

■ PRODUCT CHARACTERISTICS

VDSS	650
$R_{DS(on)Typ}(@V_{GS} = 10V)$	0.66Ω
Qg@type	36nC
ID	13A

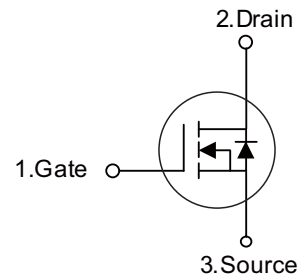
■ APPLICATIONS

- High efficiency switch mode power supplies
- Electronic ballasts
- LED power supply

■ FEATURES

- * Fast switching capability
- * Avalanche energy tested
- * Improved dv/dt capability, high ruggedness

Symbol



TO-220



TO-220F

■ ORDER INFORMATION

Order codes		Package	Packing
Halogen-Free	Halogen		
N/A	MOT13N65HF	TO-220F	50 pieces/Tube
N/A	MOT13N65A	TO-220	50 pieces/Tube

■ ABSOLUTE MAXIMUM RATINGS ($T_C = 25^\circ\text{C}$, unless otherwise specified)

PARAMETER	SYMBOL	RATINGS	UNIT	
Drain-Source Voltage	V_{DSS}	650	V	
Gate-Source Voltage	V_{GSS}	±30	V	
Continuous Drain Current	I_D	13	A	
Pulsed Drain Current (Note 2)	I	26	A	
Avalanche Energy	Single Pulsed (Note 3)	E_{AS}	255	mJ
Peak Diode Recovery dv/dt (Note 4)	dv/dt	2.9	V/ns	
Power Dissipation	TO-220	P_D	160	W
	TO-220F		42	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. $L = 1.0\text{mH}$, $I_{AS} = 22.6\text{A}$, $V_{DD} = 50\text{V}$, $R_G = 25\ \Omega$, Starting $T_J = 25^\circ\text{C}$

4. $I_{SD} \leq 13\text{A}$, $di/dt \leq 200\text{A}/\mu\text{s}$, $V_{DD} \leq BV_{DSS}$, Starting $T_J = 25^\circ\text{C}$

■ THERMAL DATA

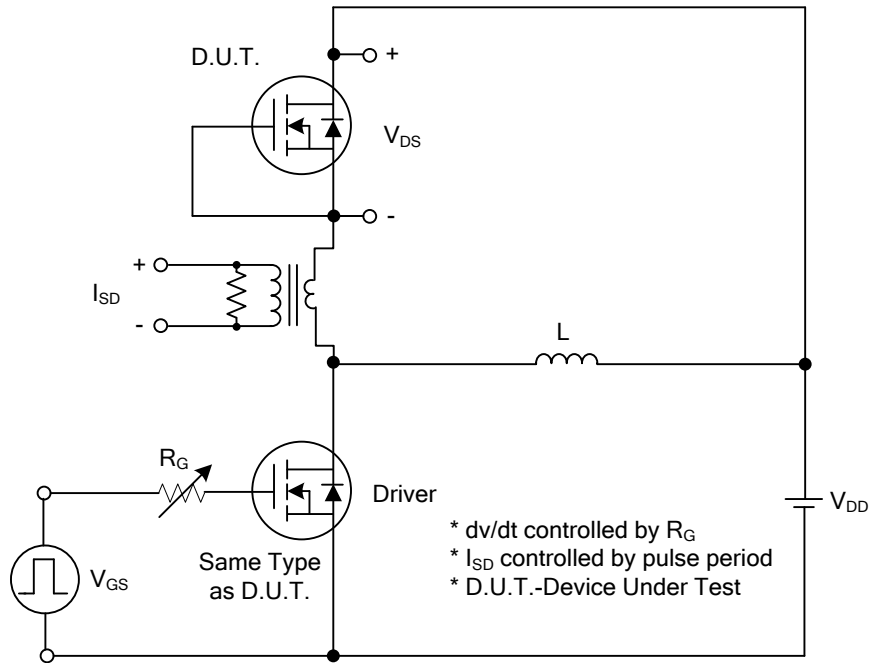
PARAMETER	SYMBOL	RATINGS	UNIT	
Junction to Ambient	θ_{JA}	62.5	°C/W	
Junction to Case	TO-220	θ_{JC}	0.78	°C/W
	TO-220F		2.98	°C/W

