



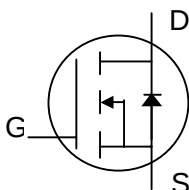
N-channel Enhancement-mode Power MOSFET

Simple Drive Requirement

Low On-resistance

Fast Switching Performance

RoHS-compliant, halogen-free



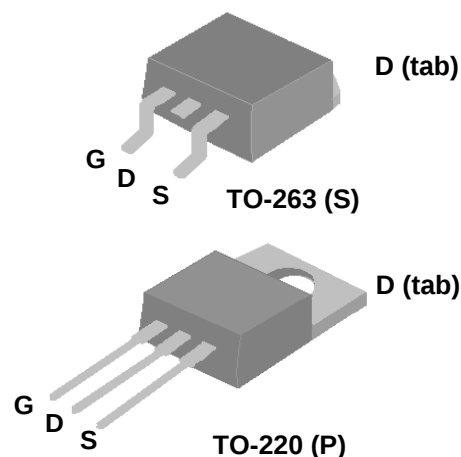
BV_{DSS}	30V
$R_{DS(ON)}$	12m Ω
I_D	45A

Description

Advanced Power MOSFETs from APEC provide the designer with the best combination of fast switching, low on-resistance and cost-effectiveness.

The AP60T03GS-HF-3 is in the TO-263 package, which is widely used for commercial and industrial surface-mount applications, and is well suited for low voltage applications such as DC/DC converters.

The AP60T03GP-HF-3 is in the TO-220 through-hole package which is used where a low PCB footprint or an attached heatsink is required.



Absolute Maximum Ratings

Symbol	Parameter	Rating	Units
V_{DS}	Drain-Source Voltage	30	V
V_{GS}	Gate-Source Voltage	± 20	V
I_D at $T_C=25^\circ\text{C}$	Continuous Drain Current	45	A
I_D at $T_C=100^\circ\text{C}$	Continuous Drain Current	32	A
I_{DM}	Pulsed Drain Current ¹	120	A
P_D at $T_C=25^\circ\text{C}$	Total Power Dissipation	44	W
	Linear Derating Factor	0.35	W/ $^\circ\text{C}$
T_{STG}	Storage Temperature Range	-55 to 175	$^\circ\text{C}$
T_J	Operating Junction Temperature Range	-55 to 175	$^\circ\text{C}$

Thermal Data

Symbol	Parameter	Value	Units
R_{thj-c}	Maximum Thermal Resistance, Junction-case	3.4	$^\circ\text{C/W}$
R_{thj-a}	Maximum Thermal Resistance, Junction-ambient	62	$^\circ\text{C/W}$

Ordering Information

AP60T03GS-HF-3TR : in RoHS-compliant halogen-free TO-263, shipped on tape and reel (800 pcs/reel)

AP60T03GP-HF-3TB : in RoHS-compliant halogen-free TO-220, shipped in tubes (50pcs/tube)



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

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
BV_{DSS}	Drain-Source Breakdown Voltage	$V_{GS}=0V, I_D=250\mu A$	30	-	-	V
$\Delta BV_{DSS}/\Delta T_J$	Breakdown Voltage Temperature Coefficient	Reference to 25°C , $I_D=1mA$	-	0.03	-	$V/^{\circ}\text{C}$
$R_{DS(ON)}$	Static Drain-Source On-Resistance	$V_{GS}=10V, I_D=20A$	-	-	12	$m\Omega$
		$V_{GS}=4.5V, I_D=15A$	-	-	25	$m\Omega$
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_D=250\mu A$	1	-	3	V
g_{fs}	Forward Transconductance	$V_{DS}=10V, I_D=10A$	-	25	-	S
I_{DSS}	Drain-Source Leakage Current ($T_J=25^{\circ}\text{C}$)	$V_{DS}=30V, V_{GS}=0V$	-	-	1	μA
	Drain-Source Leakage Current ($T_J=175^{\circ}\text{C}$)	$V_{DS}=24V, V_{GS}=0V$	-	-	250	μA
I_{GSS}	Gate-Source Forward Leakage	$V_{GS}=\pm 20V$	-	-	± 100	nA
Q_g	Total Gate Charge ²	$I_D=20A$	-	11.6	19	nC
Q_{gs}	Gate-Source Charge	$V_{DS}=24V$	-	3.9	-	nC
Q_{gd}	Gate-Drain ("Miller") Charge	$V_{GS}=4.5V$	-	7	-	nC
$t_{d(on)}$	Turn-on Delay Time ²	$V_{DS}=15V$	-	8.8	-	ns
t_r	Rise Time	$I_D=20A$	-	57.5	-	ns
$t_{d(off)}$	Turn-off Delay Time	$R_G=3.3\Omega, V_{GS}=10V$	-	18.5	-	ns
t_f	Fall Time	$R_D=0.75\Omega$	-	6.4	-	ns
C_{iss}	Input Capacitance	$V_{GS}=0V$	-	1135	1816	pF
C_{oss}	Output Capacitance	$V_{DS}=25V$	-	200	-	pF
C_{rss}	Reverse Transfer Capacitance	$f=1.0MHz$	-	135	-	pF

