

### GENERAL DESCRIPTION

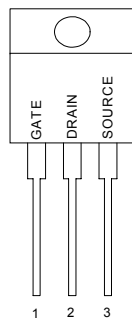
This Power MOSFET is designed for low voltage, high speed power switching applications such as switching regulators, converters, solenoid and relay drivers.

### FEATURES

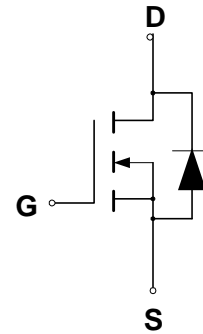
- ◆ Dynamic dv/dt Rating
- ◆ Repetitive Avalanche Rated
- ◆ Fast Switching
- ◆ Ease of Paralleling
- ◆ Simple Drive Requirements

### PIN CONFIGURATION

TO-220  
Top View



### SYMBOL



N-Channel MOSFET

### ORDERING INFORMATION

Part Number	Package
CMT09N20N220	TO-220

### ABSOLUTE MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Drain to Current – Continuous	$I_D$	9.0	A
– Pulsed (Note 1)	$I_{DM}$	36	
Gate-to-Source Voltage – Continue	$V_{GS}$	$\pm 20$	V
Total Power Dissipation	$P_D$	74	W
Derate above 25°C		0.59	W/°C
Single Pulse Avalanche Energy (Note 2)	$E_{AS}$	56	mJ
Avalanche Current (Note 1)	$I_{AR}$	9.0	A
Repetitive Avalanche Energy (Note 1)	$E_{AR}$	7.4	mJ
Peak Diode Recovery dv/dt	dv/dt	5.0	V/ns
Operating and Storage Temperature Range	$T_J, T_{STG}$	-55 to 150	°C
Thermal Resistance – Junction to Case	$\theta_{JC}$	1.70	°C/W
– Junction to Ambient	$\theta_{JA}$	62	
Maximum Lead Temperature for Soldering Purposes, 1/8" from case for 10 seconds	$T_L$	300	°C

### ELECTRICAL CHARACTERISTICS

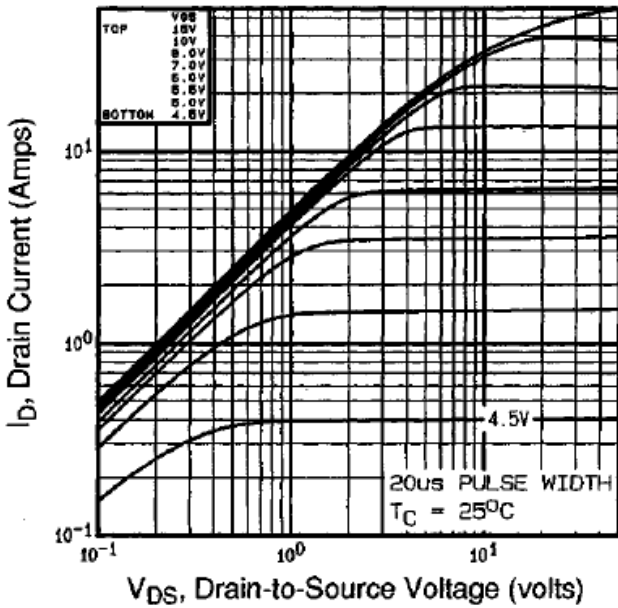
Unless otherwise specified,  $T_J = 25^\circ\text{C}$ .

