

CL70R580F

650V N-Channel Super Junction MOSFET

Features


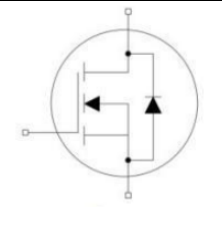
- Very Low FOM ($R_{DS(on)} \times Q_g$)
- Extremely low switching loss
- Excellent stability and uniformity
- 100% Avalanche Tested
- Built-in ESD Diode

ITEM	Value	Unit
BV_{DSS}	700	V
I_D	7	A
$R_{DS(on)(MAX)}$	0.58	Ω
$Q_{g,Typ}$	13.3	nC

Applications

- Switch Mode Power Supply (SMPS)
- Uninterruptible Power Supply (UPS)
- Power Factor Correction (PFC)
- AC to DC Converters
- Telecom

Package & Internal Circuit

TO-220F	SYMBOL
	

Absolute Maximum Ratings $T_C=25^\circ\text{C}$ unless otherwise specified

Symbol	Parameter	Value	Unit
V_{DSS}	Drain-Source Voltage	700	V
V_{GS}	Gate-Source Voltage	± 30	V
I_D	Drain Current - Continuous ($T_C = 25^\circ\text{C}$)	7	A
	Drain Current - Continuous ($T_C = 100^\circ\text{C}$)	5.6	A
$I_{DM}^{(1)}$	Drain Current - Pulsed	28	A
$E_{AS}^{(2)}$	Single Pulsed Avalanche Energy	125	mJ
I_{AR}	Avalanche Current	1.2	A
dv/dt	MOSFET dv/dt ruggedness, $V_{DS}=0\dots 400\text{V}$	50	V/ns
dv/dt	Reverse diode dv/dt, $V_{DS}=0\dots 400\text{V}$, $I_{DS} \leq I_D$	15	V/ns
P_D	Power Dissipation ($T_C = 25^\circ\text{C}$)	34	W
$V_{ESD(G-S)}$	Gate source ESD(HBM-C=100pF, R=1.5K Ω)	2000	V
T_j, T_{stg}	Operating and Storage Temperature Range	-55 to +150	$^\circ\text{C}$

Thermal Resistance Characteristics

Symbol	Parameter	Value	Unit
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case, Max.	3.68	$^\circ\text{C/W}$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient, Max.	62.5	$^\circ\text{C/W}$

Electrical Characteristics $T_J = 25\text{ }^\circ\text{C}$ unless otherwise specified

Symbol	Parameter	Test conditions	Min	Typ	Max	Unit
On-Characteristics						
V_{GS}	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = 250\ \mu\text{A}$	2.0		4.0	V
$R_{DS(ON)}$	Static Drain-Source On-Resistance	$V_{GS} = 10\text{ V}, I_D = 3.5\text{A}$		0.53	0.58	Ω
Off Characteristics						
BV_{DSS}	Drain-Source Breakdown Voltage	$V_{GS} = 0\text{ V}, I_D = 1\text{mA}$	700			V
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 700\text{ V}, V_{GS} = 0$			1	μA
		$V_{DS} = 700\text{ V}, T_C = 150\text{ }^\circ\text{C}$			100	μA
I_{GSS}	Gate-Body Leakage Current	$V_{GS} = \pm 30\text{ V}, V_{DS} = 0\text{ V}$			± 100	nA
Dynamic Characteristics						
C_{iss}	Input Capacitance	$V_{DS} = 100\text{ V}, V_{GS} = 0\text{ V},$ $f = 1.0\text{ MHz}$		588		pF
C_{oss}	Output Capacitance			17		pF
C_{rss}	Reverse Transfer Capacitance			2.7		pF
Switching Characteristics						
$t_{d(on)}$	Turn-On Time	$V_{DS} = 400\text{ V}, I_D = 7.5\text{A}, R_G = 25\ \Omega$ (Note 3,4)		11.6		ns
t_r	Turn-On Rise Time			23		ns
$t_{d(off)}$	Turn-Off Delay Time			53		ns
t_f	Turn-Off Fall Time			35.8		ns
Q_g	Total Gate Charge	$V_{DS} = 560\text{ V}, I_D = 7.5\text{ A},$ $V_{GS} = 10\text{ V}$ (Note 3,4)		13.3		nC
Q_{gs}	Gate-Source Charge			2.8		nC
Q_{gd}	Gate-Drain Charge			4.7		nC
Drain-Source Diode Characteristics and Maximum Ratings						
I_S	Maximum Continuous Drain-Source Diode Forward Current				7	A
I_{SM}	Maximum Pulsed Drain-Source Diode Forward Current				21	A
V_{SD}	Drain-Source Diode Forward Voltage	$V_{GS} = 0\text{ V}, I_S = 7\text{A}$			1.3	V
t_{rr}	Reverse Recovery Time	$V_R = 400\text{V}, I_F = 7\text{A}$ $di_F/dt = 100\text{ A}/\mu\text{s}$		395		ns
Q_{rr}	Reverse Recovery Charge			3.5		μC

