

PRODUCT CHARACTERISTICS

VDSS	500V
$R_{DS(on) Typ}(V_{GS}=10V)$	0.26Ω
Qg@type	53nC
ID	20A

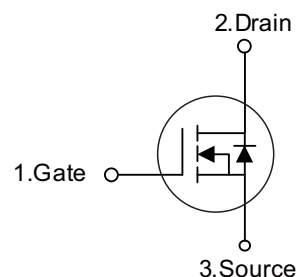
APPLICATIONS

- * High efficiency switch mode power supplies
- * Electronic lamp ballasts based on half bridge
- * LED power supplies

FEATURES

- * High Switching Speed
- * Improved dv/dt capability

Symbol



TO-220



TO-220F

ORDER INFORMATION

Order codes		Package	Packing
Halogen-Free	Halogen		
N/A	MOT20N50HF	TO-220F	50 pieces/Tube
N/A	MOT20N50A	TO-220	50 pieces/Tube

ABSOLUTE MAXIMUM RATINGS (T_C = 25°C, unless otherwise specified)

PARAMETER		SYMBOL	RATINGS	UNIT
Drain-Source Voltage		V _{DSS}	500	V
Gate-Source Voltage		V _{GSS}	±30	V
Drain Current	Continuous	I _D	20	A
	Pulsed (Note 2)	I _{DM}	80	A
Avalanche Energy	Single Pulsed (Note 3)	E _{AS}	1000	mJ
Peak Diode Recovery dv/dt		dv/dt	2.2	V/ns
Power Dissipation	TO-220	P _D	200	W
	TO-220F		43	W
Junction Temperature		T _J	+150	°C
Storage Temperature		T _{STG}	-55 ~ +150	°C

Notes: 1. Absolute maximum ratings are those values beyond which the device could be permanently damaged.

Absolute maximum ratings are stress ratings only and functional device operation is not implied.

2. Repetitive Rating: Pulse width limited by maximum junction temperature.

3. L = 10mH, I_{AS} = 14A, V_{DD} = 50V, R_G = 25Ω, Starting T_J = 25°C

4. I_{SD} ≤ 20A, di/dt ≤ 200A/μs, V_{DD} ≤ BV_{DSS}, Starting T_J = 25°C

THERMAL DATA

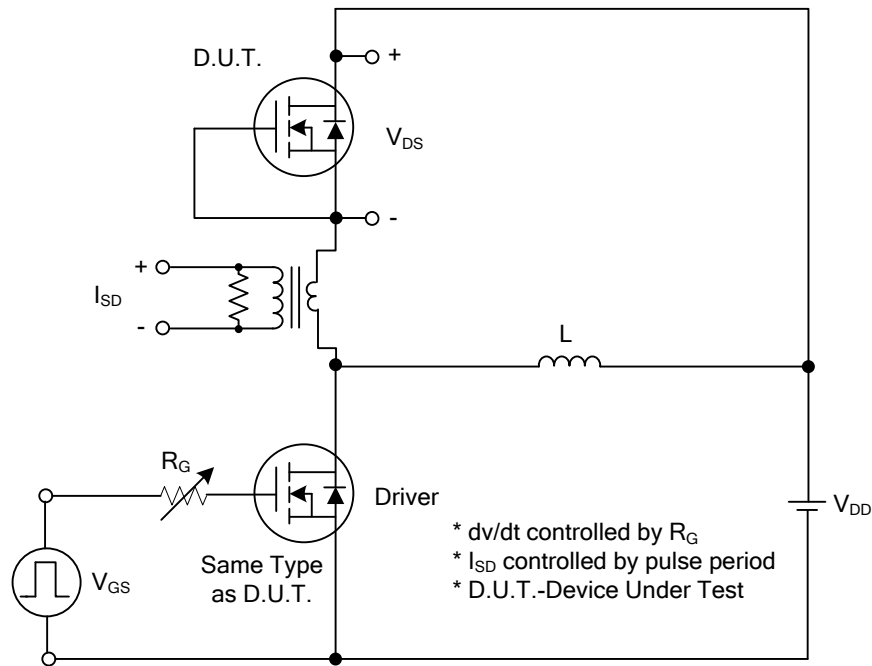
PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient	TO-220/TO-220F	θ _{JA}	62.5	°C/W
Junction to Case	TO-220	θ _{JC}	0.625	°C/W
	TO-220F		2.9	°C/W

