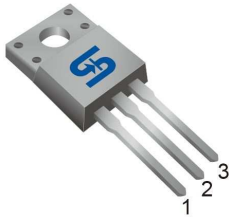


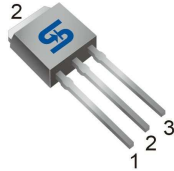
TSM60N380

600V, 11A, 0.38Ω
N-Channel Power MOSFET

ITO-220



TO-251
(IPAK)



Pin Definition:

1. Gate
2. Drain
3. Source

Key Parameter Performance

Parameter	Value	Unit
V_{DS}	600	V
$R_{DS(on)}$ (max)	0.38	Ω
Q_g	20.5	nC

TO-252
(DPAK)



Features

- Super-Junction technology
- High performance due to small figure-of-merit
- High ruggedness performance
- High commutation performance

Application

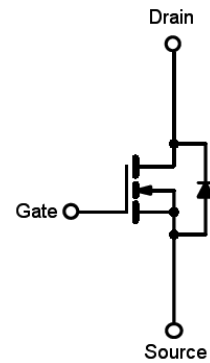
- Power Supply.
- Lighting

Ordering Information

Part No.	Package	Packing
TSM60N380CI C0G	ITO-220	50pcs / Tube
TSM60N380CH C5G	TO-251	75pcs / Tube
TSM60N380CP ROG	TO-252	2.5kpcs / 13" Reel

Note: "G" denotes for Halogen- and Antimony-free as those which contain
<900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl)
and <1000ppm antimony compounds

Block Diagram



N-Channel MOSFET

Absolute Maximum Ratings ($T_A=25^\circ\text{C}$ unless otherwise noted)

Parameter	Symbol	Limit		Unit
		ITO-220	IPAK/DPAK	
Drain-Source Voltage	V_{DS}	600		V
Gate-Source Voltage	V_{GS}	±30		V
Continuous Drain Current ^(Note 1)	I_D	11		A
Pulsed Drain Current ^(Note 2)	I_{DM}	33		A
Total Power Dissipation @ $T_C=25^\circ\text{C}$	P_{DTOT}	33	125	W
Single Pulsed Avalanche Energy ^(Note 3)	E_{AS}	169		mJ
Single Pulsed Avalanche Current ^(Note 3)	I_{AS}	2.6		A
Operating Junction and Storage Temperature Range	T_J, T_{STG}	- 55 to +150		°C

Thermal Performance

Parameter	Symbol	Limit		Unit
		ITO-220	IPAK/DPAK	
Junction to Case Thermal Resistance	$R_{\theta JC}$	3.8	1	°C/W
Junction to Ambient Thermal Resistance	$R_{\theta JA}$	62		°C/W

Electrical Specifications ($T_J=25^{\circ}\text{C}$ unless otherwise noted)

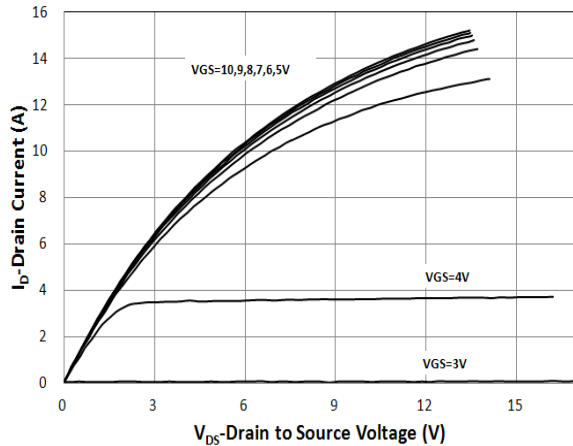
Parameter	Conditions	Symbol	Min	Typ	Max	Unit
Static (Note 4)						
Drain-Source Breakdown Voltage	$V_{GS} = 0V, I_D = 250\mu A$	BV_{DSS}	600	--	--	V
Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = 250\mu A$	$V_{GS(TH)}$	2		4	V
Gate Body Leakage	$V_{GS} = \pm 30V, V_{DS} = 0V$	I_{GSS}	--	--	± 100	nA
Zero Gate Voltage Drain Current	$V_{DS} = 600V, V_{GS} = 0V$	I_{DSS}	--	--	1	μA
Drain-Source On-State Resistance	$V_{GS} = 10V, I_D = 5.5A$	$R_{DS(ON)}$	--	0.31	0.38	Ω
Dynamic (Note 5)						
Total Gate Charge	$V_{DS} = 380V, I_D = 11A,$ $V_{GS} = 10V$	Q_g	--	20.5	--	nC
Gate-Source Charge		Q_{gs}	--	4.8	--	
Gate-Drain Charge		Q_{gd}	--	6.5	--	
Input Capacitance	$V_{DS} = 100V, V_{GS} = 0V,$ $f = 1.0MHz$	C_{iss}	--	1040	--	pF
Output Capacitance		C_{oss}	--	66	--	
Gate Resistance	$f=1MHz, \text{open drain}$	R_g	--	3.2	--	Ω
Switching (Note 6)						
Turn-On Delay Time	$V_{DD} = 380V,$ $R_{GEN} = 35\Omega,$ $I_D = 11A, V_{GS} = 10V,$	$t_{d(on)}$	--	24	--	ns
Turn-On Rise Time		t_r	--	28	--	
Turn-Off Delay Time		$t_{d(off)}$	--	70	--	
Turn-Off Fall Time		t_f	--	60	--	
Source-Drain Diode (Note 4)						
Forward On Voltage	$I_S=11A, V_{GS}=0V$	V_{SD}	--	--	1.4	V
Reverse Recovery Time	$V_R=200V, I_S=5.5A$ $dI_F/dt=100A/\mu s$	t_{rr}	--	210	--	ns
Reverse Recovery Charge		Q_{rr}	--	1.8	--	μC

