

P-Channel Enhancement Mode MOSFET

Feature
 • -100V/40A
 • R_{DS(on)} 42mΩ (Typ) @ V_{GS} = 10V
 • R_{DS(on)} 48mΩ (Typ) @ V_{GS} = 4.5V
 • 100% Avalanche Tested
 • Reliable and Rugged
 • Halogen Free and Green Devices Available (RoHS Compliant)

Pin Description



Applications
 • Portable equipment and battery powered systems
 • DC-DC Converters
 • Motor control

Ordering and Marking Information

D	U	V	Package Code	U
G400P10	G400P10	G400P10	D: TO-252-2L	U: TO-251-3L
XYXXXXXXXXXX	XYXXXXXXXXXX	XYXXXXXXXXXX	V: TO-251-3S	
			Marking Code	XYXXXXXXXXXX

Note: HJAYI lead-free products contain molting compounds for attach materials and 100% matte in plain Term. Nation finish, which are fully compliant with RoHS. HJAYI lead-free products meet or exceed the lead-free requirements of IPC/JEDEC J-STD-020 for MSL classification at lead-free peak temperature. HJAYI defines "Green" to mean lead-free (RoHS compliant) and halogen free (BFR & CR) does not exceed 800ppm by weight in homogeneous material and total of Br and Cl does not exceed 1500ppm by weight.

HJAYI reserves the right to make changes, corrections, enhancements, modifications, and improvements to this product and/or to this document at any time without notice.

Absolute Maximum Ratings

Symbol	Parameter	Rating	Unit
Common Ratings (Tc=25°C Unless Otherwise Noted)			
V _{DS}	Drain-Source Voltage	-100	V
V _{GS}	Gate-Source Voltage	-6	V
T _J	Maximum Junction Temperature	175	°C
T _{stg}	Storage Temperature Range	-55 to 175	°C
Source Current (Continuous/Body Diode)			
I _{SM}	Ruled Drain Current *	145	A
I _S	Continuous Drain Current	40	A
P _D	Maximum Power Dissipation	Tc=25°C	150
		Tc=100°C	50
R _{θJC}	Thermal Resistance, Junction-to-Case	1.5	°C/W
R _{θJA}	Thermal Resistance, Junction-to-Ambient [†]	170	°C/W
E _{AS}	Single-Pulse Avalanche Energy [‡]	140	mJ
* Limited by Tjmax, starting Tj=25°C, L = 0.3cm, V _{DS} =10V, V _{GS} =10V			

Note: * Repetitive rating, pulse width limited by max junction temperature.
 † Surface mounted on 1x2 FR-4 board.
 ‡ Limited by Tjmax, starting Tj=25°C, L = 0.3cm, V_{DS}=10V, V_{GS}=10V

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

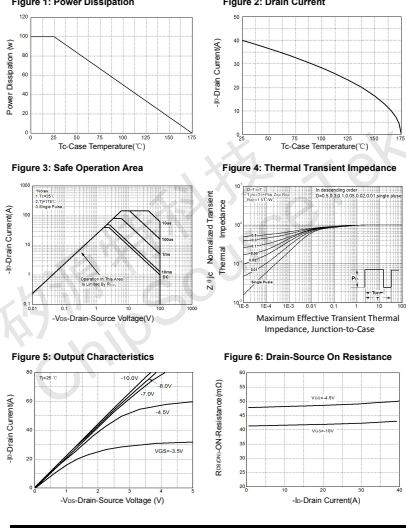
Symbol	Parameter	Test Conditions	HYG400P10LR1			Unit
			Min.	Typ.	Max.	
Static Characteristics						
BV _{DS}	Drain-Source Breakdown Voltage	V _{GS} =0V, I _{DS} =250μA	-100	-	-	V
I _{DS}	Drain-Source Leakage Current	V _{GS} =0V, V _{DS} =100V	-	-	-1	μA
I _{GS}	Gate-Source Leakage Current	V _{DS} =0V, V _{GS} =10V	-	-	5	μA
V _{GS(th)}	Gate Threshold Voltage	V _{GS} =V _{DS} , I _{DS} =250μA	-1	-2	-3	V
I _{GS(off)}	Gate-Source Leakage Current	V _{DS} =20V, V _{GS} =10V	0	-	±100	μA
R _{DS(on)}	Drain-Source On-State Resistance	V _{GS} =10V, I _{DS} =20A	42	55	60	mΩ
Diode Characteristics						
V _{SD}	Diode Forward Voltage	I _{SM} =20A, V _{GS} =0V	-0.8	-	-1.3	V
t _{rr}	Reverse Recovery Time	I _{SM} =20A, I _{SM} =100A, μs	-	-	80	ns
Q _r	Reverse Recovery Charge		-	-	70	nC