■ ELECTRICAL CHARACTERISTICS ($T_C=25^\circ\text{C}$, unless otherwise noted)

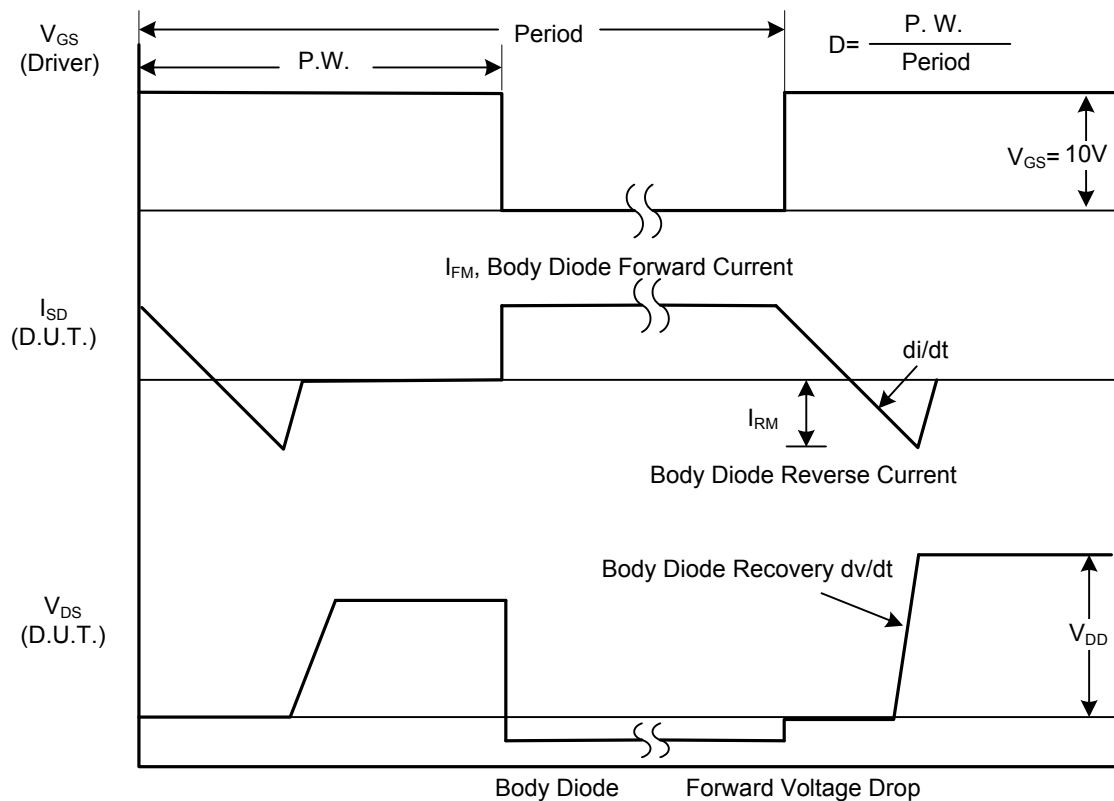
PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Off characteristics							
Drain-Source Breakdown Voltage		BV _{DSS}	I _D =250μA, V _{GS} =0V	500	-	-	V
Drain-Source Leakage Current		I _{DSS}	V _{DS} =500V, V _{GS} =0V	-	-	1	μA
Gate- Source Leakage Current	Forward	I _{GSS}	V _{GS} =+30V, V _{DS} =0V	-	-	+100	nA
	Reverse		V _{GS} =-30V, V _{DS} =0V	-	-	-100	nA
On characteristics							
Gate Threshold Voltage		V _{GS(TH)}	V _{DS} =V _{GS} , I _D =250μA	2.0	-	4.0	V
Static Drain-Source On-State Resistance		R _{DS(ON)}	V _{GS} =10V, I _D =10A	-	-	0.28	Ω
Dynamic characteristics							
Input Capacitance		C _{ISS}	V _{GS} =0V, V _{DS} =25V, f=1.0MHz	-	2450	-	pF
Output Capacitance		C _{OSS}		-	275	-	pF
Reverse Transfer Capacitance		C _{RSS}		-	16.5	-	pF
Switching characteristics							
Total Gate Charge (Note 1)		Q _G	V _{DS} =100V, V _{GS} =10V, I _D =20A I _G = 1mA (Note1, 2)	-	53	-	nC
Gate to Source Charge		Q _{GS}		-	11	-	nC
Gate to Drain Charge		Q _{GD}		-	13	-	nC
Turn-ON Delay Time (Note 1)		t _{D(ON)}	V _{DS} =100V, V _{GS} =10V, I _D =20A, R _G =25Ω (Note1, 2)	-	32	-	ns
Rise Time		t _R		-	30	-	ns
Turn-OFF Delay Time		t _{D(OFF)}		-	162	-	ns
Fall-Time		t _F		-	70	-	ns
Source-drain diode ratings and characteristics							
Maximum Body-Diode Continuous Current		I _S		-	-	20	A
Maximum Body-Diode Pulsed Current		I _{SM}		-	-	80	A
Drain-Source Diode Forward Voltage (Note 1)		V _{SD}	I _S =20A, V _{GS} =0V	-	-	1.4	V
Body Diode Reverse Recovery Time (Note 1)		t _{rr}	I _S =20A, V _{GS} =0V, V _R =400V	-	412	-	ns
Reverse Recovery Charge		Q _{rr}	dI _F /dt=100A/μs (Note 1)	-	6.5	-	μC