■ ELECTRICAL CHARACTERISTICS (T_c=25°C, unless otherwise noted)

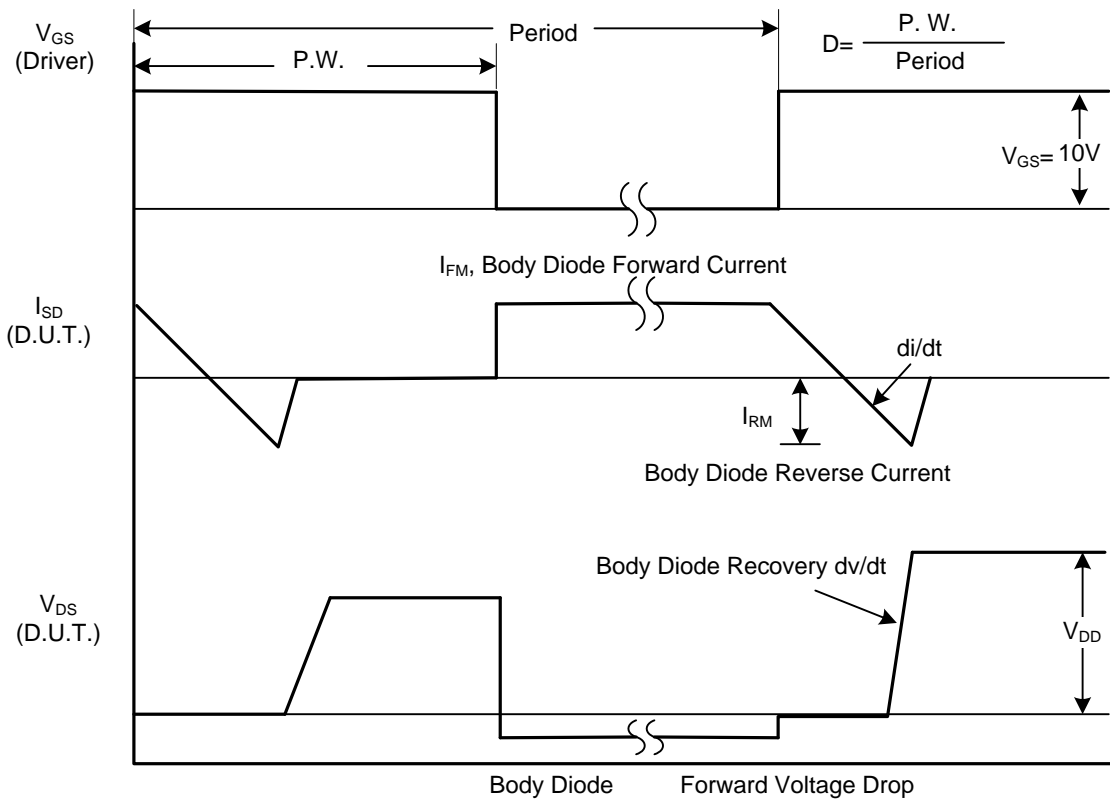
PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Off characteristics						
Drain-Source Breakdown Voltage	BV _{DSS}	V _{GS} =0V, I _D =250μA	650	-	-	V
Drain-Source Leakage Current	I _{DSS}	V _{DS} =650V, V _{GS} =0V	-	-	1	μA
Gate- Source Leakage Current	Forward	I _{GSS} V _{GS} =30V, V _{DS} =0V	-	-	100	nA
	Reverse		V _{GS} =-30V, V _{DS} =0V	-	-	-100
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 =6.5A	-	0.66	0.7	Ω
Dynamic characteristics						
Input Capacitance	C _{ISS}	V _{DS} =25V, V _{GS} =0V, f=1.0MHz	-	1700	-	pF
Output Capacitance	C _{OSS}		-	156	-	pF
Reverse Transfer Capacitance	C _{RSS}		-	11	-	pF
Switching characteristics						
Total Gate Charge (Note 1)	Q _G	V _{DS} =520V, V _{GS} =10V, I _D =13A I _G =1mA (Note 1, 2)	-	36	-	nC
Gate-Source Charge	Q _{GS}		-	9	-	nC
Gate-Drain Charge	Q _{GD}		-	9.4	-	nC
Turn-On Delay Time (Note 1)	t _{D(ON)}	V _{DS} =100V, V _{GS} =10V, I _D =13A, R _G =25Ω (Note 1, 2)	-	28	-	ns
Turn-On Rise Time	t _R		-	22	-	ns
Turn-Off Delay Time	t _{D(OFF)}		-	108	-	ns
Turn-Off Fall Time	t _F		-	37	-	ns
Drain-source diode characteristics						
Maximum Body-Diode Continuous Current	I _S		-	-	13	A
Maximum Body-Diode Pulsed Current	I _{SM}		-	-	26	A
Drain-Source Diode Forward Voltage (Note 1)	V _{SD}	I _S =13A, V _{GS} =0V	-	-	1.4	V
Reverse Recovery Time (Note 1)	t _{rr}	I _S =13A, V _{GS} =0V di/dt=100A/μs	-	410	-	ns
Reverse Recovery Charge	Q _{rr}		-	12.8	-	μC