Notes :

1. Repetitive Rating : Pulse width limited by maximum junction temperature
2. $I_{AS}=1.2\text{A}, V_{DD}=50\text{V}, R_G=25\Omega,$ Starting $T_J = 25\text{ }^\circ\text{C}$
3. Pulse Test : Pulse Width $\leq 300\ \mu\text{s},$ Duty Cycle $\leq 2\%$
4. Essentially Independent of Operating Temperature

Typical Characteristics

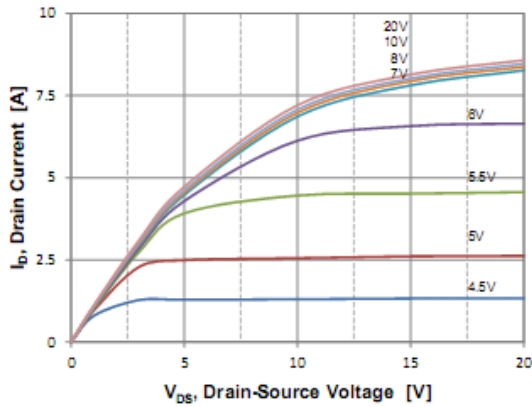


Figure 1. On Region Characteristics

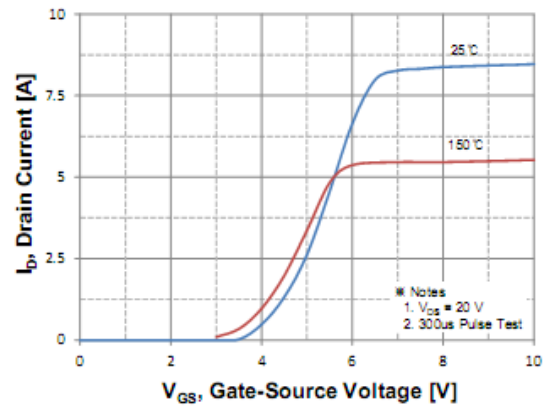


Figure 2. Transfer Characteristics

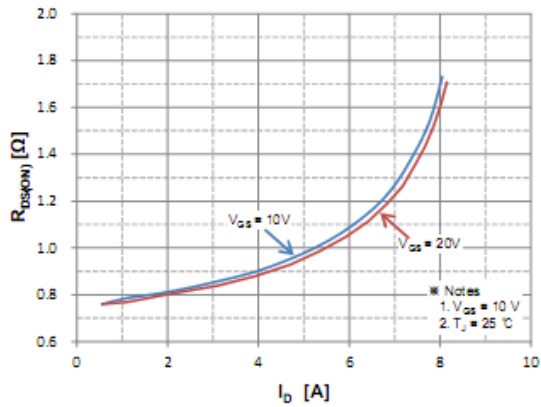


Figure 3. On Resistance Variation vs Drain Current and Gate Voltage

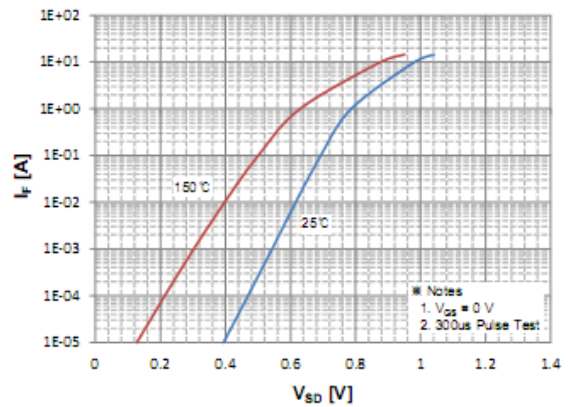


Figure 4. Body Diode Forward Voltage Variation with Source Current and Temperature