Source-Drain Diode

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
V_{SD}	Forward On Voltage ²	$I_S=45A, V_{GS}=0V$	-	-	1.3	V
I_{rr}	Reverse Recovery Time ²	$I_S=20A, V_{GS}=0V$	-	23.3	-	ns
V_{rr}	Reverse Recovery Charge	$dI/dt=100A/\mu s$	-	16	-	nC

Notes:

1. Pulse width limited by maximum junction temperature.
2. Pulse width $<300\mu s$, duty cycle $<2\%$.

THIS PRODUCT IS SENSITIVE TO ELECTROSTATIC DISCHARGE, PLEASE HANDLE WITH CAUTION.

USE OF THIS PRODUCT AS A CRITICAL COMPONENT IN LIFE SUPPORT OR OTHER SIMILAR SYSTEMS IS NOT AUTHORIZED.

APEC DOES NOT ASSUME ANY LIABILITY ARISING OUT OF THE APPLICATION OR USE OF ANY PRODUCT OR CIRCUIT DESCRIBED HEREIN; NEITHER DOES IT CONVEY ANY LICENSE UNDER ITS PATENT RIGHTS, NOR THE RIGHTS OF OTHERS.

APEC RESERVES THE RIGHT TO MAKE CHANGES WITHOUT FURTHER NOTICE TO ANY PRODUCTS HEREIN TO IMPROVE RELIABILITY, FUNCTION OR DESIGN.