Notes: 1. Pulse Test: Pulse width ≤ 300μs, Duty cycle ≤ 2%.
2. Essentially independent of operating temperature.

■ TEST CIRCUITS AND WAVEFORMS

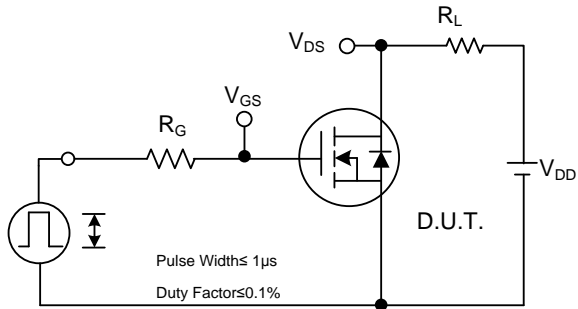


Peak Diode Recovery dv/dt Test Circuit

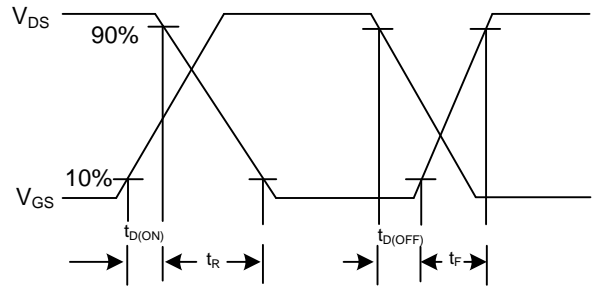


Peak Diode Recovery dv/dt Waveforms

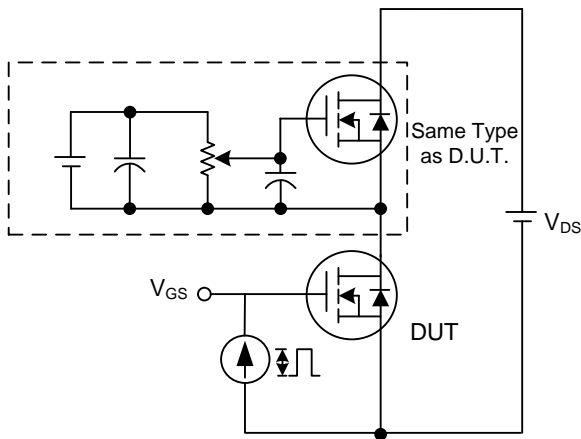
■ TEST CIRCUITS AND WAVEFORMS(Cont.)



