

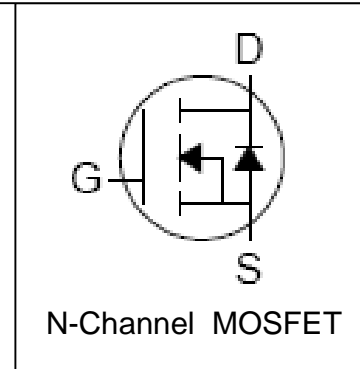
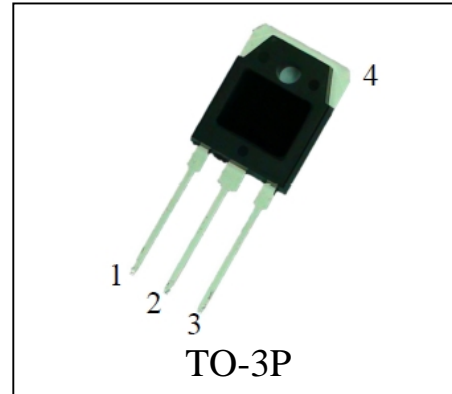
### Features

- 40V/190A,  
 $R_{DS(ON)}=2.5m$  (Typ.)@ $V_{GS}=10V$
- Super High Dense Cell Design
- Ultra Low On-Resistance
- 100% avalanche tested
- Lead Free and Green Devices Available  
 (RoHS Compliant)

