	240	
Fall time	tf			130	150	
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS						
Continuous Drain-Source Current	IS				4.4	A
Pulsed drain-source current	ISM				17.6	A
Drain-Source Diode Forward Voltage	VSD	VGS = 0 V, IS = 4.4A			1.4	V
Reverse Recovery Time	trr	dIF/dt = 100A/μs, IS = 4.4A		250		ns
Reverse Recovery Charge	Qrr	VGS = 0V (Note 1)		1.5		μC

Notes:

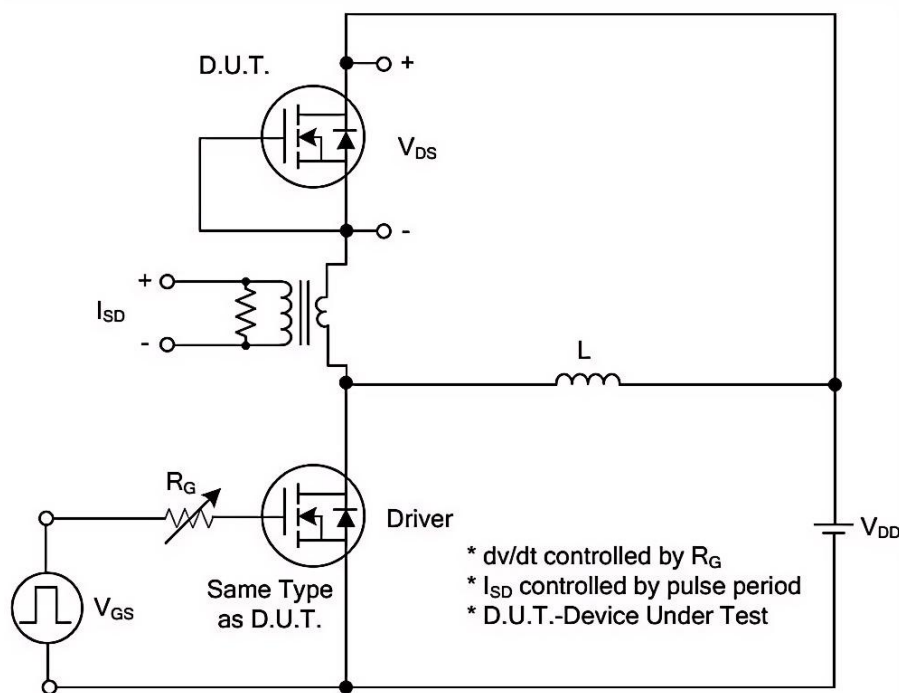
1. Pulse Test : Pulse Width $\leq 300\mu\text{s}$, duty cycle $\leq 2\%$.
2. Essentially independent of operating temperature.