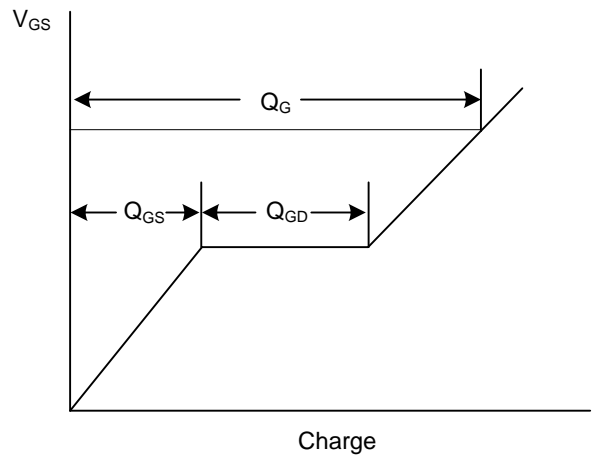
Switching Test Circuit



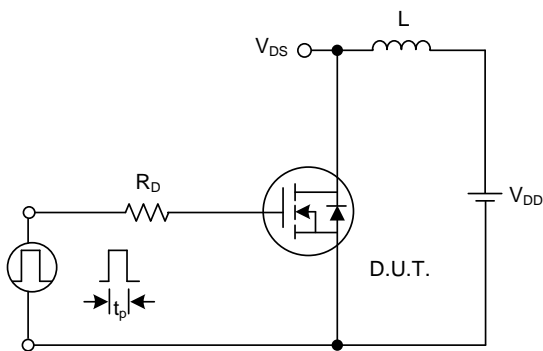
Switching Waveforms



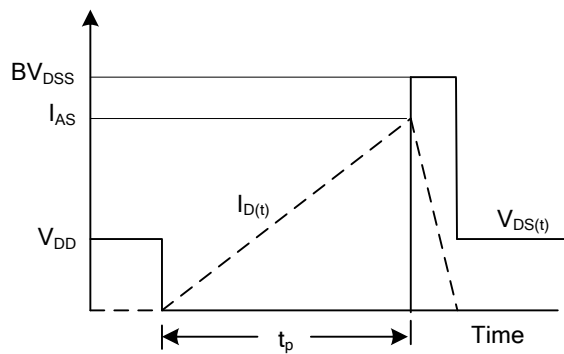
Gate Charge Test Circuit



Gate Charge Waveform

