NCE70T900F-VB Datasheet

N-Channel 700V (D-S) Power MOSFET

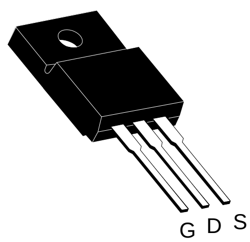
PRODUCT SUMMARY		
V_{DS} (V)	700	
$R_{DS(on)}$ (Ω) at 25 °C	V_{GS} = 10 V	1.36
Q_g Typ. (nC)	24	
Q_{gs} (nC)	6	
Q_{gd} (nC)	11	
Configuration	Single	

FEATURES

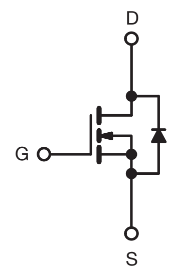
- Low Gate Charge Q_g Results in Simple Drive Requirement
- Improved Gate, Avalanche and Dynamic dV/dt Ruggedness
- Fully Characterized Capacitance and Avalanche Voltage and Current
- Compliant to RoHS directive 2002/95/EC

RoHS COMPLIANT

TO-220 FULLPAK



Top View



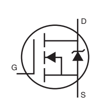
N-Channel MOSFET

ABSOLUTE MAXIMUM RATINGS (T_C = 25 °C, unless otherwise noted)					
PARAMETER			**SYMBOL**	**LIMIT**	**UNIT**
Drain-source voltage			V_{DS}	700	V
Gate-source voltage			V_{GS}	± 30	
Continuous drain current (T_J = 150 °C) [e]	V_{GS} at 10 V	T_C = 25 °C	I_D	7	A
		T_C = 100 °C		5	
Pulsed drain current [a]			I_{DM}	18	
Linear derating factor				0.63	W/°C
Single pulse avalanche energy [b]			E_{AS}	56	mJ
Maximum power dissipation			P_D	31	W
Operating junction and storage temperature range			T_J, T_{stg}	-55 to +150	°C
Drain-source voltage slope	T_J = 125 °C		dV/dt	37	V/ns
Reverse diode dV/dt [d]				27	
Soldering recommendations (peak temperature) [c]	For 10 s			300	°C
Mounting torque	M3 screw			0.6	Nm

Notes

a. Repetitive rating; pulse width limited by maximum junction temperature
b. V_{DD} = 50 V, starting T_J = 25 °C, L = 28.2 mH, R_g = 25 Ω, I_{AS} = 2 A
c. 1.6 mm from case
d. $I_{SD} \le I_D$, dI/dt = 100 A/μs, starting T_J = 25 °C
e. Limited by maximum junction temperature

THERMAL RESISTANCE RATINGS				
PARAMETER	**SYMBOL**	**TYP.**	**MAX.**	**UNIT**
Maximum junction-to-ambient	R_{thJA}	43	65	°C/W
Maximum junction-to-case (drain)	R_{thJC}	3.1	4.0	