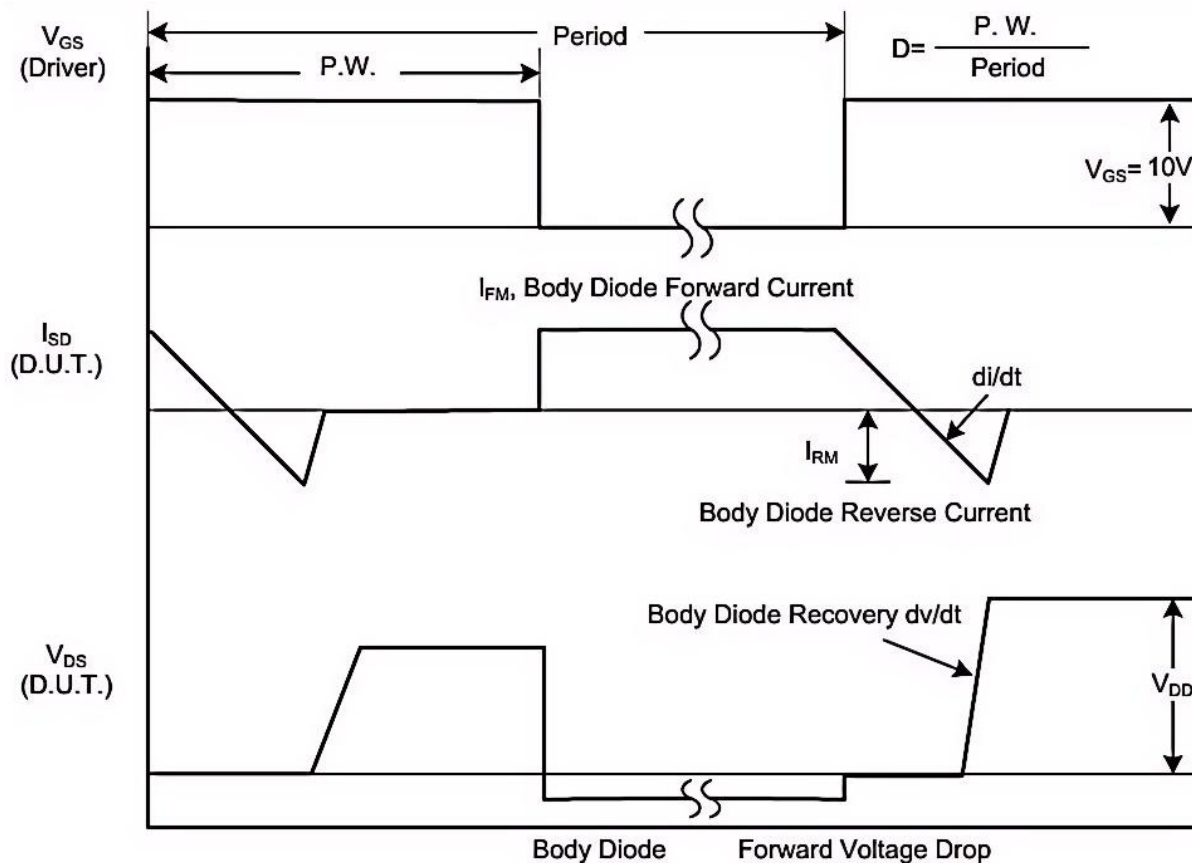
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■ TEST CIRCUITS AND WAVEFORMS



Peak Diode Recovery dv/dt Test Circuit



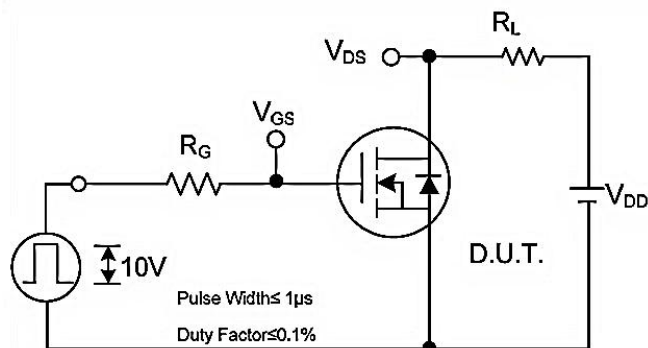
Peak Diode Recovery dv/dt Waveforms



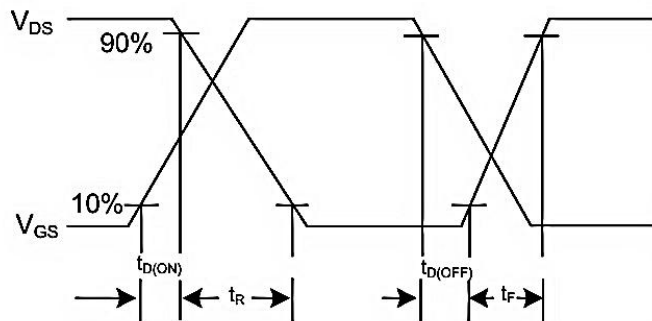
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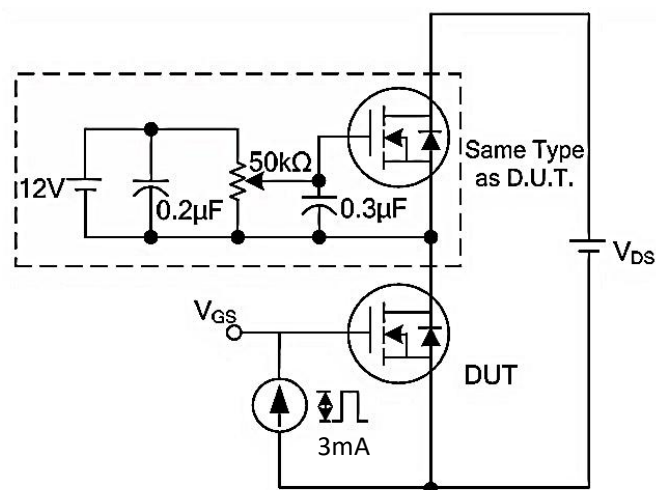
■ TEST CIRCUITS AND WAVEFORMS(Con.t)