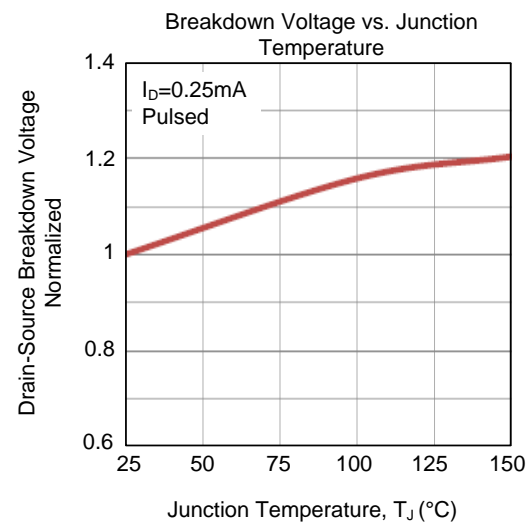
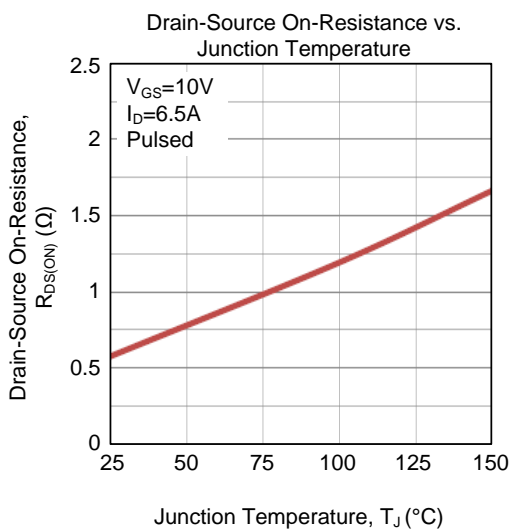
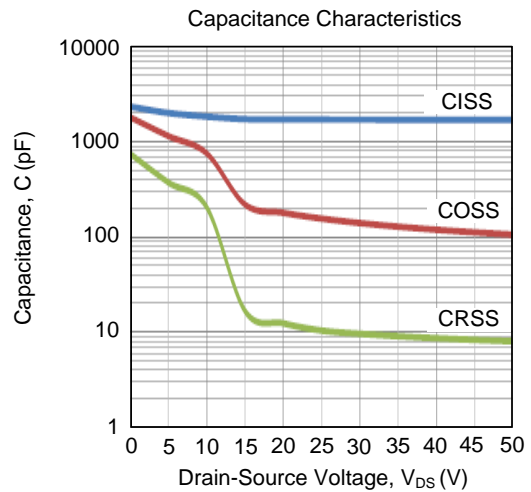
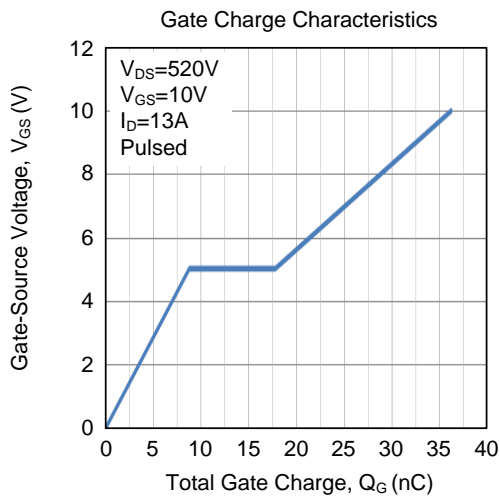
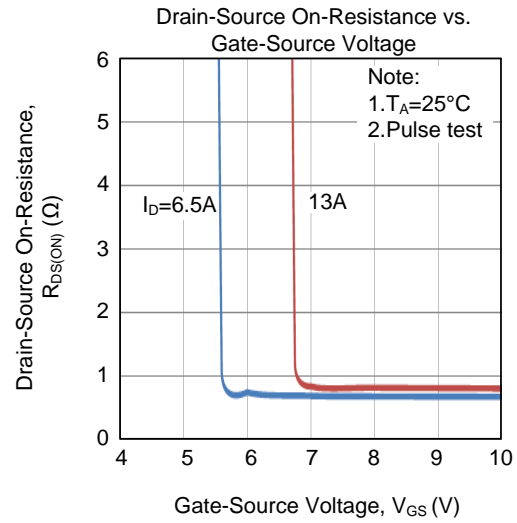
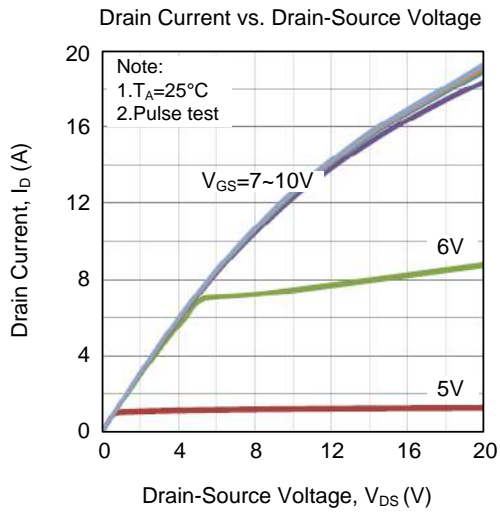