Typical Electrical Characteristics

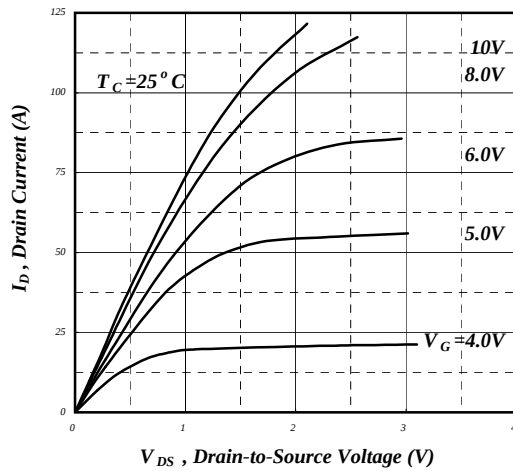


Fig 1. Typical Output Characteristics

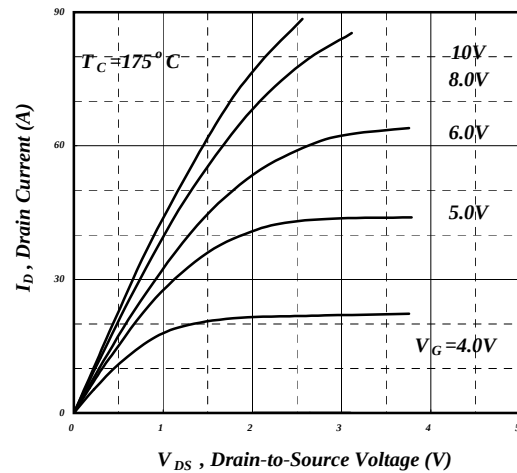


Fig 2. Typical Output Characteristics

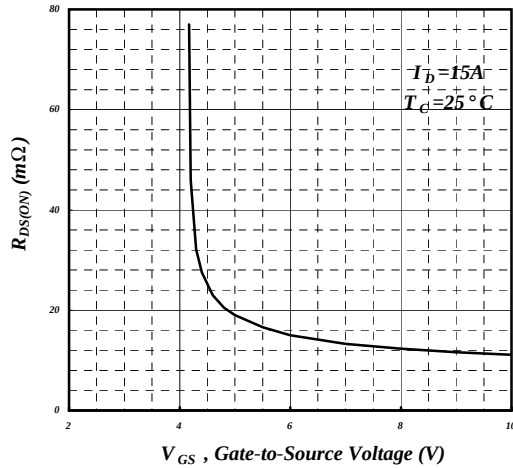


Fig 3. On-Resistance vs. Gate Voltage

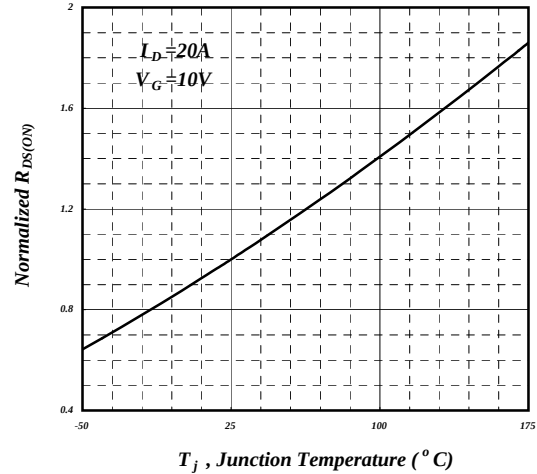


Fig 4. Normalized On-Resistance
vs. Junction Temperature

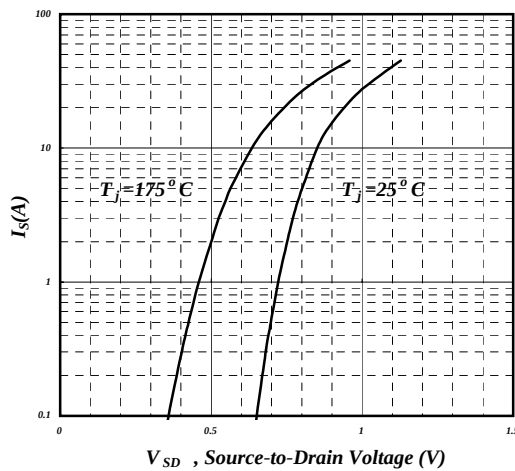


Fig 5. Forward Characteristic of
Reverse Diode

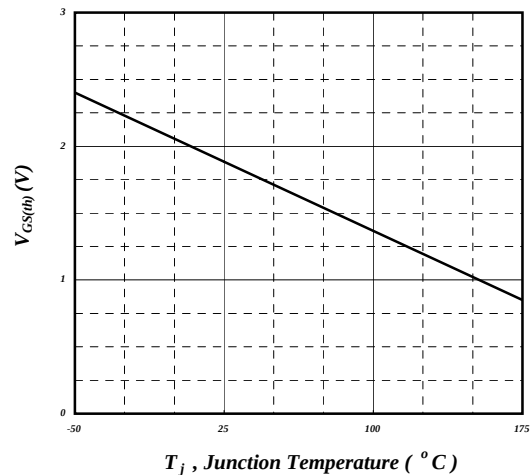


Fig 6. Gate Threshold Voltage v.s.
Junction Temperature



Typical Electrical Characteristics (cont.)