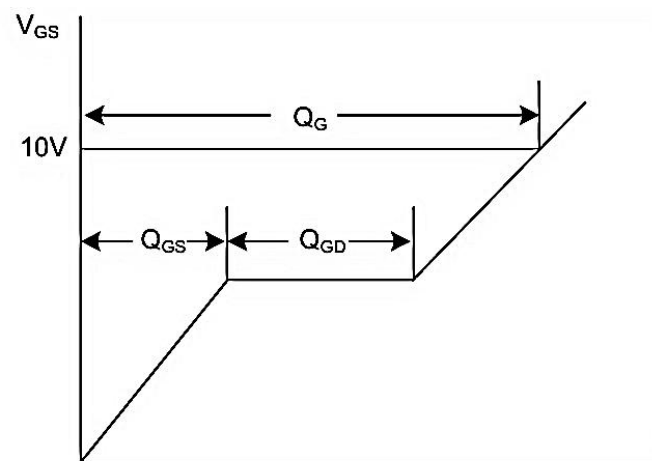
Switching Test Circuit



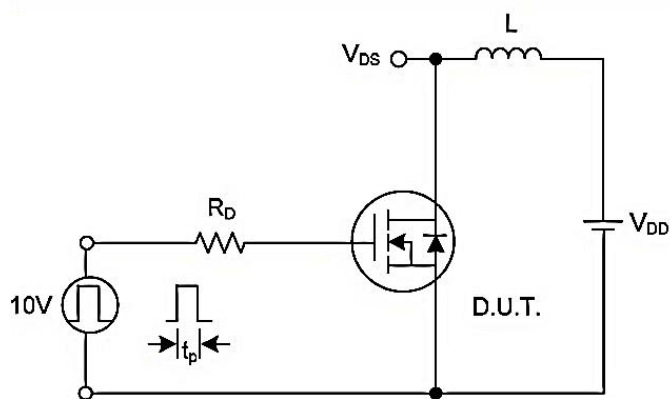
Switching Waveforms



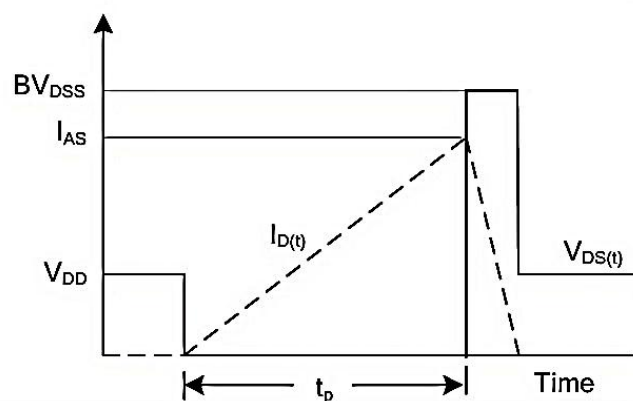
Gate Charge Test Circuit



Gate Charge Waveform



Unclamped Inductive Switching Test Circuit