Notes:

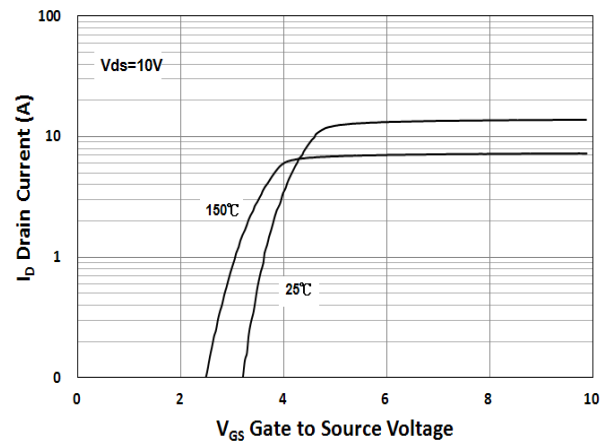
- Current limited by package
- Pulse width limited by the maximum junction temperature
- $L=50mH, I_{AS}=2.6A, V_{DD}=50V, R_G=25\Omega$, Starting $T_J=25^{\circ}\text{C}$
- Pulse test: $PW \leq 300\mu s$, duty cycle $\leq 2\%$
- For DESIGN AID ONLY, not subject to production testing.
- Switching time is essentially independent of operating temperature.