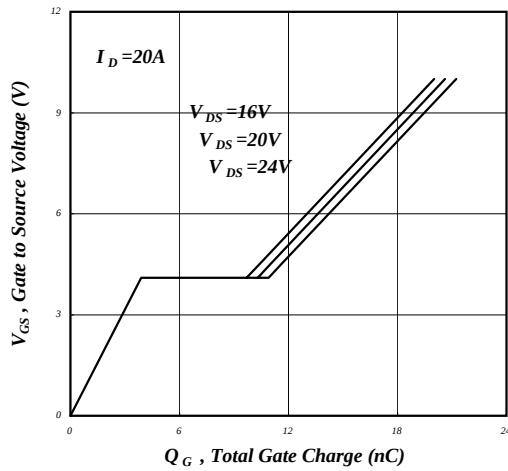


Fig 7. Gate Charge Characteristics

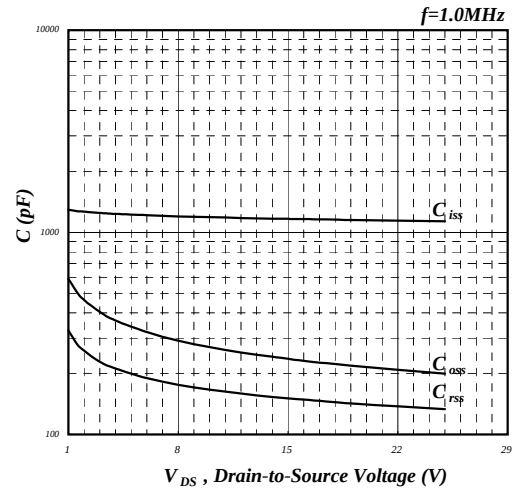


Fig 8. Typical Capacitance Characteristics

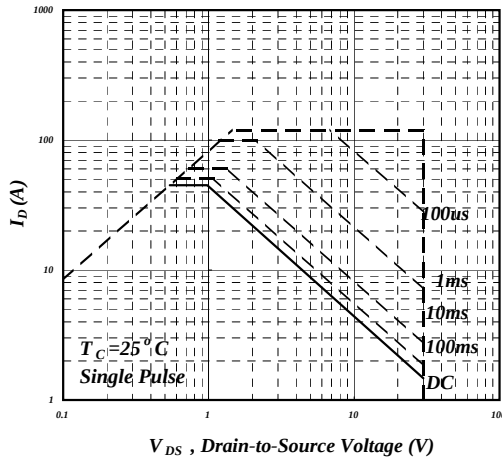


Fig 9. Maximum Safe Operating Area

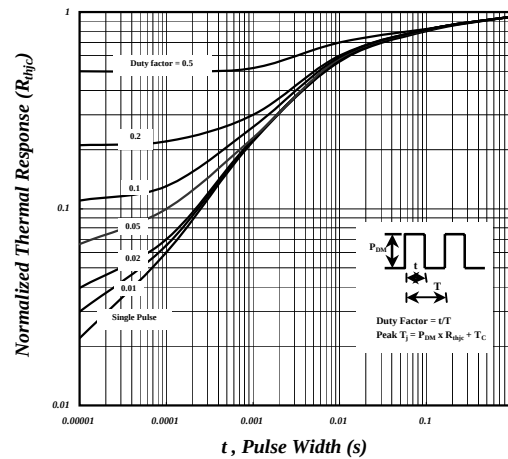


Fig 10. Effective Transient Thermal Impedance

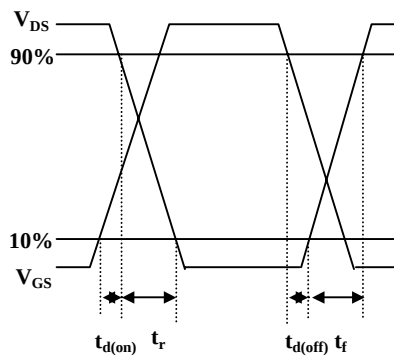


Fig 11. Switching Time Waveform

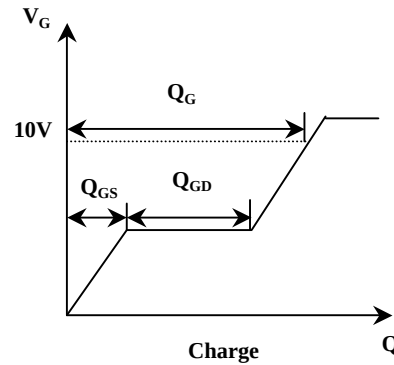