Electrical Characteristics (Cont.) (Tc=25°C Unless Otherwise Noted)

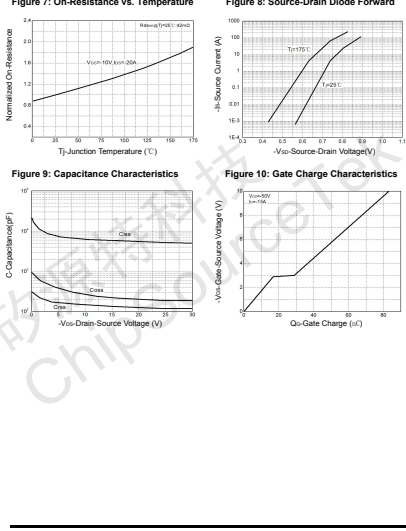
Symbol	Parameter	Test Conditions	HYG400P10LR1			Unit
			Min.	Typ.	Max.	
Dynamic Characteristics						
R _g	Gate Resistance	V _{GS} =0V, V _{DS} =0V, f=10kHz	-	9.4	-	Ω
C _{iss}	Input Capacitance	V _{GS} =0V, V _{DS} =0V	-	3000	-	pF
C _{oss}	Output Capacitance	V _{GS} =10V, V _{DS} =100V	-	160	-	pF
C _{rs}	Reverse Transfer Capacitance	Frequency=1.0MHz	-	111	-	pF
t _{on}	Turn-on Delay Time	V _{GS} =10V, V _{DS} =0V	-	22	-	ns
t _{rise}	Turn-on Rise Time	V _{GS} =10V, V _{DS} =0V	-	28	-	ns
t _{fall}	Turn-off Fall Time	I _{SM} =20A, V _{GS} =10V	-	74	-	ns
t _{off}	Turn-off Delay Time	I _{SM} =20A, V _{GS} =10V	-	66	-	ns
Gate Charge Characteristics						
Q _g	Total Gate Charge	V _{GS} =10V, V _{DS} =10V	-	83.1	-	nC
Q _{gs}	Gate-Source Charge	I _{SM} =15A	-	16.8	-	nC
Q _{gd}	Gate-Drain Charge		-	12	-	nC

Note: * Pulse test, pulse width is 300μs, duty cycle is 5.2%

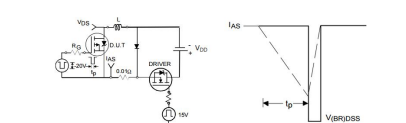
Typical Operating Characteristics



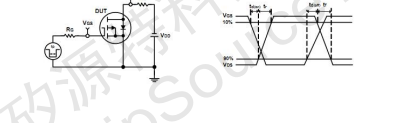
Typical Operating Characteristics(Cont.)