### Applications

- DC-DC Converters and Off-line UPS
- Switching Applications

### Pin Description



### Absolute Maximum Ratings

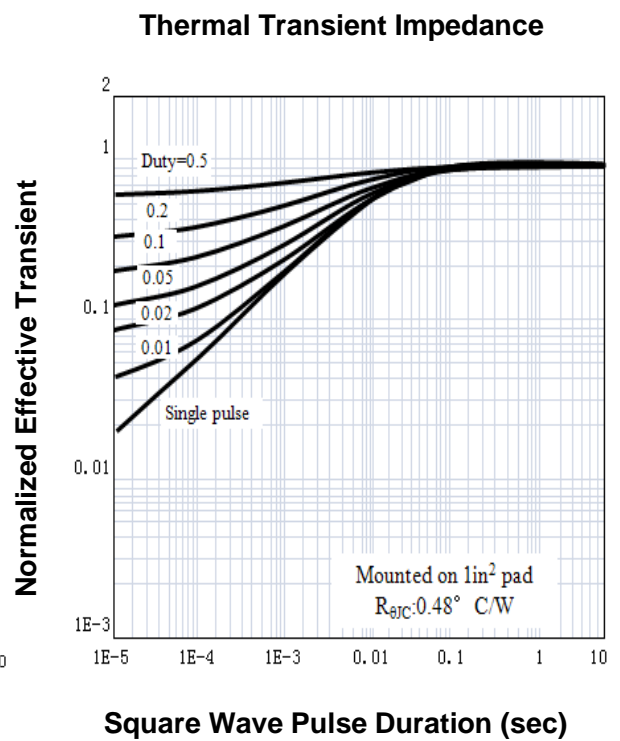
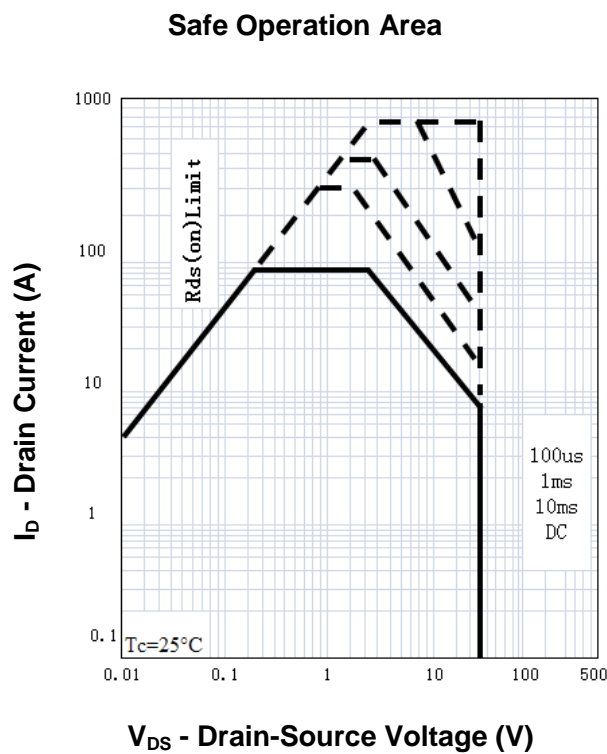
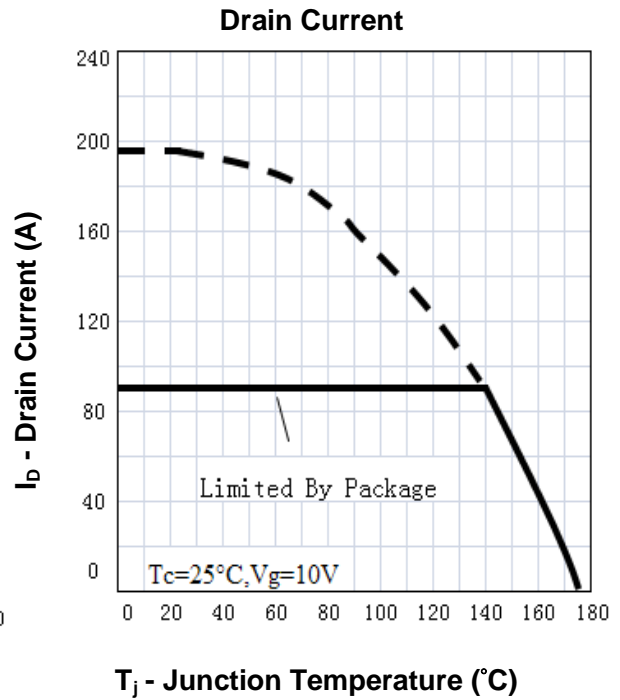
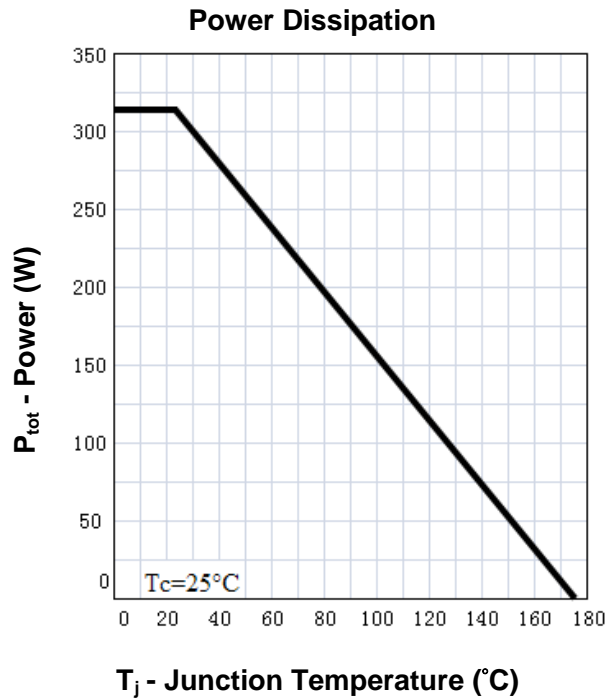
Symbol	Parameter	Rating	Unit
<b>Common Ratings</b> ( $T_C=25^\circ C$ Unless Otherwise Noted)			
$V_{DSS}$	Drain-Source Voltage	40	V
$V_{GSS}$	Gate-Source Voltage	$\pm 20$	
$T_J$	Maximum Junction Temperature	175	$^\circ C$
$T_{STG}$	Storage Temperature Range	-55 to 175	$^\circ C$
$I_S$	Diode Continuous Forward Current	$T_C=25^\circ C$ 190 <sup>①</sup>	A
<b>Mounted on Large Heat Sink</b>			
$I_{DP}$	300 $\mu s$ Pulse Drain Current Tested	$T_C=25^\circ C$ 760 <sup>②</sup>	A
$I_D$	Continuous Drain Current( $V_{GS}=10V$ )	$T_C=25^\circ C$ 190 <sup>①</sup>	A
		$T_C=100^\circ C$ 146 <sup>①</sup>	
$P_D$	Maximum Power Dissipation	$T_C=25^\circ C$ 312	W
		$T_C=100^\circ C$ 156	W
$R_{\theta JC}$	Thermal Resistance-Junction to Case	0.48	$^\circ C/W$
<b>Drain-Source Avalanche Ratings</b>			
$E_{AS}$ <sup>③</sup>	Avalanche Energy, Single Pulsed	812	mJ