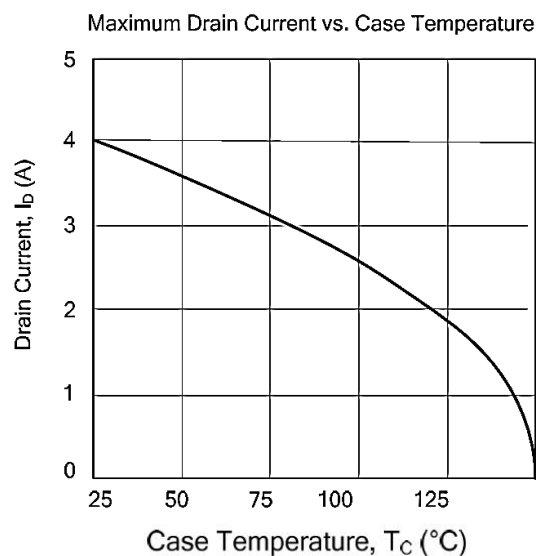
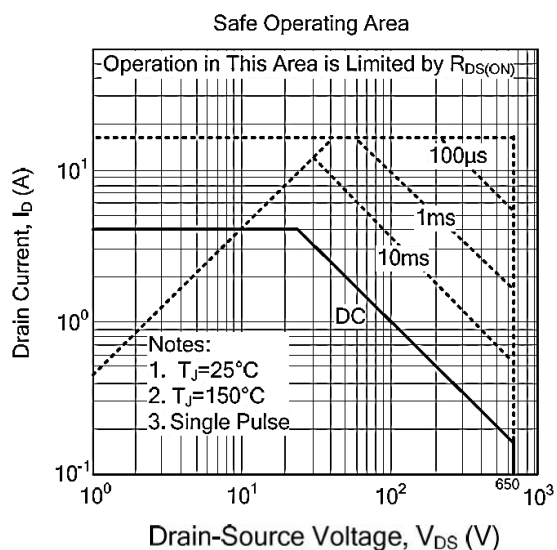
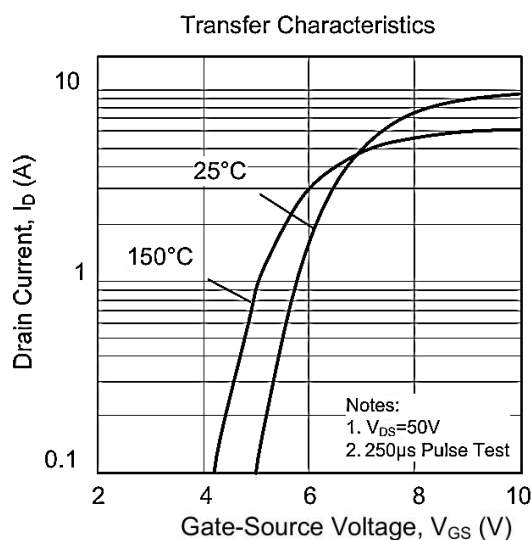
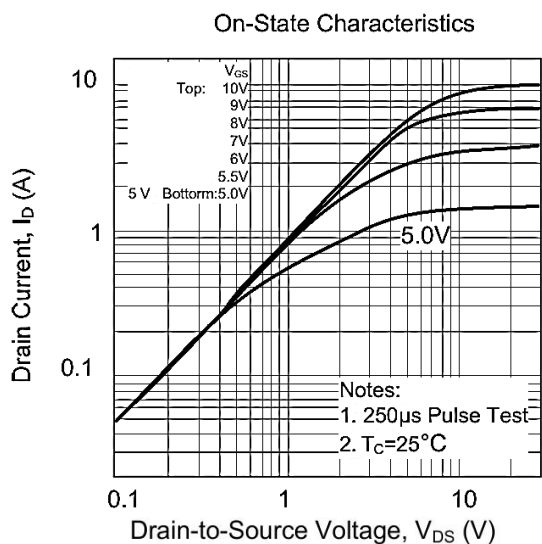
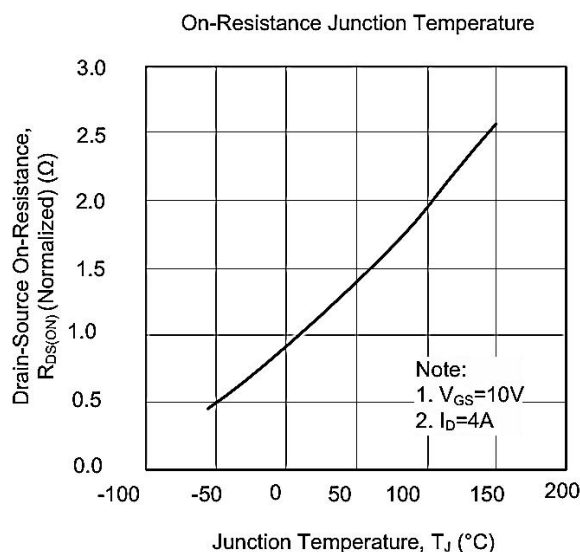
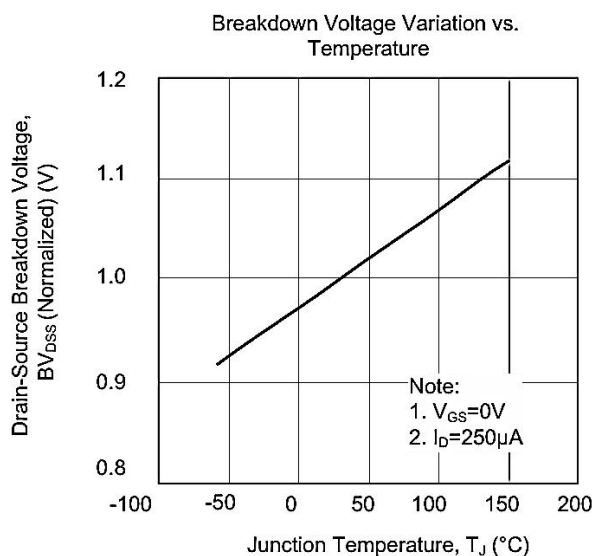
Unclamped Inductive Switching Waveforms