SPECIFICATIONS (T_J = 25 °C, unless otherwise noted)						
PARAMETER	**SYMBOL**	**TEST CONDITIONS**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
Static						
Drain-source breakdown voltage	V_{DS}	V_{GS} = 0 V, I_D = 250 μA	700	-	-	V
V_{DS} temperature coefficient	$\Delta V_{DS}/T_J$	Reference to 25 °C, I_D = 1 mA	-	0.73	-	V/°C
Gate-source threshold voltage (N)	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = 250 μA	2	-	4	V
Gate-source leakage	I_{GSS}	V_{GS} = ± 20 V	-	-	± 100	nA
		V_{GS} = ± 30 V	-	-	± 1	μA
Zero gate voltage drain current	I_{DSS}	V_{DS} = 700 V, V_{GS} = 0 V	-	-	1	μA
		V_{DS} = 560 V, V_{GS} = 0 V, T_J = 125 °C	-	-	10	
Drain-source on-state resistance	$R_{DS(on)}$	V_{GS} = 10 V, I_D = 3 A	-	1.36	-	Ω
Forward transconductance	g_{fs}	V_{DS} = 30 V, I_D = 3 A	-	2	-	S
Dynamic						
Input capacitance	C_{iss}	V_{GS} = 0 V, V_{DS} = 100 V, f = 1 MHz	410	820	-	pF
Output capacitance	C_{oss}		20	60	-	
Reverse transfer capacitance	C_{rss}		2	4	-	
Effective output capacitance, energy related [a]	$C_{o(er)}$	V_{DS} = 0 V to 560 V, V_{GS} = 0 V	-	36	-	
Effective output capacitance, time related [b]	$C_{o(tr)}$		-	117	-	
Total gate charge	Q_g	V_{GS} = 10 V, I_D = 3 A, V_{DS} = 520 V	-	24	48	nC
Gate-source charge	Q_{gs}		-	6	-	
Gate-drain charge	Q_{gd}		-	11	-	
Turn-on delay time	$t_{d(on)}$	V_{DD} = 560 V, I_D = 3 A, V_{GS} = 10 V, R_g = 9.1 Ω	-	14	28	ns
Rise time	t_r		-	12	24	
Turn-off delay time	$t_{d(off)}$		-	30	60	
Fall time	t_f		-	20	40	
Gate input resistance	R_g	f = 1 MHz, open drain	0.4	1.4	2.7	Ω
Drain-Source Body Diode Characteristics						
Continuous source-drain diode current	I_S	MOSFET symbol showing the integral reverse p - n junction diode 	-	-	7	A
Pulsed diode forward current	I_{SM}		-	-	18	
Diode forward voltage	V_{SD}	T_J = 25 °C, I_S = 3 A, V_{GS} = 0 V	-	0.83	1.3	V
Reverse recovery time	t_{rr}	T_J = 25 °C, I_F = I_S = 3 A, dI/dt = 100 A/μs, V_R = 25 V	118	237	474	ns
Reverse recovery charge	Q_{rr}		-	2.2	-	μC
Reverse recovery current	I_{RRM}		-	16	-	A

Notes

a. $C_{oss(er)}$ is a fixed capacitance that gives the same energy as C_{oss} while V_{DS} is rising from 0 % to 80 % V_{DSS}

b. $C_{oss(tr)}$ is a fixed capacitance that gives the same charging time as C_{oss} while V_{DS} is rising from 0 % to 80 % V_{DSS}

TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)

