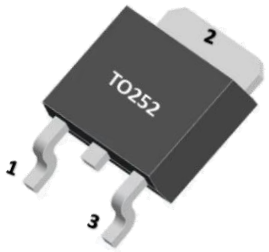
M65R380D

N-CHANNEL POWER MOSFET

11A, 650V N-CHANNEL SUPER-JUNCTION POWER MOSFET

■ DESCRIPTION

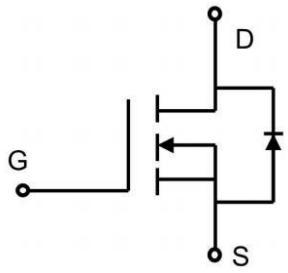
M65R380D This N-Channel enhancement mode power MOSFET is produced using advanced Super Juction technology. It achieves low conduction loss and switching losses.It leads the design engineers to their power converters with high efficiency, high power density, and superior thermal behavior. Furthermore, it's universal applicable, i.e., suitable for hard and soft switching topologies.



■ FEATURES

* V_{DS}=650V, I_D= 11A
* $R_{DS(on)}$（ max. ）=380 mΩ@V_{GS}= 10V
* New revolutionary high voltage technology
* Ultra low gate charge
* High peak current capability

SYMBOL



■ APPLICATIONS

* Switch Mode Power Supply (SMPS)
* Uninterruptible Power Supply (UPS)
* Power Factor Correction (PFC)
* LED lighting power

■ MARKING

: HY LOGO

M65R380D=Device Code

XXXX=Date Code

Solid Dot=Green molding compound

■ ABSOLUTE MAXIMUM RATINGS(TA=25°C, unless otherwise specified.)

SYMBOL	PARAMETER		VALUE	UNIT
V_{DS}	Drain-Source Voltagee(VGS=0V）		650	V
V_{GS}	Gate-Source Voltagee		±20	V
V_{GS}	Gate-Source Voltagee(VDS=0V), AC(f>1HZ)		±30	V
I_D	Continuous Drain Current	T_C=25℃	11	A
		T_C= 100℃	7	
I_{DM}	Drain Current Pulsed(Note 1)		44	A
P_D	Power Dissipation（T_C=25℃）		23	W
	-Derate above 25°C		0.19	W/℃
E_{AS}	Single Pulsed Avalanche Energy (Note 2)		166	mJ

SYMBOL	PARAMETER	VALUE	UNIT
dv/dt	Reverse Diode dv/dt, V_{DS}≤480V (Note 3)	15	V/ns
dVds/dt	Drain Source Voltage Slope, V_{DS}≤480V	50	V/ns
T_J	Operation Junction Temperature Range	-55 to+150	℃
T_{STG}	Storage Temperature Range	-55 to+150	℃

Note: E_{AS} condition: V_{DD}=20V,L=0.5mH, R_G=25Ω, Starting T_J = 25°C

■ THERMAL CHARACTERISTICS

SYMBOL	CHARACTERISTICS	MAX	UNIT
RθJC	Thermal Resistance, Junction-to-Case	1.3	℃/W
RθJA	Thermal Resistance, Junction-to-Ambient	62.5	℃/W
Tsold	Soldering Temperature, Wave Soldering only Allowed at Leads. (1.6mm from Case for 10s)	260	℃

■ ELECTRICAL CHARACTERISTICS (T_A=25°C, unless otherwise specified)

CHARACTERISTICS	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Off Characteristics						
Drain -Source Breakdown Voltage	BV_{DSS}	V_{GS}=0V, I_D=250uA	650	--	--	V
Drain-Source Leakage Current	I_{DSS}	V_{DS}=650V ， V_{GS}=0V T_J = 25℃	--	--	1.0	uA
Gate-Source Leakage Current	I_{GSS}	V_{GS}=+20V,V_{DS}=0V	--	--	100	nA
Gate-Source Leakage Current	I_{GSS}	V_{GS}=-20V,V_{DS}=0V	--	--	-100	nA
On Characteristics						
Gate Threshold Voltage	$V_{GS(th)}$	V_{GS}=V_{DS} , I_D=250uA	2.5	3.7	4.5	V
Static Drain- Source On State Resistance	$R_{DS(on)}$	V_{GS}= 10V, I_D=5.5A	--	0.32	0.38	Ω
Gate resistance	Rg	f= 1MHz	--	3.1	--	Ω
Dynamic Characteristics						
Input Capacitance	Ciss	VDS=100V, V_{GS}=0V f= 1MHz	--	678	--	pF
Output Capacitance	C0ss		--	30	--	
Reverse Transfer Capacitance	Crss		--	0.9	--	
Switching Characteristics						
Turn-on Delay Time	td(on)	V_{DD}=325V, V_{GS}=10V R_G=25Ω I_D= 11A,(Note 4,5)	--	14	--	ns
Turn-on Rise Time	tr		--	36	--	
Turn-off Delay Time	td(off)		--	48	--	
Turn-off Fall Time	tf		--	28	--	
Total Gate Charge	Qg	V_{DD}=520V, V_{GS}=0 to 10V I_D= 11A (Note 4,5)	--	20	--	nC
Gate-Source Charge	Qgs		--	5.7	--	
Gate-Drain Charge	Qgd		--	10	--	

