

## GENERAL DESCRIPTION

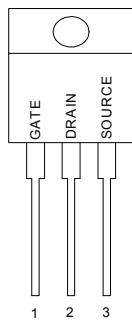
This high voltage MOSFET uses an advanced termination scheme to provide enhanced voltage-blocking capability without degrading performance over time. In addition, this advanced MOSFET is designed to withstand high energy in avalanche and commutation modes. The new energy efficient design also offers a drain-to-source diode with a fast recovery time. Designed for high voltage, high speed switching applications in power supplies, converters and PWM motor controls, these devices are particularly well suited for bridge circuits where diode speed and commutating safe operating areas are critical and offer additional and safety margin against unexpected voltage transients.

## FEATURES

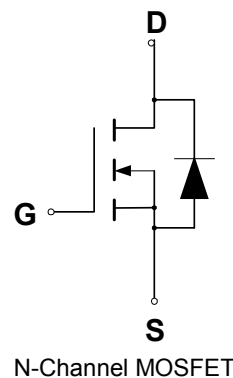
- ◆ Reduced Gate Charge
- ◆ Ultra Low On-Resistance Provides Higher Efficiency
- ◆ Avalanche Energy Specified
- ◆ Source-to-Drain Diode Recovery Time Comparable to a Discrete Fast Recovery Diode
- ◆ Diode is Characterized for Use in Bridge Circuits
- ◆  $I_{BSS}$  and  $V_{DS(on)}$  Specified at Elevated Temperature

## PIN CONFIGURATION

TO-220/TO-220FP  
Front View



## SYMBOL



## ABSOLUTE MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Drain to Current – Continuous	$I_D$	8.5	A
– Pulsed	$I_{DM}$	25.5	
Gate-to-Source Voltage – Continue	$V_{GS}$	±30	V
Total Power Dissipation – TO220	$P_D$	164	W
– TO220FP		35	
Derate above 25°C – TO220		1.32	W/°C
– TO220FP		0.37	
Operating and Storage Temperature Range	$T_J, T_{STG}$	-55 to 150	°C
Single Pulse Drain-to-Source Avalanche Energy – $T_J = 25^\circ\text{C}$ ( $V_{DD} = 100\text{V}, V_{GS} = 10\text{V}, I_L = 7.5\text{A}, L = 10\text{mH}, R_G = 25\Omega$ )	$E_{AS}$	281.25	mJ
Thermal Resistance – Junction to Case -TO220	$\theta_{JC}$	0.8	°C/W
– Junction to Case -TO220FP		3	
– Junction to Ambient -TO220, TO220FP	$\theta_{JA}$	62.5	
Maximum Lead Temperature for Soldering Purposes, 1/8" from case for 10 seconds	$T_L$	260	°C

### ORDERING INFORMATION

Part Number	Package
GPT09N60GN220	TO-220
GPT09N60GN220FP	TO-220 Full Package
GPT09N60DGN220FP	TO-220 Full Package

\*Note: G : Suffix for Pb Free Product

### ELECTRICAL CHARACTERISTICS

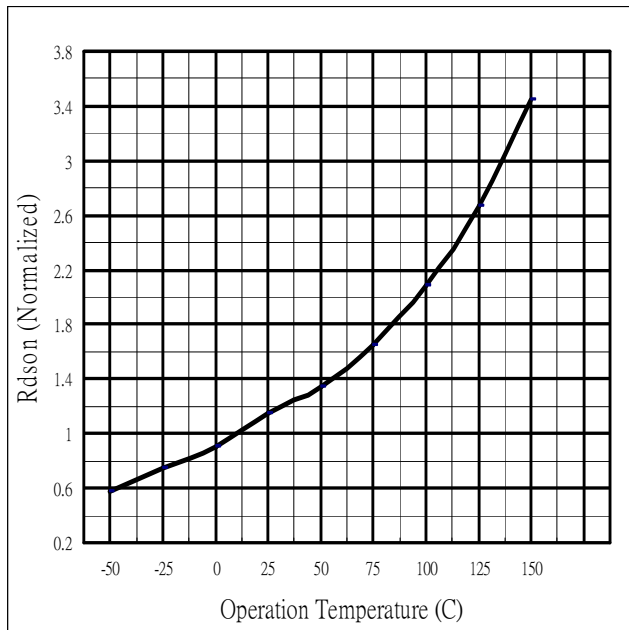
Unless otherwise specified,  $T_J = 25^\circ\text{C}$ .