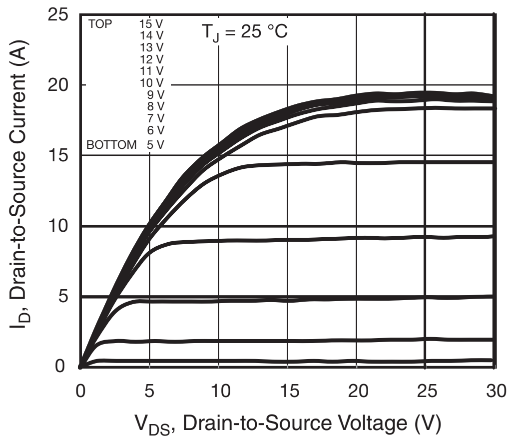


Fig. 1 - Typical Output Characteristics

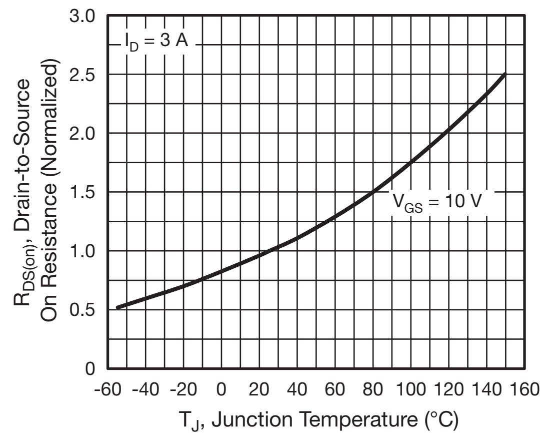


Fig. 4 - Normalized On-Resistance vs. Temperature

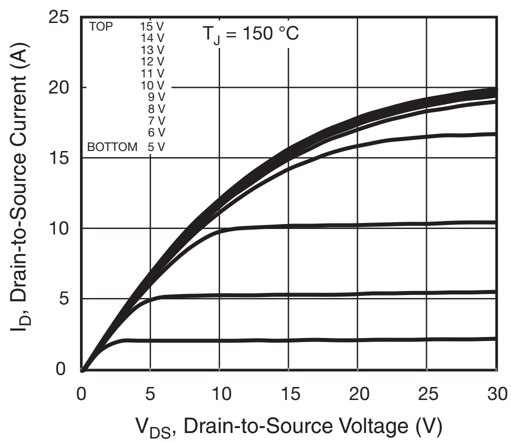


Fig. 2 - Typical Output Characteristics

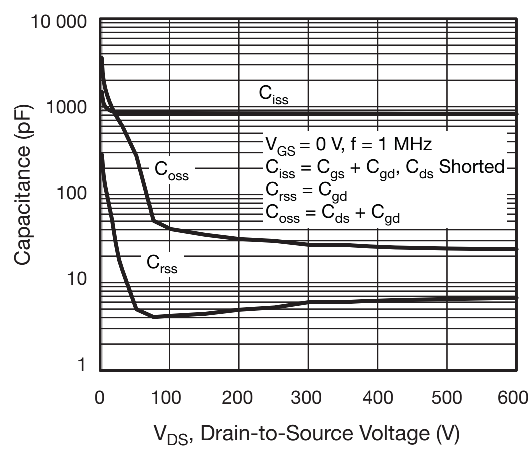


Fig. 5 - Typical Capacitance vs. Drain-to-Source Voltage

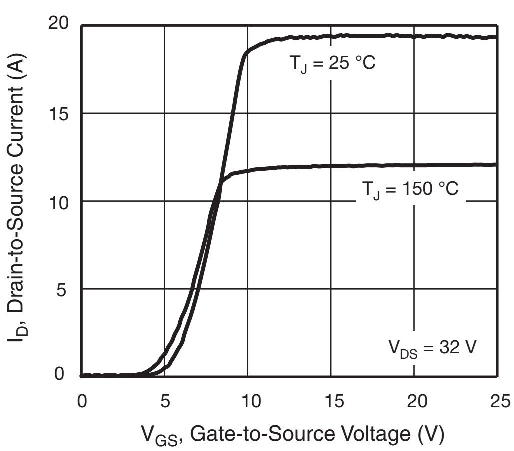


Fig. 3 - Typical Transfer Characteristics

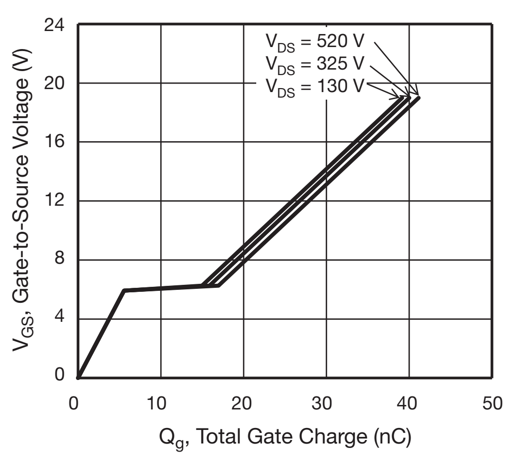