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■ TYPICAL CHARACTERISTICS



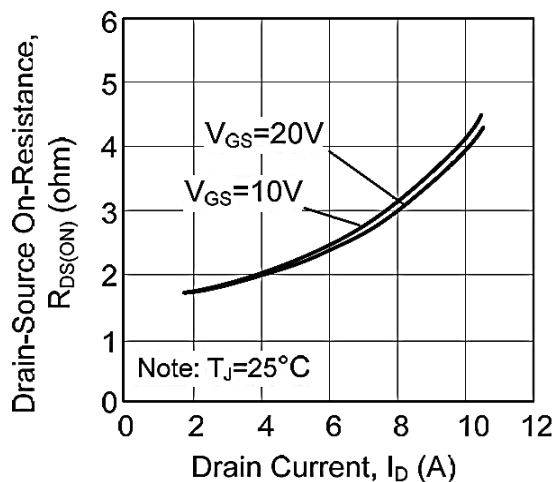


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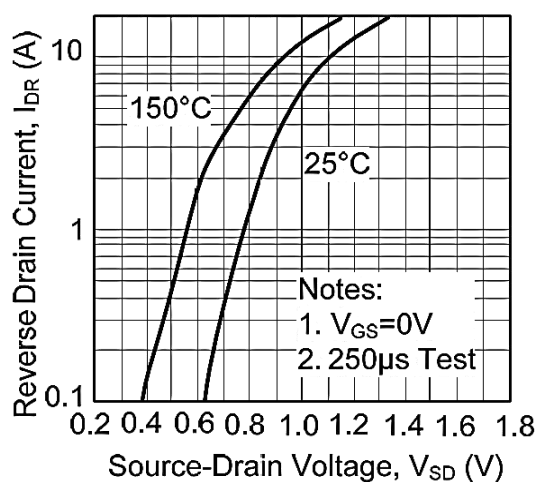
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■ TYPICAL CHARACTERISTICS(Con.t)

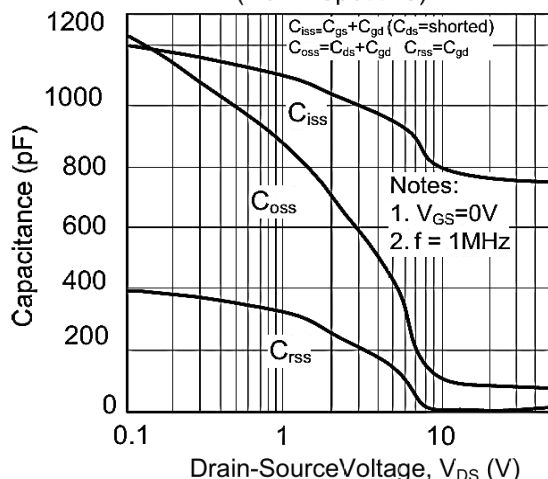
On-Resistance Variation vs. Drain Current and Gate Voltage