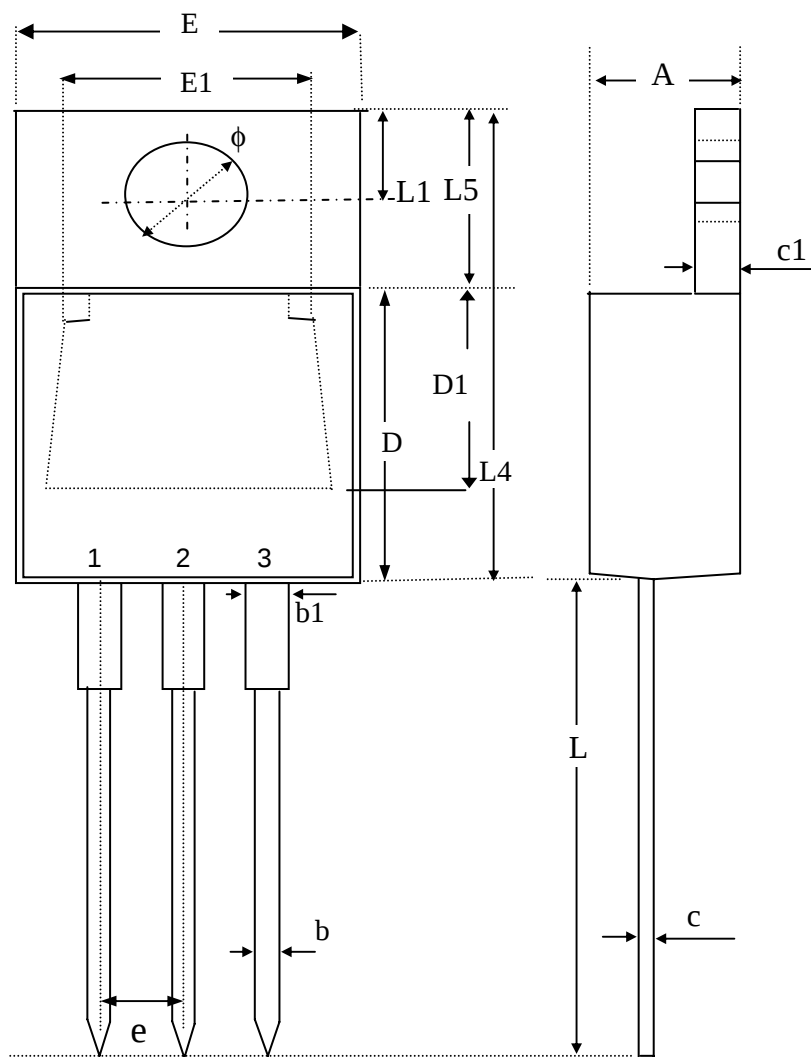


Fig 12. Gate Charge Waveform



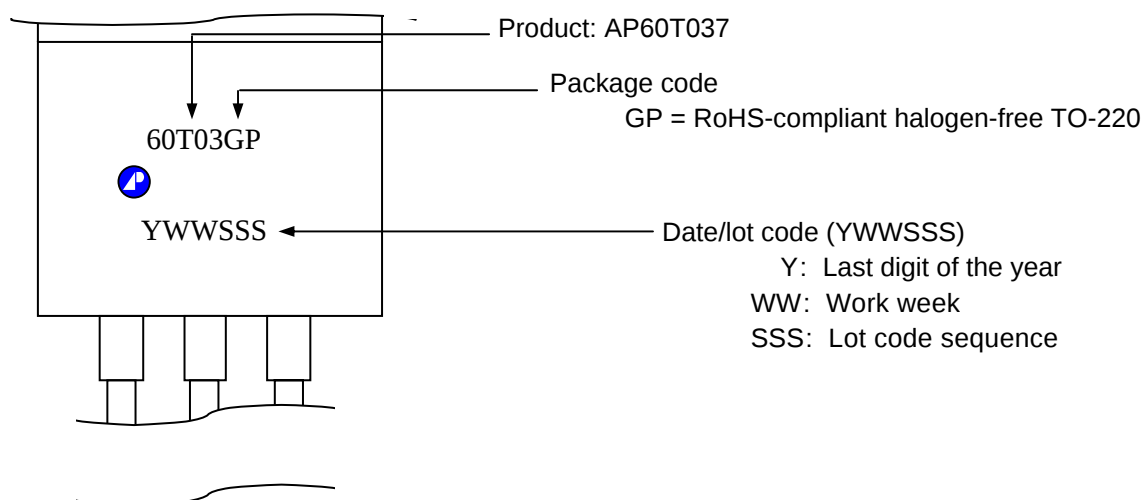
Package Dimensions: TO-220



SYMBOLS	Millimeters		
	MIN	NOM	MAX
A	4.40	4.60	4.80
b	0.76	0.88	1.00
D	8.60	8.80	9.00
c	0.36	0.43	0.50
E	9.80	10.10	10.40
L4	14.70	15.00	15.30
L5	6.20	6.40	6.60
D1	5.10 REF.		
c1	1.25	1.35	1.45
b1	1.17	1.32	1.47
L	13.25	13.75	14.25
e	2.54 REF.		
L1	2.60	2.75	2.89
φ	3.71	3.84	3.96
E1	7.4 REF.		