**Electrical Characteristics** ( $T_C=25^\circ\text{C}$  Unless Otherwise Noted)

Symbol	Parameter	Test Condition	RU40190Q2			Unit
			Min.	Typ.	Max.	
<b>Static Characteristics</b>						
$BV_{DSS}$	Drain-Source Breakdown Voltage	$V_{GS}=0V, I_{DS}=250\mu A$	40			V
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS}=40V, V_{GS}=0V$ $T_J=85^\circ\text{C}$			1 30	$\mu A$
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_{DS}=250\mu A$	2	3	4	V
$I_{GSS}$	Gate Leakage Current	$V_{GS}=\pm 20V, V_{DS}=0V$			$\pm 100$	nA
$R_{DS(ON)}^{(4)}$	Drain-Source On-state Resistance	$V_{GS}=10V, I_{DS}=75A$		2.5	3.5	m $\Omega$
<b>Diode Characteristics</b>						
$V_{SD}^{(4)}$	Diode Forward Voltage	$I_{SD}=75A, V_{GS}=0V$			1.2	V
$t_{rr}$	Reverse Recovery Time	$I_{SD}=75A, di_{SD}/dt=100A/\mu s$		40		ns
$Q_{rr}$	Reverse Recovery Charge			52		nC
<b>Dynamic Characteristics</b> <sup>(5)</sup>						
$R_G$	Gate Resistance	$V_{GS}=0V, V_{DS}=0V, F=1\text{MHz}$		1.2		$\Omega$
$C_{iss}$	Input Capacitance	$V_{GS}=0V,$ $V_{DS}=20V,$ Frequency=1.0MHz		4800		pF
$C_{oss}$	Output Capacitance			950		
$C_{riss}$	Reverse Transfer Capacitance			480		
$t_{d(ON)}$	Turn-on Delay Time			19		
$t_r$	Turn-on Rise Time	$V_{DD}=20V, R_L=0.3\Omega,$ $I_{DS}=75A, V_{GEN}=10V,$ $R_G=2.5\Omega$		96		
$t_{d(OFF)}$	Turn-off Delay Time			70		
$t_f$	Turn-off Fall Time			50		
<b>Gate Charge Characteristics</b> <sup>(5)</sup>						
$Q_g$	Total Gate Charge	$V_{DS}=32V, V_{GS}=10V,$ $I_{DS}=75A$		120		nC
$Q_{gs}$	Gate-Source Charge			34		
$Q_{gd}$	Gate-Drain Charge			46		

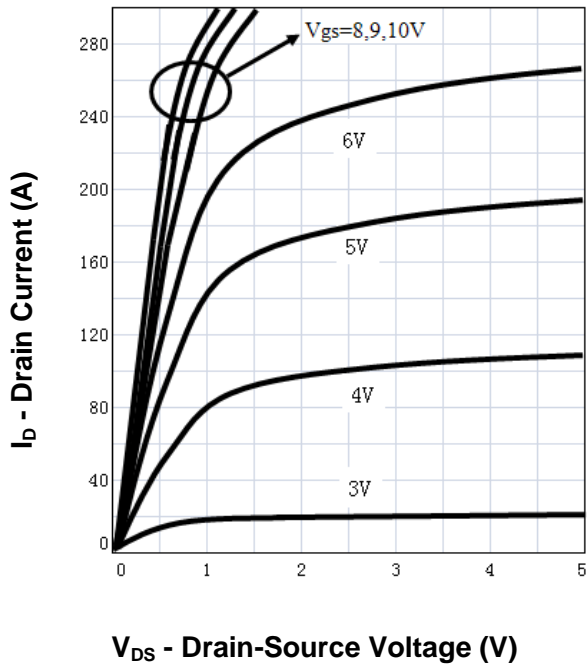
- Notes: ① Calculated continuous current based on maximum allowable junction temperature. Package limitation current is 90A.  
 ② Pulse width limited by safe operating area.  
 ③ Limited by  $T_{Jmax}, I_{AS}=57A, V_{DD}=32V, R_G=50\Omega$ , Starting  $T_J=25^\circ\text{C}$ .  
 ④ Pulse test; Pulse width  $\leq 300\mu s$ , duty cycle  $\leq 2\%$ .  
 ⑤ Guaranteed by design, not subject to production testing.