Notes: 1. Pulse Test: Pulse width $\leq 300\mu\text{s}$, Duty cycle $\leq 2\%$.
2. Essentially independent of operating temperature.

■ TEST CIRCUITS AND WAVEFORMS

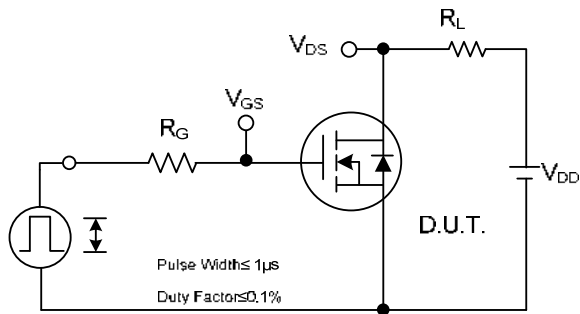


Peak Diode Recovery dv/dt Test Circuit

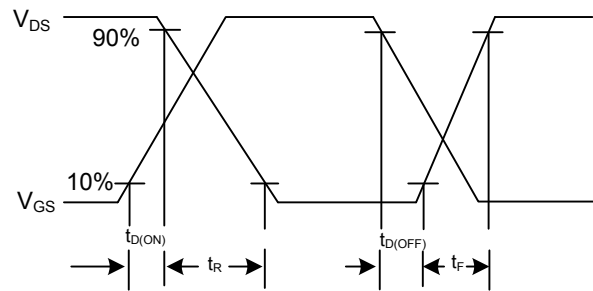


Peak Diode Recovery dv/dt Waveforms

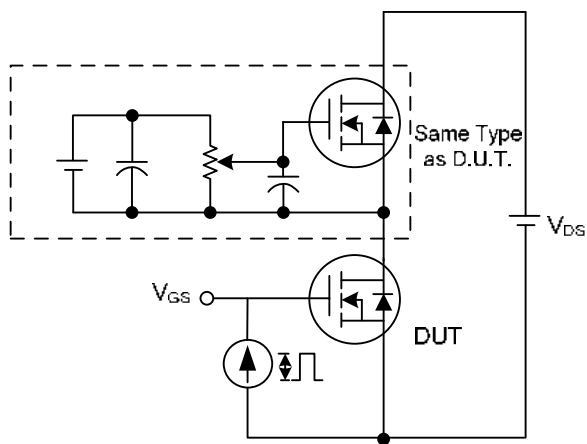
■ TEST CIRCUITS AND WAVEFORMS(Cont.)