Characteristic	Symbol	GPT09N60			Units
		Min	Typ	Max	
Drain-Source Breakdown Voltage ( $V_{GS} = 0\text{ V}$ , $I_D = 250\ \mu\text{A}$ )	$V_{(BR)DSS}$	600			V
Drain-Source Leakage Current ( $V_{DS} = 600\text{ V}$ , $V_{GS} = 0\text{ V}$ )	$I_{DSS}$			1	$\mu\text{A}$
Gate-Source Leakage Current-Forward ( $V_{gsf} = 30\text{ V}$ , $V_{DS} = 0\text{ V}$ )	$I_{GSSF}$			100	nA
Gate-Source Leakage Current-Reverse ( $V_{gsr} = 30\text{ V}$ , $V_{DS} = 0\text{ V}$ )	$I_{GSSR}$			100	nA
Gate Threshold Voltage ( $V_{DS} = V_{GS}$ , $I_D = 250\ \mu\text{A}$ )	$V_{GS(th)}$	2.5	3.5	4.5	V
Static Drain-Source On-Resistance ( $V_{GS} = 10\text{ V}$ , $I_D = 4.5\text{A}$ ) *	$R_{DS(on)}$			0.95	$\Omega$
Forward Transconductance ( $V_{DS} = 15\text{ V}$ , $I_D = 4.5\text{A}$ ) *	$g_{FS}$		7.5		S
Input Capacitance	$(V_{DS} = 25\text{ V}$ , $V_{GS} = 0\text{ V}$ , $f = 1.0\text{ MHz}$ )	$C_{iss}$	1290		pF
Output Capacitance		$C_{oss}$	112		pF
Reverse Transfer Capacitance		$C_{rss}$	9.3		pF
Turn-On Delay Time	$(V_{DD} = 300\text{ V}$ , $I_D = 9\text{ A}$ , $V_{GS} = 10\text{ V}$ , $R_G = 9.1\Omega$ ) *	$t_{d(on)}$	22.9		ns
Rise Time		$t_r$	20.6		ns
Turn-Off Delay Time		$t_{d(off)}$	42.5		ns
Fall Time		$t_f$	25.6		ns
Total Gate Charge	$(V_{DS} = 480\text{ V}$ , $I_D = 9\text{ A}$ , $V_{GS} = 10\text{ V}$ ) *	$Q_g$	29		nC
Gate-Source Charge		$Q_{gs}$	6		nC
Gate-Drain Charge		$Q_{gd}$	11.4		nC
<b>SOURCE-DRAIN DIODE CHARACTERISTICS</b>					
Forward On-Voltage(1)	$(I_S = 9\text{ A}$ , $V_{GS} = 0\text{ V}$ , $d_I/d_t = 100\text{A}/\mu\text{s}$ )	$V_{SD}$		1.5	V
Forward Turn-On Time		$t_{on}$		**	ns
Reverse Recovery Time		$t_{rr}$		405	ns