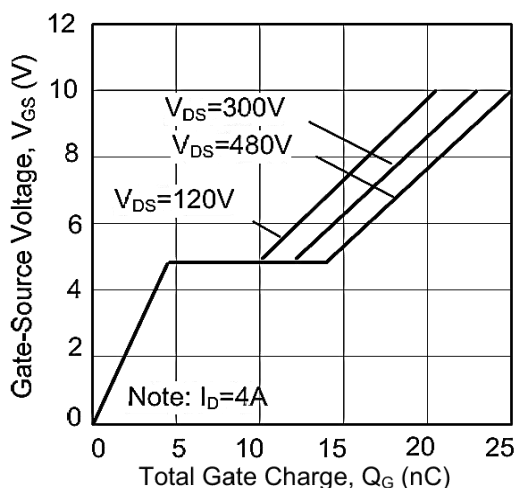
On State Current vs. Allowable Case Temperature



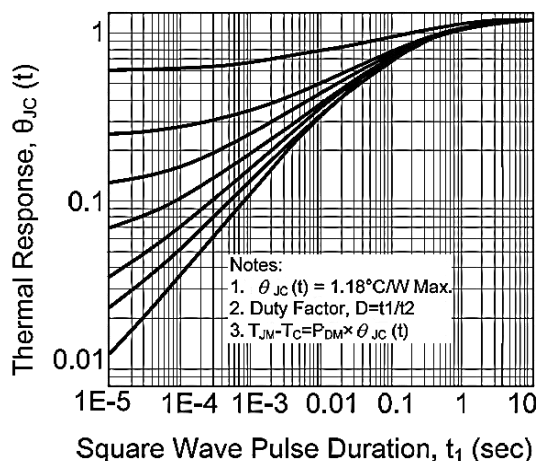
Capacitance Characteristics (Non-Repetitive)



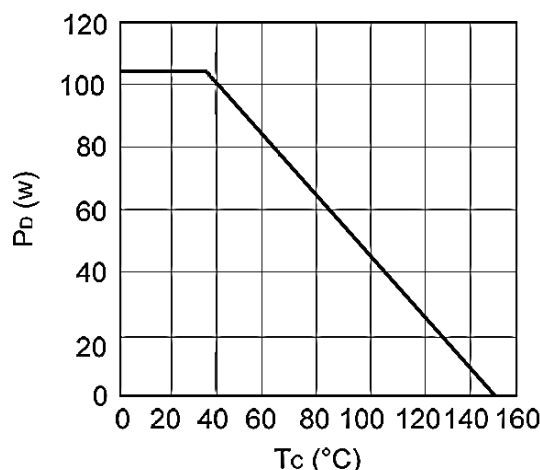
Gate Charge Characteristics



Transient Thermal Response Curve



Power Dissipation

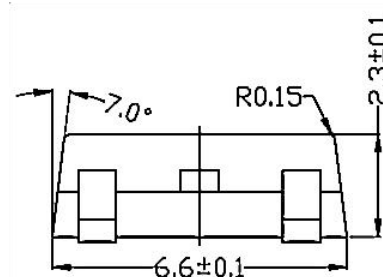
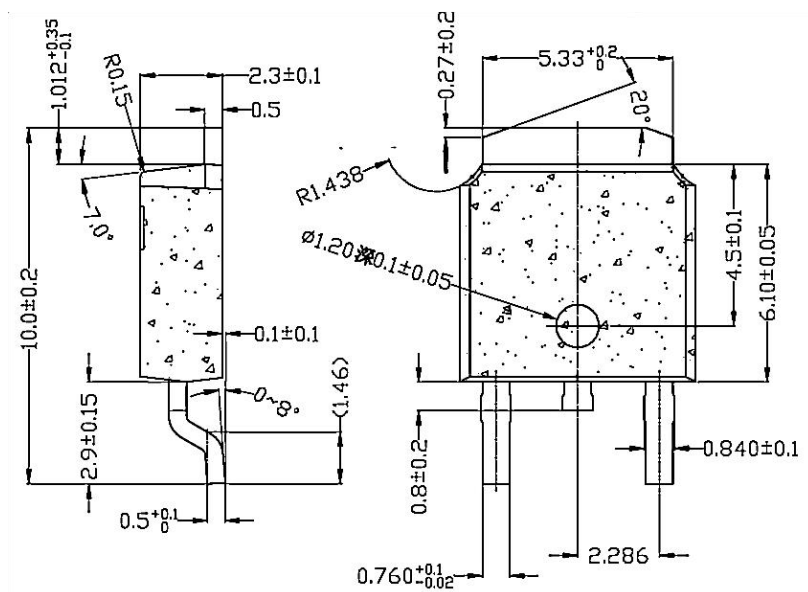