Electrical Characteristics Curves

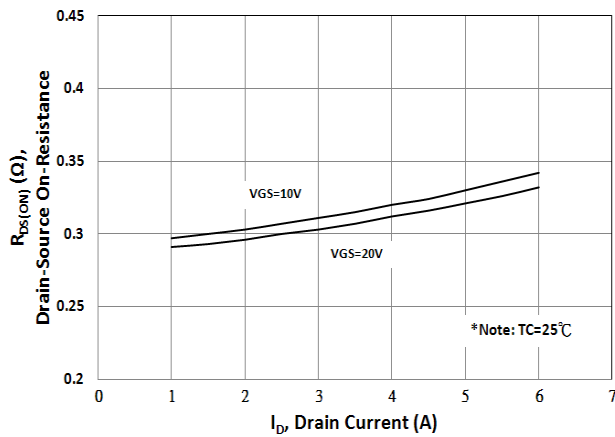
Output Characteristics



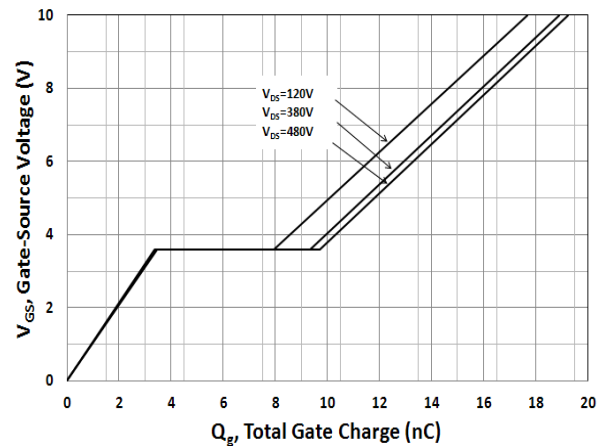
Transfer Characteristics



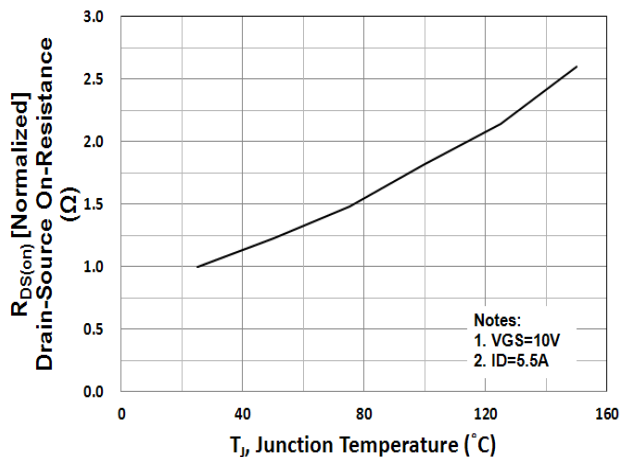
On-Resistance vs. Drain Current



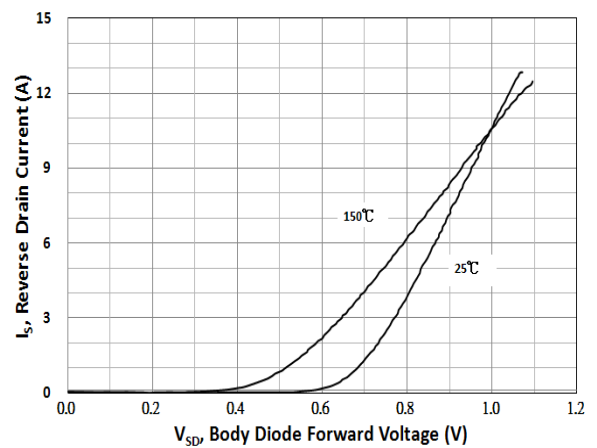
Gate-Source Voltage vs. Gate Charge



On-Resistance vs. Junction Temperature

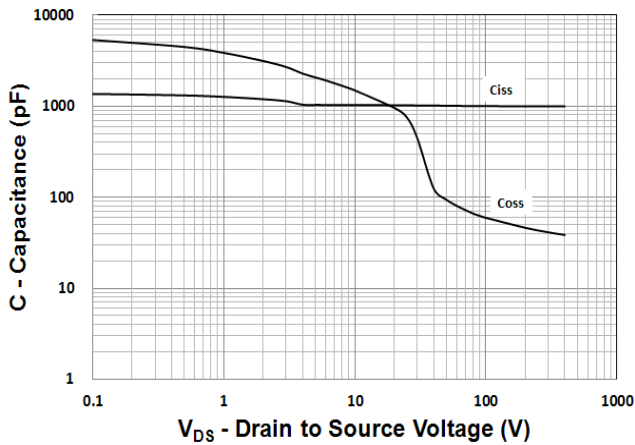