**Typical Characteristics**

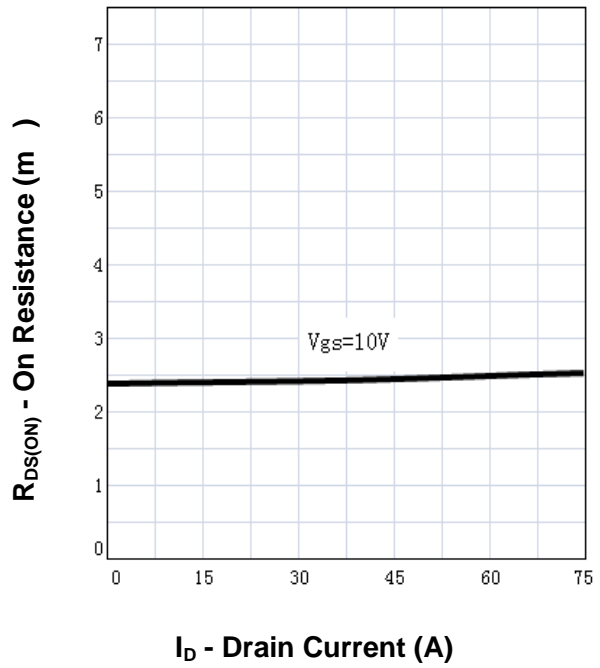


**Typical Characteristics**

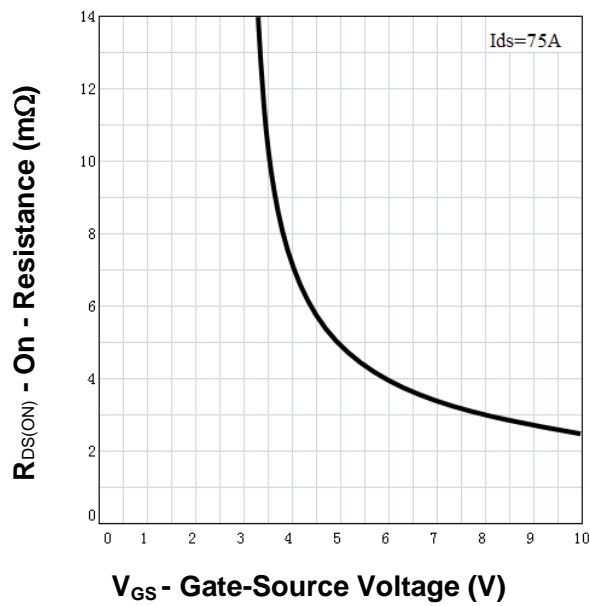
**Output Characteristics**



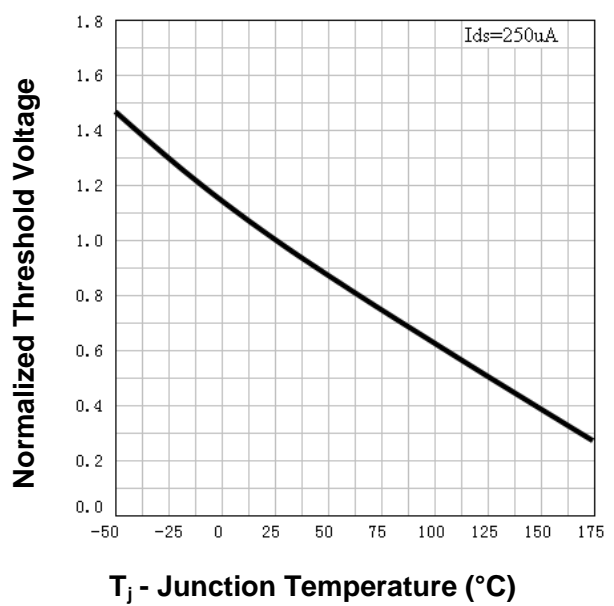
**Drain-Source On Resistance**



**Drain-Source On Resistance**

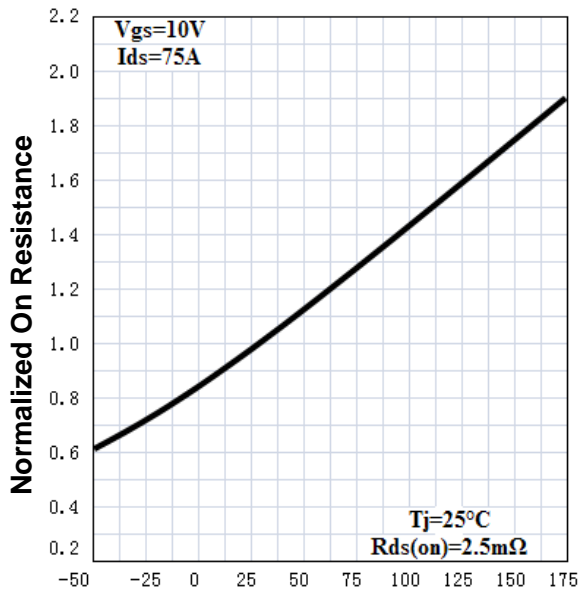