Fig. 6 - Typical Gate Charge vs. Gate-to-Source Voltage

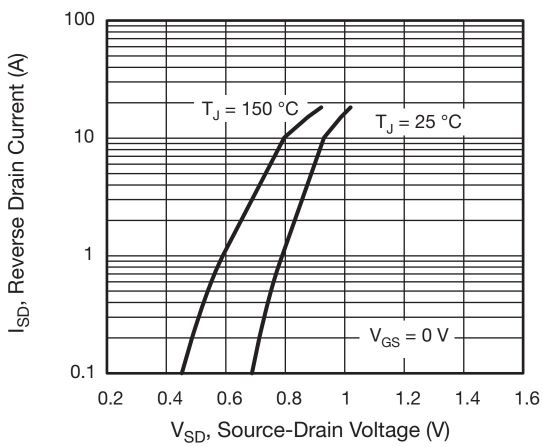


Fig. 7 - Typical Source-Drain Diode Forward Voltage

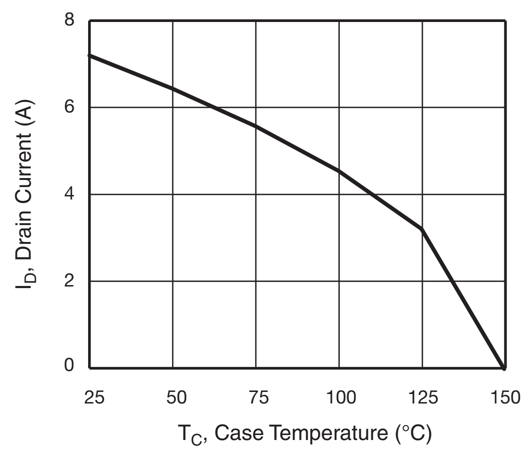


Fig. 9 - Maximum Drain Current vs. Case Temperature

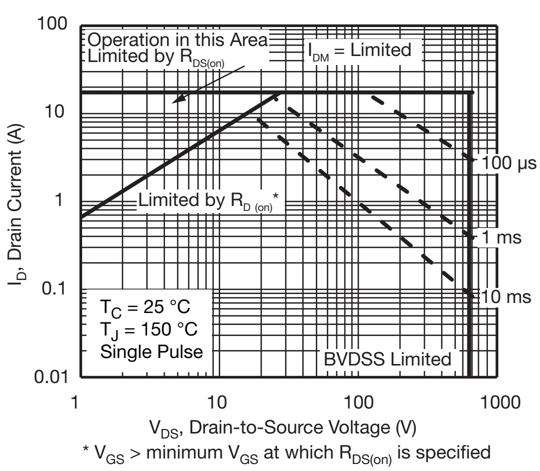


Fig. 8 - Maximum Safe Operating Area

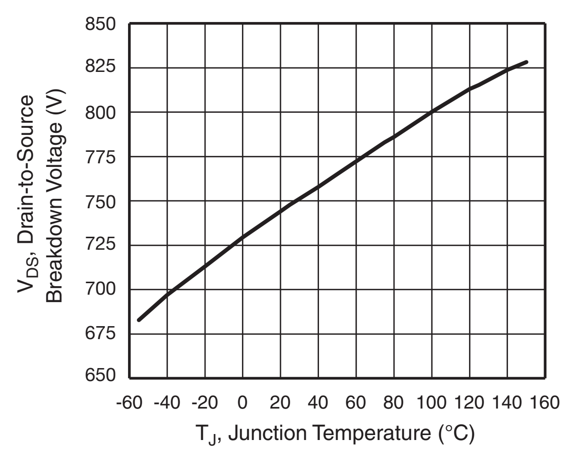


Fig. 10 - Temperature vs. Drain-to-Source Voltage

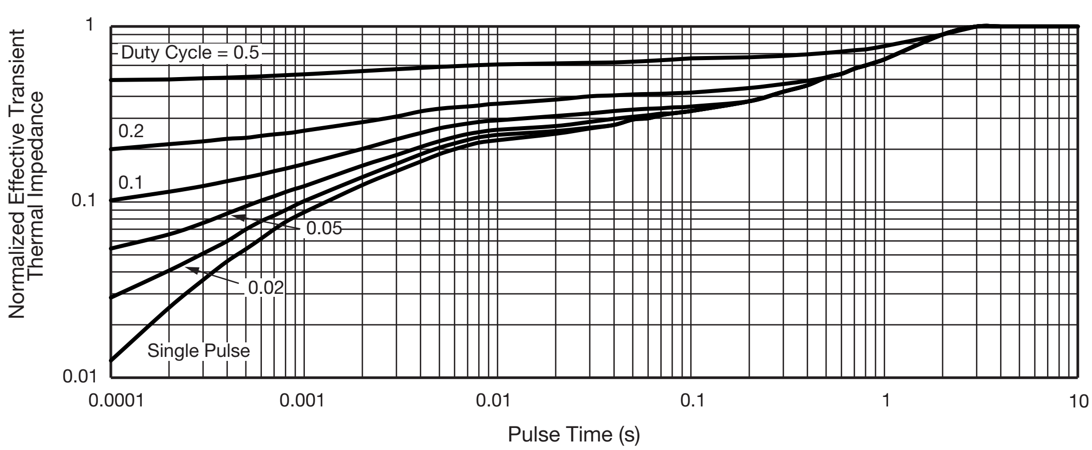


Fig. 11 - Normalized Thermal Transient Impedance, Junction-to-Case