Characteristic	Symbol	CMT09N20			Units
		Min	Typ	Max	
Drain-Source Breakdown Voltage ( $V_{GS} = 0\text{ V}$ , $I_D = 250\ \mu\text{A}$ )	$V_{(BR)DSS}$	200			V
Drain-Source Leakage Current ( $V_{DS} = 200\text{V}$ , $V_{GS} = 0\text{ V}$ ) ( $V_{DS} = 160\text{V}$ , $V_{GS} = 0\text{ V}$ , $T_J = 125^\circ\text{C}$ )	$I_{DSS}$			25 250	$\mu\text{A}$
Gate-Source Leakage Current-Forward ( $V_{gsf} = 20\text{ V}$ , $V_{DS} = 0\text{ V}$ )	$I_{GSSF}$			100	nA
Gate-Source Leakage Current-Reverse ( $V_{gsr} = -20\text{ V}$ , $V_{DS} = 0\text{ V}$ )	$I_{GSSR}$			-100	nA
Gate Threshold Voltage ( $V_{DS} = V_{GS}$ , $I_D = 250\ \mu\text{A}$ )	$V_{GS(th)}$	2.0		4.0	V
Static Drain-Source On-Resistance ( $V_{GS} = 10\text{ V}$ , $I_D = 5.4\text{A}$ ) (Note 4)	$R_{DS(on)}$			0.40	$\Omega$
Forward Transconductance ( $V_{DS} = 50\text{V}$ , $I_D = 5.4\text{ A}$ ) (Note 4)	$g_{FS}$	3.8			mhos
Input Capacitance	$(V_{DS} = 25\text{ V}$ , $V_{GS} = 0\text{ V}$ , $f = 1.0\text{ MHz}$ )	$C_{iss}$		800	pF
Output Capacitance		$C_{oss}$		240	pF
Reverse Transfer Capacitance		$C_{rss}$		76	pF
Turn-On Delay Time	$(V_{DD} = 100\text{ V}$ , $I_D = 5.9\text{ A}$ , $R_G = 12\Omega$ , $R_D = 16\Omega$ ) (Note 4)	$t_{d(on)}$		9.4	ns
Rise Time		$t_r$		28	ns
Turn-Off Delay Time		$t_{d(off)}$		39	ns
Fall Time		$t_f$		20	ns
Total Gate Charge	$(V_{DS} = 160\text{V}$ , $I_D = 5.9\text{A}$ , $V_{GS} = 10\text{ V}$ ) (Note 4)	$Q_g$			43 nC
Gate-Source Charge		$Q_{gs}$			7.0 nC
Gate-Drain Charge		$Q_{gd}$			23 nC
Internal Drain Inductance (Measured from the drain lead 0.25" from package to center of die)	$L_D$			4.5	nH
Internal Drain Inductance (Measured from the source lead 0.25" from package to source bond pad)	$L_S$			7.5	nH
<b>SOURCE-DRAIN DIODE CHARACTERISTICS</b>					
Reverse Recovery Charge	$I_F = 5.9\text{A}$ , $di/dt = 100\text{A}/\mu\text{s}$ , $T_J = 25^\circ\text{C}$ (Note 4)	$Q_{rr}$		1.1	2.2 $\mu\text{C}$
Forward Turn-On Time		$t_{on}$		**	
Reverse Recovery Time		$t_{rr}$		170	340
Diode Forward Voltage	$I_S = 9.0\text{A}$ , $V_{GS} = 0\text{ V}$ , $T_J = 25^\circ\text{C}$ (Note 4)	$V_{SD}$			1.5 V

