

Descriptions

This is 200V 40A N-CHANNEL MOSFET in a TO-220F Plastic Package.

Features

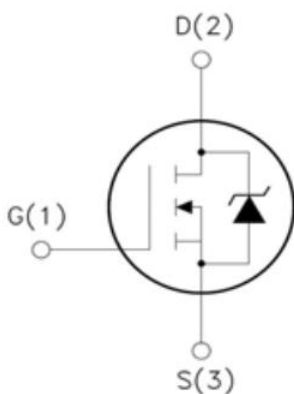
- Low Intrinsic Capacitances.
- Excellent Switching Characteristics.
- Extended Safe Operating Area.
- Unrivalled Gate Charge :Qg= 163nC (Typ.).
- BVDSS=200V, ID=40A
- 100% Avalanche Tested

Parameter	Value	Unit
V_{DS}	200	V
I_D	40	A
$R_{DS(ON)(MAX)}@10V$	41	mΩ

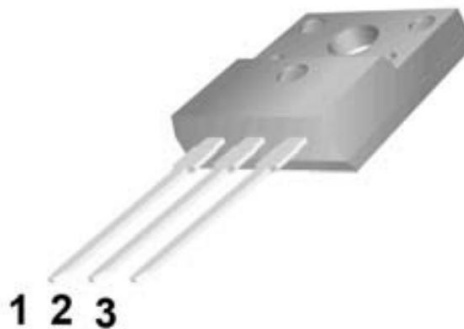
Applications

General purpose

Equivalent Circuit & Pinning



TO-220F



1.Gate(G) 2.Drain(D) 3.Source(S)

Absolute Maximum Ratings(Ta=25°C)

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V_{DS}	200	V
Gate-Source Voltage	V_{GS}	±20	V
Drain Current-Continuous	I_D	40	A
Drain Current-Continuous($T_c=100^\circ\text{C}$)	$I_D(100^\circ\text{C})$	28	A
Pulsed Drain Current	I_{DM}	160	A
Maximum Power Dissipation	P_D	60	W
Derating factor		0.4	W/°C
Single pulse avalanche energy ^(Note 5)	E_{AS}	480	mJ
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-55 To 175	°C

Thermal Characteristic

Thermal Resistance,Junction-to-Case ^(Note 2)	$R_{\theta JC}$	2.5	°C/W
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Electrical Characteristics(Ta=25°C)

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	BV _{DSS}	V _{GS} =0V I _D =250μA	200	220	-	V
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} =200V, V _{GS} =0V	-	-	1	μA
Gate-Body Leakage Current	I _{GSS}	V _{GS} =±20V, V _{DS} =0V	-	-	±100	nA
On Characteristics (Note 3)						
Gate Threshold Voltage	V _{GS(th)}	V _{DS} =V _{GS} , I _D =250μA	2	3.2	4	V
Drain-Source On-State Resistance	R _{DS(ON)}	V _{GS} =10V, I _D =20A	-	36.4	41	mΩ
Forward Transconductance	g _{FS}	V _{DS} =25V, I _D =25A	26	-	-	S
Dynamic Characteristics (Note4)						
Input Capacitance	C _{iss}	V _{DS} =25V, V _{GS} =0V, F=1.0MHz	-	6500	-	PF
Output Capacitance	C _{oss}		-	290	-	PF
Reverse Transfer Capacitance	C _{rss}		-	220	-	PF
Switching Characteristics (Note 4)						
Turn-on Delay Time	t _{d(on)}	V _{DD} =30V, I _D =2A, R _L =15Ω V _{GS} =10V, R _G =2.5Ω	-	26	-	nS
Turn-on Rise Time	t _r		-	24	-	nS
Turn-Off Delay Time	t _{d(off)}		-	91	-	nS
Turn-Off Fall Time	t _f		-	39	-	nS
Total Gate Charge	Q _g	V _{DS} =30V, I _D =30A, V _{GS} =10V	-	163		nC
Gate-Source Charge	Q _{gs}		-	31		nC
Gate-Drain Charge	Q _{gd}		-	64		nC
Drain-Source Diode Characteristics						
Diode Forward Voltage (Note 3)	V _{SD}	V _{GS} =0V, I _s =40A	-		1.2	V
Diode Forward Current (Note 2)	I _s		-	-	40	A
Reverse Recovery Time	t _{rr}	TJ = 25°C, IF = 40A di/dt = 100A/μs (Note3)	-	42		nS
Reverse Recovery Charge	Q _{rr}		-	66		nC
Forward Turn-On Time	t _{on}	Intrinsic turn-on time is negligible (turn-on is dominated by LS+LD)				