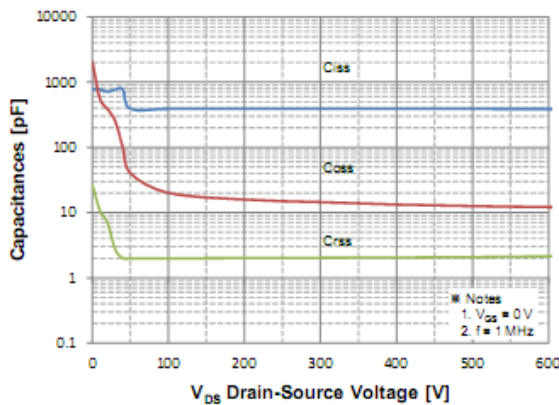


Figure 5. Capacitance Characteristics

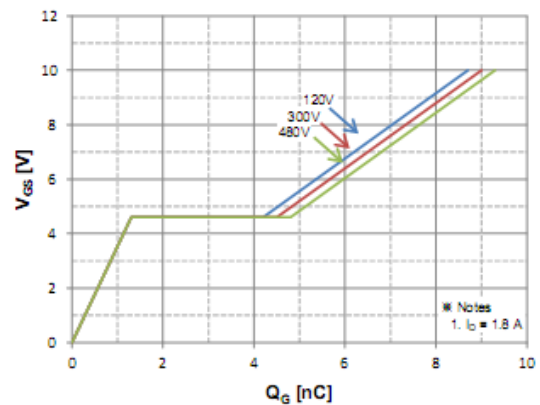


Figure 6. Gate Charge Characteristics

Typical Characteristics

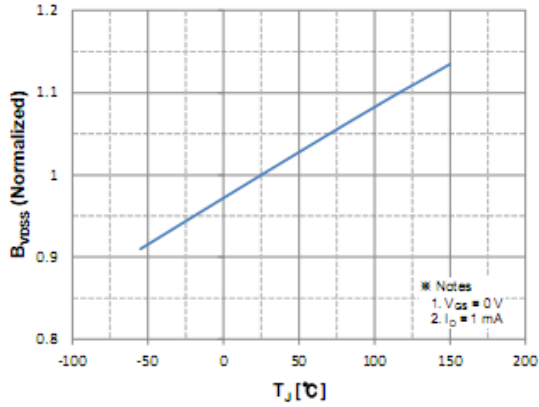


Figure 7. Breakdown Voltage Variation vs. Temperature