M65R380D *N-CHANNEL POWER MOSFET*

CHARACTERISTICS	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS						
Continuous Source Current	IS	Integral Reverse P-N Junction	--	--	11	A
Pulsed Source Current	ISM	Diode in the MOSFET	--	--	44	
Diode Forward Voltage	VSD	IS= 11A, VGS=0V	--	0.9	1.4	V
Reverse Recovery Time	Trr	IS= 11A,VGS=0V	--	276	--	ns
Reverse Recovery Charge	Qrr	d IF/dt= 100A/μS	--	3.34	--	μC

Notes:

1. Repetitive Rating: Pulse Width Limited by Maximum Junction Temperature.
2. EAS condition: Starting TJ=25℃, VDD=50V, VG= 10V, RG=25ohm.
3. ISD≤ID, di/dt ≤ 200A/us, VDD ≤ BVDSS , Starting TJ =25℃ .
4. Pulse Test: Pulse Width≤300μs, Duty Cycle≤2%.
5. Essentially Independent of Operating Temperature Typical Characteristics.

■ TYPICAL CHARACTERISTICS

Fig.1: Output Characteristics

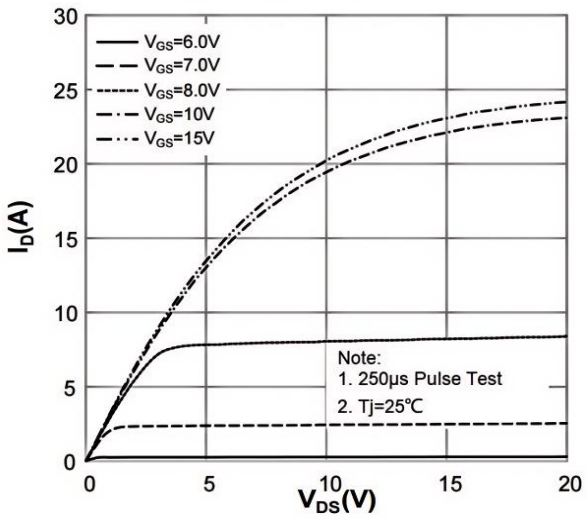


Fig.2: Typical Transfer Characteristics

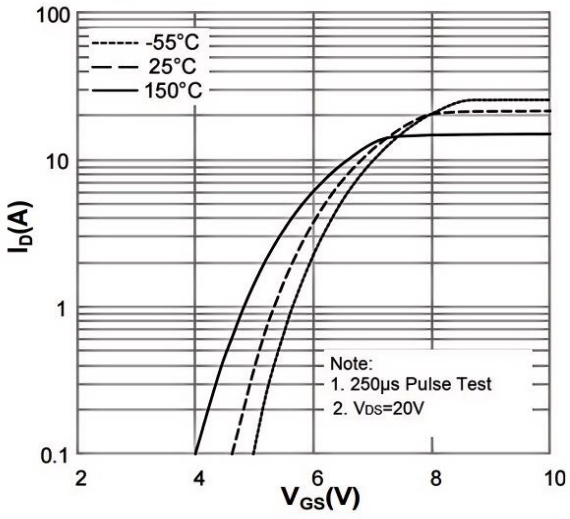


Fig.3: Typical On-resistance vs. Drain Current

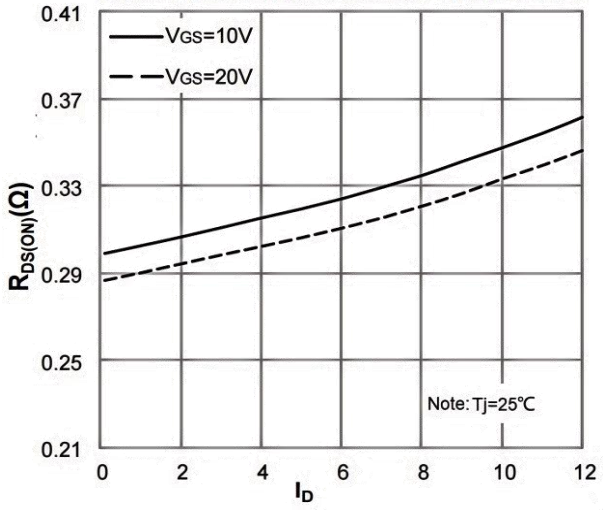
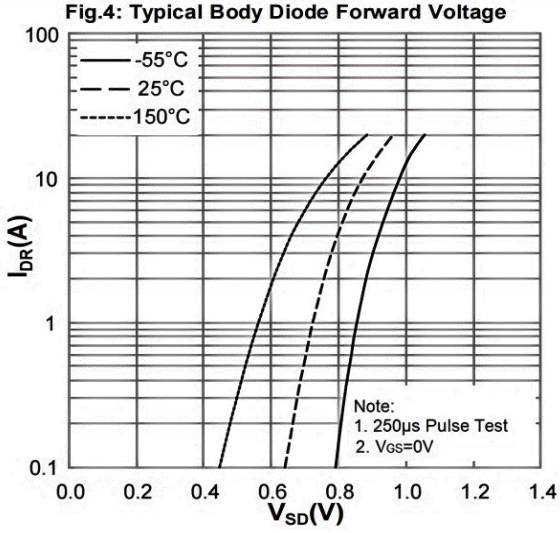


Fig.4: Typical Body Diode Forward Voltage



■ TYPICAL CHARACTERISTICS(Con.t)