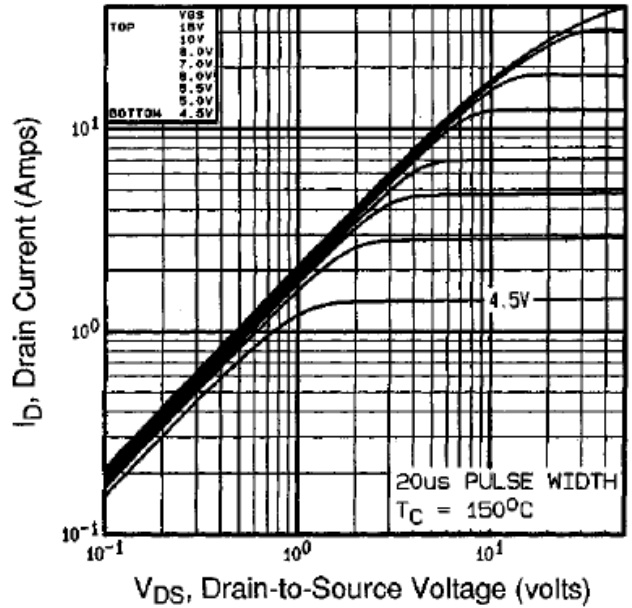
**Note**

- (1) Repetitive rating; pulse width limited by max. junction temperature
  - (2)  $V_{DD} = 100\text{V}$ ,  $V_{GS} = 10\text{V}$ , starting  $T_J = 25^\circ\text{C}$ ,  $L=1.38\text{mH}$ ,  $R_G = 25\Omega$ ,  $I_{AS} = 9.0\text{A}$
  - (3)  $I_{SD} \leq 9.0\text{A}$ ,  $di/dt \leq 120\text{A}/\mu\text{s}$ ,  $V_{DD} \leq V_{(BR)DSS}$ ,  $T_J \leq 150^\circ\text{C}$
  - (4) Pulse Test: Pulse Width  $\leq 300\mu\text{s}$ , Duty Cycle  $\leq 2\%$
- \*\* Negligible, Dominated by circuit inductance

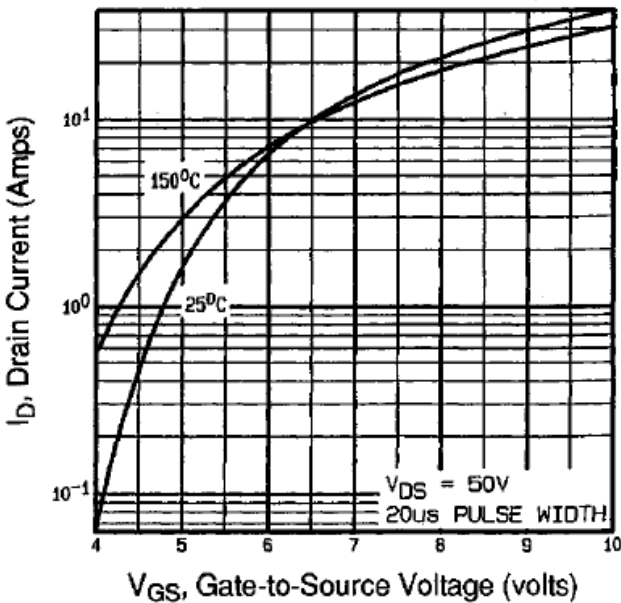
**TYPICAL ELECTRICAL CHARACTERISTICS**



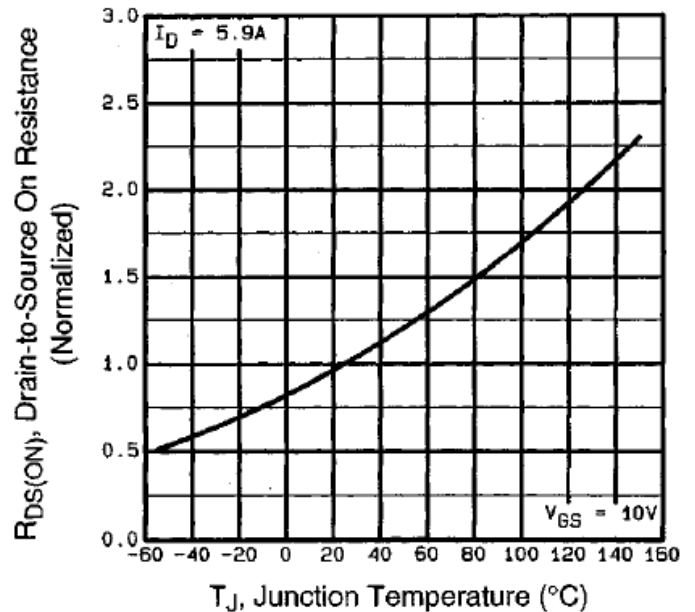
**Fig 1.** Typical Output Characteristics,  
 $T_C=25^\circ\text{C}$