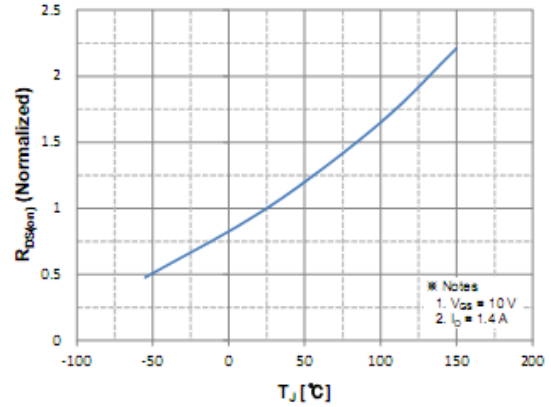


Figure 8. On-Resistance Variation vs. Temperature

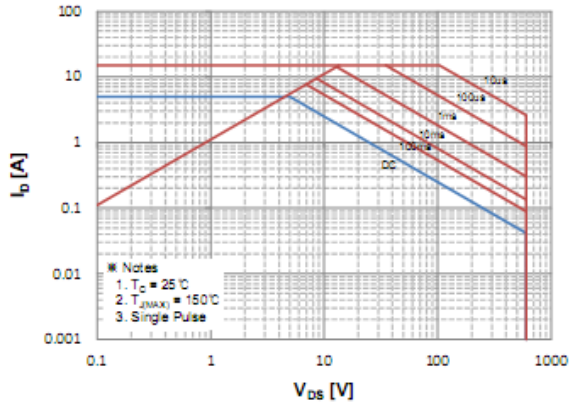


Figure 9. Maximum Safe Operating Area

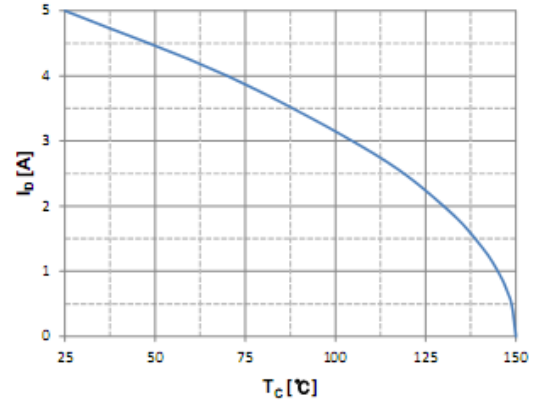


Figure 10. Maximum Drain Current vs. Case Temperature

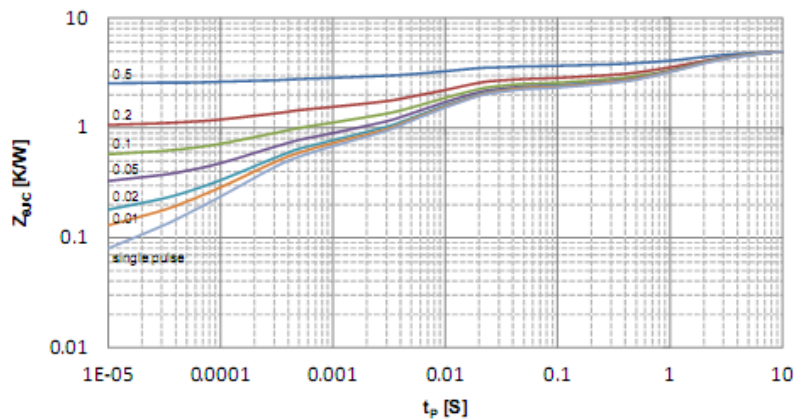