Unclamped Inductive Switching Test Circuit

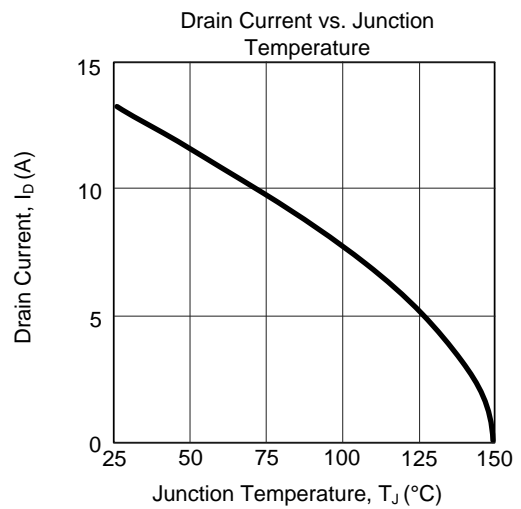
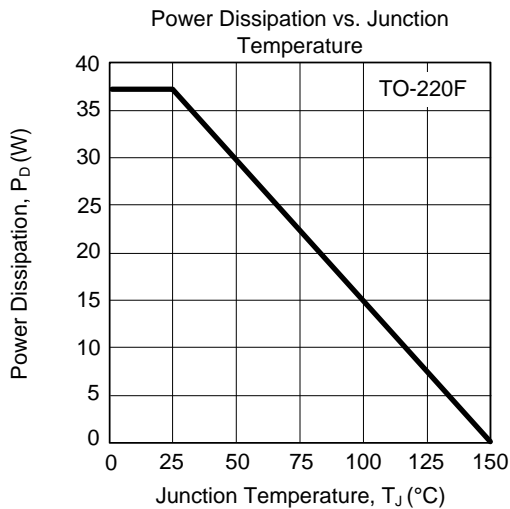
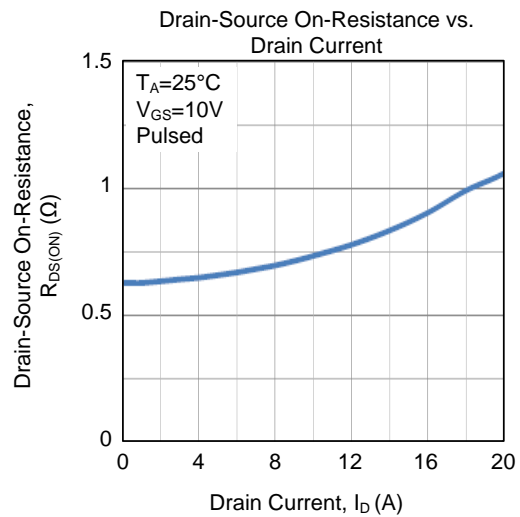
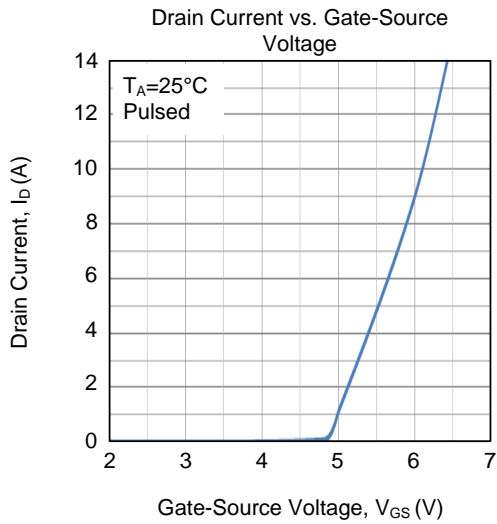
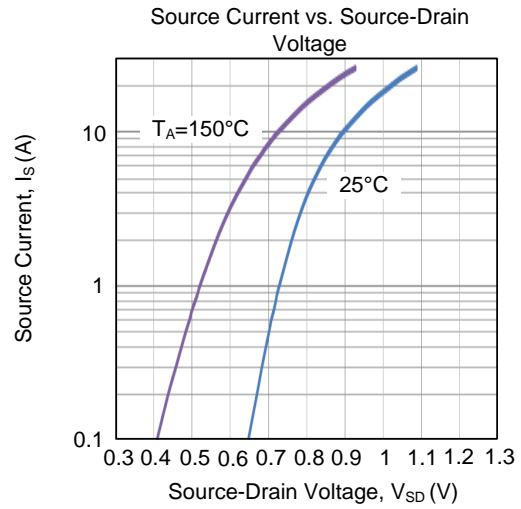
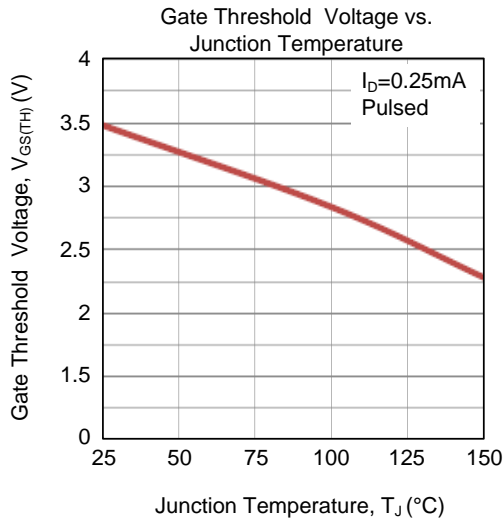