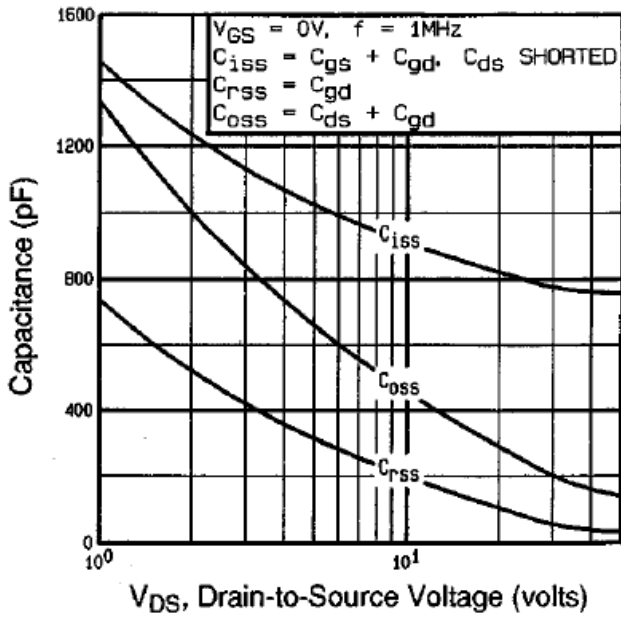
**Fig 2.** Typical Output Characteristics,  
 $T_C=150^\circ\text{C}$



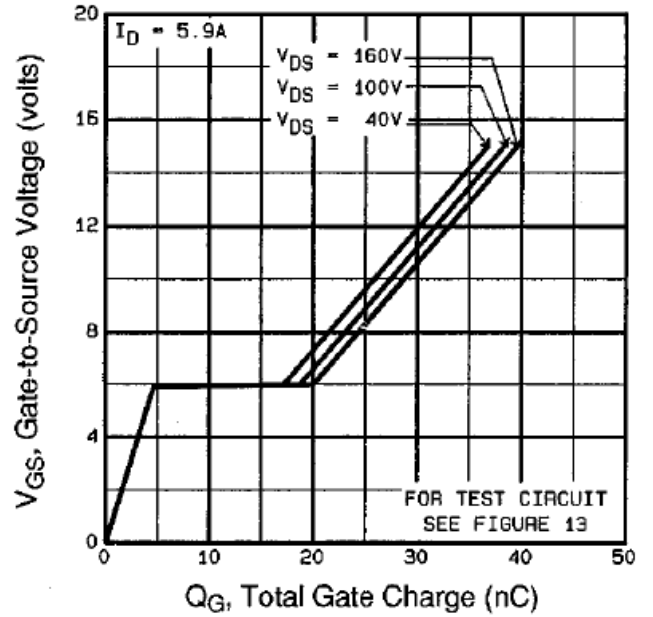
**Fig 3.** Typical Transfer Characteristics



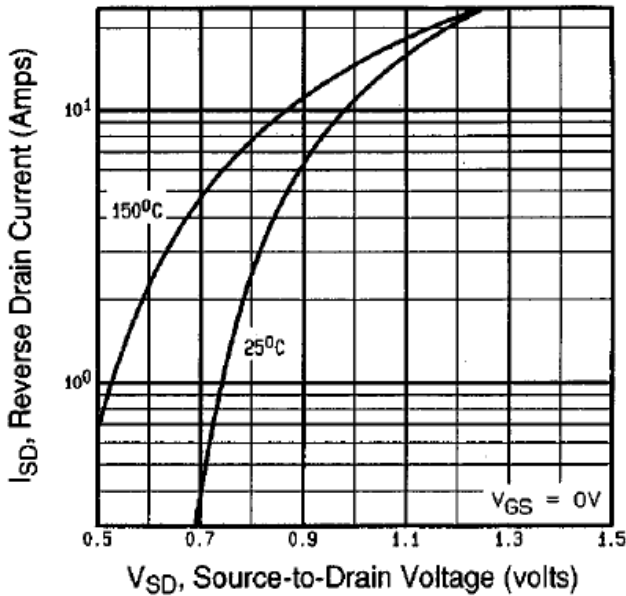
**Fig 4.** Normalized On-Resistance  
Vs. Temperature