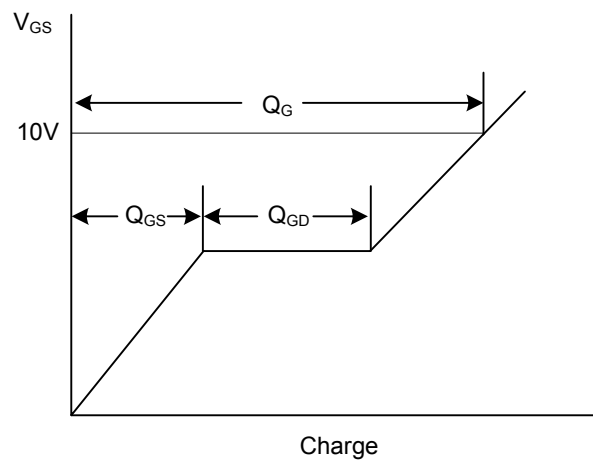
Switching Test Circuit



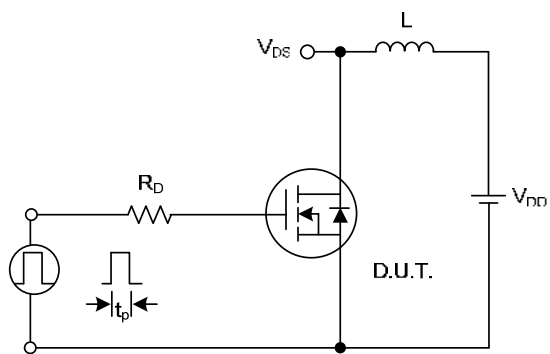
Switching Waveforms



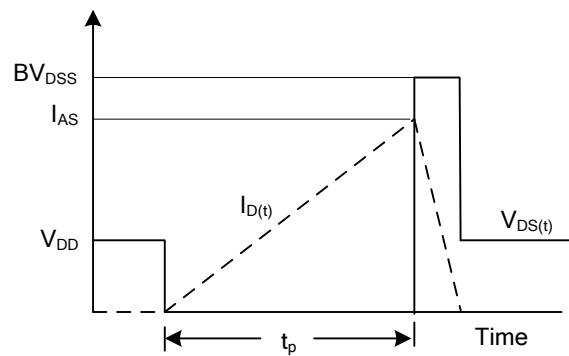
Gate Charge Test Circuit



Gate Charge Waveform