Source-Drain Diode Forward Current vs. Voltage

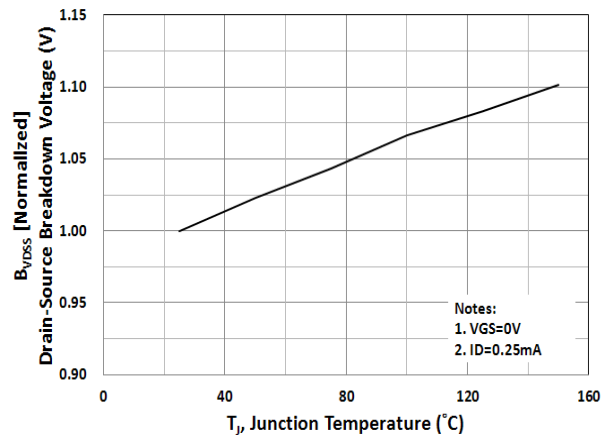


Electrical Characteristics Curves

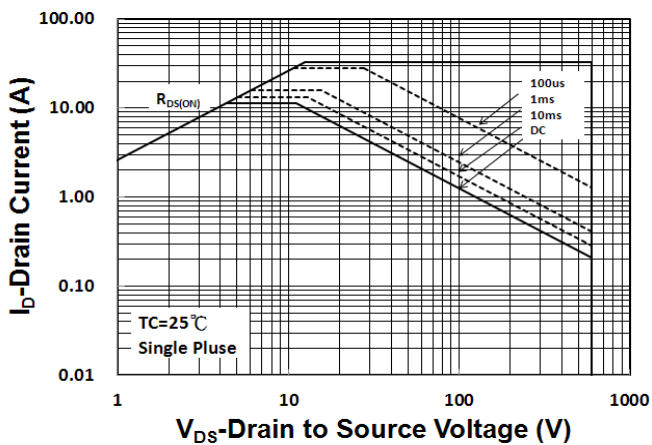
Capacitance vs. Drain-Source Voltage



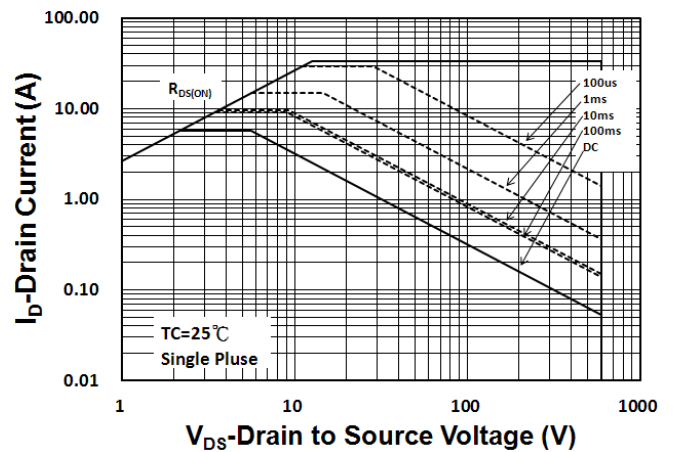
BV_{DSS} vs. Junction Temperature



Maximum Safe Operating Area (DPAK/IPAK)

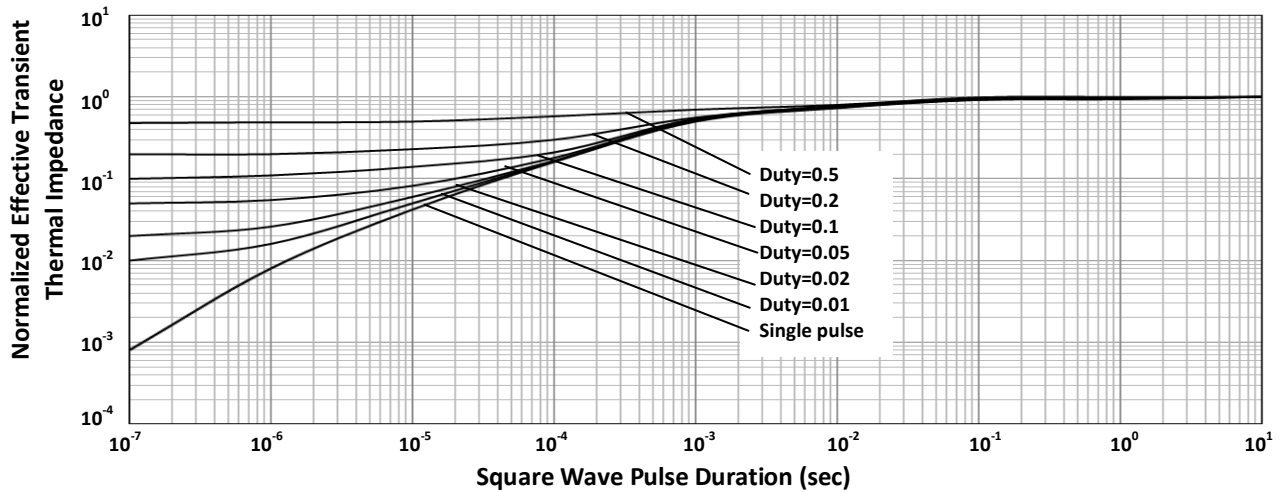


Maximum Safe Operating Area (ITO-220)