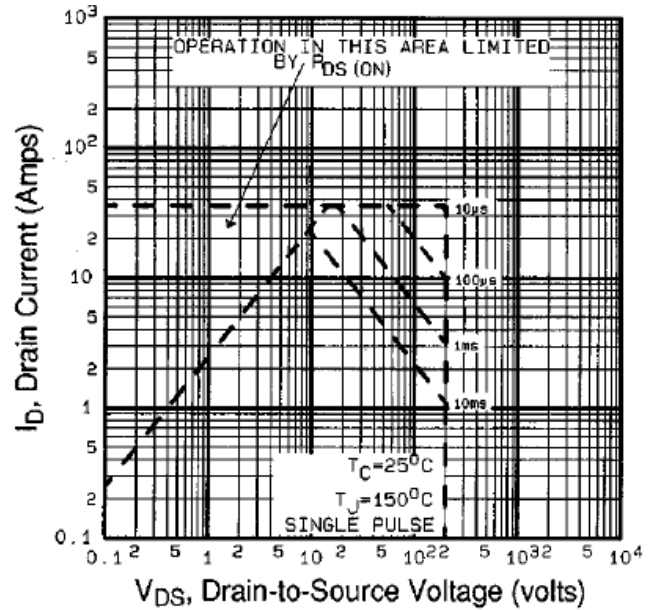
**Fig 5.** Typical Capacitance Vs. Drain-to-Source Voltage



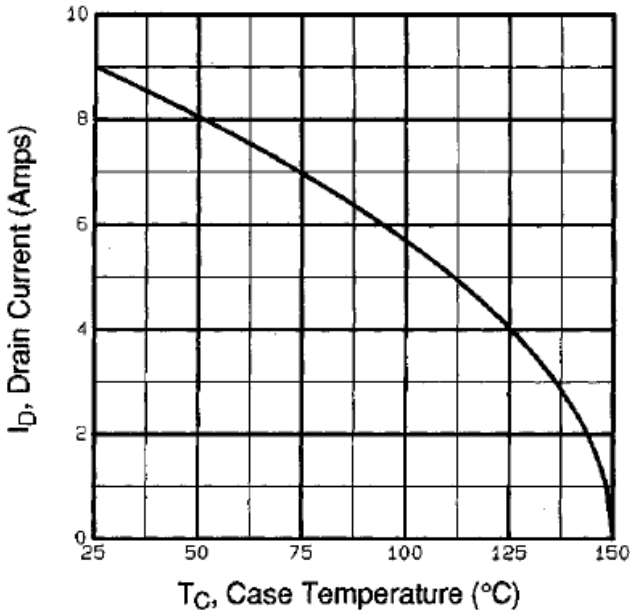
**Fig 6.** Typical Gate Charge Vs. Gate-to-Source Voltage



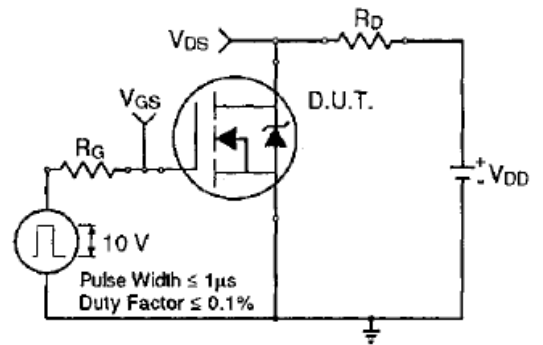
**Fig 7.** Typical Source-Drain Diode Forward Voltage