Fig.5: Typical Capacitance Characteristics

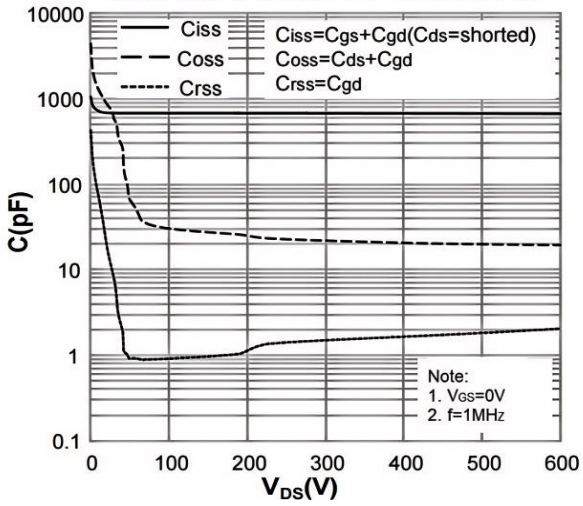


Fig.6: Typical Gate Charge Characteristics

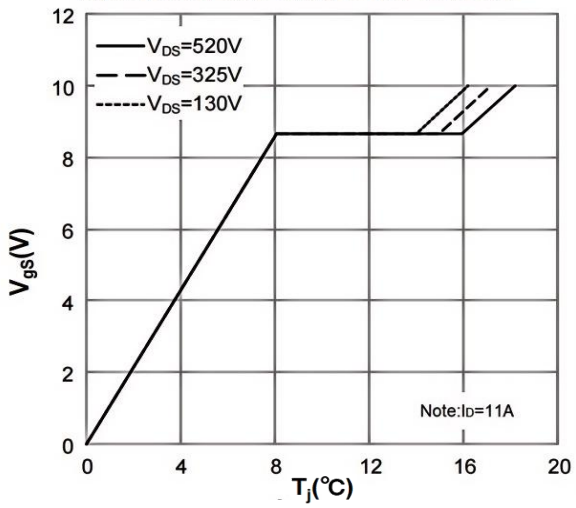


Fig.7: Nomalized Breakdown Volatge vs. Juction Temperature