Notes:

1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Surface Mounted on FR4 Board, $t \leq 10$ sec.
3. Pulse Test: Pulse Width $\leq 300\mu s$, Duty Cycle $\leq 2\%$.
4. Guaranteed by design, not subject to production
5. E_{AS} condition: $j=25^\circ C, V_{DD}=50V, V_G=10V, L=0.5mH, R_g=25\Omega$

Electrical Characteristic Curve

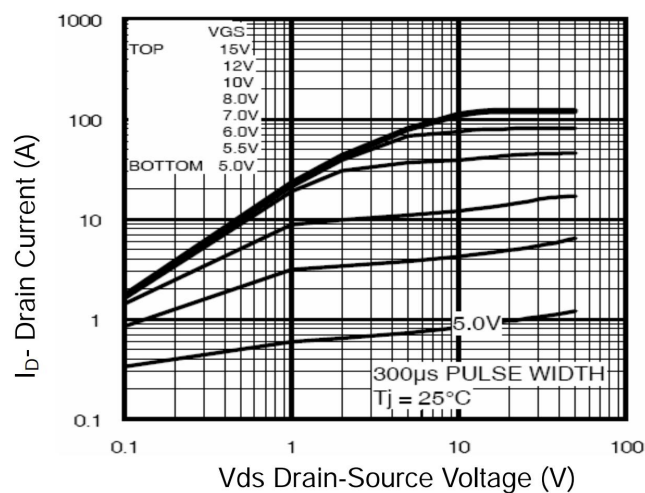


Figure 1 Output Characteristics

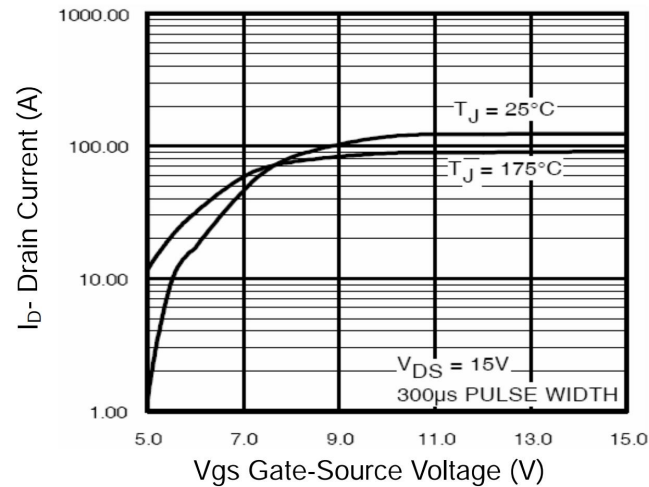


Figure 2 Transfer Characteristics

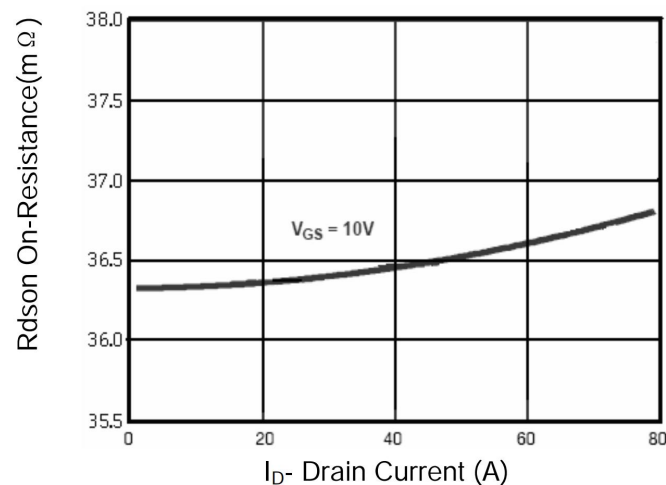


Figure 3 $R_{DS(on)}$ - Drain Current

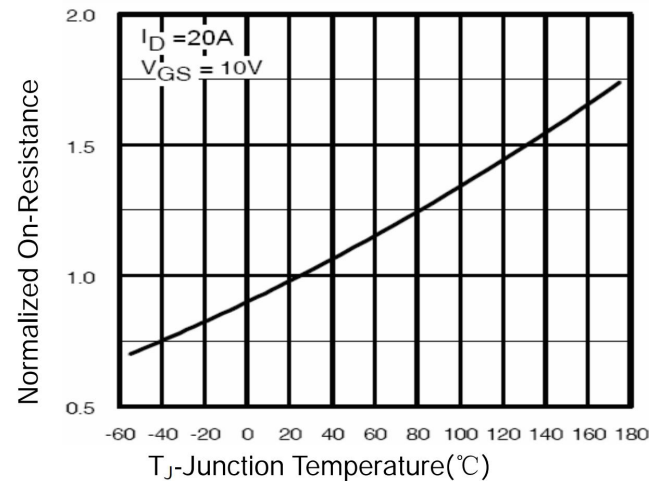


Figure 4 $R_{DS(on)}$ -JunctionTemperature

Electrical Characteristic Curve