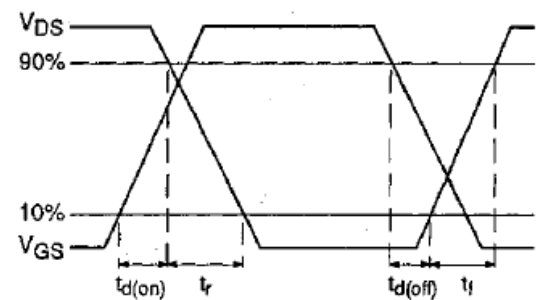
**Fig 8.** Maximum Safe Operating Area



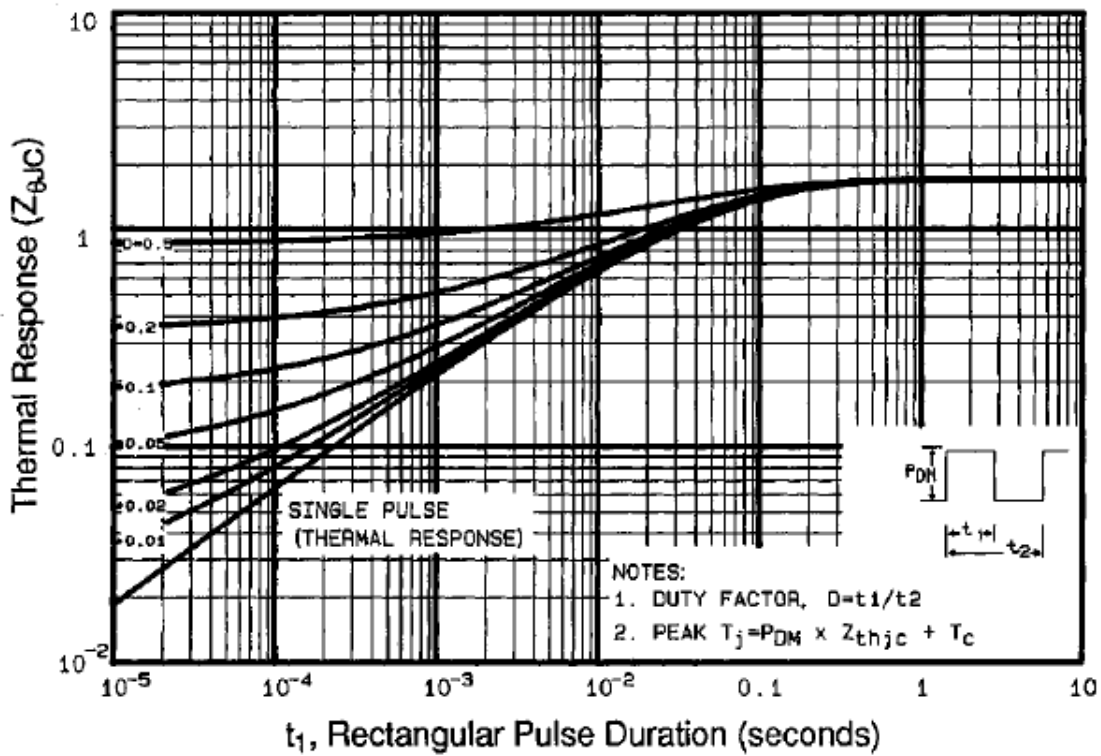
**Fig 9.** Maximum Drain Current Vs. Case Temperature



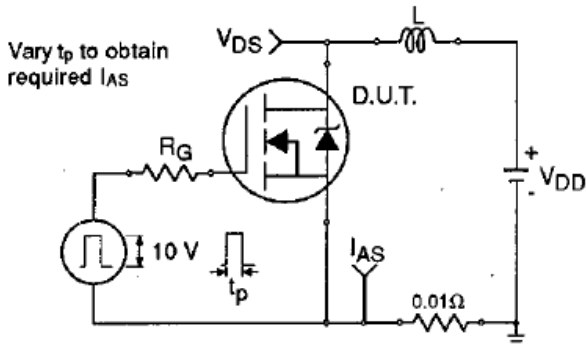
**Fig 10a.** Switching Time Test Circuit