Unclamped Inductive Switching Waveforms

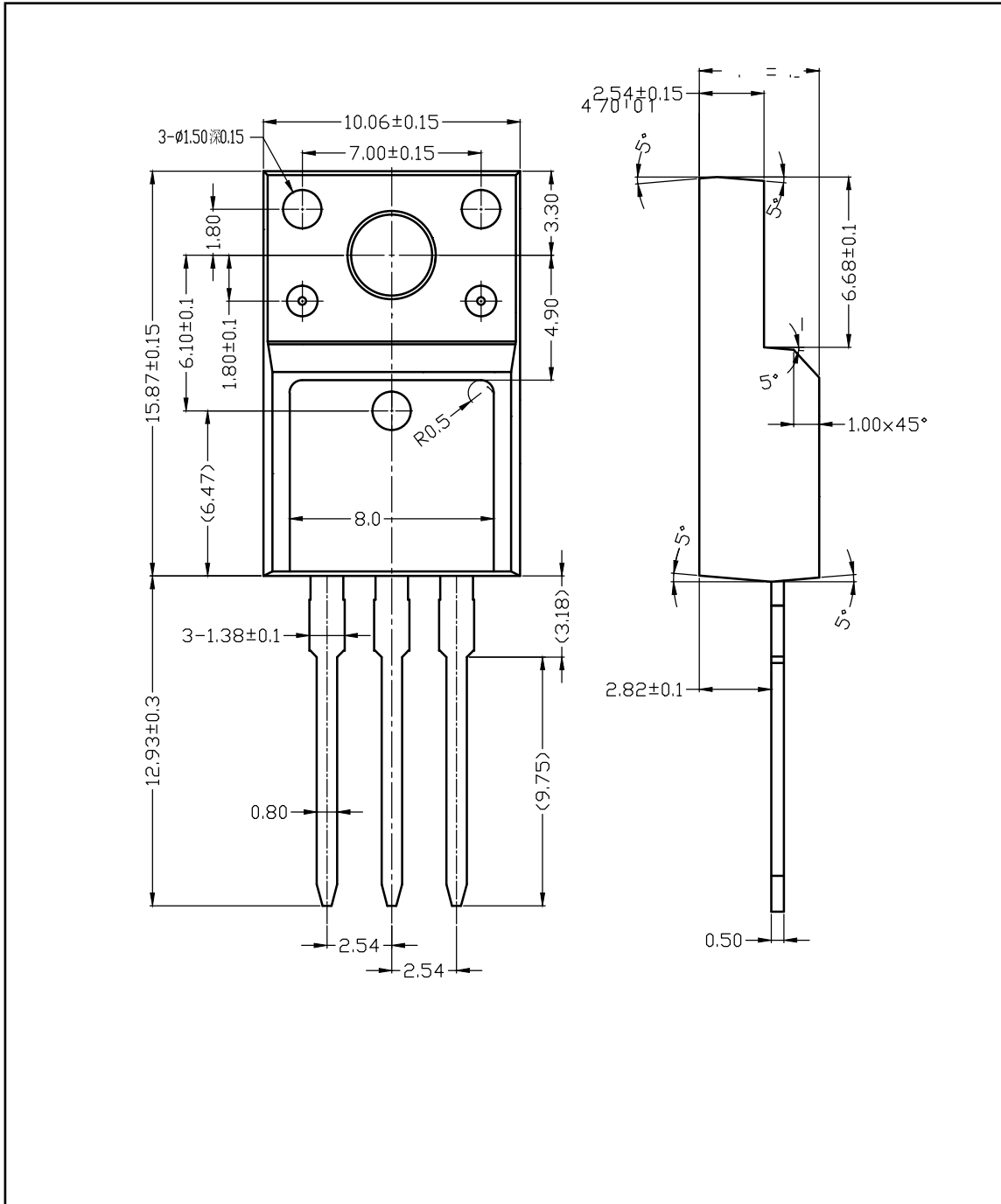
■ TYPICAL CHARACTERISTICS



■ TYPICAL CHARACTERISTICS(Cont.)



■ TO-220F-3L PACKAGE OUTLINE DIMENSIONS



■ TO-220-3L PACKAGE OUTLINE DIMENSIONS