Figure 11. Transient Thermal Response Curve

Fig 12. Gate Charge Test Circuit & Waveform

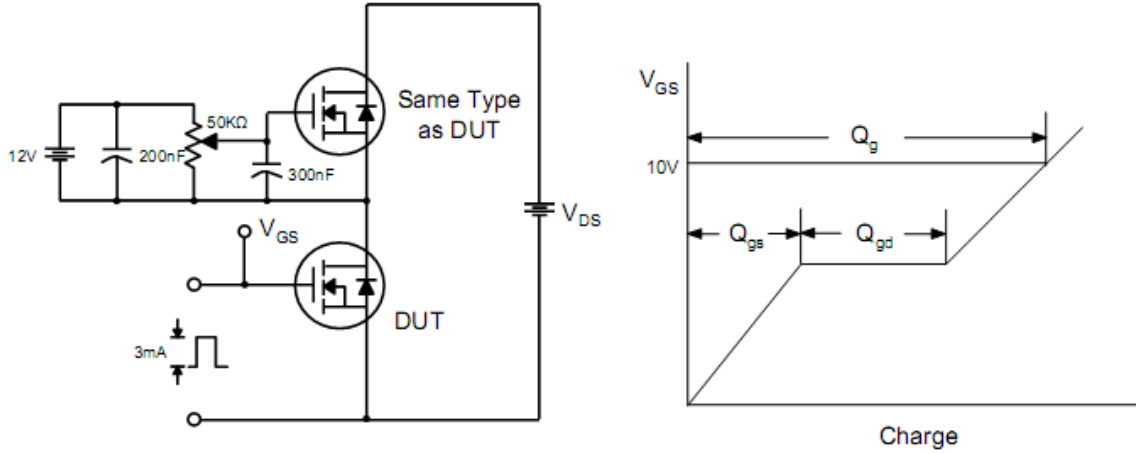


Fig 13. Resistive Switching Test Circuit & Waveforms

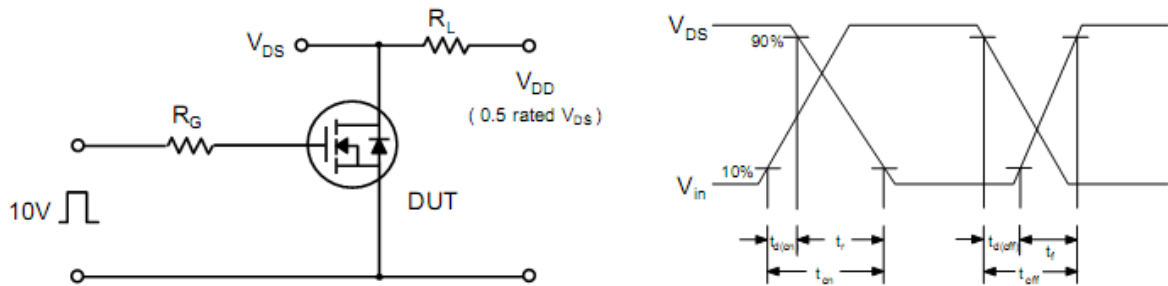


Fig 14. Unclamped Inductive Switching Test Circuit & Waveforms