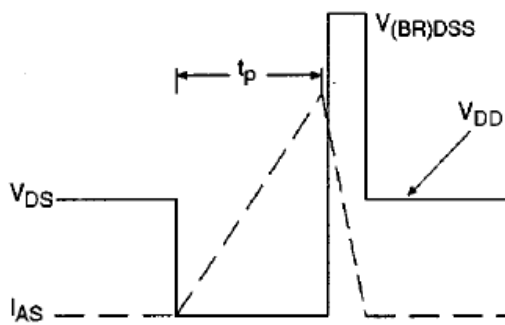
**Fig 10b.** Switching Time Waveforms



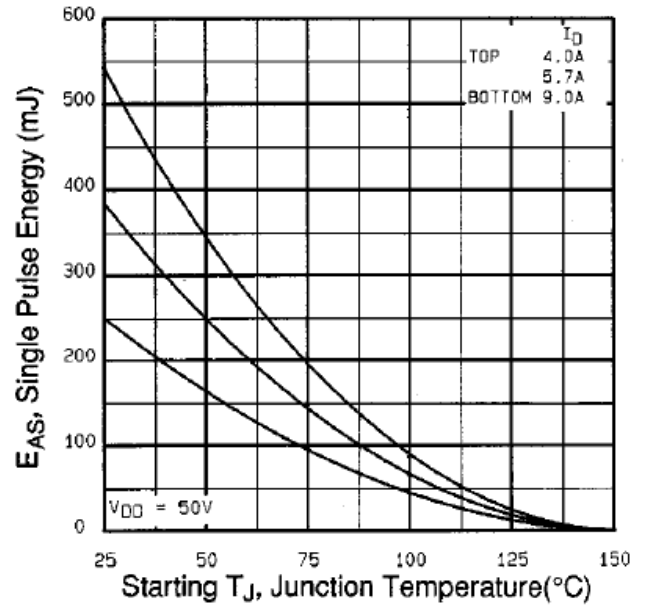
**Fig 11.** Maximum Effective Transient Thermal Impedance, Junction-to-Case



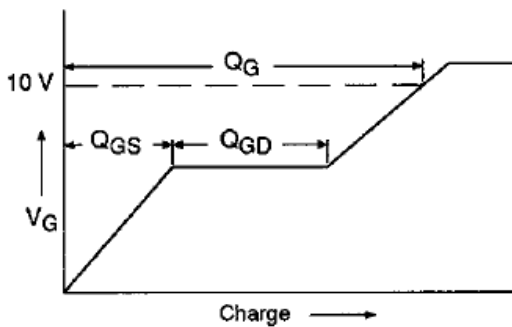
**Fig 12a.** Unclamped Inductive Test Circuit



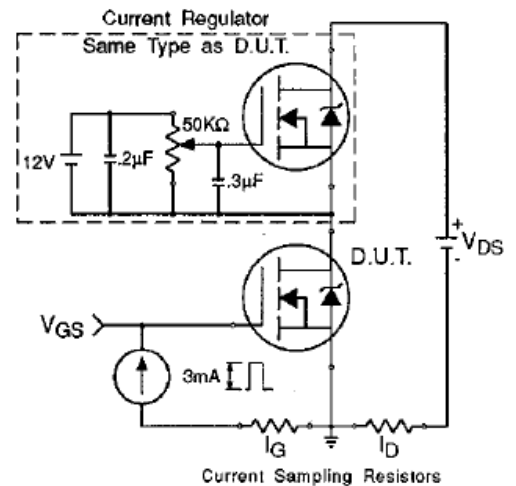
**Fig 12b.** Unclamped Inductive Waveforms