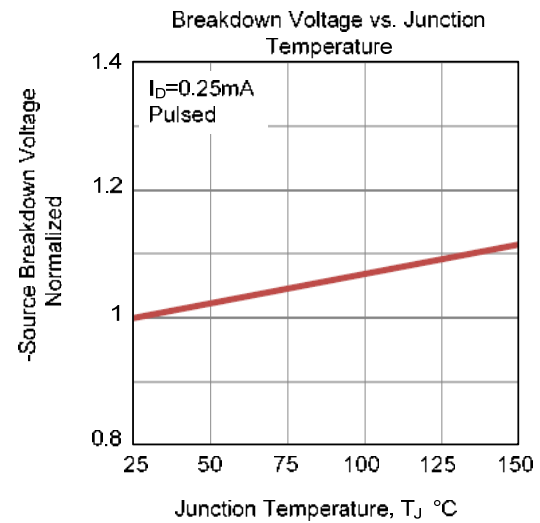
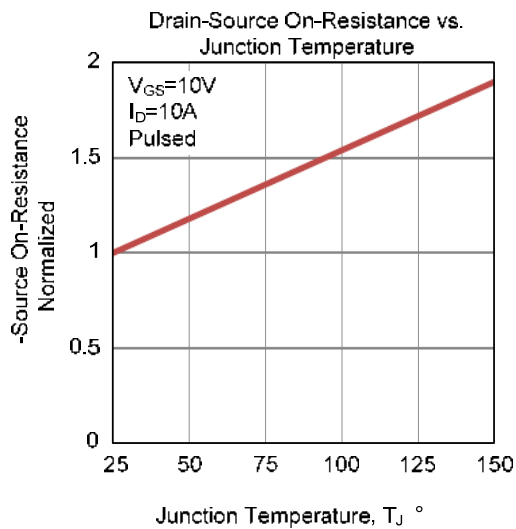
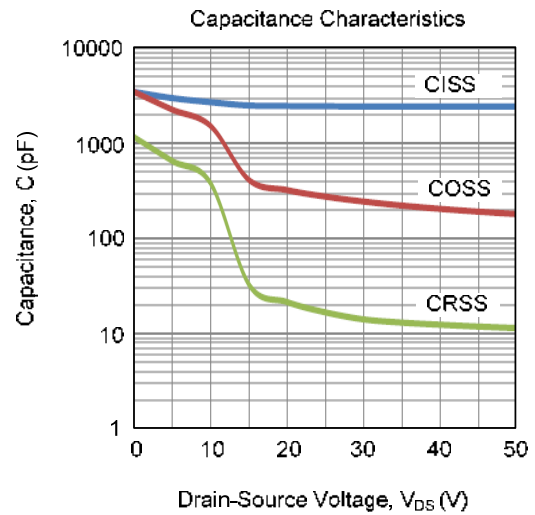
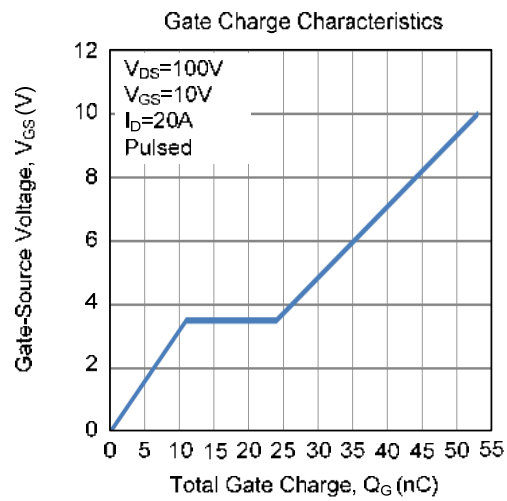
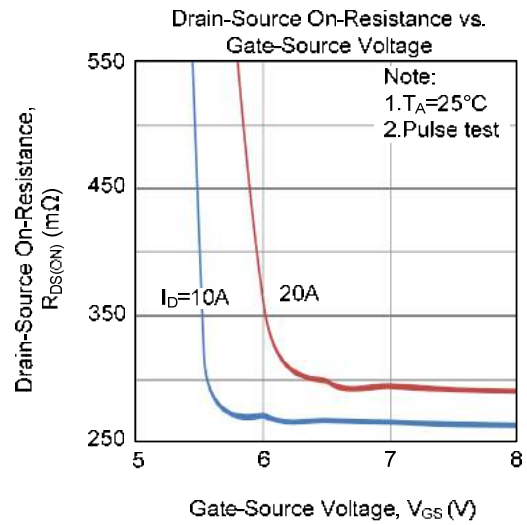
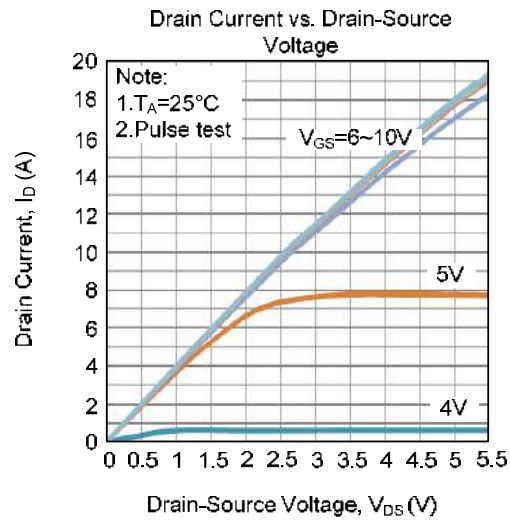