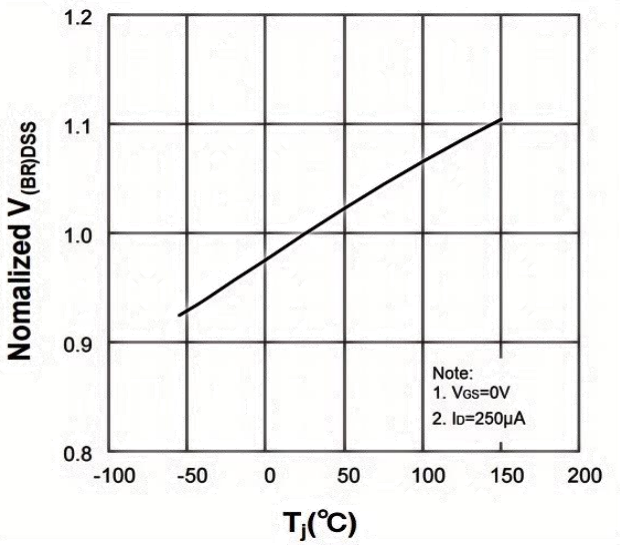


Fig.8: Nomalized on Resistance vs. Juction Temperature

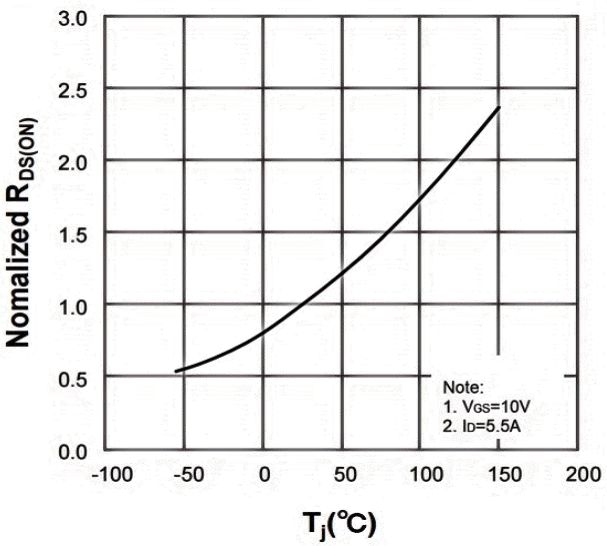
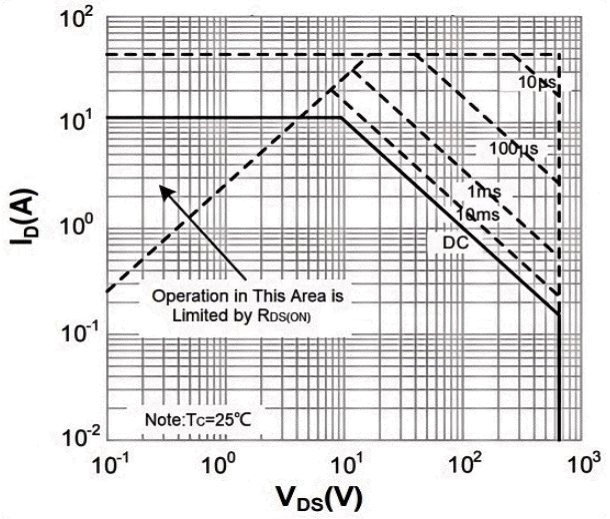
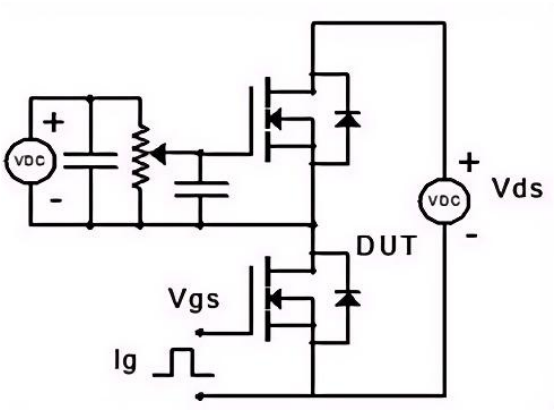