**Gate Threshold Voltage**



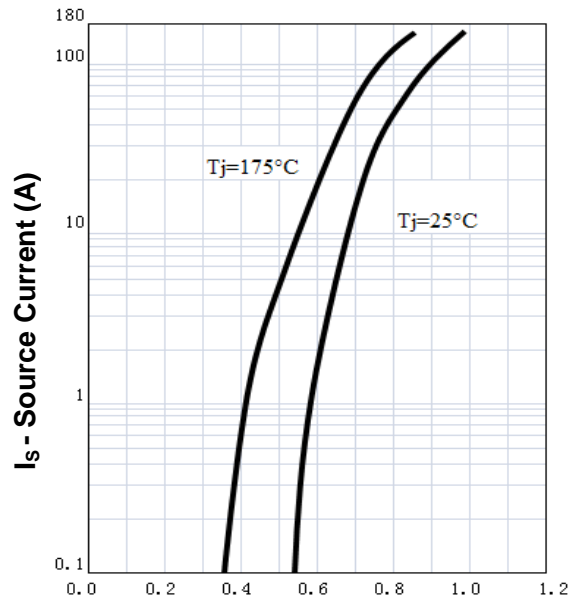
**Typical Characteristics**

**Drain-Source On Resistance**



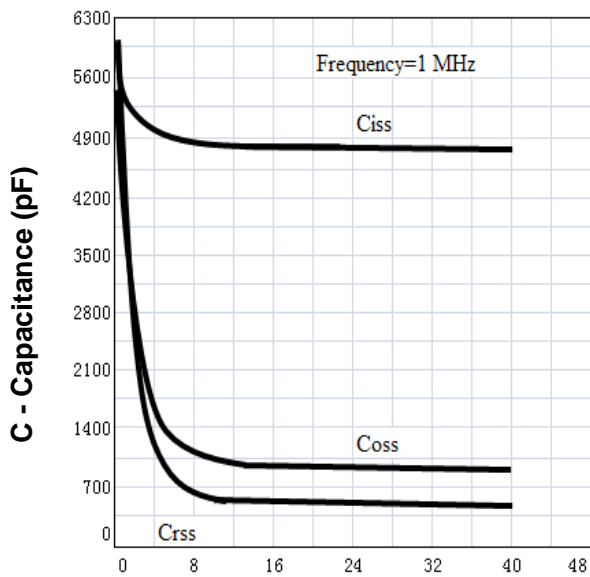
**T<sub>j</sub> - Junction Temperature (°C)**

**Source-Drain Diode Forward**



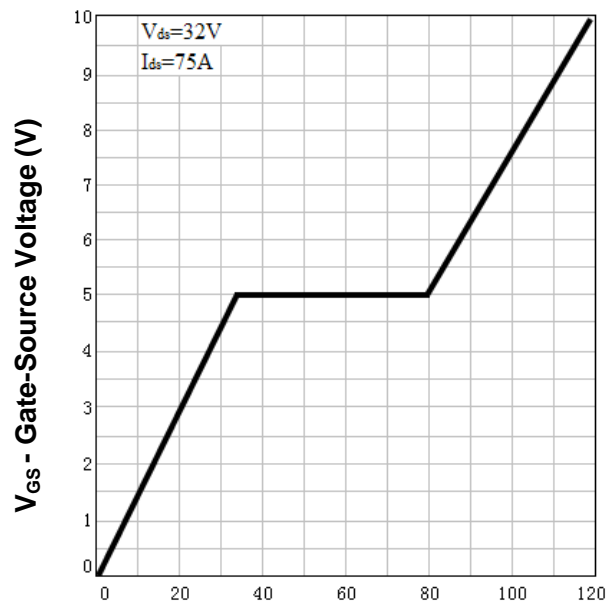
**V<sub>SD</sub> - Source-Drain Voltage (V)**