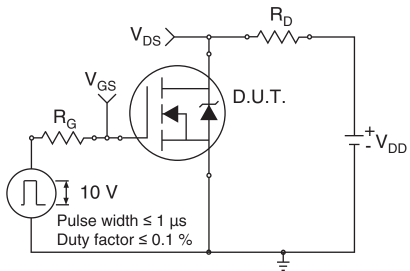


Fig. 12 - Switching Time Test Circuit

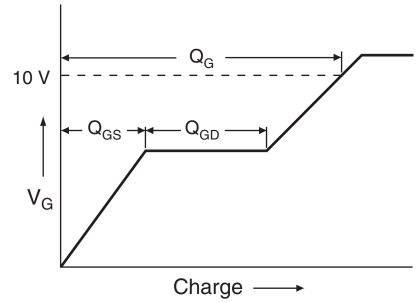


Fig. 16 - Basic Gate Charge Waveform

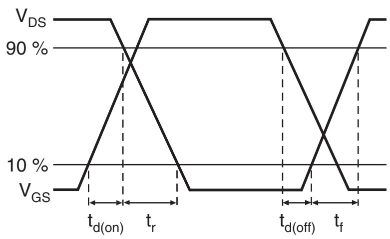


Fig. 13 - Switching Time Waveforms

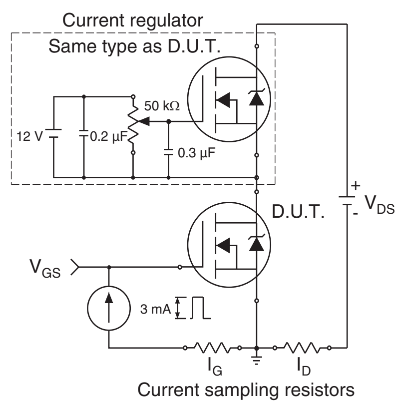


Fig. 17 - Gate Charge Test Circuit

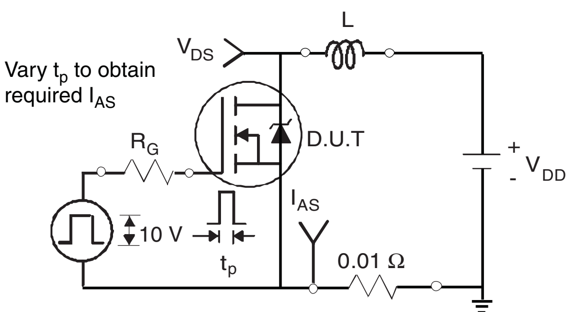


Fig. 14 - Unclamped Inductive Test Circuit

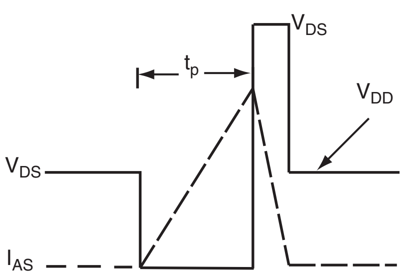
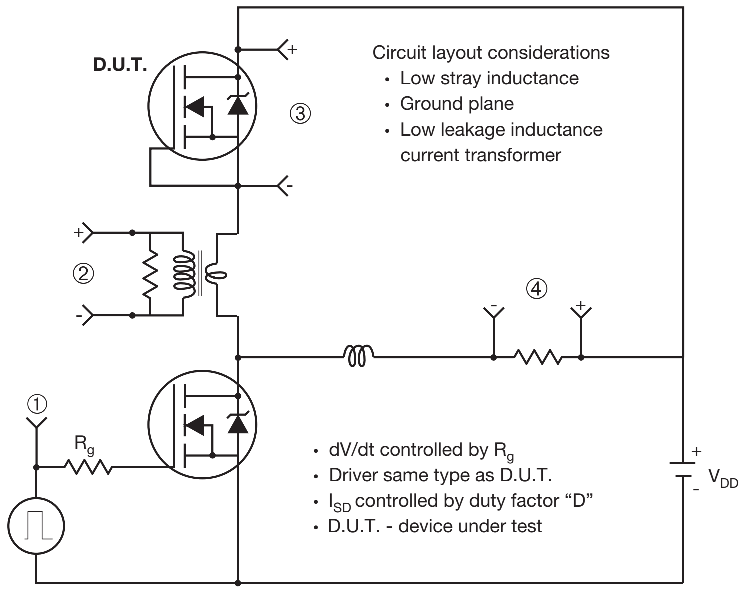
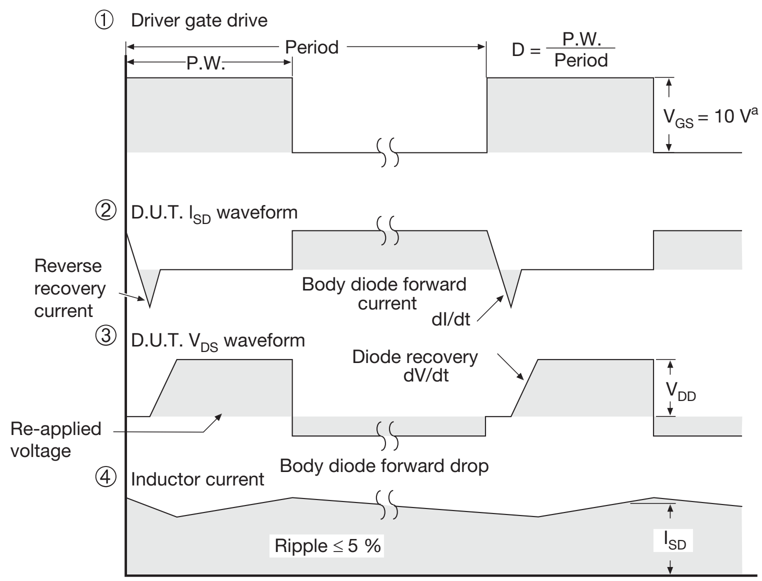