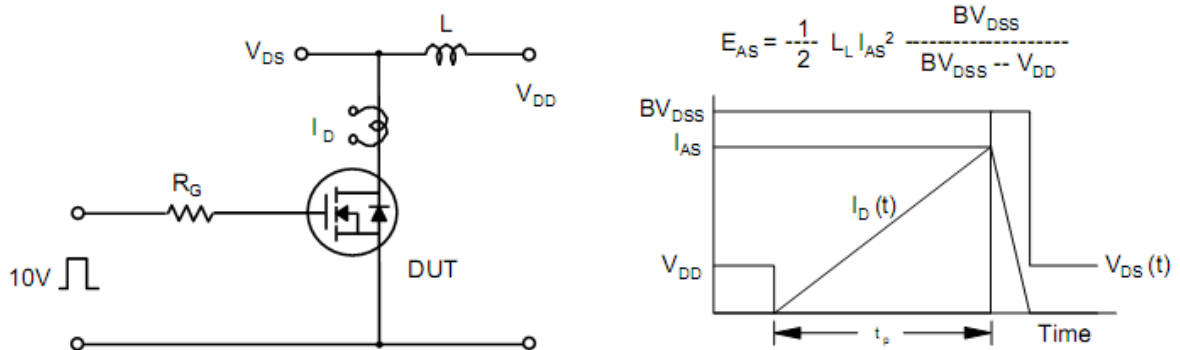
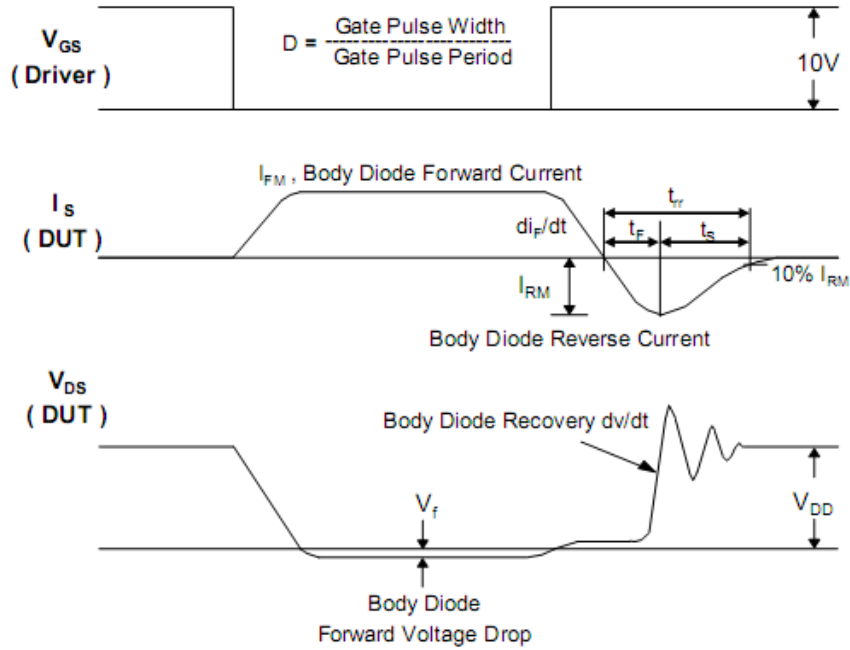
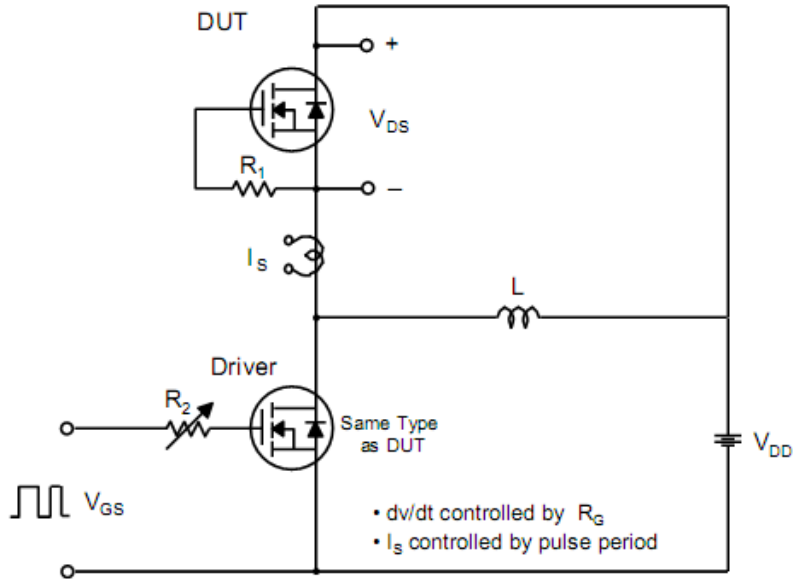
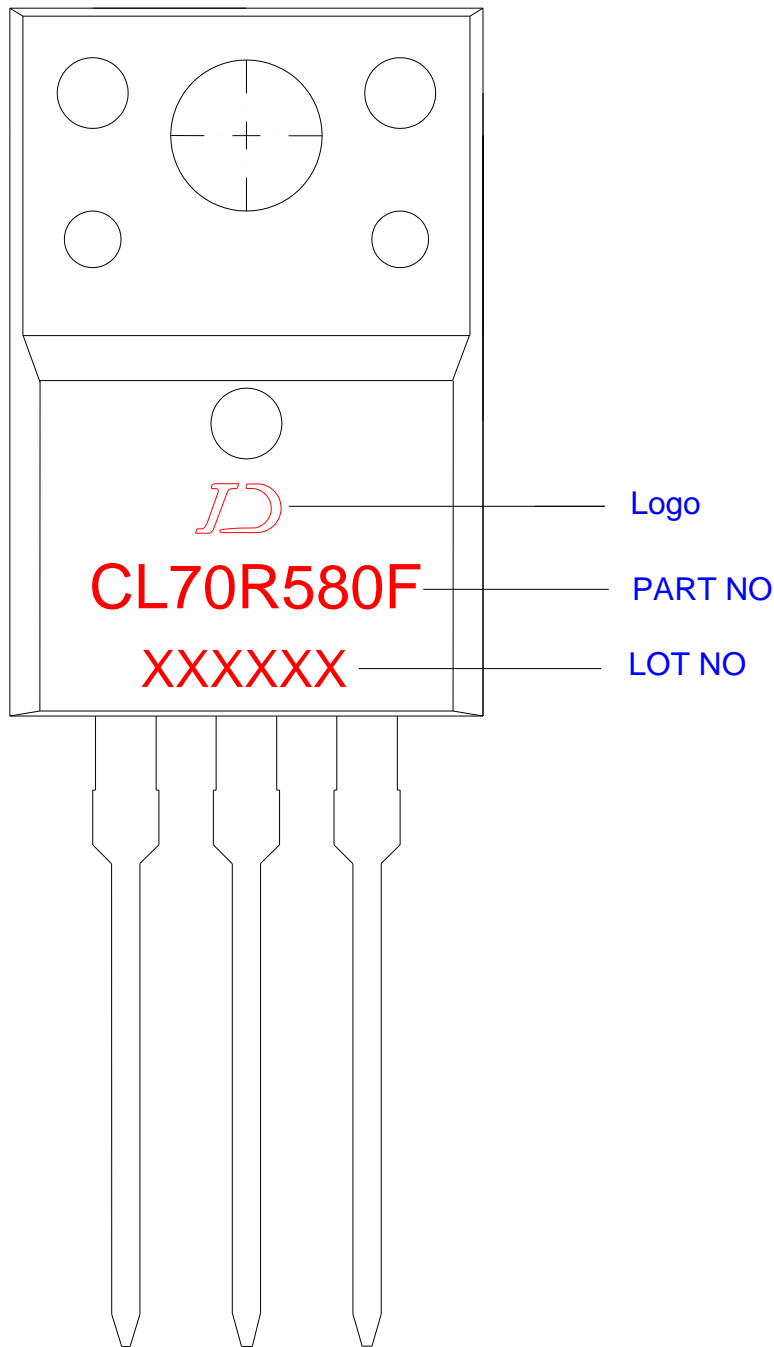


Fig 15. Peak Diode Recovery dv/dt Test Circuit & Waveforms



Marking



Package Dimension (Unit: mm)

T0-220F