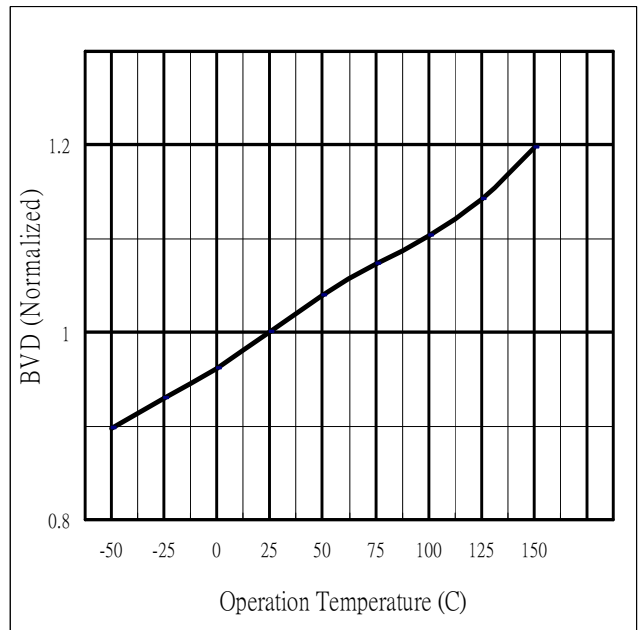
\* Pulse Test: Pulse Width  $\leq 300\mu\text{s}$ , Duty Cycle  $\leq 2\%$

\*\* Negligible, Dominated by circuit inductance

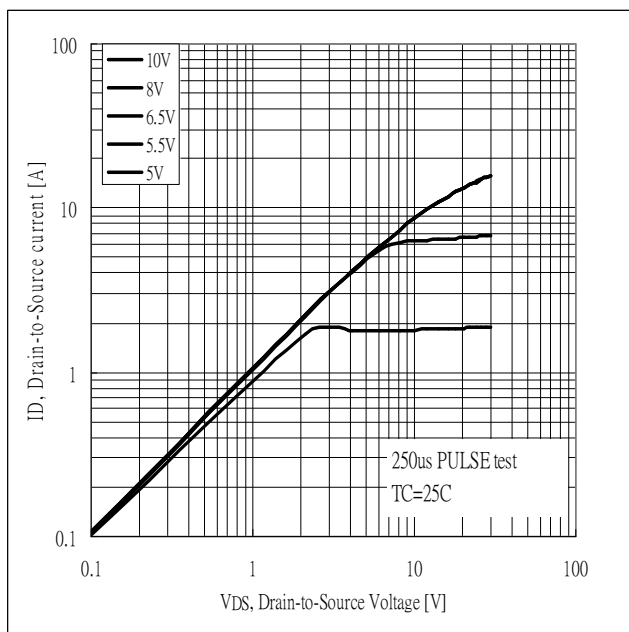
**TYPICAL ELECTRICAL CHARACTERISTICS**



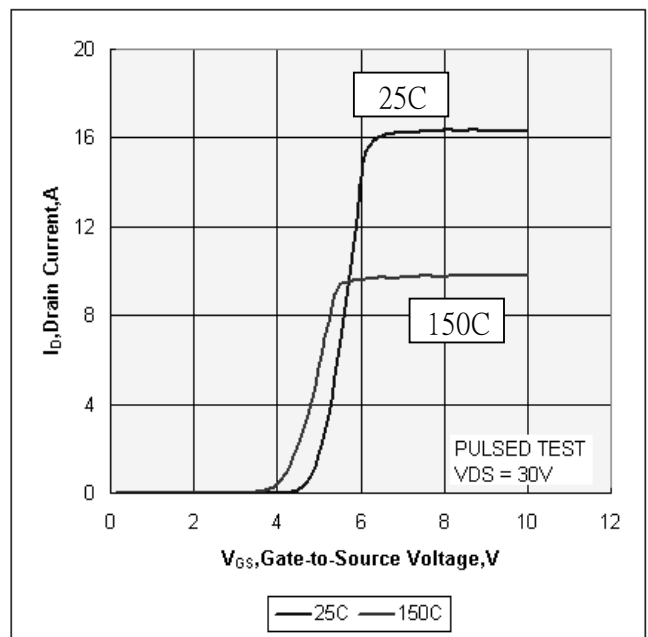
**Fig 1. On-Resistance Vs. Temperature**