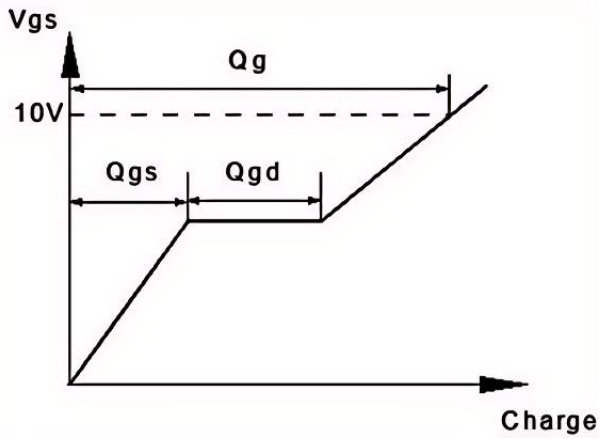
Fig.9: Maximum Safe Operating Area



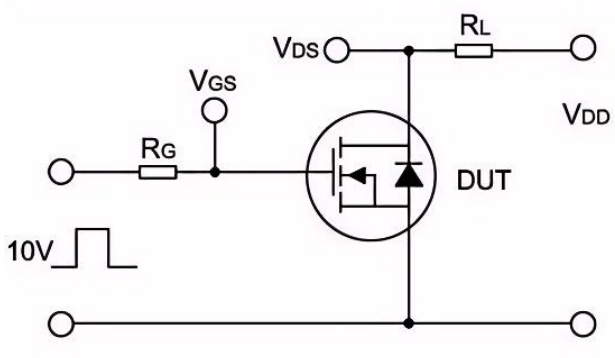
■ TEST CIRCUIT

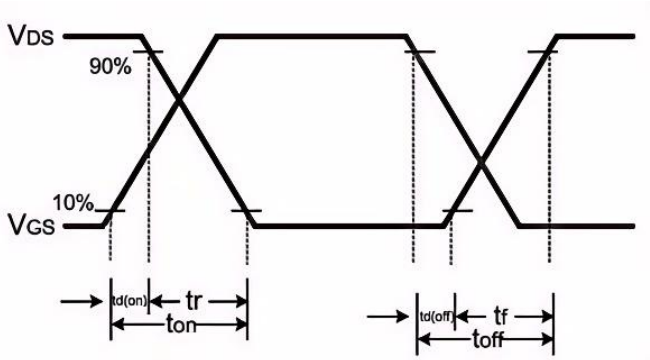
Gate Charge Test Circuit & Waveform



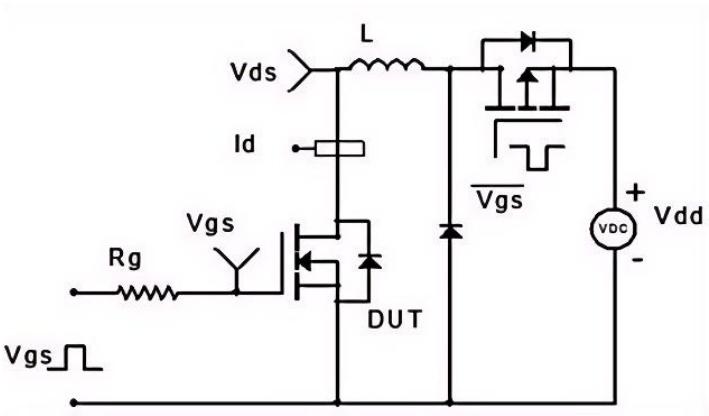


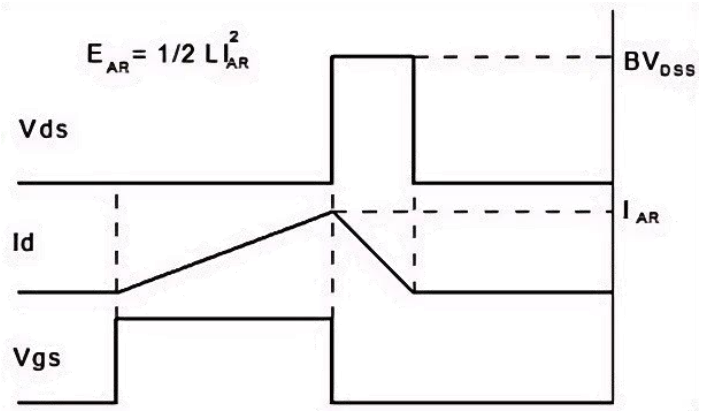
Resistive Switching Test Circuit & Waveform