Unclamped Inductive Switching Test Circuit

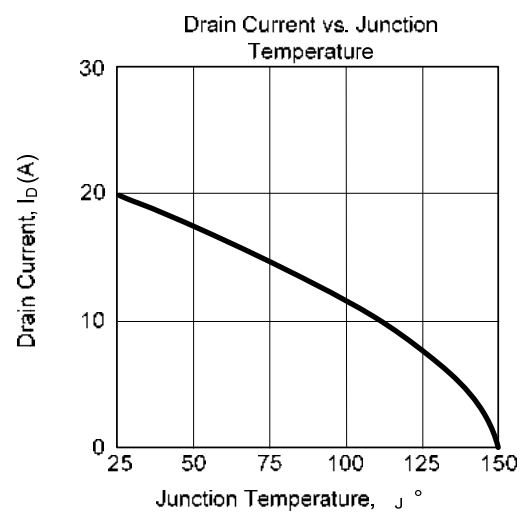
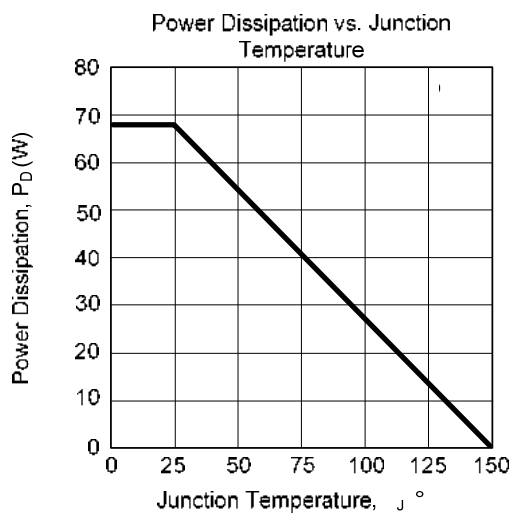
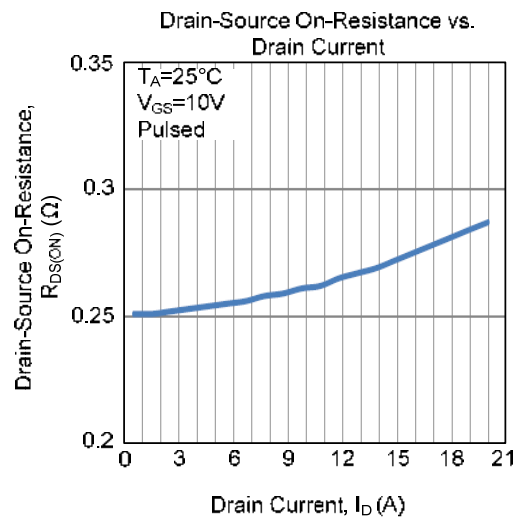
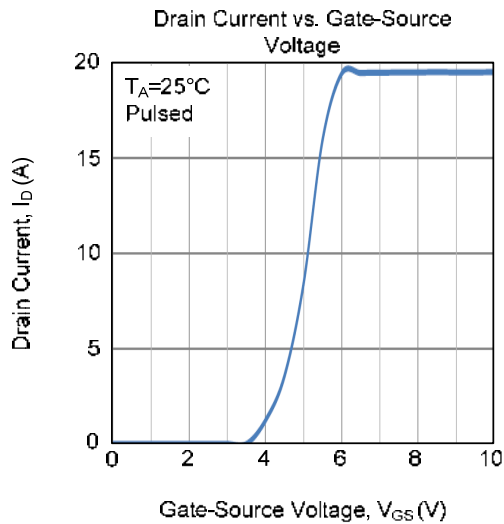
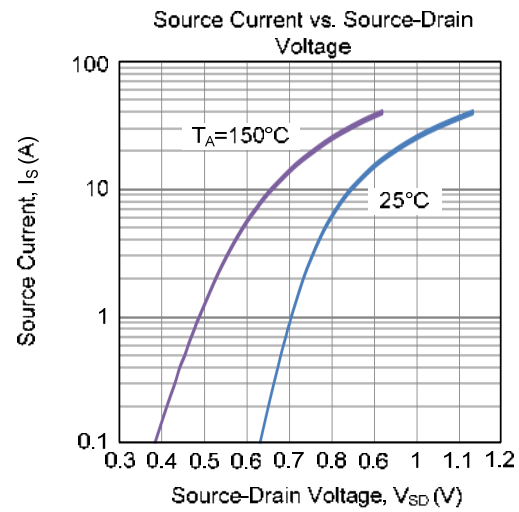
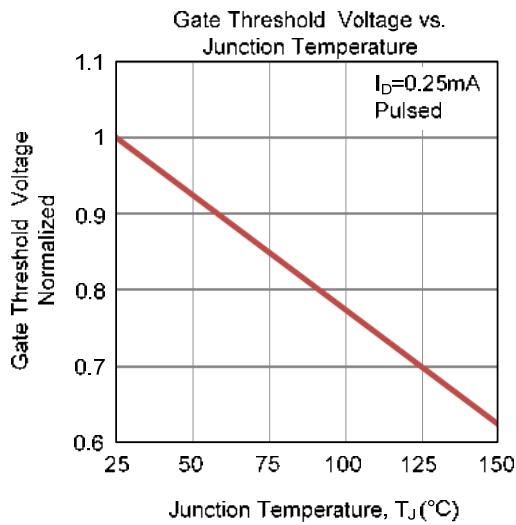