**Fig.2 Breakdown Voltage Variation vs. Temperature**



**Fig 3. Typical Output Characteristics**



**Fig 4. Typical Transfer Characteristics**

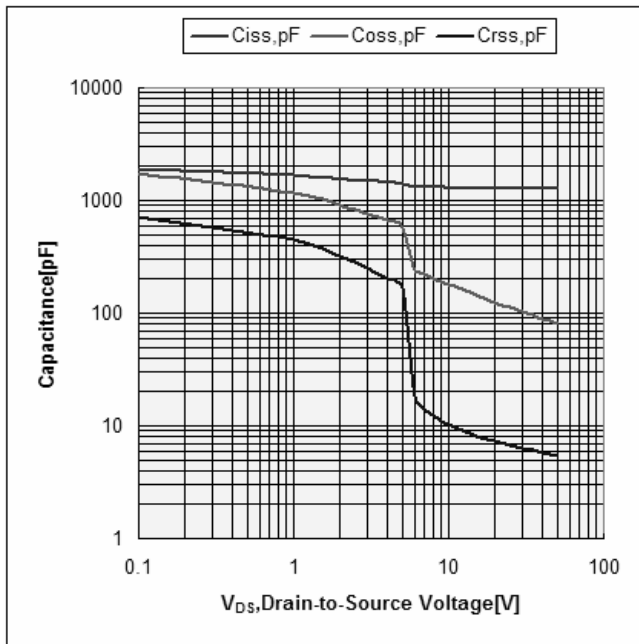


Fig 5. Typical Capacitance Vs. Drain-to-Source Voltage

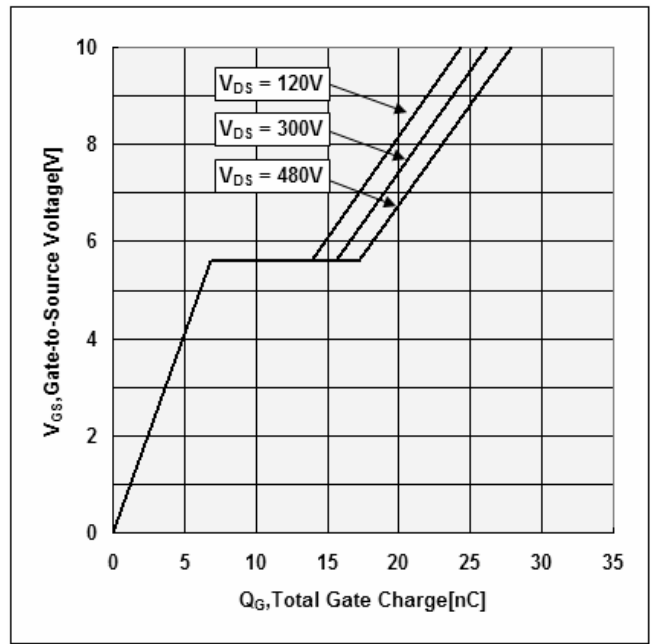
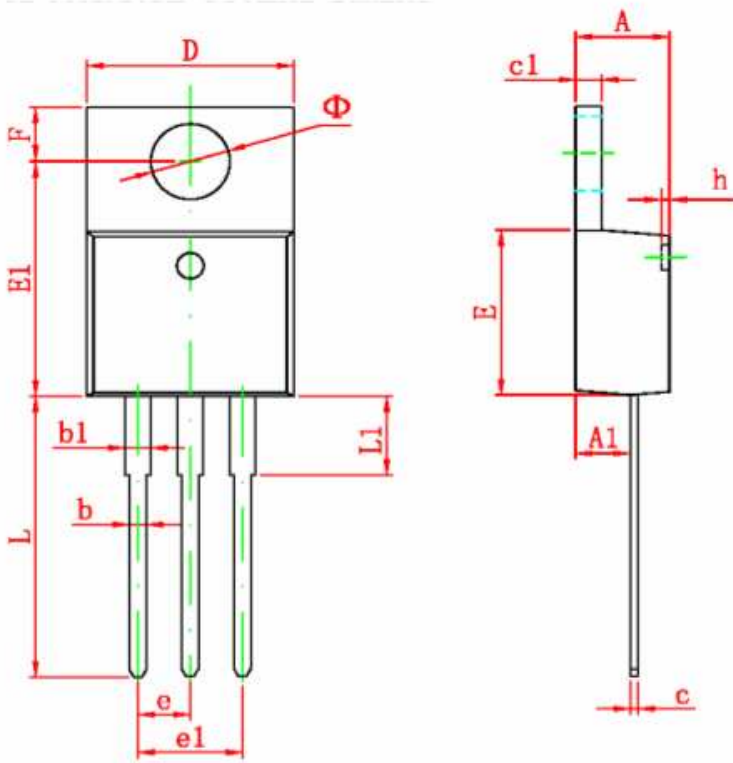