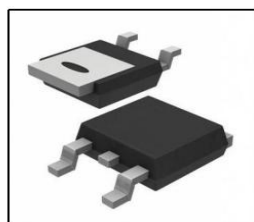
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TO - 252 PACKAGE OUTLINE DIMENSIONS



TO - 252 PACKING INFORMATION



2500PC
S/reel



2 Reel/BOX



Outer box

5 Inner
Box



Inner box

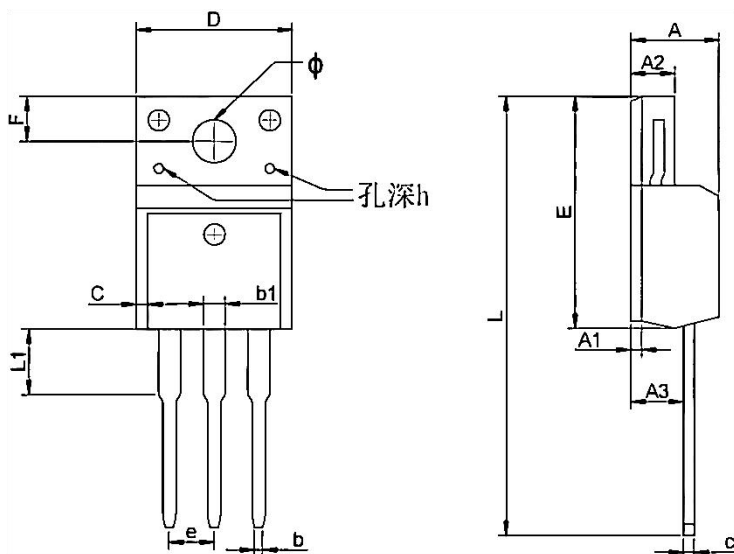
Package version	Reel dimensions $\Phi \times H$ (mm)	Per Reel (pcs)	Reels per box	Inner box dimensions $L \times W \times H$ (mm)	Outer box (pcs)	Outer box dimensions $L \times W \times H$ (mm)
TO-252	$\Phi 330 \times 20$	2500	2	360*340*50	25000	375*375*280



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TO-220F PACKAGE OUTLINE DIMENSIONS



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	4.300	4.750	0.169	0.185
A1	1.830 REF		0.072 REF	
A2	2.300	2.850	0.090	0.112
A3	2.500	2.900	0.098	0.114
b	0.400	0.420	0.016	0.016
b1	1.220	1.280	0.048	0.050
C	0.690	0.720	0.027	0.028
c	0.490	0.510	0.019	0.020
D	9.960	10.200	0.392	0.400
E	15.000	15.950	0.588	0.625
e	2.574 TYP		0.101TYP	
F	3.470 REF		0.136 REF	
y	3.200 REF		0.125 REF	
h	0.000	0.300	0.000	0.012
L	28.780	28.900	1.128	1.133
L1	2.990	3.100	0.117	0.122

TO - 220F PACKING INFORMATION



50PCS

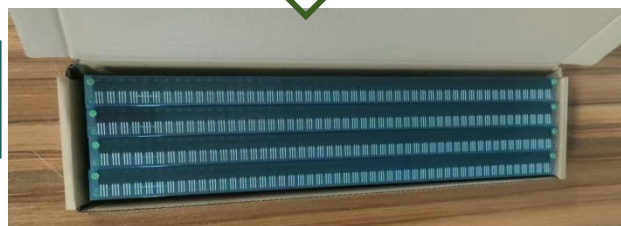


20 Tube



Outer Box

5 Inner
Box



Inner Box

Package version	Tube dimensions LxWxH (mm)	Per Tube (pcs)	Tube per box	Inner box dimensions LxWxH (mm)	PCS/ Inner box	Outer box dimensions LxWxH(mm)	PCS/ Outer box
TO-220F	530*32*7	50	20	580*155*50	1000	602*277*188	5000