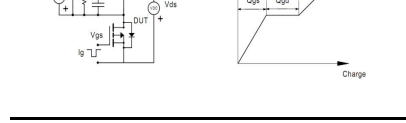
Avallanche Test Circuit and Waveforms



Switching Time Test Circuit and Waveforms



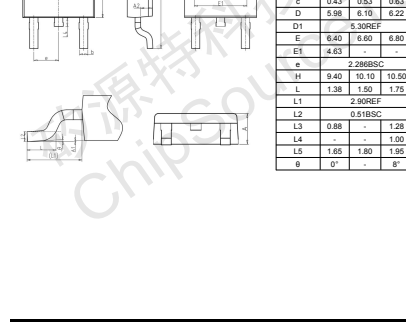
Gate Charge Test Circuit and Waveforms



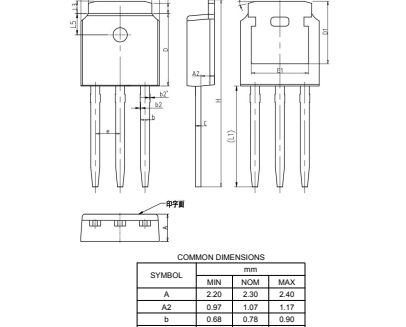
Device Per Unit

Package Type	Unit	Quantity
TO-252-2L	Tape	75
TO-251-3S	Tape	75
TO-251-3S	Tube	75

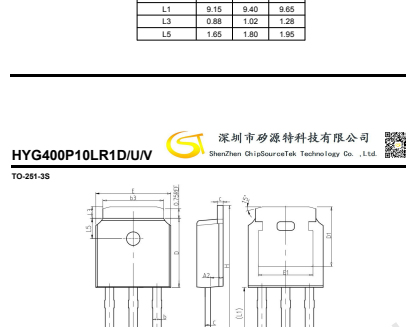
Package Information TO-252-2L



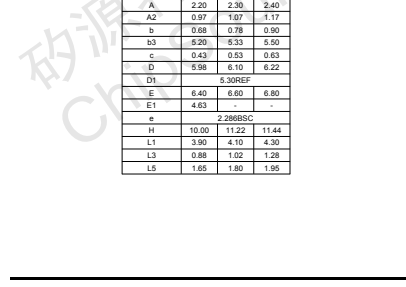
TO-251-3L



TO-251-3S



Classification Profile



Profile	Prefeat & Solder	Su-Pb Eutectic Assembly	Pb-Free Assembly
Temperature min (T _{min})	100 °C	150 °C	150 °C
Temperature max (T _{max})	260 °C	260 °C	260 °C
Time (T _{min} to T _{max})	60-120 seconds	60-120 seconds	60-120 seconds
Average temp. (T _{avg})	3 °C/second max.	3 °C/second max.	3 °C/second max.
Time at liquidus (t _L)	60-150 seconds	60-150 seconds	60-150 seconds
Time at 23 °C	See Classification Temp in table 1	See Classification Temp in table 2	See Classification Temp in table 2
Time to 23 °C within 5 °C of the specified classification temperature (T ₅)	30" seconds	30" seconds	30" seconds
Average temperature with T ₅ (T ₅)	6 °C/second max.	6 °C/second max.	6 °C/second max.
Time 23 °C to peak temperature	6 minutes max.	6 minutes max.	6 minutes max.

*Tolerance for peak profile Temperature (T₅) is defined as a supplier minimum and a user maximum.
 †Tolerance for time at peak profile temperature (t_L) is defined as a supplier minimum and a user maximum.

Table 1 Su-Pb Eutectic Process - Classification Temperatures (°C)

Package	Volume mm ³	Volume mm ³	Volume mm ³
Thickness	<350	350-2000	>2000
<2.5 mm	200 °C	200 °C	200 °C
≥2.5 mm	250 °C	245 °C	245 °C

Table 2 Pb-Free Process - Classification Temperatures (°C)

Package	Volume mm ³	Volume mm ³	Volume mm ³
Thickness	<350	350-2000	>2000
<1.6 mm < 2.5 mm	200 °C	200 °C	200 °C
≥ 2.5 mm	250 °C	245 °C	245 °C

Reliability Test Program

Test Item	Method	Description
SOLDERABILITY	JESD-22, A102	3 Sec, 240 °C
PROGON	JESD-22, A113	30"/2000"/100hrs
HTR	JESD-22, A108	168 hrs/500hr/1000hr, Bias @ 150 °C
HTR	JESD-22, A108	168 hrs/500hr/1000hr, V _{GS} 100% @ 150 °C
PCT	JESD-22, A102	85 hrs, 100%RH, Bias @ 21 °C
TCT	JESD-22, A104	500 Cycles, 55 °C~150 °C