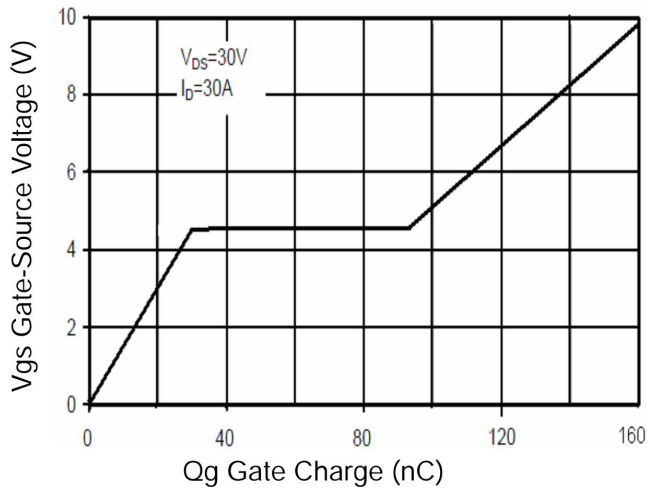


Figure 5 Gate Charge

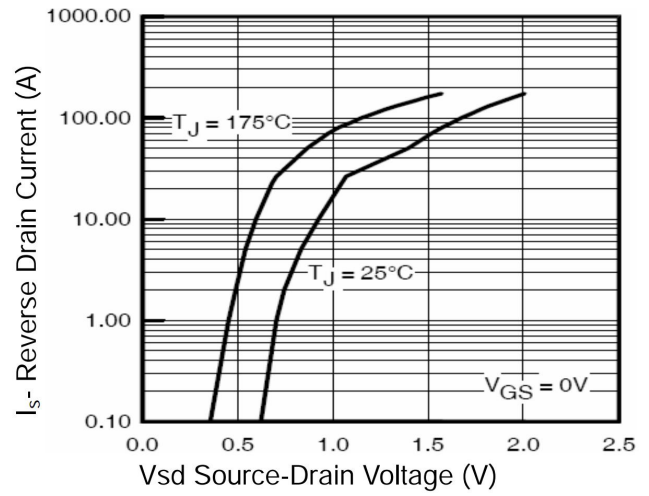


Figure 6 Source- Drain Diode Forward

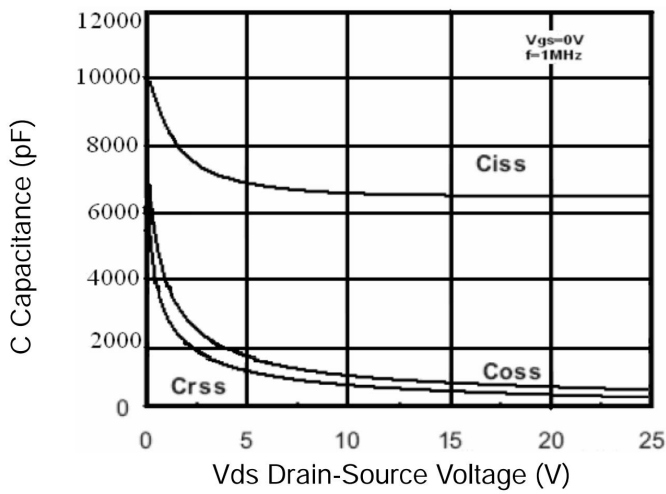


Figure 7 Capacitance vs Vds

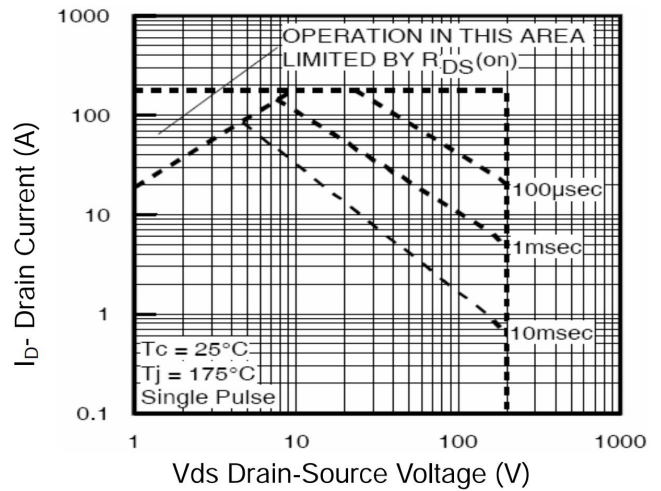


Figure 8 Safe Operation Area

Electrical Characteristic Curve