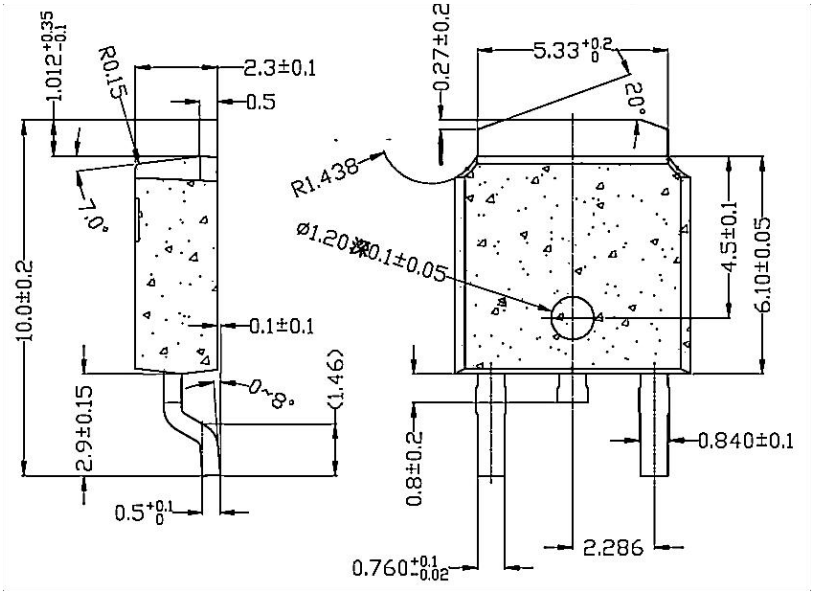


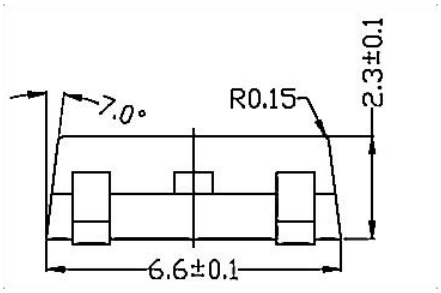
Unclamped Inductive Switching Test Circuit & Waveform



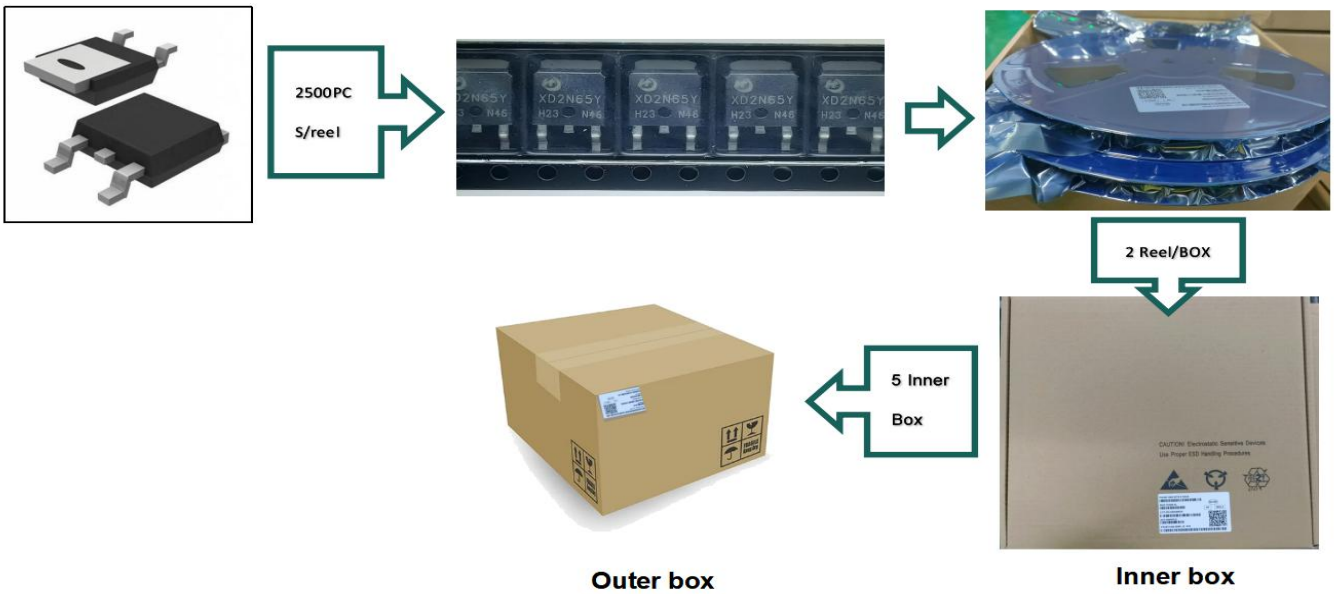


■ TO - 252 Package Outline Dimensions





■ TO - 252 Packing Information



Package version	Reel dimensions Φ×H (mm)	Per Reel (pcs)	Reels per box	Inner box dimensions L×W×H(mm)	Outer box (pcs)	Outer box dimensions L×W×H (mm)
TO-252	Φ330*20	2500	2	360*340*50	25000	375*375*280