Fig. 15 - Unclamped Inductive Waveforms

Peak Diode Recovery dV/dt Test Circuit



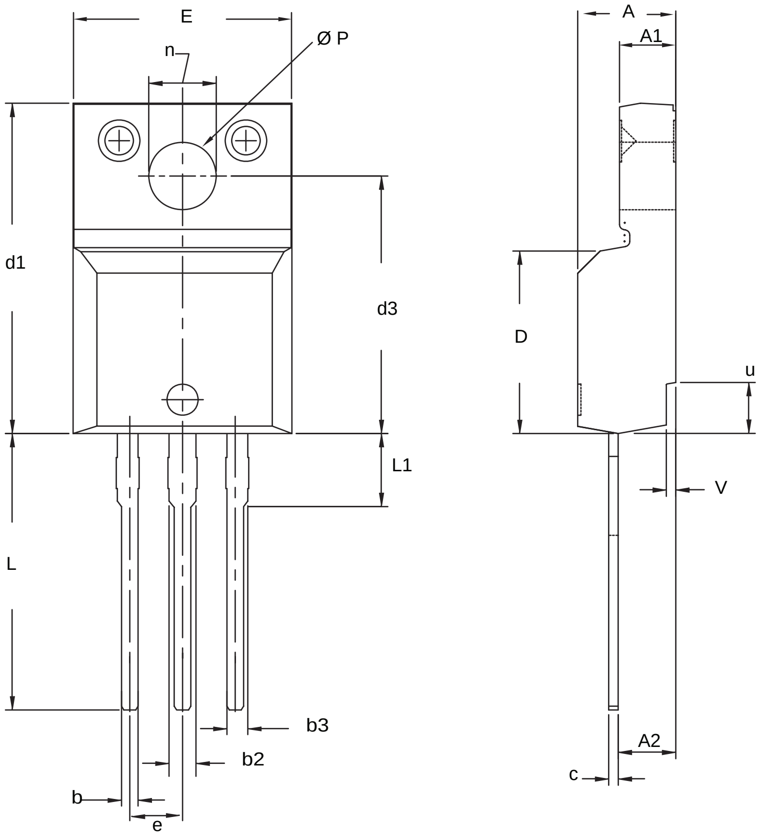


Note

a. V_{GS} = 5 V for logic level devices

Fig. 18 - For N-Channel

TO-220 FULLPAK (HIGH VOLTAGE)



	MILLIMETERS		INCHES	
DIM.	MIN.	MAX.	MIN.	MAX.
A	4.570	4.830	0.180	0.190
A1	2.570	2.830	0.101	0.111
A2	2.510	2.850	0.099	0.112
b	0.622	0.890	0.024	0.035
b2	1.229	1.400	0.048	0.055
b3	1.229	1.400	0.048	0.055
c	0.440	0.629	0.017	0.025
D	8.650	9.800	0.341	0.386
d1	15.88	16.120	0.622	0.635
d3	12.300	12.920	0.484	0.509
E	10.360	10.630	0.408	0.419
e	2.54 BSC		0.100 BSC	
L	13.200	13.730	0.520	0.541
L1	3.100	3.500	0.122	0.138
n	6.050	6.150	0.238	0.242
Ø P	3.050	3.450	0.120	0.136
u	2.400	2.500	0.094	0.098
v	0.400	0.500	0.016	0.020
ECN: X09-0126-Rev. B, 26-Oct-09 DWG: 5972				

Notes
1. To be used only for process drawing.
2. These dimensions apply to all TO-220, FULLPAK leadframe versions 3 leads.
3. All critical dimensions should C meet C_{pk} > 1.33.
4. All dimensions include burrs and plating thickness.
5. No chipping or package damage.

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