Unclamped Inductive Switching Waveforms

■ TYPICAL CHARACTERISTICS



■ TYPICAL CHARACTERISTICS(Cont.)



Technical drawing of a mechanical part, showing front, top, and side views with dimensions.

Front View Dimensions:

- Overall width: 10.06 ± 0.15
- Overall height: 15.87 ± 0.15
- Top section width: 7.00 ± 0.15
- Top section height: 3.30
- Bottom section height: 4.90
- Central circular feature diameter: $3 - \phi 1.50 \pm 0.15$
- Central circular feature height: 1.80 ± 0.1
- Central circular feature width: 1.80 ± 0.1
- Central circular feature radius: $R0.5$
- Central circular feature diameter: 8.0
- Bottom section width: $3 - 1.38 \pm 0.1$
- Bottom section height: 12.93 ± 0.3
- Bottom section width: 0.80
- Bottom section height: 2.54
- Bottom section width: 2.54
- Bottom section height: (9.75)
- Bottom section width: (3.18)

Top View Dimensions:

- Overall width: 4.70 ± 0.1
- Overall height: 6.68 ± 0.1
- Top section width: 2.54 ± 0.15
- Top section height: 5°
- Top section width: 5°
- Top section height: $1.00 \times 45^\circ$
- Top section width: 5°
- Top section height: 5°
- Top section width: 0.50

Side View Dimensions:

- Overall width: 180
- Overall height: 12.93 ± 0.3
- Top section width: 2.82 ± 0.1
- Top section height: 5°
- Top section width: 5°
- Top section height: 5°
- Top section width: 0.50

■ TO-220-3L PACKAGE OUTLINE DIMENSIONS