**Capacitance**



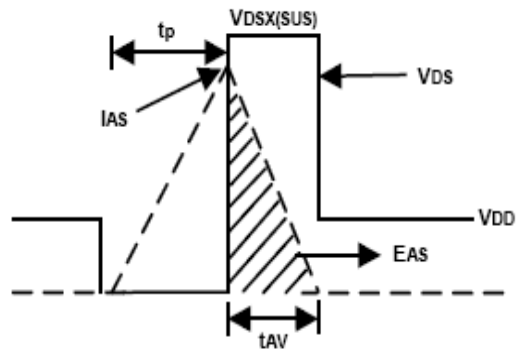
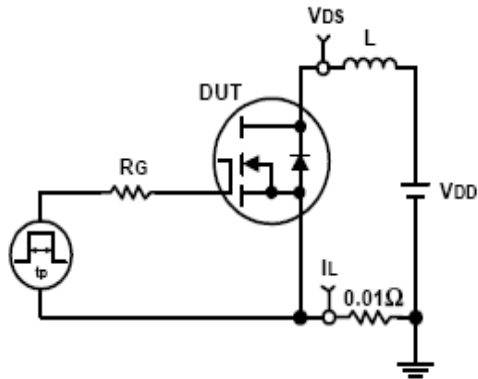
**V<sub>DS</sub> - Drain-Source Voltage (V)**

**Gate Charge**

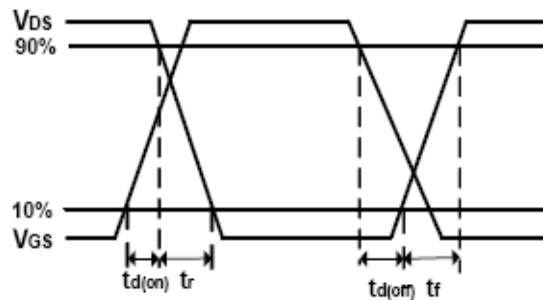
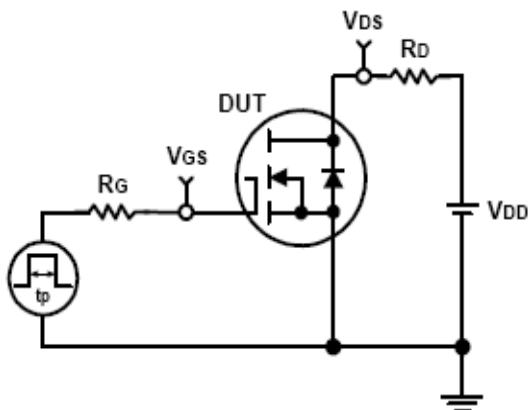