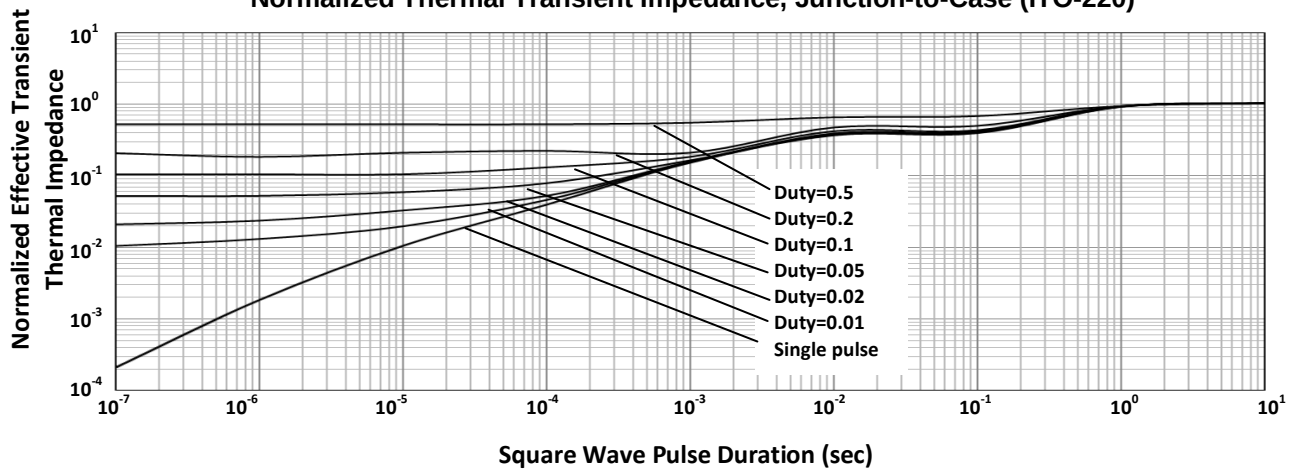


Electrical Characteristics Curve

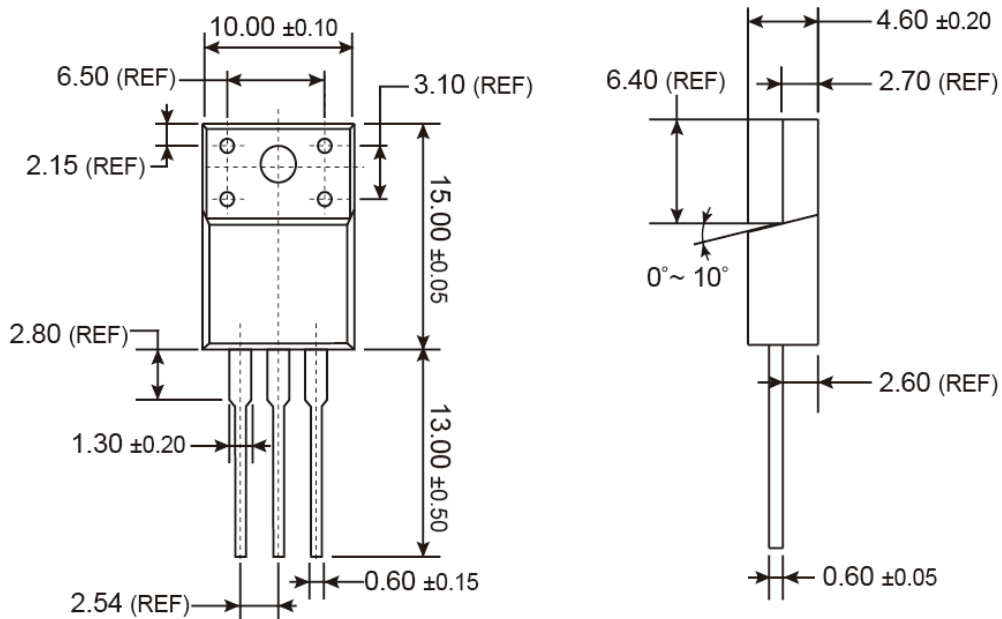
Normalized Thermal Transient Impedance, Junction-to-Case (DPAK/IPAK)



Normalized Thermal Transient Impedance, Junction-to-Case (ITO-220)