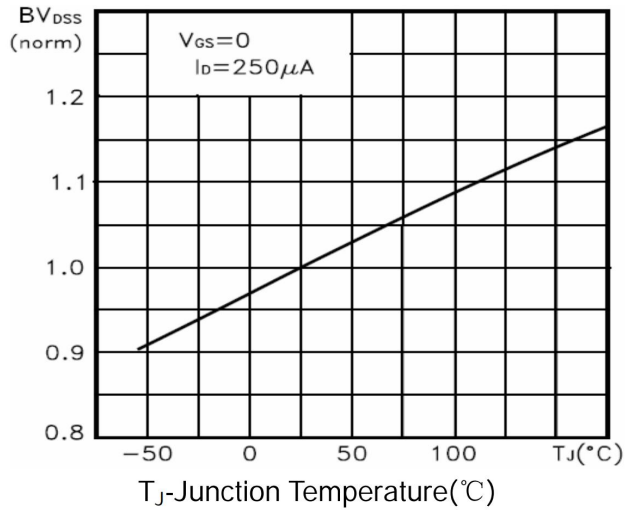


Figure 9 BV_{DSS} vs Junction Temperature

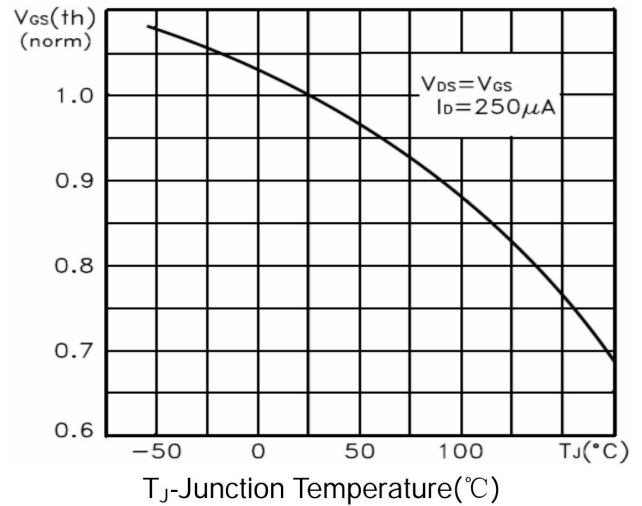


Figure 10 $V_{GS(th)}$ vs Junction Temperature

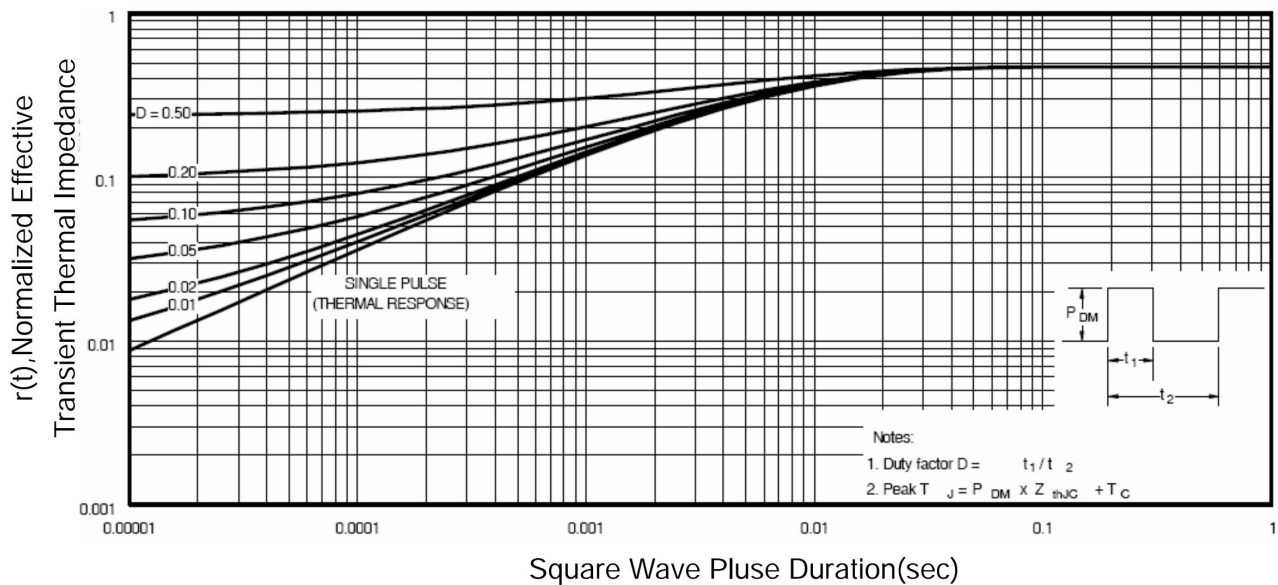
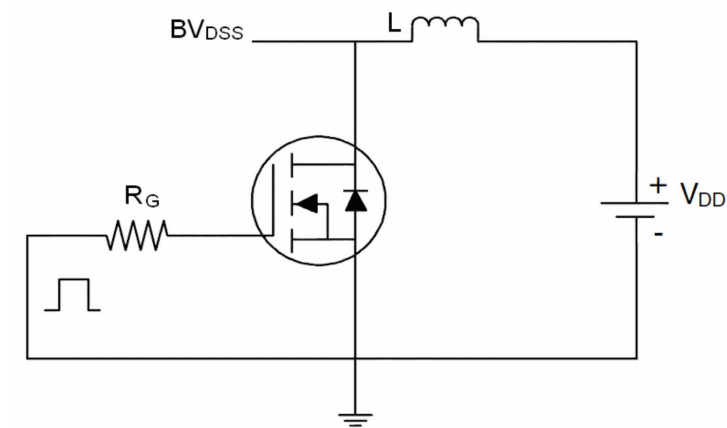


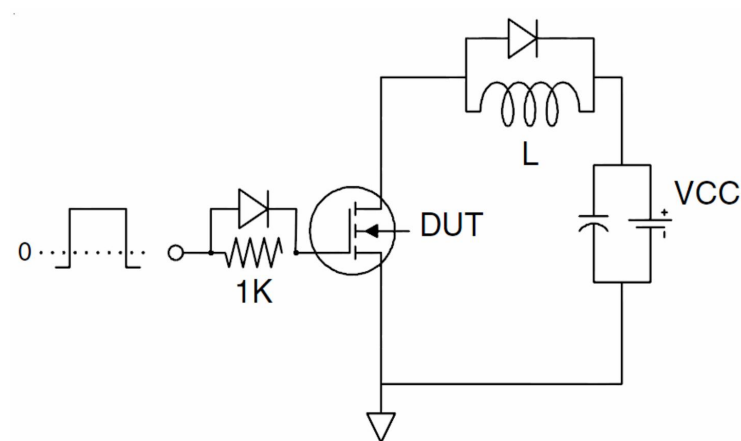
Figure 11 Normalized Maximum Transient Thermal Impedance