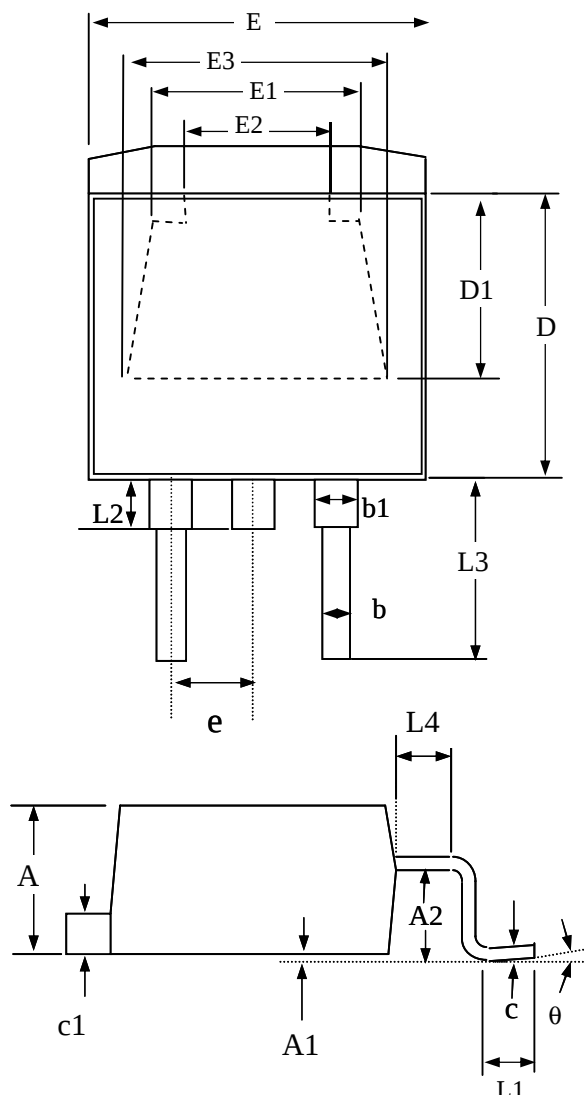
1. All dimensions are in millimeters.
2. Dimensions do not include mold protrusions.

Marking Information: TO-220





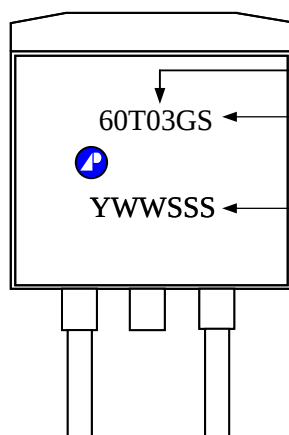
Package Dimensions: TO-263



SYMBOLS	Millimeters		
	MIN	NOM	MAX
A	4.25	4.75	5.20
A1	0.00	0.15	0.30
A2	2.20	2.45	2.70
b	0.70	0.90	1.10
b1	1.07	1.27	1.47
c	0.30	0.45	0.60
c1	1.15	1.30	1.45
D	8.30	8.90	9.40
D1	----	5.10(ref)	----
E	9.70	10.10	10.50
E1	----	7.40(ref)	----
E2	----	6.40(ref)	----
E3	----	8.00(ref)	----
e	2.04	2.54	3.04
L1	----	2.54(ref)	----
L2	-----	1.50	-----
L3	4.50	4.90	5.30
L4	-----	1.50	----
θ	0°	-----	5°

1. All dimensions are in millimeters.
2. Dimensions do not include mold protrusions.

Marking Information: TO-263



Product: AP60T03

Package code:

GS = RoHS-compliant halogen-free TO-263

Date Code (YWWSSS)

Y : Last digit of the year

WW : Work week

SSS : Lot code sequence