Fig 6. Typical Gate Charge Vs. Gate-to-Source Voltage

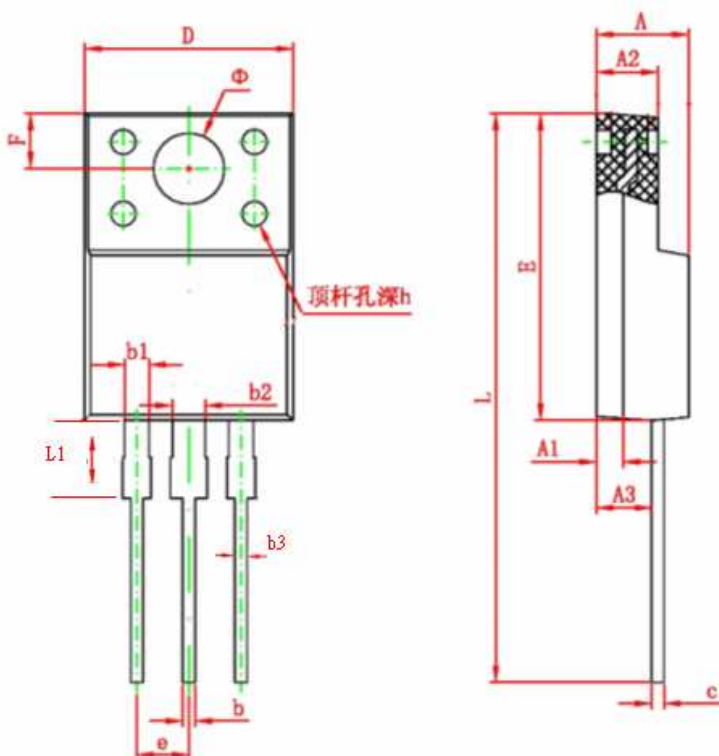
**PACKAGE DIMENSION**

**TO-220**



Symbol	Dimensions In Millimeters	
	Min.	Max
A	4.40	4.80
A1	2.10	2.84
b	0.71	0.91
b1	1.17	1.37
c	0.30	0.60
c1	1.17	1.47
D	9.40	10.60
E	8.40	9.60
e	2.54 TYP.	
e1	4.90	5.60
F	3.00 REF.	
$\Phi$	3.50 REF.	
h	0.00	0.30
L	12.50	14.00
L1	3.50	4.00

**TO-220F**



Symbol	Dimensions In Millimeters	
	Min.	Max
A	3.80	4.70
A1	1.3 REF.	
A2	2.20	3.20
A3	2.10	3.20
b	0.30	0.95
b1	1.00	1.75
b2	1.00	1.75
b3	0.50	0.80
c	0.30	0.90
D	9.90	10.40
E	14.60	16.20
e	2.54 TYP.	
F	3.00 REF.	
$\Phi$	3.50 REF.	
h	0.00	0.30
L	28.00	30.00
L1	3.20	3.55

## IMPORTANT NOTICE

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