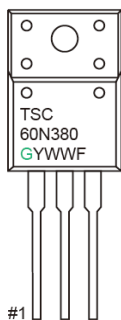


ITO-220 Mechanical Drawing



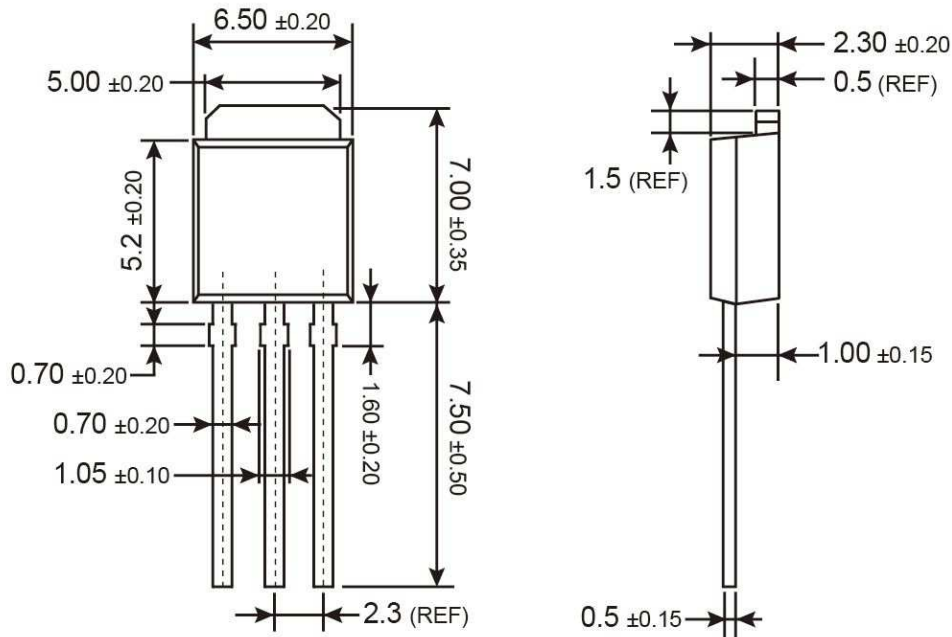
Unit: Millimeters

Marking Diagram



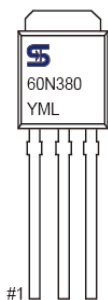
- G** = Halogen Free
- Y** = Year Code
- WW** = Week Code (01~52)
- F** = Factory Code

TO-251 (IPAK) Mechanical Drawing



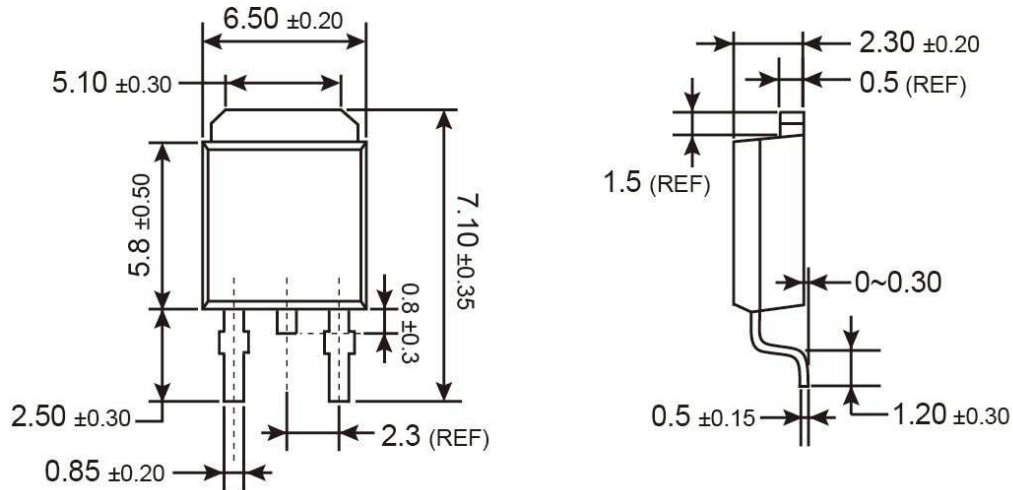
Unit: Millimeters

Marking Diagram



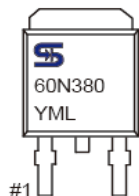
- Y** = Year Code
- M** = Month Code for Halogen Free Product
(**O**=Jan, **P**=Feb, **Q**=Mar, **R**=Apr, **S**=May, **T**=Jun, **U**=Jul, **V**=Aug, **W**=Sep, **X**=Oct, **Y**=Nov, **Z**=Dec)
- L** = Lot Code

TO-252 (DPAK) Mechanical Drawing



Unit: Millimeters

Marking Diagram



- Y** = Year Code
- M** = Month Code for Halogen Free Product
(**O**=Jan, **P**=Feb, **Q**=Mar, **R**=Apr, **S**=May, **T**=Jun, **U**=Jul, **V**=Aug, **W**=Sep, **X**=Oct, **Y**=Nov, **Z**=Dec)
- L** = Lot Code

TSM60N380

600V, 11A, 0.38Ω
N-Channel Power MOSFET

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