**Fig 12c.** Maximum Avalanche Energy Vs. Drain Current

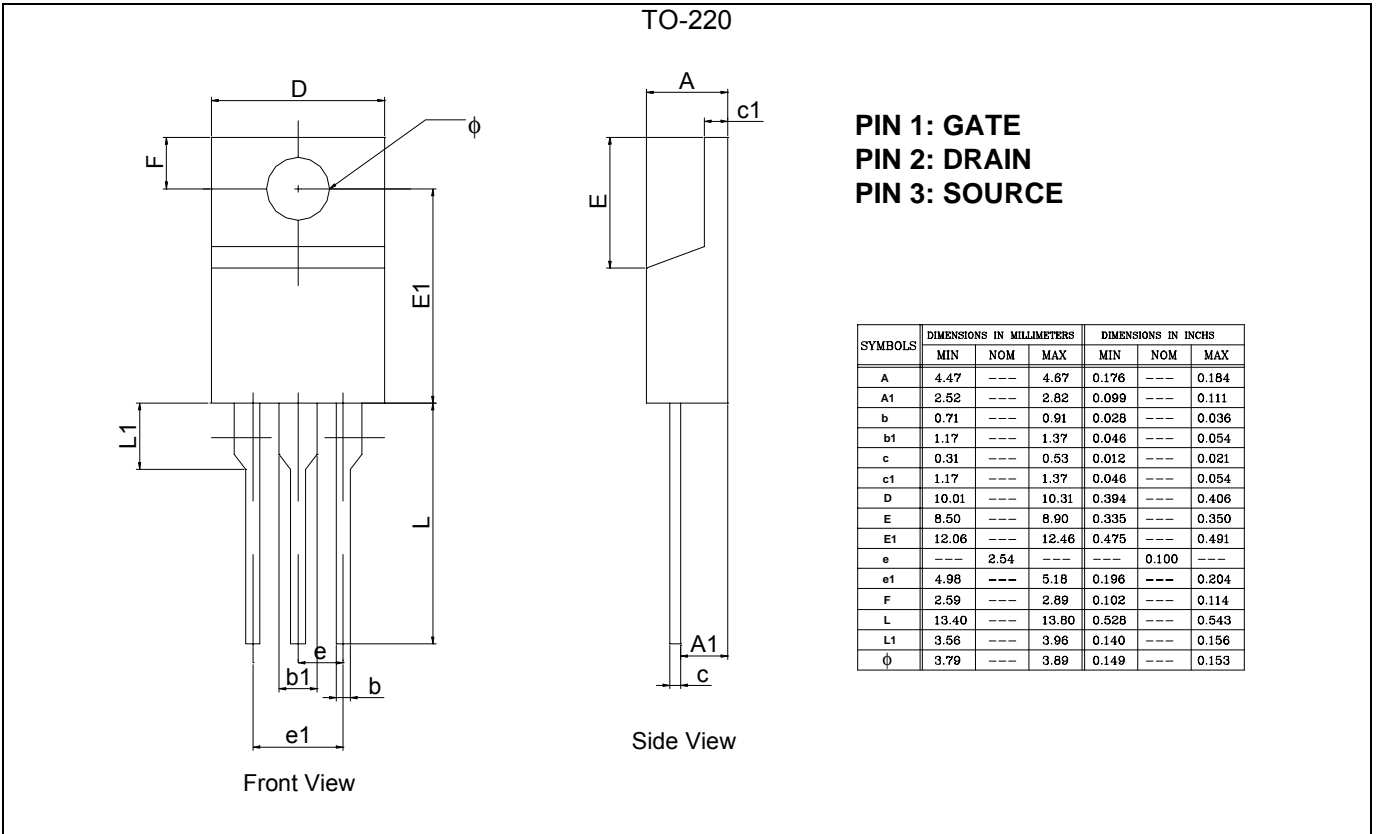


**Fig 13a.** Basic Gate Charge Waveform



**Fig 13b.** Gate Charge Test Circuit

### PACKAGE DIMENSION



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## IMPORTANT NOTICE

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