**Q<sub>G</sub> - Gate Charge (nC)**

**Avalanche Test Circuit and Waveforms**



**Switching Time Test Circuit and Waveforms**

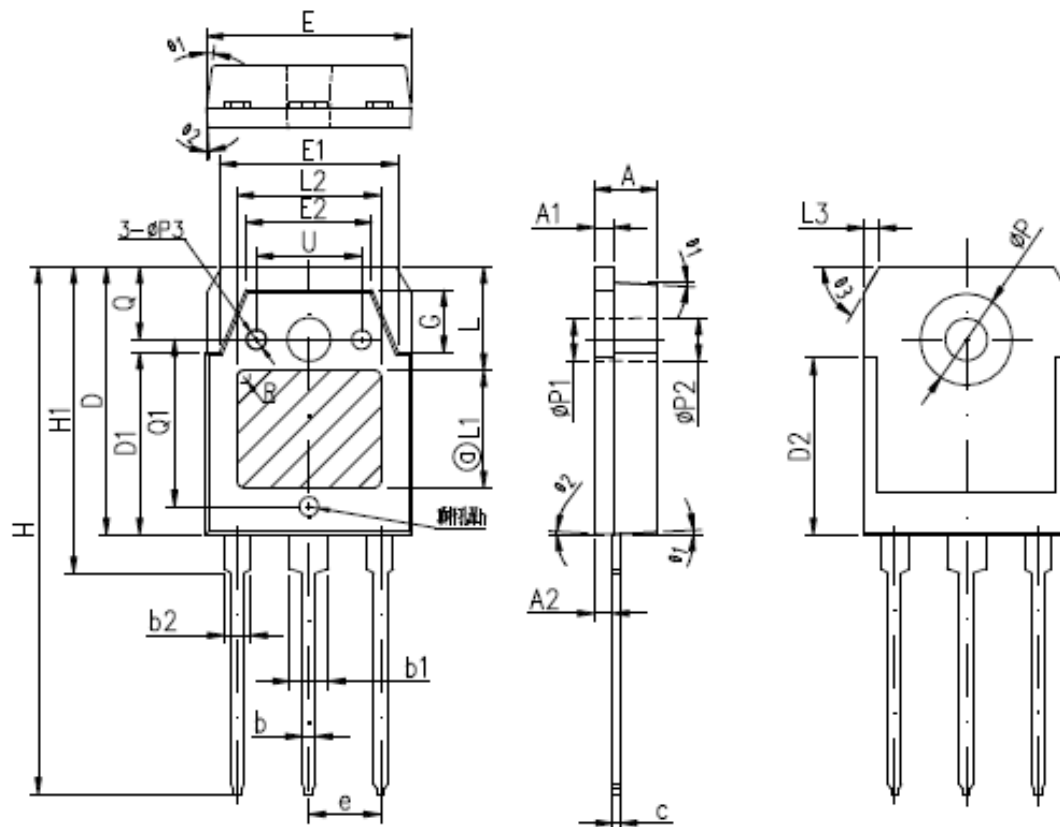


**Ordering and Marking Information**

<b>Device</b>	<b>Marking</b>	<b>Package</b>	<b>Packaging</b>	<b>Quantity</b>	<b>Reel Size</b>	<b>Tape width</b>
RU40190Q2	RU40190Q2	TO-3P	Tube	30	-	-

**Package Information**

**TO3P Package Outline**



SYMBOL	MM			INCH			SYMBOL	MM			INCH		
	MIN	NOM	MAX	MIN	NOM	MAX		MIN	NOM	MAX	MIN	NOM	MAX
A	4.60	4.80	5.00	0.181	0.189	0.197	h	0.05	0.10	0.15	0.002	0.004	0.006
A1	1.40	1.50	1.60	0.055	0.059	0.063	L	7.40 TYP			0.291 TYP		
A2	1.33	1.38	1.43	0.052	0.054	0.056	L1	9.00 TYP			0.354 TYP		
b	0.80	1.00	1.20	0.031	0.039	0.047	L2	11.00 TYP			0.433 TYP		
b1	2.80	3.00	3.20	0.110	0.118	0.126	L3	1.00 REF			0.039 REF		
b2	1.80	2.00	2.20	0.071	0.079	0.087	Øp	6.90	7.00	7.10	0.272	0.276	0.280
c	0.50	0.60	0.70	0.020	0.024	0.028	Øp1	3.20 REF			0.126 REF		
D	19.75	19.90	20.05	0.778	0.783	0.789	Øp2	3.50 REF			0.138 REF		
D1	13.70	13.90	14.10	0.539	0.547	0.555	Øp3	1.40	1.50	1.60	0.055	0.059	0.063
D2	12.90 REF			0.508 REF			R	0.50 REF			0.020 REF		
E	15.40	15.60	15.80	0.606	0.614	0.622	Q	5.00 REF			0.197 REF		
E1	13.40	13.60	13.80	0.528	0.535	0.543	Q1	12.56	12.76	12.96	0.494	0.502	0.510
E2	9.40	9.60	9.80	0.370	0.378	0.386	U	7.80	8.00	8.20	0.307	0.315	0.323
e	5.45 TYP			0.215 TYP			1	5°	7°	9°	5°	7°	9°
G	4.60	4.80	5.00	0.181	0.189	0.197	2	1°	3°	5°	1°	3°	5°
H	40.30	40.50	40.70	1.587	1.594	1.602	3	60° REF			60° REF		
H1	23.20	23.40	23.60	0.913	0.921	0.929							



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