Test Circuit

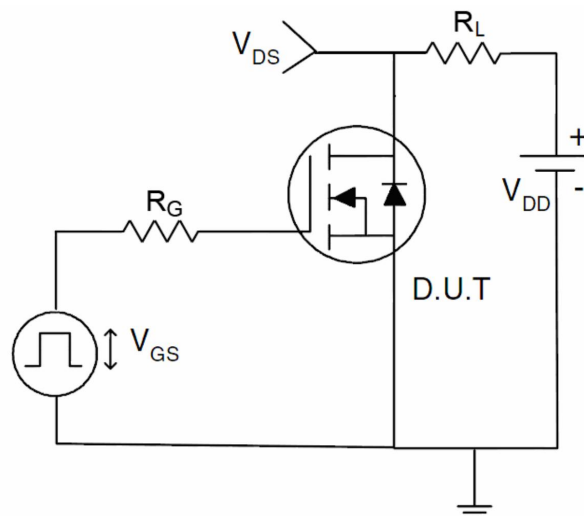
1) E_{AS} test Circuits



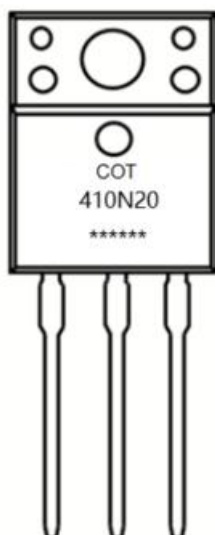
2) Gate charge test Circuit



3) Switch Time Test Circuit



Marking Instructions



Note:

COT:

410N20:

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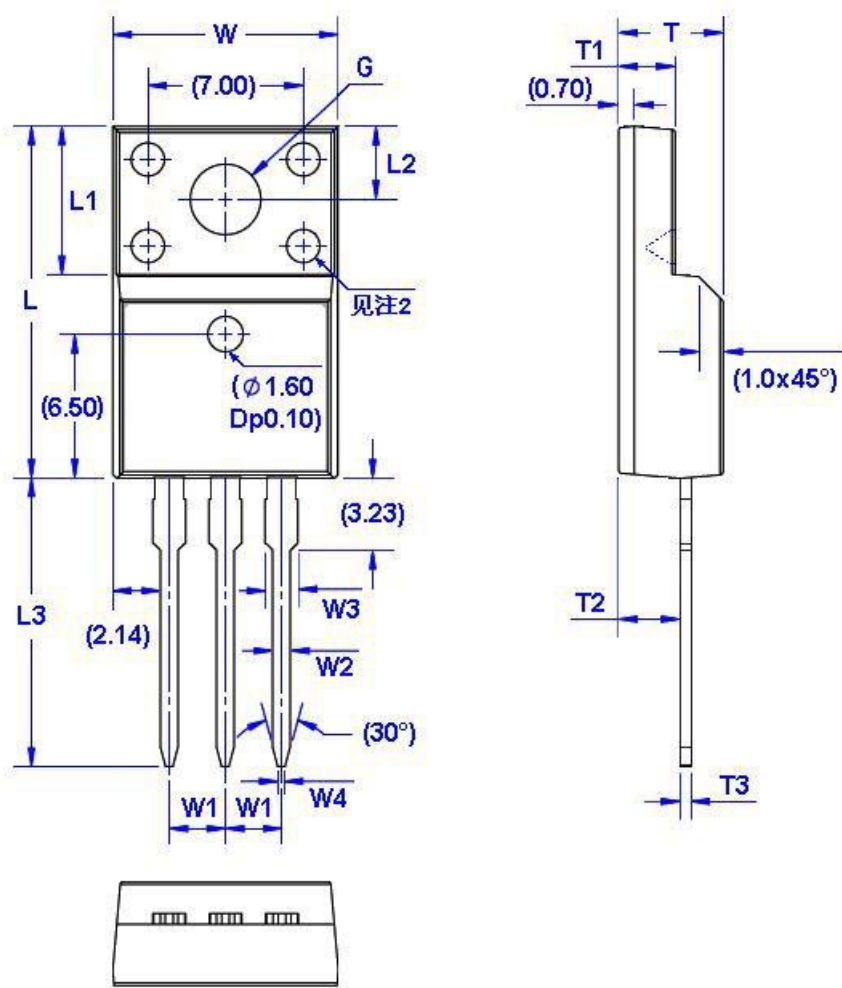
Company Code

Product Type Code

*: Inner Code * : Year Code **: Week Code **: Lot Code.

Package Outline Dimensions

TO-220F



Symbol	Size		Symbol	Size		Symbol	Size		Symbol	Size	
	Min	Max		Min	Max		Min	Max		Min	Max
W	9.96	10.36	W4	0.25	0.45	L3	12.78	13.18	T3	0.45	0.60
W1	2.54 (TYP)		L	15.67	16.07	T	4.50	4.90	G(Φ)	3.08	3.28
W2	0.70	0.90	L1	6.48	6.88	T1	2.34	2.74			
W3	1.24	1.47	L2	3.20	3.40	T2	2.56	2.96			